World Journal of Laparoscopic Surgery

An Official Publication of the World Association of Laparoscopic Surgeons, UK

WJOLS

Also available online at
www.jaypeejournals.com
www.wjols.com

Access Online Resources

For more details, visit
www.wjols.com

Bibliographic Listings:
ProQuest, Scopus, Journals Factor,
EBSCO,Genamics JournalSeek, Emcare, HINARI, Embase,
J Gate, Google Scholar, Ulrich, CiteFactor, SIS,
OAJI, MIAR, SIF, COSMOS, ESJI, SJIF, SJR, IIJIF, ICI

JAYPEE Jaypee Journals

Editorial

As a Minimal Access Surgeons, we have made a commitment to lifelong learning. You cannot think of a single laparoscopic surgery that you have performed the same way when you were in training. The mission of World Journal of Laparoscopic Surgery (WJOLS) is to publish peer-reviewed articles in the fields of laparoscopic surgery, although the journal strives to publish quality articles submitted from members and nonmembers of World Association of Laparoscopic Surgeons (WALS) around the world, there is a strong emphasis on the concepts of evidence based surgery, to improve surgeon`s interest in using an evidence-based approach in clinical practice and to reinforce the requirement for laparoscopic surgeons to get involved in minimal access surgery as surgical research and practice. We want to help laparoscopic surgeons "work smarter, not harder," implement new laparoscopic and robotic technologies into their practices, and find creative financial advantages for surgeon that are both legal and compliant.

Nowadays laparoscopic surgery is a gold standard treatment of all type of inguinal hernia operation, gastrointestinal surgery, pediatric surgery and gynecological surgery therefore every surgeon and gynecologist must keep their knowledge up-to-date. With rapidly evolving technology, continuously advancing procedures, and ever-increasing documentation requirements, it's hard to stay on top of all. Our goal, as an editorial staff of WJOLS, is to provide a journal where every laparoscopic article, column, and feature contains maximum information that directly benefits your practice as a surgeon or gynecologist, it should also benefit your patients, and keeps you informed of the latest techniques, procedures, and products.

I hope that this classic journal will remain of value to laparoscopic surgeons, urologist, and gynecologist, whether already well-established in laparoscopic surgery or just embarking on a laparoscopic surgical career. This issue contains many articles with a strong emphasis on recent advancement in laparoscopic surgery. I hope the readers will like this issue very much and give their valuable feedback.

It is with great pleasure that I express my gratitude to all my readers and WALS members that has appreciated and loved WJOLS. I would also appreciate your advice and suggestions for further improvement of this peer-reviewed journal.

R.K.Mishra
MBBS, MS, MRCS, Dip. Lap, FICRS, FIMSA
Editor-in-Chief
World Journal of Laparoscopic Surgery
Chairman
World Laparoscopy Hospital
Gurgaon, India

10.5005/jp-journals-10033-1272

ORIGINAL ARTICLE

Comparison of Open and Laparoscopic Radical Cystectomy for Bladder Cancer: Safety and Early Oncological Results

[1]Reva Sergey, [2]Nosov Alexander, [3]Djalilov Imran, [4]Petrov Sergey

ABSTRACT

Objectives: To evaluate perioperative and postoperative morbidity and functional results of laparoscopic radical cystectomy (LRC) in a single-site cohort of patients by comparing it with standard open radical cystectomy (ORC).

Materials and methods: A prospective analysis was performed in 42 muscle invasive and locally advanced bladder cancer (BCa) patients who underwent radical cystectomy (RC) between February 2012 and March 2014 in N.N. Petrov Research Institute of Oncology, Saint Petersburg, Russia. The final cohort included 21 ORC and 21 LRC patients. The average patients' age was 64 (38 to 81) years, which did not differ between the groups. The pathological stage was similar in the LRC and ORC groups. Multivariable logistic and median regression was performed to evaluate the operating time, perioperative, and postoperative complications (30-day and 90-day) according to Clavien classification, readmission rates, and length of stay (LOS) – both totally and in ICU.

Results: The operating time during LRC was longer than that of ORC (398 *vs* 243 minutes respectively). Despite that, there was no statistically significant influence of the type of surgery on intraoperative complications – 14.3% in the ORC group and 4.7% in the LRC patients. The major complication rates (Clavien grade ≥ 3; 23.8 *vs* 19.4%) were similar between the groups. However, LRC had four times lower rate of minor complications (Clavien grade 1 and 2) compared to ORC (4.7 *vs* 19.0%). Laparoscopic radical cystectomy had a significantly shorter LOS (27.8 *vs* 22.6 days in the ORC and LRC groups respectively), but no significant differences in ICU stay existed (5.1 *vs* 2.1 days). Morbidity was presented by one patient in each group (average rate 5.8%). The common transfusion rate during and after surgical intervention was 19.6% and was higher in the ORC group (33.3 *vs* 4.7% in LRC); additionally, intraoperative bleeding was lower after laparoscopic cystectomy – the average volume of blood loss was 285 mL in LRC and 577 mL during ORC. Depending on the timing of complications, there were 30-day complications in 19 patients (37.2%) and 90 days in 27 patients (52.9%). The greatest difference was observed between the grades of gastrointestinal complications (foremost, ileus) with significantly better outcomes in the LRC patients – 14.2% compared to 47.6% in ORC.

Conclusion: We have found that LRC is safe and associated with lower blood loss, reduced postoperative ileus, and lower LOS compared with ORC. Using a population-based cohort, we have found that laparoscopic surgery for bladder cancer reduced minor complications (mainly due to lower bleeding and gastrointestinal complication rate) and had no impact on major complications.

Keywords: Bladder cancer, Complications, Ileal neobladder, Radical cystectomy.

How to cite this article: Sergey R, Alexander N, Imran D, Sergey P. Comparison of Open and Laparoscopic Radical Cystectomy for Bladder Cancer: Safety and Early Oncological Results. World J Lap Surg 2016;9(2):51-57.

Source of support: Nil

Conflict of interest: None

[1,3]Oncologist-urologist, [2]Chief, [4]Scientist

[1-4]Department of Oncourology, N.N. Petrov Research Institute of Oncology, Saint Petersburg, Russian Federation

Corresponding Author: Reva Sergery, Professor, Department of Oncourology, N.N. Petrov Research Institute of Oncology Saint Petersburg, Russian Federation, e-mail: sgreva79@mail.ru

INTRODUCTION

Despite significant improvements in perioperative complications during last decades, radical cystectomy (RC) in patients with bladder cancer (BCa) is thought to be a major operative procedure with potential for substantial morbidity and mortality.[1,2]

Due to a widespread use of the laparoscopic technique, minimally invasive RC and intestinal urinary reconstruction is becoming more and more common. This technique has some benefits in terms of duration of hospitalization with probably reduced morbidity of the procedure.[3-5] Among these techniques, laparoscopic radical cystectomy (LRC) has been demonstrated to be feasible, safe, and provides operative and functional advantages. Besides, minimally invasive approach could increase the number of patients eligible for adjuvant chemotherapy.[6] Despite that, technical difficulties and high cost of the procedure have hampered its widespread adoption. Recently, Smith et al[7] have showed that only 3% of surgeons performed purely intracorporeal urinary diversion. Moreover, despite significant improvement in mortality rates (from 2.4–15.0% in early series to 0–3.9% in recent reports), early complication rates were not reduced noticeably and still remain as high as 11 to 68%.[8]

In this study, we report the results of treatment of patients with BCa in terms of safety (30-day and 90-day complication rate) and immediate oncological results after LRC with complete intracorporeal ileal urinary diversion in 21 patients, by comparing them with the similar number of patients treated with open radical cystectomy (ORC).

MATERIALS AND METHODS

Between January 2012 and March 2014, 42 convective patients underwent RC at our institution as initial treatment for muscle invasive or locally advanced BCa, with no evidence of distant metastasis. Among these patients, 21 underwent LRC (group 1) and 21 ORC (group 2). The study protocol was approved by the institutional review board of N.N. Petrov Research Institute of Oncology. Pretreatment characteristics of patients are presented in Table 1. Preoperative evaluation was conducted according to the current European Association of Urology (EAU) guidelines. Patients with previous radiation therapy and/or radiotherapy were excluded from the study. Among all patients, in 2 (3.9%) of them cystectomy was performed due to non-muscle invasive bladder cancer (NMIBC), refractory to the intravesical BCG therapy. Preparation to the cystectomy included inter alia, mechanical (enema), or medicamental (laxatives) intestinal preparation. Open radical cystectomy and LRC were performed by one or two surgeons (AN or SP). The indications, contraindications, and techniques were described previously.[9-11] Briefly, according to the treatment protocol, standard or extended pelvic lymphadenectomy was performed in all cases; during the procedure in male patients, prostate and seminal vesicles were removed, whereas in women patients the ovarian, uterus, and anterior vagina wall were removed. In all the cases, purely intracorporeal incontinent urinary diversion was performed.

The postoperative care included no use of the nasogastric tube, early activation (1 day postoperatively), and early feeding (2 to 3 days postoperatively) of the patient. Removal of the abdominal drain was made when the output was < 100 mL/day. The ureteral stents were removed 10 to 14 days postoperatively.

Intraoperative, postoperative 30- and 90-day complications were assessed according to the modified Clavien–Dindo classification.[12] Pursuant to the patient protocol, the operation time, bleeding volume, and blood transfusion rates were checked and analyzed. In the early postoperative period, we assessed the impact of the surgery type on duration of hospitalization (totally and in ICU), intestinal and urinary complications separately in the 30- and 90-day periods, readmission and reoperation rates. All patients were eligible for a minimum 90-day follow-up. The follow-up data were collected from a patient survey 1 month after cystectomy and once per 3 months thereafter. Patients with positive surgical margins were managed in an adjuvant setting.

Differences in proportions and means were tested using a two-sided t-test. The value of $p \leq 0.05$ was accepted as statistically significant in rejecting the null hypothesis (no difference in proportions/means).

Table 1: Pretreatment patient characteristics

	Value	
Variable	*LRC (n = 21)*	*ORC (n = 21)*
Age (y) (average, IQR)	64.0 (37–78)	68.4 (52–80)
Clinical tumor stage, n (%)		
cT1	1 (4.3)	2 (9.5)
cT2	6 (26.1)	1 (4.8)
cT3-4	6 (26.1)	7 (33.3)
Sex:		
Male, n (%)	19 (90.4)	21 (100)
Female, n (%)	2 (9.6)	–
BMI, kg/m^2	34	32
Previous surgery, n (%)	7 (33.3)	5 (23.8)

LRC: Laparoscopic radical cystectomy; ORC: Open radical cystectomy; IQR: Interquartile range

RESULTS

Intraoperative and Pathomorphological Data

The operative data are summarized in Table 2. The average operating time was higher in the LRC group when assessed totally (368 *vs* 263 minutes) and separately in the extirpative (143 *vs* 118 minutes) and reconstructive (225 *vs* 145 minutes) steps, in laparoscopic and open surgery respectively ($p = 0.04$). Among intraoperative complications, the most serious one was damaging of the major blood vessels – one case in each group (due to intracorporeal sutures). The most frequent complication was bleeding (grade 2) which required blood transfusion seven times higher (33.3 *vs* 4.7%) in the ORC group ($p = 0.02$). No intraoperative mortality was observed. None of the cases required conversion to open cystectomy.

The median hospitalization duration was 12.6 and 21.1 days, which largely depended on (1) Perioperative comorbidity and (2) the day of removal of urethral stents.

The main intestinal function recovery criteria – median time to regular diet and to stool – were 4.3 and 4.4 days in the LRC group, and 6.2 and 7.5 days in the ORC group (p-value < 0.05 between the groups in both cases).

Table 2: Operative data

	Median value	
Variable	*LRC (n = 21)*	*ORC (n = 21)*
Total operative time, min	368	263
Extirpative component time, min	143	118
Reconstructive component time, min	225	145
Estimated blood loss, mL	285	577
Transfusion rate, %	4.7	33.3
Time to regular diet, days	4.3	6.2
Length of ICU stay, days	2.0	3.1
Time of hospital stay, days	12.6	21.1

LRC: Laparoscopic radical cystectomy; ORC: Open radical cystectomy; ICU: Intensive care unit

The pathologic data are presented in Table 3. None of the patients had concomitant incidental prostate cancer; all tumors were transitional cell carcinomas. The number of cases with carcinoma in situ was not assessed. The positive surgical margin rate was similar in both groups (9.5%). These 4 (2 in both groups) patients, as well as 11 (5 and 6 in the LRC and ORC groups respectively) patients with positive lymph nodes, received adjuvant chemotherapy. All pathological data did not differ significantly between the groups.

Early Postoperative Period

In any grade, the 30-day complication rate was 35.7% (15 patients) – 47.6 and 23.8% in the ORC and LRC groups respectively ($p < 0.05$). In 23 (54.8%) patients 90-day complications were observed – 14 (66.7%) and 9 (42.9%) after open and laparoscopic RC respectively ($p = 0.04$). In each group 30-day mortality occurred in 1 patient ($p = 0.6$). Distribution of patients according to the grade of complications and time of their development is presented in Table 4, and according to the type of event and treatment strategy in Table 5.

Reoperation was performed in 4 (19.0%) and 2 (9.0%) of the patients in the ORC [anastomotic ureteroileal urinary leakage in one patient, pelvic abscess in one patient, and intestinal anastomotic failure (leakage or ileus) in three patients] and LRC (one patient both in anastomotic ureteroileal urinary leakage and intestinal anastomotic leakage) groups respectively ($p = 0.65$). No cases of conversion to open surgery and no perioperative mortalities were reported.

We did not find significant difference between the groups in neither intraoperative ($p = 0.7$) nor 30-day ($p = 0.55$) complications with grade 3 and more.

Three patients (14.3%) in the ORC group and 2 (9.5%) in the LRC group required repeated hospitalization in 90 days after initial surgery ($p = 0.65$). The reason was grade 3 complications – acute upper urinary tract infection (one patient in each group), ileal obstruction (one patient in each group), and pelvic abscess (one patient in the ORC group).

Table 3: Pathological data

	Median value	
Pathologic outcome	*LRC (n = 21)*	*ORC (n = 21)*
pT stage		
pT1, n (%)	3 (14.3)	1 (4.8)
pT2, n (%)	6 (28.5)	6 (28.5)
pT3-4, n (%)	12 (57.2)	14 (66.7)
Removed lymph nodes, n (range)	14 (5–22)	15 (8–27)
pN+, n (%)	5 (23.8)	6 (28.5)
Positive surgical margine, n (%)	2 (9.5)	2 (9.5)

LRC: Laparoscopic radical cystectomy; ORC: Open radical cystectomy

Table 4: Postoperative data

	Median value	
Value	*LRC (n = 21)*	*ORC (n = 21)*
30-day complications		
Grade 0, n (%)	16 (76.1)	11 (52.3)
Grade 1 and 2, n (%)	2 (9.5)	6 (28.5)
Grade 3–5, n (%)	3 (14.2)	4 (19.0)
90-day complications		
Grade 0, n (%)	12 (57.1)	7 (33.3)
Grade 1 and 2, n (%)	3 (14.2)	7 (33.3)
Grade 3–5, n (%)	6 (28.5)	7 (33.3)
90-day readmission rate, n (%)	2 (9.5)	3 (14.2)

LRC: Laparoscopic radical cystectomy; ORC: Open radical cystectomy

Table 5: Postoperative complications

Category, n (%)	*Value*	*Treatment*	*Frequency, n (%)*
Infectious, 4 (12.9)	UTI	Anbiotics combined treatment	3 (75)
	Sepsis		1 (25)
Gastrointestinal, 11 (35.4)	Ileus intestinal anastomosis failure	Medicamentous surgery	1 (50) 1 (50)
Hematological, 2 (6.4)	Anemia	Surveillance medicamentous	1 (50) 1 (50)
Wound infection, 1 (3.2)	Pelvic abscess	Surgery	1 (100)
Urogenital, 9 (29.0)	Hydronohrosis	Medicamentous surgery	3 (42.9) 4 (57.1)
	Ureteroileal anastomosis failure	Surgery	2 (100)

DISCUSSION

Historically, RC has been associated with the highest risk of morbidity and mortality compared to all other major urologic procedures, particularly in the more elderly population. Standardized reports on complications after ORC using the validated Clavien reporting system reveal disappointingly high complication and mortality rates – from 26 to 64% and 1 to 7% respectively.[13-16]

Until recently, there has been a dearth in standardized reporting of complications after RC. Only 2% of reports (73 open series and 36 minimally invasive series) from 1995 to 2005 met at least nine of the critical reporting elements in surgical outcomes according to Donat.[17]

A lot of studies demonstrated the unmet need for treatment of MIBC in terms of safety and efficacy. The purpose of introduction of the minimally invasive approach was to improve operative, pathological, and short-term clinical outcomes to the open approach. According to recent data, LRC suggests that operative

results include lower intraoperative blood loss, earlier return to bowel function, less pain, and quicker postoperative convalescence.[18] However, complication reports may be limited by reporting and selection bias for healthier patients. Moreover, the difficulty in obtaining data on complications results from a lack of consistency in reporting complications.[19]

One of the limiting factors of laparoscopic cystectomy is its labor intensity and duration. Indeed, recent data show an increased treatment time compared to open surgery.[4] In our study, the duration of LRC was 1.6 times greater than ORC. However, when analyzing the entire series of laparoscopic surgery, a significant decrease was found in this indicator up to 1.3 times in the last 10 transactions compared to the first 10, which means that we gain experience. In other words, we find that LRC takes longer to do than open procedure but results in better functional outcomes with reduced blood loss, transfusion rate, shorter length of stay in hospital, and fewer complication rates. According to the recent literature, nearly 40% of this patient cohort experienced at least one readmission within 90 days following RC. No differences in age, gender, race, or stage were observed between patients who did *vs* did not undergo the ER. Gastrointestinal, wound, and deep vein thrombosis complications were most commonly documented with readmission within 30 days. Genitourinary, neurologic, and cardiac complications were more common in those with later readmissions. Stimson et al[18] showed that the readmission rates were as high as 27%, with bowel, urinary, and infectious complications being the most common reasons. The transfusion rate in one series was appr. 66%, with an average estimated blood loss of 1 l for 1,142 consecutive ORCs.[15] Our experience shows that in accordance with the mentioned studies, when comparing LRC and ORC, the results favor the use of the laparoscopic approach. Other important characteristics are the number of days in ICU and duration of hospitalization. There was no significant difference between these items ($p = 0.53$).

According to the Clivlend's clinic data, which has the greatest experience in minimally invasive RC with intracorporeal urinary diversion, this technique of intestinal substitution is significantly better than the extracorporeal one in terms of better intestinal function recovery. Other complication rates were comparable between both groups.[20] Totally, despite significant improvements in armamentarium and surgical technique, the complication rate after minimally invasive RC remains high. In the largest series, the 30-day complication rate is about 60 to 65%, and in 90 days complications occurred in nearly 80%.[21] Among all patients with 90-day complications, 80% had grade 1 and 2 according to Clavien system.[15] The results of our study suggest benefits of the minimally invasive approach.

Several studies showed survival impairment after intraoperative blood transfusion. Thus, the transfusion rate could be potentially important for patients due to its hypothetically immunosuppressive effect.[22] According to the literature, blood loss in open, laparoscopic, and robotic RC is about 700 to 1500, 250 to 790, and 22 to 460 respectively.[23] The same authors showed lower blood transfusion rate for minimally invasive RC [5 to 20% and 1 to 4% in LRC and robot-assisted RC (RARC) respectively] compared to the open procedure (14 to 40%).[24] Our study showed higher (compared to the literature data) blood loss during ORC, probably due to a lower number of patients. However, in the literature we found similar results with blood loss reduction due to reducing invasiveness of intervention.[25]

Another significant problem related to radical bladder surgery consists in gastrointestinal complications. Intraoperative rectal wall damage occurred at a relatively low rate – about 0.2% (up to 4% according to some data).[15] The same rate (0.2 to 2%) was noted for large blood vessels damaging both in LRC and ORC.[24] Such intraoperative adverse events (Table 2) were associated with locally advanced tumors and did not depend on the type of surgery (ORC or LRC).

With the minimally invasive approach, patients with ileal conduit urinary diversion had a decreased risk of complications compared to continent urinary diversions. Totally, the 90-day perioperative mortality rate was 5.3%.[26] According to our data, the most clinically significant event (in terms of hospital and ICU readmission rates, repeated surgery) was gastrointestinal complications, particularly, ileus. This event has the greatest differences among the patients after LRC (14.2%) and ORC (47.6%). Recent studies showed that postoperative ileus happened in 23, 3, and 8% of patients after open, laparoscopic, and robotic cystectomy respectively.[15,27] However, many studies used different definition of this event. Ramirez et al in the recent review found 21 articles with a clear definition of postoperative ileus. The most frequent one was absence of flatulence, stool on the 5th or 6th postoperative day; postoperative nausea and vomiting which required to stop enteral feeding and to start intravenous feeding and/or nasogastrointestinal intubation on the 5th or 6th postoperative day; absence of intestinal movement on the 5th postoperative day; intestinal movement impairment which lead to prolonged hospitalization.[28] Recovery of the bowel function and/or removal of the gastric tube and/or inability of oral food intake after 5 postoperative days were the criteria for establishment of dynamic intestinal obstruction (ileus) in our study. According to these, we

suspected ileus in 38 and 4.7% of patients in the I and II groups respectively. Suspicion of mechanical obstruction was an indication for repeated surgery – revision of the abdominal cavity. This was performed in seven (13.7%) cases. In the study conducted by Chang et al,[13] postoperative ileus was the most common cause for prolonged hospital stay after cystectomy. Our data support this position, making aware of the modern trends and standards for management of patients, which include, for example, minimizing the traumatic mechanical intraoperative effects on the intestine, which distinguishes the technique of laparoscopic cystectomy using the open method. The study made some changes in the technique of the operation and, predominantly, LRC. So, in the first 10 patients, ureterolieal anastomosis (UIA) formation was performed with interrupted sutures and holding the left ureter through the mesentery of the sigmoid colon, and in the next 4 to 5 cystectomies nodal sutures were made, and the left ureter was thrown over the sigmoid colon. This led to a significant decrease in the intestinal phase time from 250 to 200 minutes. Furthermore, there was a trend to reduce frequency in the formation of anastomotic strictures and, as a consequence, hydronephrosis (4% for the first 10 operations and 1% subsequently) with the absence of anastomosis defect (gap) developed (1 case in both groups).

Lymphocele and chyloperitoneum were more common than LRC (6.4%), whereas no differences were observed between ORC and RARC – about 2%.[15] In our results, the frequency of such complications did not differ among the groups.

Urinary fistula developed in about 1% after ORC, LRC, and RARC.[24] The incidence of UIA was higher after LRC in several studies – up to 15%, while after ORC and RARC the rate was 1.5 to 10%.[5,23,29] According to some assumptions, the risk factor for this complication is excessive dissection of the urether formation by extracorporeal anastomosis. However, in a recent study represented by Anderson et al,[30] the difference in frequency of UIA stricture formation between ORC and LRC was not significant, despite some differences (8.5 and 12.6% respectively, $p = 0.21$), and decreases with improvement of surgical technique.

In terms of oncological results, in recent meta-analysis Fonseka et al[19] showed that LRC provides better outcomes than ORC and similar to RARC. Totally, talking about early oncological results, we must reflect several factors: Surgical margins, the number of removed and positive lymph nodes. Data from the International Laparoscopic Cystectomy Registry (ILCR) demonstrate a soft-tissue surgical margins (STSMs) rate of 2%.[31] Advancing T stage, positive lymph nodes, and increasing age were independently associated with a higher likelihood of STSMs, while the number of cases and institution volume were not found to be predictive.[32] For every increase in pathological T stage above pT2, there was a five times higher chance for positive STSM ($p < 0.001$). In a series of 121 patients, Snow-Lisy et al[33] reported a positive STSM rate of 6.6%. In patients with large tumors and/or suspected extravesical disease, wide dissection of the perivesical tissue is recommended to reduce STSM rates.[34] We found positive surgical margin in two cases in both groups – 9.5% ($p > 0.05$).

The same absence of difference was noted regarding the lymph nodes – the average number of totally removed (15 and 16 in the LRC and ORC groups respectively) and the amount of positive nodes (5 and 6 in the LRC and ORC groups respectively). The 2004 consensus study by Herr et al[35] targeted at standardizing outcomes of surgical treatment for invasive bladder cancer and identified 15 lymph nodes as the minimal acceptable yield for this surgery. Generally, this rule matches all studies mentioned in this analysis.

Unfortunately, due to a short period of follow-up, we cannot provide survival analysis for our cohorts. However, several recent studies showed similar recurrence-free, cancer-specific, and overall survival after minimally invasive and open cystectomy. MD Anderson's low-risk cohort of MIBC showed a 5-year DSS of 81%; the same statistic published by Hautmann et al[4] for all-comers cT2-cT4a Nx was 71%.

The major limitations of our study are retrospective analysis, low number of patients in groups, single-center experience, lack of long-term oncological results, and possible biases. However, there are few studies comparing LRC and ORC, particularly with totally intracorporeal urinary diversion.

CONCLUSION

Laparoscopic cystectomy is a safe radical treatment of bladder cancer associated with reduced blood loss, lower incidence of early postoperative complications (including dynamic ileus), leading to a reduction in duration of hospitalization and good early functional results. However, to be recognized as a standard treatment, it requires more prospective data on safety of laparoscopic cystectomy, functional, oncological results, and cost-effectiveness. Moreover, for complete evaluation of LRC effectiveness and its adequate comparison with the open procedure, it is necessary to obtain long-term oncological results.

REFERENCES

1. Hollenbeck BK, Miller DC, Taub D, Dunn RL, Khuri SF, Henderson WG, Montie JE, Underwood W 3rd, Wei JT. Identifying risk factors for potentially avoidable complications following radical cystectomy. J Urol 2005 Oct;174(4 Pt 1): 1231-1237.

2. Lawrentschuk N, Colombo R, Hakenberg OW, Lerner SP, Månsson W, Sagalowsky A, Wirth MP. Prevention and management of complications following radical cystectomy for bladder cancer. Eur Urol 2010 Jun;57(6):983-1001.
3. Challacombe BJ, Bochner BH, Dasgupta P, Gill I, Guru K, Herr H, Mottrie A, Pruthi R, Redorta JP, Wiklund P. The role of laparoscopic cystectomy in the management of muscle-invasive bladder cancer with special emphasis on cancer control and complications. Eur Urol 2011 Oct;60(4):767-775.
4. Hautmann RE, Abol-Enein H, Davidsson T, Gudjonsson S, Hautmann SH, Holm HV, Lee CT, Liedberg F, Madersbacher S, Manoharan M, et al. ICUD-EAU International Consultation on Bladder Cancer 2012: urinary diversion. Eur Urol 2013 Jan;63(1):67-80.
5. Menon M, Hemal AK, Tewari A, Shrivastava A, Shoma AM, El-Tabey NA, Shaaban A, Abol-Enein H, Ghoneim MA. Nerve-sparing robot-assisted radical cystprostatectomy and urinary diversion. BJU Int 2003 Aug;92(3):232-236.
6. Colombo R. Editorial comment on: defining early morbidity of radical cystectomy for patients with bladder cancer using a standardized reporting methodology. Eur Urol 2009 Jan;55(1):175-176.
7. Smith AB, Raynor M, Amling CL, Busby JE, Castle E, Davis R, Nielsen M, Thomas R, Wallen EM, Woods M, et al. Multi-institutional analysis of robotic radical cystectomy for bladder cancer: perioperative outcomes and complications in 227 patients. J Laparoendosc Adv Surg Tech A 2012 Jan-Feb;22(1):17-21.
8. Daneshmand S, Ahmadi H, Schuckman AK, Mitra AP, Cai J, Miranda G, Djaladat H. Enhanced recovery after surgery in patients undergoing radical cystectomy for bladder cancer. J Urol 2014 Jul;192(1):50-56.
9. Witjes JA, Compérat E, Cowan NC, De Santis M, Gakis G, Lebret T, Ribal MJ, Van der Heijden AG, Sherif A, European Association of Urology. EAU guidelines on muscle-invasive and metastatic bladder cancer: summary of the 2013 guidelines. Eur Urol 2014 Apr;65(4):778-792.
10. Skinner DG. Technique of radical cystectomy. Urol Clin North Am 1981 Jun;8(2):353-366.
11. Simonato A, Gregori A, Lissiani A, Bozzola A, Galli S, Gaboardi F. Laparoscopic radical cystoprostatectomy: a technique illustrated step by step. Eur Urol 2003 Jul;44(1): 132-138.
12. Dindo D, Demartines N, Clavien PA. Classification of surgical complications. A new proposal with evaluation in a cohort of 6336 patients and results of a survey. Ann Surg 2004 Aug;240(2):205-213.
13. Chang SS, Cookson MS, Baumgartner RG, Wells N, Smith JA Jr. Analysis of early complications after radical cystectomy: results of a collaborative care pathway. J Urol 2002 May;167(5):2012-2016.
14. Quek ML, Stein JP, Daneshmand S, Miranda G, Thangathurai D, Roffey P, Skinner EC, Lieskovsky G, Skinner DG. A critical analysis of perioperative mortality from radical cystectomy. J Urol 2006 Mar;175(3 Pt 1):886-889; discussion 889-890.
15. Shabsigh A, Korets R, Vora KC, Brooks CM, Cronin AM, Savage C, Raj G, Bochner BH, Dalbagni G, Herr HW, et al. Defining early morbidity of radical cystectomy for patients with bladder cancer using a standardized reporting methodology. Eur Urol 2009 Jan;55(1):164-174.
16. Novara G, De Marco V, Aragona M, Boscolo-Berto R, Cavalleri S, Artibani W, Ficarra V. Complications and mortality after radical cystectomy for bladder transitional cell cancer. J Urol 2009 Sep;182(3):914-921
17. Donat SM. Standards for surgical complication reporting in urologic oncology: time for a change. Urology 2007 Feb;69(2):221-225.
18. Stimson CJ, Chang SS, Barocas DA, Humphrey JE, Patel SG, Clark PE, Smith JA Jr, Cookson MS. Early and late perioperative outcomes following radical cystectomy: 90-day readmissions, morbidity and mortality in a contemporary series. J Urol 2010 Oct;184(4):1296-1300.
19. Fonseka T, Ahmed K, Froghi S, Khan SA, Dasgupta P, Shamim Khan M. Comparing robotic, laparoscopic and open cystectomy: a systematic review and meta-analysis. Arch Ital Urol Androl 2015 Mar;31;87(1):41-48.
20. Azzouni FS, Din R, Rehman S, Khan A, Shi Y, Stegemann A, Sharif M, Wilding GE, Guru KA. The first 100 consecutive, robot-assisted, intracorporeal ileal conduits: evolution of technique and 90-day outcomes. Eur Urol 2013 Apr;63(4): 637-643.
21. Madersbacher S, Schmidt J, Eberle JM, Thoeny HC, Burkhard F, Hochreiter W, Studer UE. Long-term outcome of ileal conduit. J Urol 2003 Mar;169(3):985-990.
22. Hendrickson JE, Hillyer CD. Noninfectious serious hazards of transfusion. Anesth Analg 2009 Mar;108(3):759-769.
23. Ng CK, Kauffman EC, Lee MM, Otto BJ, Portnoff A, Ehrlich JR, Schwartz MJ, Wang GJ, Scherr DS. A comparison of postoperative complications in open versus robotic cystectomy. Eur Urol 2010 Feb;57(2):274-281.
24. Huang J, Lin T, Liu H, Xu K, Zhang C, Jiang C, Huang H, Yao Y, Guo Z, Xie W. Laparoscopic radical cystectomy with orthotopic ileal neobladder for bladder cancer: oncologic result of 171 cases with a median 3-year follow-up. Eur Urol 2010 Sep;58(3):442-449.
25. Kox ML, El-Galley R, Busby GE. Robotic versus open radical cystectomy: identification of patients who benefit from the robotic approach. J Endourol 2013 Jan;27(1):40-44.
26. Nazmy M, Yuh B, Kawachi M, Lau CS, Linehan J, Ruel NH, Torrey RR, Yamzon J, Wilson TG, Chan KG. Early and late complications of robot-assisted radical cystectomy: a standardized analysis by urinary diversion type. J Urol 2014 Mar;191(3):681-687.
27. Castillo OA, Abreu SC, Mariano MB, Tefilli MV, Hoyos J, Pinto I, Cerqueira JB, Gonzaga LF, Fonseca GN. Complications in laparoscopic radical cystectomy. The South American experience with 59 cases. Int Braz J Urol 2006 May-Jun;32(3):300-305.
28. Ramirez JA, McIntosh AG, Strehlow R, Lawrence VA, Parekh DJ, Svatek RS. Definition, incidence, risk factors and prevention of paralytic ileus following radical cystectomy: a systematic review. Eur Urol 2013 Oct;64(4):588-597.
29. Albisinni S, Limani K, Ingels L, Kwizera F, Bollens R, Hawaux E, Quackels T, Vanden Bossche M, Peltier A, Roumeguère T, et al. Long-term evaluation of oncologic and functional outcomes after laparoscopic open-assisted radical cystectomy: a match-pair analysis. World J Urol 2014 Dec;32(6):1455-1461.
30. Anderson CB, Morgan TM, Kappa S, Moore D, Clark PE, Davis R, Penson DF, Barocas DA, Smith JA Jr, Cookson MS, et al. Ureteroenteric anastomotic strictures after radical cystectomy – does operative approach matter? J Urol 2013 Feb;189(2):541-547.

31. Haber GP, Crouzet S, Gill IS. Laparoscopic and robotic assisted radical cystectomy for bladder cancer: a critical analysis. Eur Urol 2008 Jul;54(1):54-62.
32. Hellenthal NJ, Hussain A, Andrews PE, Carpentier P, Castle E, Dasgupta P, Kaouk J, Khan S, Kibel A, Kim H, et al. Surgical margin status after robot assisted radical cystectomy: results from the International Robotic Cystectomy Consortium. J Urol 2010 Jul;184(1):87-91.
33. Snow-Lisy DC, Campbell SC, Gill IS, Hernandez AV, Fergany A, Kaouk J, Haber GP. Robotic and laparoscopic radical cystectomy for bladder cancer: long-term oncologic outcomes. Eur Urol 2014 Jan;65(1):193-200.
34. Yuh B, Padalino J, Butt ZM, Tan W, Wilding GE, Kim HL, Mohler JL, Guru KA. Impact of tumur volume on surgical and pathological outcomes after robot-assisted radical cystectomy. BJU Int 2008 Sep;102(7):840-843.
35. Herr H, Lee C, Chang S, Lerner S. Standardization of radical cystectomy and pelvic lymph node dissection for bladder cancer: a collaborative group report. J Urol 2004 May;171(5):1823-1828; discussion 1827-1828.

10.5005/jp-journals-10033-1273

ORIGINAL ARTICLE

Percutaneous Transabdominal External Looped Needle for Peritoneal Closure in Laparoscopic Transabdominal Preperitoneal Inguinal Hernia Repair

[1]Ahmed E Lasheen, [2]AbdelRhman Sarhan, [3]Ayman Salem, [4]Tark Shiref

ABSTRACT

Introduction: Transabdominal preperitoneal (TAPP) hernioplasty is a common procedure for groin hernia repair. The peritoneal closure after mesh placement is recommended to avoid mesh exposure to the viscera with the risk of adhesions and bowel incarceration into peritoneal defects. This study offers a novel technique for peritoneal closure by using external looped needle.

Materials and methods: During the period from April 2013 through August 2015, during laparoscopic inguinal hernia repair in 117 patients, the peritoneal closure was achieved by percutaneous transabdominal external looped needle. The needle was passed directly through the abdominal wall to close the peritoneal flaps using Vicryl no. 0. The mean follow-up period was 28 months.

Results: The age of this patients' group ranged from 20 to 66 years (mean age 47 years). The mean time to put one stitch was 1.8 minutes. No recurrence, pain, intestinal adhesion, obstruction, mesh bulging, or infection was recorded in this patients' group during the period of follow-up.

Conclusion: Our technique for peritoneal closure during laparoscopic inguinal hernia repair (TAPP) is effective, safe, and easy.

Keywords: Laparoscopic hernia repair, Looped needle, Peritoneal closure.

How to cite this article: Lasheen AE, Sarhan AR, Salem A, Shiref T. Percutaneous Transabdominal External Looped Needle for Peritoneal Closure in Laparoscopic Transabdominal Preperitoneal Inguinal Hernia Repair. World J Lap Surg 2016;9(2):58-62.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

Corbitt[1] first reported the technique of laparoscopic herniorrhaphy. Subsequently, transabdominal preperitoneal (TAPP) approach and totally extraperitoneal (TEP) approach have become the most commonly used approaches. Transabdominal preperitoneal is an approved and common surgical procedure for groin hernia repair in adults, especially for bilateral and recurrent inguinal hernias after open repairs.[2] The procedure is performed by dissection of the preperitoneal space and a mesh repairs the hernia defect. The closure of the peritoneum after mesh placement must be performed uninterrupted and completely to avoid adhesion of viscera to the mesh and intestinal obstructions by bowel herniation through peritoneal defects into the preperitoneal space.[3] Incomplete peritoneal closure or its breakdown in laparoscopic preperitoneal hernia repair increases the risk of bowel obstruction. The optimal peritoneal closure method in TAPP remains debatable.[4] Here, we presented a novel procedure to close the peritoneal flaps during TAPP repair.

[1-4]General Surgeon

[1-4]Department of General and Laparoscopic Surgery, Faculty of Medicine, Zagazig University, Zagazig, Sharkia, Egypt

Corresponding Author: Ayman Salem, General Surgeon Department of General and Laparoscopic Surgery, Faculty of Medicine, Zagazig University, Zagazig, Sharkia, Egypt, e-mail: lasheenahmed@yahoo.com

MATERIALS AND METHODS

This study was done from April 2013 through August 2015 in General and Laparoscopic Surgery Department, Zagazig University Hospital, Egypt. One hundred seventeen patients were included in this article. This research was discussed and approved by the ethical committee of Zagazig University on January 2013. All information about the procedure were discussed with all the patients, and a written consent was taken from the patients for inclusion of their data in this study. The age of the patients ranged from 20 to 66 years (mean age, 49 years).

Surgical Technique

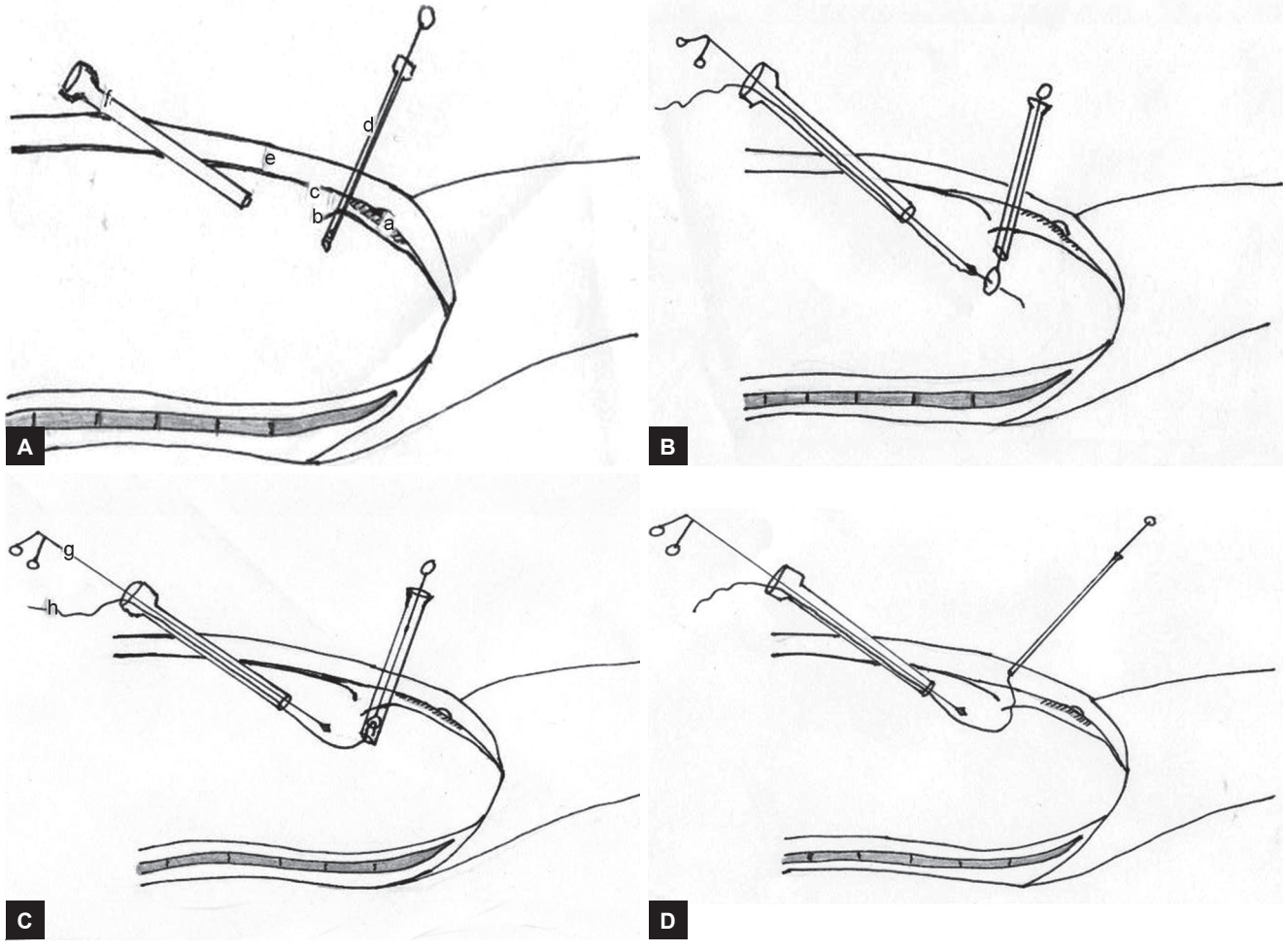
The TAPP procedure was performed in this patients' group under general anesthesia. As usual, the peritoneum was incised superiorly (3–4 cm) above the hernia defects. This incision extended from the medial umbilical ligament to the anterior superior iliac spine laterally. Then dissection of the hernia sac and complete exposure of the preperitoneal space were completed. The optimal mesh size was prepared to cover all myopectineal orifices, with an overlap of at least 3 to 5 cm from the margin of hernia defect(s) in all directions.[5] A suitable mesh (polyprolene mesh) goes to the preperitoneal space, where it was fixed

Figs 1A to C: (A) Loop at the tip of stent inside the needle; (B) long needle; and (C) metal stent inside the needle. This diagram of looped needle and our technique needs two-looped needles

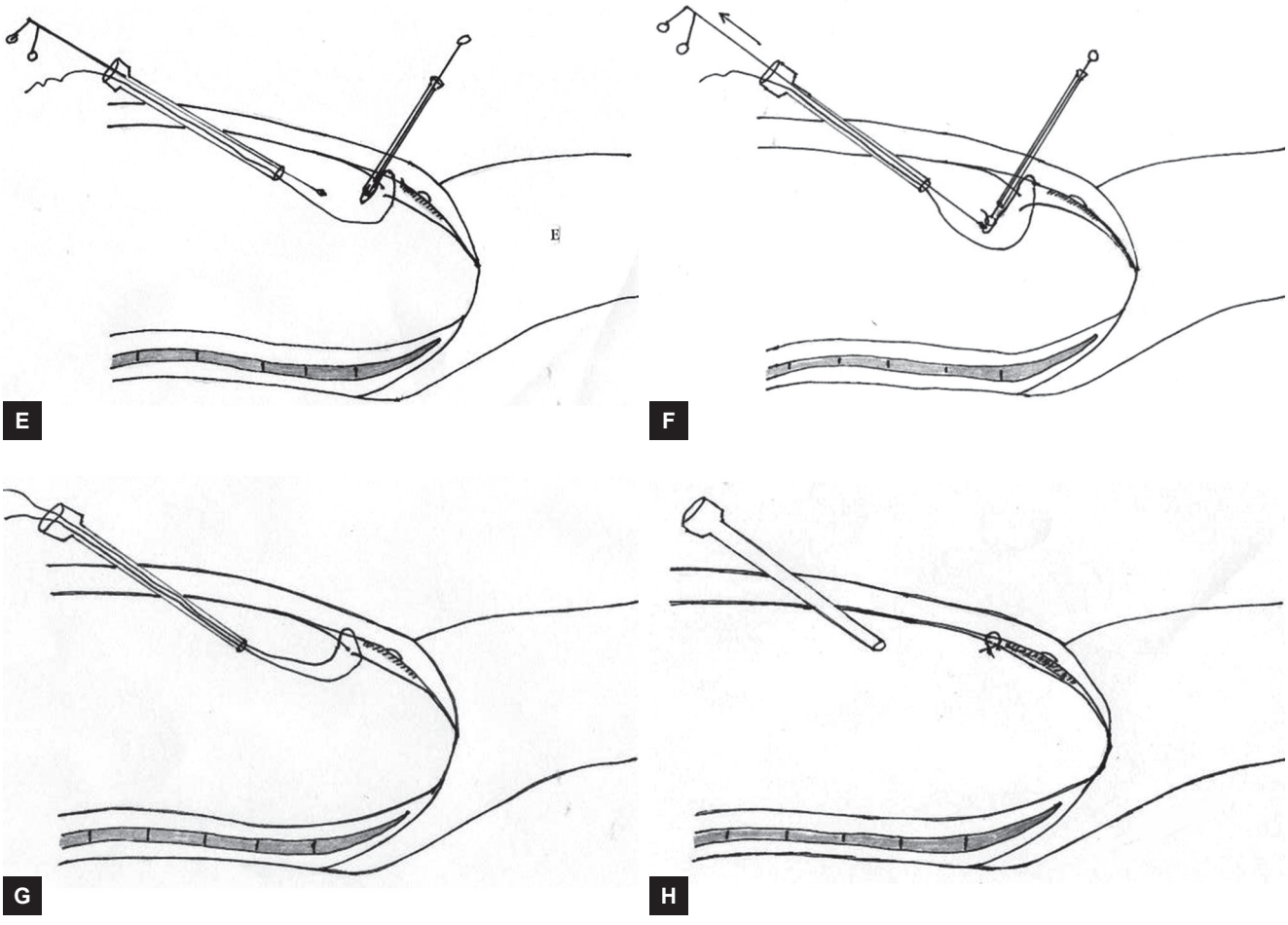
in its position using Glubran 2 (Gem SRL, Viareggio, Italy). The peritoneum was closed using Vicryl no. 0 by helping external looped needle through anterior abdominal wall. The looped needle was prepared by the corresponding author, using long needle (15–20 cm) and inside it loop, which can be pushed or pulled through the needle sheath to hold or release the thread (Figs 1 A to C). The looped needle passes directly from the anterior abdominal wall to the lower peritoneal flap. Then, the inside loop was pushed to come out from the needle tip. One end of Vicryl no. 0 was passed through working port to put into the loop by laparoscopic forceps. The loop was pulled to hold Vicryl end inside the needle. The needle with Vicryl and loop inside it is withdrawn for some distance and redirected by pushing to pass through the inner layer of abdominal wall and upper peritoneal flap. The loop was pushed to release the Vicryl end from needle tip. The Vicryl end was holed by laparoscopic forceps to bring it outside the abdominal cavity through the same working port. The suture was tied extracorporeal or intracorporeal (Figs 2A to H). Multiple sutures were put until good peritoneal closure was achieved (Figs 3A to C). The pneumoperitoneum was emptied under direct viewing with a laparoscope, and external pressure was applied to the inguinal region. The follow-up period ranged from 3 to 32 months (mean 28 months). The intra and postoperative complications were recorded.

RESULTS

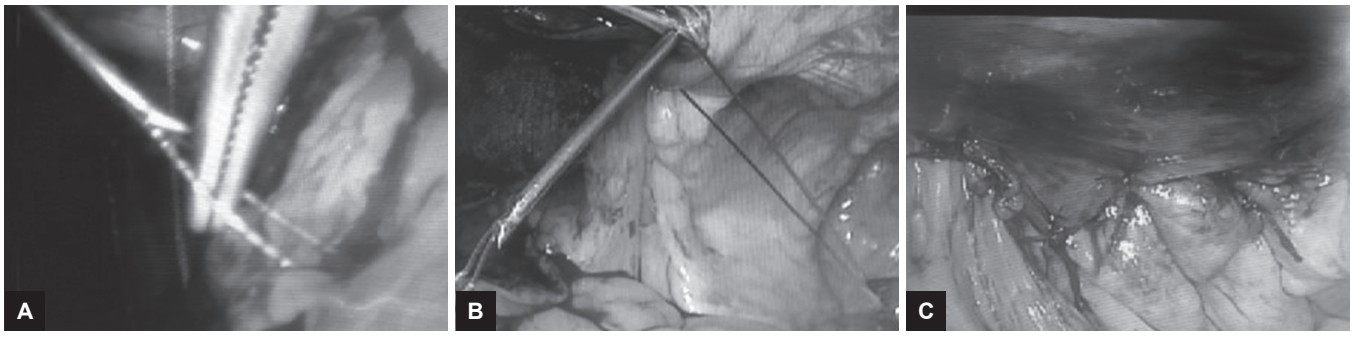
The mean age was 49.3 years (21–63 years), mean body mass index (BMI) was 24.5 (18.1–30.2), and mean operative time was 100 minutes (90–120 minutes). The mean time to put one suture by this technique was 1.8 minutes (1.5–3 minutes). The mean number of sutures to achieve good peritoneal closure was seven sutures (5–9 sutures).



Figs 2A to D: (A) The looped needle passes directly from abdominal wall to abdominal cavity, then through the lower peritoneal flap; (B) the stent and loop push through the needle to appear through the abdominal cavity. Then, the end of Vicryl no. 0 put inside the loop by using laparoscopic forceps; (C) the stent and the loop are withdrawn to hold the Vicryl end inside the needle. The needle is withdrawn to retract its tip at inner layer of anterior abdominal wall; and (D) Redirected and pushing of needle with Vicryl through inner layer of abdominal wall and upper peritoneal flap was done



Figs 2E to H: (E) The needle tip and Vicryl end appeared after passing through the upper peritoneal flap; (F) the stent was pushed through the needle to release the Vicryl end. Then, the Vicryl end was holed by laparoscopic forceps and withdrawn to bring the Vicryl end outside the abdominal cavity from the same working port; (G) one suture was complete, where the Vicryl passed through the lower peritoneal flap, inner layer of anterior abdominal wall, and upper peritoneal flap. The two limbs of suture came out through the working port; and (H) the suture was tied extracorporeally or intracorporeally



Figs 3A to C: (A) The looped needle passed through the abdominal wall and lower peritoneal flap. The Vicryl end was inserted inside the loop using laparoscopic forceps; (B) first suture is completed (one limb passes through the lower peritoneal flap, inner layer of anterior abdominal wall, and another limb through the upper peritoneal flap); and (C) nine sutures were needed to achieve good peritoneal closure in this case

The unilateral cases consisted of 77 indirect, 31 direct, 5 bilateral (all indirect), and 4 recurrent unilateral inguinal hernia after open hernia repair. Ninety-six patients (82%) returned to their usual activities in 1 week and 21 patients (17.9%) required up to 2 weeks. Twenty-three patients (19.7%) experienced mild inguinal pain for 3 weeks. The intra-abdominal pressure must be lowered and external pressure was applied to inguinal area during sutures tying to evacuate the gas from the preperitoneal space. No recurrence, chronic pain, intestinal adhesion, obstruction, mesh bulging, or infection was recorded in this patient group during the period of follow-up.

DISCUSSION

The TAPP procedure has various technical difficulties and new devices have been developed that solve some of these problems.[6] Complete closure of the peritoneum after TAPP repair is an essential step of the operation to avoid on the one hand mesh exposure to the bowel with the risk of adhesion and bowel obstruction and on the other hand bowel incarceration through herniation into the preperitoneal space.[7] Penetrating devices, such as tacks, clips, staples, or strap devices should be avoided for mesh fixation and also for peritoneal closure, because of the risk of nerve injuries and adhesions.[8,9] LeBlanc[10] reported tack hernia as one of the complications after using tacks for mesh fixation or peritoneal closure in laparoscopic hernia repair. The peritoneal incision should be noninvasively approximated, for instance, using an absorbable, whose ends get fixed with absorbable clips.[11] The patients who had the peritoneum closed with a running suture had reduced incidence (from 0.8–0.1%) of small bowel obstruction from herniation through the peritoneal closure.[12] The suturing using intraperitoneal needle and other suturing devices is difficult and needs special port and good experience. Recently, uni- or bidirectional braided, self-anchoring, and knotless sutures are frequently used and offer time-saving work.[6] But, with a risk of cut through the peritoneal flaps can occur, producing gap and internal herniation through the preperitoneal space. Some authors reported small bowel obstruction after using a self-anchoring braided suture for peritoneal closure in TAPP repair.[7] Short stitches are generally recommended and barbed devices seem to be unsuitable for closure of a thin peritoneal layer, because this may lead to laceration and gapping of the peritoneum. Furthermore, grabbing sufficient amounts of peritoneal tissue with tensioning of the thread no more than required for adequate peritoneal closure is recommended to minimize the risk of exposition of the suture material to the viscera and to avoid bare endings of the thread, because the barbs generally have an affinity for bowel ingrowth.[13-15] Also, uncovered parts of the thread can occur due to suture penetration and are conceivable owing to peritoneal rupture can never be absolutely ruled out with the potential risk of severe complications such as a small bowel injury and obstruction.[7] Since 1995, the EndoStitch device (Covidien, USA) has been used for laparoscopic suturing.[16,17] Although the use of this device in TAPP has been reported,[18] it is not commonly used in herniorrhaphy. To date, there have been no suitable devices for peritoneal closure for beginners.[6] Small bowel obstruction after TAPP can be caused by displaced spiral tacks used for peritoneal closure, as reported by Fitzgerald et al,[19] with an incidence of 0.2 to 0.5%. Additionally, the study by Kapiris et al. reported reduced complaints of persistent inguinal pain as they adopted a stable-free technique for mesh fixation and peritoneal closure.[12] In our technique for peritoneal closure, the suture (Vicryl no. 0) passed through the upper and lower peritoneal flaps with in between part of inner layer of anterior abdominal wall. So, this prevents cut through, or breakdown of peritoneal flaps and obliteration of any gap. The external looped needle was passed through the anterior abdominal wall directly over the peritoneal flaps, so no need of more ports or much instruments. The manipulation of this external looped needle is easy to a beginner laparoscopic surgeon also.

CONCLUSION

Peritoneal closure by using an external looped needle is effective, easy, and needs no much instrumentations or experiences during TAPP repair of inguinal hernia.

REFERENCES

1. Corbitt JD Jr. Laparoscopic herniorrhaphy. Surg Laparosc Endosc 1991 Mar;1(1):23-25.
2. Mahon D, Decadt B, Rhodes M. Prospective randomized trial of laparoscopic (transabdominal preperitoneal) *vs* open(mesh) repair for bilateral and recurrent inguinal hernia. Surg Endosc 2003 Sep;17(9):1386-1390.
3. McKay R. Preperitoneal herniation and bowel obstruction post laparoscopic inguinal hernia repair: case report and review of the literature. Hernia 2008 Oct;12(5):535-537.
4. Ross SW, Oommen B, Kim M, Walters AL, Augenstein VA, Heniford BT. Tacks, staples, or suture: method of peritoneal closure in laparoscopic transabdominal preperitoneal inguinal hernia repair effects early quality of life. Surg Endosc 2015 Jul;29(7):1686-1693.
5. Lasheen AE, Safwat K, Morsy M, Allam Z, Awad W. Modified transabdominal external needle for mesh size estimation in laparoscopic hernia repair. Int J Surg 2014 Oct;12(10): 1074-1076.
6. Takayama S, Nakai N, Shiozaki M, Ogawa R, Sakamoto M, Takeyama H. Use of barbed suture for peritoneal closure in transabdominal preperitoneal hernia repair. World J Gastrointest Surg 2012 Jul 27;4(7):177-179.
7. Kohler G, Mayer F, Lechner M, Bittner R. Small bowel obstruction after TAPP repair caused by a self anchoring barbed suture device for peritoneal closure: case report and review of the literature. Hernia 2015 Jun;19(3):389-394.
8. Tolver MA, Rosenberg J, Juul P, Bisgaard T. Randomized clinical trial of fibrin glue versus tacked fixation in laparoscopic groin hernia repair. Surg Endosc 2013 Aug;27(8): 2727-2733.
9. Lovisetto F, Zonta S, Rota E, Mazzilli M, Bardone M, Bottero L, Faillace G, Longoni M. Use of human fibrin glue (Tissucol) versus staples for mesh fixation in laparoscopic transabdominal preperitoneal herniplasty: a prospective, randomized study. Ann Surg 2007 Feb;245(2):222-231.

10. LeBlanc KA. Tack hernia: a new entity. JSLS 2003 Oct-Dec;7(4): 383-387.
11. Bittner R, Leibl BJ, Jager C, Kraft B, Ulrich M, Schwarz J. TAPP – Stuttgart technique and result of a large single center series. J Minim Access Surg 2006 Sep;2(3):155-159.
12. Kapiris SA, Brough WA, Royston CM, O'Boyle C, Sedman PC. Laparoscopic transabdominal preperitoneal (TAPP) hernia repair. A 7-year two-center experience in 3017 patients. Surg Endosc 2001 Sep;15(9):972-975.
13. Burchett MA, Mattar SG, McKenna DT. Iatrogenic intestinal and mesenteric injuries with small bowel volvulus following use of barbed suture during laparoscopic myomectomy. J Laparoendosc Adv Surg Tech A 2013 Jul;23(7):632-634.
14. Buchs NC, Ostermann S, Hauser J, Roche B, Iselin CE, Morel P. Intestinal obstruction following use of laparoscopic barbed suture: a new complication with new material? Minim Invasive Ther Allied Technol 2012 Sep;21(5):369-371.
15. Nemecek E, Negrin L, Beran C, Neemecek R, Hollinsky C. The application of the V-Loc closure device for gastrointestinal sutures: a preliminary study. Surg Endosc 2013 Oct;27(10):3830-3834.
16. Adams JB, Schulam PG, Moore RG, Partin AW, Kavoussi LR. New laparoscopic suturing device: initial clinical experience. Urology 1995 Aug;46(2):242-245.
17. Stringer NH. Laparoscopic myomectomy with the EndoStitch 10-mm laparoscopic suturing device. J Am Assoc Gynecol Laparosc 1996 Feb;3(2):299-303.
18. Shatari T, Nozawa K, Mieno K, Kodaira S. A new method of peritoneal closure following laparoscopic herniorrhaphy. Surg Today 1998;28(8):866-867.
19. Fitzgerald HL, Orenstein SB, Novitsky YW. Small bowel obstruction owing to displaced spiral tack after laparoscopic TAPP inguinal hernia repair. Surg Laparosc Endosc Percutan Tech 2010 Jun;20(3):e132-e135.

10.5005/jp-journals-10033-1274

RESEARCH ARTICLE

Laparoscopic-assisted Vaginal Hysterectomy *vs* Hand-assisted Laparoscopic Hysterectomy

[1]Sheriff Z Kotb, [2]Mohamed El-Metwally, [3]Nazem Shams, [4]Ashraf Khater

ABSTRACT

Objectives and background: The use of laparoscopic techniques now permits combination of benefits of both abdominal and vaginal hysterectomy. But, laparoscopic hysterectomy has been associated with a higher risk of urinary tract injury compared with abdominal and vaginal procedures, and the risks of these minimally invasive approaches must be balanced with the benefits. Hand-assisted laparoscopic surgery was first described in the early 1990s as a surgical method designed to facilitate the performance of challenging laparoscopic procedures while maintaining the advantages of a minimally invasive approach.

Our present study aims to compare between laparoscopic-assisted vaginal hysterectomy (LAVH) and hand-assisted laparoscopic hysterectomy (HALH).

Materials and methods: This study was conducted at the Oncology Center of Mansoura University (OCMU). A total of 41 sequential patients scheduled for hysterectomy were divided randomly (patient by patient) into two groups: group 1 included 21 patients who underwent LAVH and group 2 included 20 patients who underwent HALH from August 2010 to March 2013.

Patients were excluded from this study if they had contraindications to either vaginal hysterectomy, such as several prior abdominal surgeries, vaginal stenosis, or severe endometriosis, or to laparoscopy, including underlying medical conditions that could be worsened by pneumoperitoneum or the Trendelenburg position. Body mass index was not a limiting factor for patient inclusion in the study.

Results: The clinical characteristics of the 41 patients were similar as regards age, parity, and uterine size. The indications for hysterectomy among the study groups were nearly similar. No statistically significant difference was found between the two groups in operative time. Operative blood loss was higher in the LAVH group. Two cases in the LAVH group were converted to laparotomy to control bleeding and to repair a urinary bladder tear.

Conclusion: The HALH group had less analgesic consumption, earlier ambulation, shorter hospital stay, and earlier regain of daily and coital activities. On the contrary, the HALH group had much more direct costs, which requires much effort to be directed toward this fruitful technique and more training programs to surgeons to increase their experience in enriching hand skills in this emerging technique.

Keywords: Hand-assisted laparoscopy surgery (HALS), Hysterectomy, Laparoscopic-assisted vaginal hysterectomy.

How to cite this article: Kotb SZ, El-Metwally M, Shams N, Khater A. Laparoscopic-assisted Vaginal Hysterectomy *vs* Hand-assisted Laparoscopic Hysterectomy. World J Lap Surg 2016;9(2):63-70.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

Hysterectomy is one of the most commonly performed major gynecological procedures.[1] Approximately 494,000 hysterectomies are performed annually in the United States, making this procedure one of the most commonly performed surgeries in women of reproductive age.[2]

The optimum approach to hysterectomy would retain the advantage of abdominal route which includes clear visualization and easy manipulation of the adnexal structures, and advantage of vaginal hysterectomy, namely avoidance of a large abdominal incision. The use of laparoscopic techniques now permits combination of these benefits. But, laparoscopic hysterectomy has been associated with a higher risk of urinary tract injury compared with abdominal and vaginal procedures, and the risks of these minimally invasive approaches must be balanced with the benefits.[3]

The laparoscopic approach requires a higher level of technical skills, especially with total laparoscopic hysterectomy (TLH) for which the entire procedure, including suturing of the vaginal cuff, is performed by laparoscopic route.[4]

Currently, there are several methods of laparoscopic hysterectomy including laparoscopic-assisted vaginal hysterectomy (LAVH), hand-assisted laparoscopic hysterectomy (HALH), TLH, and, more recently, robotic hysterectomy. Three main types of hysterectomy are now used: Abdominal, vaginal, and laparoscopic. Laparoscopic assisted vaginal hysterectomy has already gained widespread acceptance since it was first reported by Reich et al in 1989.[5]

Laparoscopic-assisted vaginal hysterectomy has become a popular alternative to abdominal hysterectomy in cases that are difficult to manage via the vaginal route alone.[6]

[1-3]Professor, [4]Assistant Professor

[1-4]Department of Surgical Oncology, Mansoura Oncology Center, Faculty of Medicine, Mansoura University, Dakahlia Egypt

Corresponding Author: Sherif Zaki Kotb, Professor Department of Surgical Oncology, Mansoura Oncology Center Faculty of Medicine, Mansoura University, Dakahlia, Egypt Phone: 0201005133536, e-mail: drsherifkotb60@yahoo.com

Laparoscopic-assisted vaginal hysterectomy is now regarded as a safe and feasible technique for managing uterine diseases, because it offers minimal postoperative discomfort, less blood loss, shorter hospital stay, rapid convalescence, and an early return to activities of daily living.[7]

Hand-assisted laparoscopic surgery was first described in the early 1990s to facilitate the performance of challenging laparoscopic procedures while maintaining the advantages of a minimally invasive approach.[8]

In this technique, the surgeon's nondominant hand is introduced into the abdominal cavity by means of a hand-port device while maintaining pneumoperitoneum. The dominant hand is then used to manipulate instruments in concert with a surgical assistant. Hand-assisted laparoscopy combines the benefits of laparoscopy with advantages of a conventional laparotomy, allowing for improved exposure, manual exploration, blunt dissection, and immediate control of hemostasis.[9]

MATERIALS AND METHODS

This cross-sectional study included 41 sequential patients scheduled for hysterectomy at the Oncology Center, Mansoura University (OCMU) who were divided randomly (patient by patient) into two groups: Group 1 included 21 patients who underwent LAVH and group 2 included 20 patients who underwent HALH from August 2010 to March 2013.

Patients were excluded from this study if they had contraindications to either vaginal hysterectomy, such as several prior abdominal surgeries, vaginal stenosis, or severe endometriosis, or to laparoscopy, as underlying medical conditions that could be worsened by pneumoperitoneum or the Trendelenburg position. Body mass index (BMI) was not a limiting factor for patient inclusion in the study.

Full history and general, abdominal, and vaginal examinations were conducted for every patient. Complete blood count, liver and renal functions, and electrocardiography were ordered too. An informed consent for every patient was obtained. All patients underwent the same standard preparation prior to surgery, including antibiotic prophylaxis and administration of low molecular weight heparin.

Group 1: Laparoscopic-assisted vaginal hysterectomy

A peritoneal access is performed with a 10-mm sheath placed infraumbilically using closed (Veress needle) or open (Hasson trocar) technique. Carbon dioxide is insufflated with a high-flow (>3 l/min) insufflator at pressures of <15 mm Hg. The laparoscope is inserted and upper abdominal contents are visualized. The patient is placed in 20° to 30° Trendelenburg position for visualization of the pelvic structures. Additional sheaths are placed under laparoscopic guidance. Two 5-mm sheaths are placed approximately 3 to 4 cm medial to and slightly above the level of the anterior superior iliac spines. The inferior epigastric vessels should be avoided when these sheaths are being placed. Additional 10-mm sheath is placed in the suprapubic location.

The bowel is manipulated out of the pelvis with atraumatic forceps. The course of every pelvic ureter is visualized through the medial leaf of the broad ligament, and its position is verified during each portion of the procedure.

The uterus was placed on lateral traction (with the help of uterine manipulator), and the round ligament on each side was elevated and divided with the endoscopic scissors using monopolar electrocautery or with clip applier (Fig. 1). The peritoneum was opened lateral to the fallopian tube and infundibulopelvic ligament, and ovarian vessels were controlled with endoscopic scissors with monopolar cautery or with ligature (Fig. 2). In majority of cases salpingo-oophorectomy was performed.

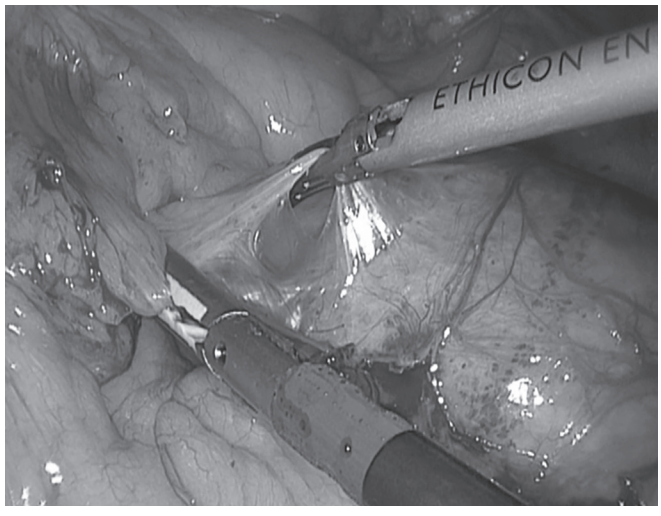


Fig. 1: Using uterine manipulator, the left round ligament is exposed and divided with clip applier or endoscopic scissors with monopolar cautery

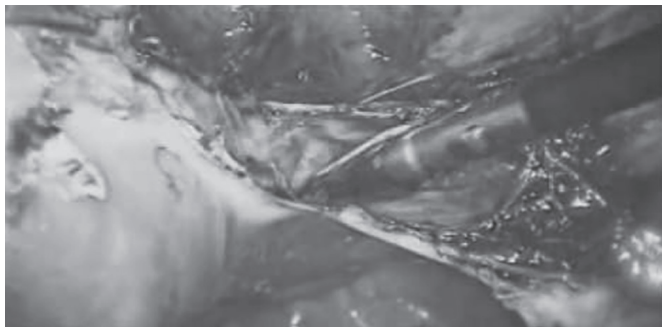


Fig. 2: Control of the infundibulopelvic ligament with the ligature

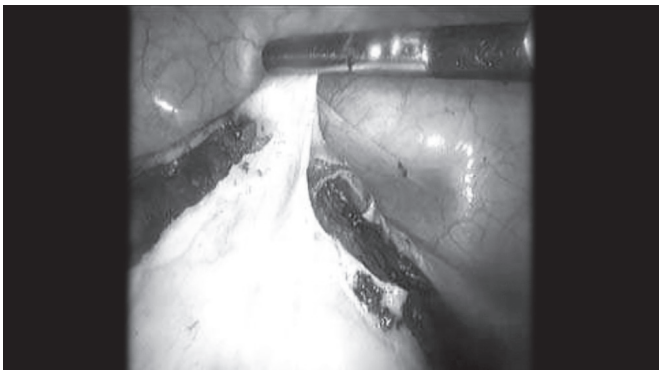


Fig. 3: An incision is made with scissors in the anterior vesico-uterine peritoneum

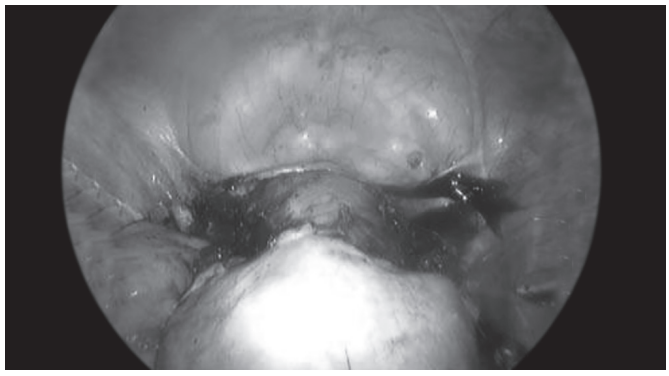


Fig. 4: The bladder is dissected away from the anterior cervix by sharp dissection

A window was created in the broad ligament with endoscopic scissors above the level of the ureter, extending from the infundibulopelvic ligament to the uterine vessels which are controlled with clip applier or ligature.

An incision was made with scissors in the anterior vesicouterine peritoneum. The bladder was pushed away from the anterior cervix by sharp dissection (Figs 3 and 4). Posterior peritoneum was incised by diathermy and uterosacral ligament was transected.

The vaginal phase consists of posterior colpotomy, followed by clamping, cutting, and suture-ligating the remaining paracervical tissues. The uterine vessels are sought and controlled. After completing the vaginal phase, the uterus is removed vaginally (Fig. 5). After removal of uterus, laparoscopic view to assure hemostasis was done (Fig. 6).

Group 2: Hand-assisted laparoscopic hysterectomy

The procedure is like group 1, but the intra-abdominal hand does most of the retracting action and also tactile sensation of the ureters. After freeing the whole uterus, the hand device is removed and the vagina is incised and the specimen is retrieved through the abdomen (Figs 7 and 8). The vaginal stump is closed with continuous vicryl sutures. Closure of LAP DISC wound

Fig. 5: Vaginal phase of posterior colpotomy and uterus is removed vaginally

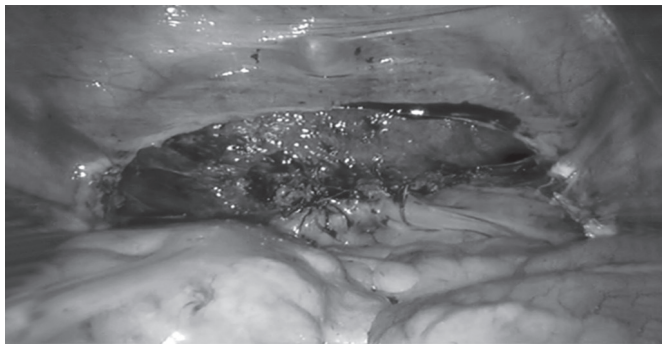
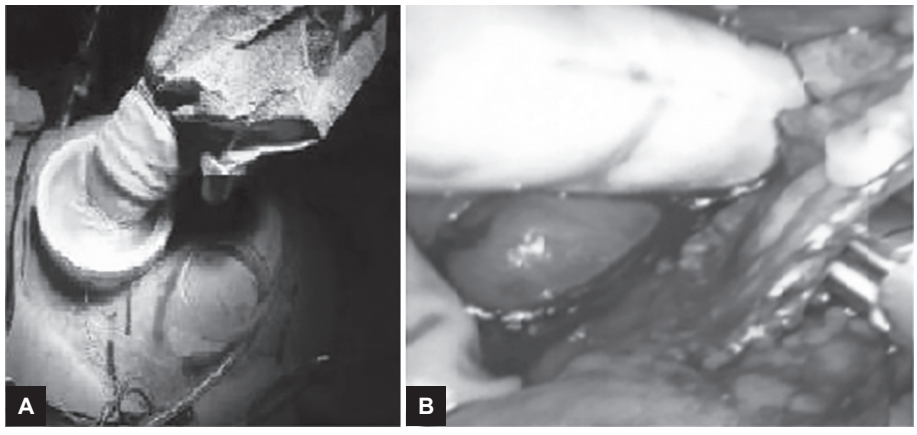


Fig. 6: After removal of uterus, laparoscopic view to assure hemostasis

Figs 7A and B: (A) Incision made in the pubic area to insert the LAB DISC; and (B) insertion of the LAB DISC



Figs 8A and B: (A) Hand-assisted technique at the moment of uterine artery control; and (B) control of the uterine artery

in two layers first the rectus sheath by vicryl 1-0 then skin and a pneumoperitoneum is re-created to confirm homeostasis and re-check for peristalsis of the ureters.

RESULTS

From August 2010 to March 2013, 41 consecutive patients fell within the criteria of the study. According to the date of admission, every patient was given an ordinal number. Patients with odd number were scheduled to have LAVH, and those with even numbers were scheduled to have HALH.

In our study the clinical characteristics of the 41 patients were similar as regards follow-up duration, age, parity, and uterine size (Table 1). The indications for hysterectomy among the study groups were nearly similar with uterine fibroids, and endometrial carcinoma comprised 78% of indications in both groups with no statistically significant difference (Table 2).

The mean operative time of HALH was insignificantly shorter than that of LAVH (123.50 *vs* 131.67 min respectively) (Table 3). There was a significant decline in the operative time with progress of the study (160–105 min in the first group and 190 to 95 min in the second group) (Graph 1).

Table 1: The clinical characteristics of the 61 patients

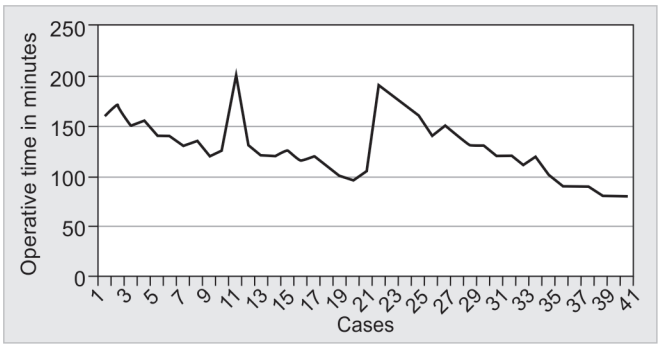
Items	*Group 1: LAVH*	*Group 2: HALH*	*Total*	*p-value*
Number	21	20	41	
Follow-up (months)	20.71	20.90	20.78	0.959
Mean age ± SD (years)	48.52 ± 7.55	52.10 ± 10.71	48.66 ± 8.54	0.222
Mean Parity ± SD	3.14 ± 1.15	2.95 ± 1.15	3.15 ± 1.20	0.594
The largest diameter of uterus (cm)	9.62 ± 1.72	9.85 ± 1.50	9.81 ± 1.70	0.649

LAVH: Laparoscopic-assisted vaginal hysterectomy; HALH: Hand-assisted laparoscopic hysterectomy; SD: Standard deviation

Table 2: The indications for hysterectomy among the study groups

	Study groups		
Items	*Group 1: LAVH*	*Group 2: HALH*	*Total*
Total number	21	20	41
Uterine fibroid	11 (52.5%)	8 (40%)	19 (46.4%)
Endometrial carcinoma	4 (19%)	9 (45%)	13 (31.7%)
Ovarian cancer	4 (19%)	2 (10%)	6 (14.6%)
Cervical carcinoma	2 (9.5%)	1 (5%)	3 (7.3%)

LAVH: Laparoscopic-assisted vaginal hysterectomy; HALH: Hand-assisted laparoscopic hysterectomy



Graph 1: The operative time for hysterectomy among laparoscopic-assisted vaginal hysterectomy study group

Table 3: The operative time for hysterectomy among the study groups

	Group 1: LAVH	*Group 2: HALH*	*p-value*
Number	21	20	
Mean time ± SD (min)	131.67 ± 24.92	123.50 ± 34.22	0.386
Mean time in first 10 cases (min)	142.50 ± 16.3	151.00 ± 23.31	0.426
Mean time in last 10 cases (min)	121.82 ± 28.04	96.00 ± 15.78	0.058*

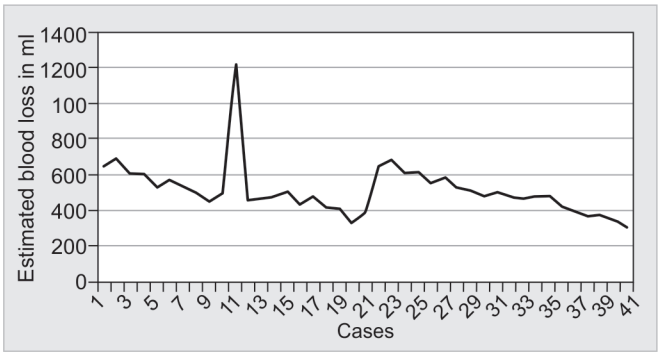
*Significant; LAVH: Laparoscopic-assisted vaginal hysterectomy; HALH: Hand-assisted laparoscopic hysterectomy

The need for blood transfusion was higher in the LAVH group, but the difference is not statistically significant (Table 4; Graph 2). We found no significant relation

Table 4: Estimated blood loss (mL), blood transfusion (packed RBC units), IV fluids (mL), and Hb reduction (gm/dL)

Items	*Group 1: LAVH*	*Group 2: HALH*	*p-value*
Number	21	20	
Mean blood loss (mL)	532.62 ± 175.80	490.75 ± 100.45	0.358
Mean blood transfusion (packed RBC units)	2.10 ± 0.83	1.90 ± 0.64	0.406
Mean IV fluids (mL)	2785.71 ± 845.15	2925.00 ± 19.99	0.531
Hb reduction (gm/dL)	1.34 ± 0.37	1.15 ± 0.21	0.055

RBC: Red blood cells; IV: Intravenous; Hb: Hemoglobin; LAVH: Laparoscopic-assisted vaginal hysterectomy; HALH: Hand-assisted laparoscopic hysterectomy



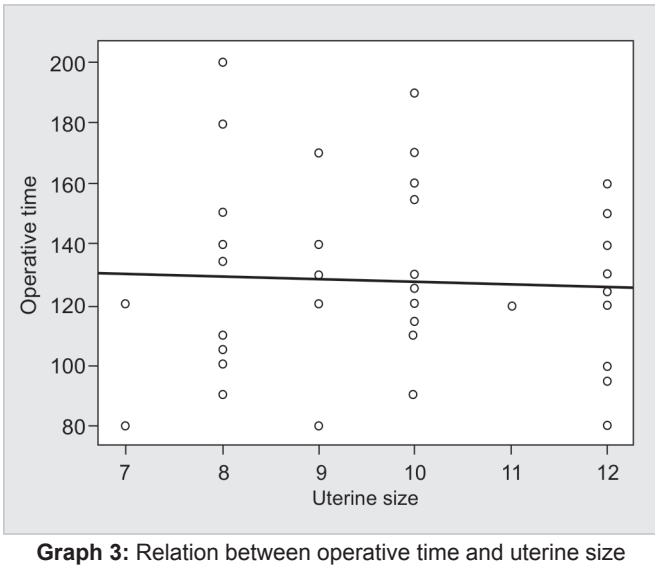
Graph 2: Blood loss among successive laparoscopic operations: as the study continues, there is a progressive decrease of the estimated blood loss

between uterine size and operative time and estimated blood loss. On the other hand, both time to begin ambulation and to regain daily activities are strongly related to operative time (p = 0.001, p = 0.006 respectively) (Table 5; Graph 3 to 5).

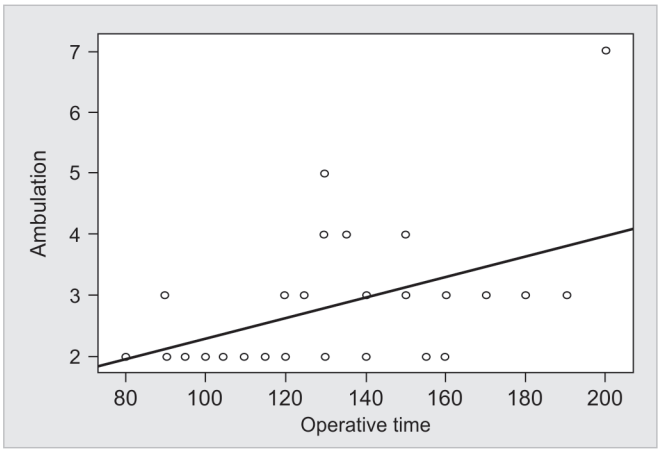
Table 5: Comparison between operative time and blood loss against uterine size, ambulation, and time to regain daily activities

Items	*p- and r-value*	*Operative time*	*Estimated blood loss*
Uterine size (cm)	r-value	0.050	0.100
	p-value	0.755	0.535
Ambulation (days)	r-value	0.500	0.684
	p-value	0.001*	0.000*
Regaining daily activities	r-value	0.424	0.609
	p-value	0.006*	0.000*

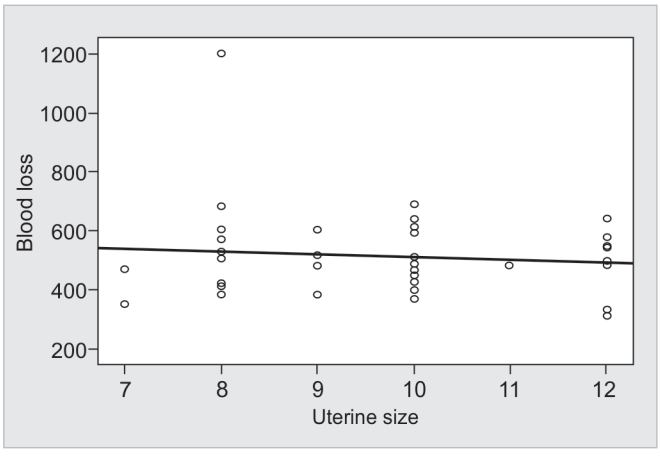
*Significant



Graph 3: Relation between operative time and uterine size



Graph 4: Relation between operative time and ambulation



Graph 5: Relation between blood loss and uterine size

In our study, two cases (9.5%) of the LAVH group needed laparotomy: To control bleeding in one case and to repair bladder injury in the other. No difficulty was met in delivering the uterus in any case in both groups. We did not do any morcellation for the specimens. No bowel or ureteric injuries occurred. No conversion was need in the HALH group (Table 6).

Mean hospital stay in the HALH group was significantly shorter than the LAVH group (3.45 *vs* 4.57 respectively; p = 0.007) (Table 7).

Postoperative complications included fever in five cases (12.2%): Four in the LAVH (due to urinary tract infection in three cases and wound infection in one case [this was the case that had laparotomy to control

Table 6: Intraoperative complications

Items	Group 1: LAVH	Group 2: HALH	Total	p-value
Number	21	20	41	
Anesthetic problems	0	0	0	
Intraoperative bleeding	1 (4.8%)	0	1 (2.4%)	0.323
Bladder injury	2 (9.5%)	0	2 (4.9%)	0.157
Ureteric injury	0	0	0	—
Bowel injury	0	0	0	—
Vascular injury	0	0	0	—
Conversion	2 (9.5%)	0	2 (4.9%)	0.157

LAVH: Laparoscopic-assisted vaginal hysterectomy; HALH: Hand-assisted laparoscopic hysterectomy

Table 7: Early postoperative findings

Items	Group 1: LAVH	Group 2: HALH	p-value
Number	21	20	
Mean postoperative analgesic consumption (75 mg Diclofenac Na)	11.24 ± 0.37	8.90 ± 1.89	0.010*
Mean flatulence relief time (hours)	27.81 ± 12.62	28.50 ± 4.10	0.814
Mean ambulation (nurse shifts)	3.00 ± 1.22	2.50 ± 0.61	0.108
Mean hospital stay (days)	4.57 ± 1.50	3.45 ± 0.94	0.007*

*Significant; LAVH: Laparoscopic-assisted vaginal hysterectomy; HALH: Hand-assisted laparoscopic hysterectomy

bleeding]) and one case in the HALH group due to wound infection (Table 8).

No significant difference was found between both groups as regards resumption of ordinary daily activities. But the mean duration of resumption of coital activities (if there were) was significantly lower in the HALH group (47.67 days) than in the LAVH group (58.00 days) (Table 9).

Table 8: Early postoperative complications

Items	Group 1: LAVH	Group 2: HALH	Total	p-value
Number	21	20	41	
Fever	4 (19.0%)	1 (5.0%)	5 (12.2%)	0.169
Wound infection	1 (4.8%)	1 (5.0%)	2 (4.9%)	0.972
Urinary tract infection	3 (14.3%)	0	3 (7.3%)	0.079
Hematomas	0	0	0	—
Deep venous thrombosis	0	0	0	—
Revision/ secondary studies	0	0	0	—

LAVH: Laparoscopic-assisted vaginal hysterectomy; HALH: Hand-assisted laparoscopic hysterectomy

Table 9: Late postoperative findings

	Group 1: LAVH	Group 2: HALH	p-value
Number	21	20	
Mean time for regaining daily activities (days)	25.00 ± 12.35	23.25 ± 5.45	0.564
Mean time for regaining coital activities (days) in sexually active cases	15† 58.00 ± 13.73	15† 47.67 ± 7.29	0.018*

†This number represents only cases who are sexually active
*Significant; LAVH: Laparoscopic-assisted vaginal hysterectomy; HALH: Hand-assisted laparoscopic hysterectomy

Late Postoperative Complications

Wo cases in the first group were readmitted, one for repair of vesicovaginal fistula and the other for repair of incisional hernia (after laparotomy to control bleeding). No cases were readmitted in the second group. No case had a recurrence until the end of the study (mean follow-up period was 24 months, the highest is 36 months), as shown in Table 10.

Our study found that hand piece in laparoscopic hysterectomy allows for tactile sensation, easy specimen retrieval through hand-port site, rapid control of bleeding by manual pressure, improved depth perception, and shortened learning curve. It avoids conversion to open approach and reduces operative time. On the contrary, the hand piece in laparoscopic hysterectomy has some drawbacks as hand encroaches upon intra-abdominal working space, requires large incision, and device-dependent air leak was reported frequently. It is also ergonomically unfavorable, leading to shoulder and forearm fatigue and strain. It also increases the costs of the operation (Table 11).

Table 10: Late postoperative complications

Items	Group 1: LAVH	Group 2: HALH	Total	p-value
Number	21	20	41	
Vesicovaginal fistula	1	0	1	0.323
Incisional hernia	0	0	1	0.323
Readmission	1	0	2	0.927

LAVH: Laparoscopic-assisted vaginal hysterectomy; HALH: Hand-assisted laparoscopic hysterectomy

DISCUSSION

In most studies about laparoscopic hysterectomy, dysfunctional uterine bleeding is a major indication. This is different from our study which is restricted to cases with tumors. In our study, uterine fibroids and endometrial carcinoma comprised 78% of indications in both groups.

Our series of LAVH with mean operative time of 131.5 min is comparable with that of other studies: Ikram et al[10] (178.0 min); Park et al[11] (253.8 min); Hong et al[12]

Table 11: Technical difference between LAVH and HALH

Items	*Group 1: LAVH*	*Group 2: HALH*
Incisions.	Only small stab incisions for ports	A 7 cm incision beside the ordinary ports
Incisional hernia	0	0
Working space	More working space	The hand inside the abdomen encroaches on the working space
Device-dependent air leakage	Rare	Occurs more
Specimen retrieval	Difficult	Easier
Control of bleeding	Slower	Rapid
Depth perception	Absent	Present
Conversion to open approach	2	0
Operative time	Longer	Shorter
Cost	Less	Higher

LAVH: Laparoscopic-assisted vaginal hysterectomy; HALH: Hand-assisted laparoscopic hysterectomy

(270 min); Ding et al[13] (120 min); Twijnstra et al[14] (144 min); Shin et al[15] (112.5 min); and Song et al[16] (102 min).

Estimated blood loss, the need for blood transfusion, and haemoglobin reduction were higher in the LAVH group, but the difference is not statistically significant. Mean estimated blood loss in the LAVH group was 532.62 mL, which is higher than other studies: Ikram et al[10] (105.13 mL); Park et al[11] (433.6 mL); Hong et al[12] (500 mL); Ding et al[13] (200 mL); Twijnstra et al[14] (457 mL); Soliman et al[17] (517.5 mL); and Song et al[16] (314 mL).

In our study, there was no relationship between the uterine size and the operative time or the rate of complications. But our study cannot efficiently address this issue because our patient group was selected with avoidance of relatively large uteri. In our institution, we are not familiar with morcellation because most of our patients have malignant or potentially malignant conditions.

Shiota et al[18] compared the surgical results (blood loss, operative time, rates of conversion to laparotomy, intra- and postoperative complications) among nine groups classified by uterine weight. Statistically significant differences in surgical outcomes were found between the group with a uterine weight ≥800 gm and the other groups. So when the uterine weight was ≥800 gm, total abdominal hysterectomy was more appropriate because significant blood loss and/or complications would be expected during LAVH. A removed uterus weighing 800 gm is reportedly equivalent to a preoperative uterine size of approximately 12 cm. Therefore, LAVH may be safely indicated for patients with a uterine size ≤12 cm (approximately equivalent to the uterine size at 16 weeks' gestation).[18]

We depended on the findings of Shiota et al[18] when we were planning for our study, so we chose 12 cm as a cutting point for the size of the uterus or adnexa to be excluded from the study. In the future we are planning to study laparoscopic hysterectomy on larger uteri.

The reason for converting laparoscopic hysterectomy to the conventional abdominal approach was uncontrollable bleeding or bladder injury. As reported in other studies, BMI and uterus weight are confirmed to be independent risk factors for conversion.[19]

Hospital stay in the HALH group was shorter (3.45 days) than in the LAVH group (4.57 days). This difference was statistically significant ($p = 0.007$). Duration of hospital stay in our study is comparable to that of Ding et al[13] (5 days), Soliman et al[17] (4.5 days) and Shin et al[15] (3.79 days). Asian, especially Korean, studies reported longer durations of hospital stay: Hong et al[12] (7 days) and Park et al[11] (10 days).

We also found no statistically significant difference between both groups as regards resumption of ordinary daily activities (mean time is 24 days). But the mean duration of resumption of coital activities (if there were) was significantly lower in the HALH group (47.67 days) compared with the LAVH group (58.00 days). Yi et al,[20] in a meta-analysis, found this period to vary between 21 and 30 days (mean is 25 days).

For all malignant cases in the study, there were no residual or recurrent tumors. The relatively small number and the short interval of follow-up make this study inappropriate to discuss the effect of various laparoscopic approaches on the oncologic aspects.

SUMMARY AND CONCLUSION

Laparoscopic-assisted vaginal hysterectomy has become a popular alternative to abdominal hysterectomy in cases that are difficult to manage via vaginal route alone.

Hand-assisted laparoscopic surgery was first described in the early 1990s as a surgical method designed to facilitate the performance of challenging laparoscopic procedures while maintaining the advantages of a minimally invasive approach.

Our present study aims to compare between LAVH and laparoscopic HALH. We included 41 sequential patients scheduled for hysterectomy at OCMU from August 2010 to March 2013. They were divided randomly (patient by patient) into two groups.

The clinical characteristics of the 41 patients were similar as regards follow-up duration, age, parity, and uterine size. The indications for hysterectomy among the study groups were nearly similar. No statistically significant difference was found between the two groups in operative time, which decreased progressively for

both groups but more in the second group. Operative blood loss was higher in the LAVH group. Two cases in the LAVH group were converted to laparotomy to control bleeding and to repair a urinary bladder tear. The HALH group showed less analgesic consumption, earlier ambulation, shorter hospital stay, and earlier regain of daily and coital activities. On the contrary, the HALH group had much more direct costs.

KEY MESSAGES

Hand-assisted laparoscopic technique was successfully developed and manual access to the laparoscopic field facilitated completion of an otherwise minimally invasive procedure.

We demonstrated that HALH is technically feasible, and in selected cases may provide an alternative to conventional techniques of hysterectomy.

Modifications in the technique that reduce surgical time would be beneficial and careful case selection and preparation is important for a successful outcome.

In our study the direct cost of HALH was much more than laparoscopic hysterectomy, because the LAP DISC® alone costs about £850. So we recommend its usage in patients with large uteri as the indirect costs of conventional laparotomy may exceed the direct costs of hand-assisted surgery.

REFERENCES

1. Gil-Moreno A, Puig O, Perez-Benavente MA, Díaz B, Vergés R, De la Torre J, Martínez-Palones JM, Xercavins J. Total laparoscopic radical hysterectomy (type II–III) with pelvic lymphadenectomy in early invasive cervical cancer. J Minim Invasive Gynecol 2005 Mar-Apr;12(2):113-120.
2. Centers for Disease Control and Prevention. National Center for Health Statistics. Number of all-listed procedures for discharges from short stay hospitals: United States, 2010 [cited 2013 Jan 1]. Available from: http://www.cdc.gov/nchs/data/nhds/10 Detailed diagnoses procedures/2010 det10_ all listed procedures.pdf.
3. Nieboer TE, Johnson N, Lethaby A, Tavender E, Curr E, Garry R, van Voorst S, Mol BW, Kluivers KB. Surgical approach to hysterectomy for benign gynaecological disease. Cochrane Database Syst Rev 2009 Jul8;(3):CD003677.
4. Farquhar CM, et al. Obstet Gynecol 2002;99(2):229-234.
5. Reich H, de Cripo J, McGlynn F. Laparoscopic hysterectomy. J Gynecol Surg 1989;5:213-215.
6. Ben Hur H, Phipps JH. Laparoscopic hysterectomy. J Am Assoc Gynecol Laparosc 2000 Feb;7(1):140-146.
7. Reich H, Roberts L. Laparoscopic hysterectomy in current gynecological practice. Gynaec Pract 2003 Jun;3(1):32-40.
8. Munver, R, Del Pizzo, JJ, Sosa, RE. The evolution and current applications of hand assisted laparoscopy. Contemporary Urology, 2003;15(10):30-58.
9. Meijer DW, Bannernberg JJ, Jakimowicz JJ. Hand – assisted endosc 2000;14:891-895.
10. Ikram M, Saeed M, Shazia J. Hysterectomy comparison of laparoscopic assisted vaginal versus total abdominal hysterectomy. Professional Med J 2012 Mar-Apr;19(2): 214-221.
11. Park J-Y, Kim D-Y, Kim J-H, Kim YM, Kim YT, Nam JH. Laparoscopic versus open radical hysterectomy for elderly patients with early-stage cervical cancer. Am J Obstet Gynecol 2012 Sep;207(3):195.e1-195.e8.
12. Hong JH, Choi JS, Lee JH, Eom JM, Ko JH, Bae JW, Park SH. Can laparoscopic radical hysterectomy be a standard surgical modality in stage IA2–IIA cervical cancer? Gynec Oncol 2012 Oct;127(1):102-106.
13. Ding DC, Chu TY, Chan YH. Trend changes in the proportion of minimal invasive hysterectomies over a five-year period: a single-center experience. Tzu Chi Med J 2012 Sep;24(3): 136-138.
14. Twijnstra ARH, Kianmanesh Rad NA, Smeets MJGH, Admiraal JF, Jansen FW. Twenty-first century laparoscopic hysterectomy: Should we not leave the vaginal step out? Gynecol Surg 2009 Nov;6(4):311-316.
15. Shin JW, Lee HH, Lee SP, Park CY. Total laparoscopic hysterectomy and laparoscopy-assisted vaginal hysterectomy. JSLS 2011 Apr-Jun;15(2):218-221.
16. Song X, Waters HC, Pan K, Subramanian D, Sedgley RC, Raff GJ. Laparoscopic supracervical hysterectomy versus laparoscopic-assisted vaginal hysterectomy. JSLS 2011 Oct-Dec;15(4):460-470.
17. Soliman HO, Elsebaie HI, Gad ZS, Iskandar SS, Gareer WY. Laparoscopic hysterectomy in the treatment of endometrial cancer: NCI experience. J Egyptian Natl Cancer Inst 2011 Sep;23(3):101-104.
18. Shiota M, Kotani Y, Umemoto M, Tobiume T, Hoshiai H. Indication for laparoscopically assisted vaginal hysterectomy. JSLS 2011 Jul-Sep;15(3):343-345.
19. Twijnstra AR, Blikkendaal MD, van Zwet EW, van Kesteren PJ, de Kroon CD, Jansen FW. Predictors of successful surgical outcome in laparoscopic hysterectomy. Obstet Gynecol 2012 Apr;119(4):700-708.
20. Yi YX, Zhang W, Zhou Q, Guo WR, Su Y. Laparoscopic-assisted vaginal hysterectomy vs abdominal hysterectomy for benign disease: a meta-analysis of randomized controlled trials. Eur J Obstet Gynecol Reprod Biol 2011 Nov; 159(1):1-18.

10.5005/jp-journals-10033-1275

REVIEW ARTICLE

Modifications of Laparoscopic Cholecystectomy

John Suresh Kumar TR

ABSTRACT

Aims: More than 30 different ways of performing laparoscopic cholecystectomy (LC) are described in the literature. These were developed by surgeons with the aim to improve postoperative and esthetic outcome following LC. The modifications included reduction in port size and/or number than what is used in standard LC. The aim of this literature review was to evaluate the technical feasibility of the modifications of LC without compromising safety and the benefits associated with these modifications in terms of safety, postoperative pain, cosmesis, early recovery, and patient satisfaction.

Materials and methods: Literature review was performed on articles describing different techniques of LC, variations in port number and size, and their advantages over one another. The search was made by using search engines like Google, PubMed, Springer link, and HighWire Press.

Observation: Reduction in number of ports and port size especially in epigastric site gave advantages in terms of decreased postoperative pain score and esthesis. There was an increase in the number of transumbilical single-site surgery (TUSS) being performed in recent years with advantages like decreased postoperative pain and increased patient acceptance being documented in various studies. Hybrid technique of using additional ports during single-site laparoscopic surgery (SSLS) may be used as a bridge to single-site surgery while the surgeon is in a learning curve from a multiport surgery to SSLS. Currently NOTES cholecystectomy is under evaluation and not routinely performed. But current literature does not provide enough evidence of any clear benefit of any of these modifications over standard LC.

Conclusion: This literature review showed that even though there are some advantages in postoperative pain score, esthetic outcome, and patient acceptance while doing the different types of LC in selected patients, there is no evidence of any clear benefit over conventional LC. It is not acceptable to compromise the vision and increase the risk of bile duct injury to the patient while doing LC. Hence, modified LC may be performed by surgeons only after gaining enough experience and in selected group of patients without violating the basic principles of laparoscopic surgery.

Keywords: Laparoscopic cholecystectomy, Miniport laparoscopic cholecystectomy, NOTES, SILS, Single-site laparoscopic surgery, Three-port laparoscopic cholecystectomy, Transumbilical single-site surgery, Two-port cholecystectomy.

Assistant Professor

Department of Surgery, Dr. Somervell Memorial CSI Medical College, Thiruvananthapuram, Kerala, India

Corresponding Author: John Suresh Kumar TR, Assistant Professor, Department of Surgery, Dr. Somervell Memorial CSI Medical College, Thiruvananthapuram, Kerala, India, Phone: +919447582576, e-mail: drjohnsuresh@yahoo.com

How to cite this article: Kumar TRJS. Modifications of Laparoscopic Cholecystectomy. World J Lap Surg 2016;9(2):71-74.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

Professor Dr. Med Erich Muhe of Boblingen, Germany, performed the first laparoscopic cholecystectomy (LC) on September 12, 1985. Currently, it is the most commonly performed laparoscopic procedure and the procedure of choice for gallbladder diseases. Apart from the standard technique of performing LC, several surgeons have come up with their own versions of doing LC by reducing the size and/or number of ports with the aim of improving cosmetic and postoperative outcomes. The most recent modification of this procedure is the single-site laparoscopic cholecystectomy (SSLC).

Standard Laparoscopic Cholecystectomy (4 Ports Standard LC) (Fig. 1)

The four ports in standard LC are:

1. One 10 mm optical port through the umbilical area – 10 mm 30° telescope is routinely used.
2. 10 mm operating port on the epigastric area.
3. 5 mm operating port in right subcostal region in midclavicular line.
4. 5 mm assistant port in right subcostal anterior axillary line to retract the fundus.

Operating ports and camera follows base-ball diamond concept. With left hand Hartmann's pouch is retracted

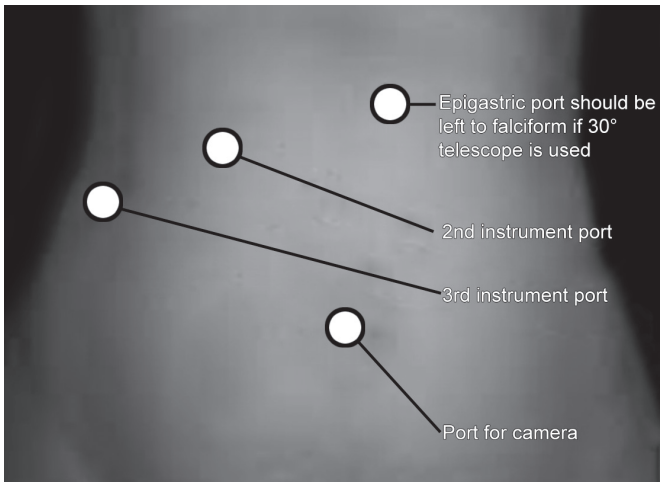


Fig. 1: Ports in standard LC

and with right hand posterior and anterior windows are created by dissecting in Calot's triangle. Critical view of safety is of utmost important to prevent bile duct injury. Clipping of the cystic duct and cystic artery is achieved from 10 mm epigastric port. Gallbladder extraction is generally done from either epigastric or umbilical port.

Reduced Port Size Laparoscopic Cholecystectomy

The size of epigastric trocar is reduced from 10 to 5 mm and this is claimed to reduce the pain and improve the cosmesis. This requires bipolar coagulation of the cystic artery and 5 mm clip applicator for clipping the cystic duct or ligation of cystic duct with an extra corporeal knot. At the end of the procedure the gallbladder is extracted through the umbilical port. Another variant of this technique is where a 5 mm telescope is used at the umbilicus and a 10 mm epigastric trocar is used for standard clip ligature of the cystic duct and epigastric extraction of the gallbladder.[1]

Miniport Laparoscopic Cholecystectomy (Fig. 2)

This is done by a 10 mm umbilical port, 2 mm subcostal and lateral ports (MiniSite, US Surgical), and a 5 mm epigastric port (US Surgical). In addition, 2 mm graspers (MiniSite EndoGrasp; US Surgical) were used. A 5 mm clip was used on the cystic artery and duct; a 5 mm 30° laparoscope was placed through the epigastric port to remove the specimen through umbilical port.

Reduced Port (Number) Laparoscopic Cholecystectomy

Attempts were made by surgeons to reduce the port number from 4 to 3, but the vision was quite different, and hence many of them continued to do standard four-port LC. A three-port LC can be performed by using a suture for fundal traction, so that the vision of the Calot's triangle is not compromised. The traction suture is inserted from the right lower chest wall taking care it does not penetrate the pleura or the lung in the right anterior or mid-axillary line with a straight needle inserted percutaneously or by a free thread inserted into the abdomen and withdrawn by a prolene loop inserted through a standard 18 G needle, an epidural needle, or the verees needle. We can also use figure of eight suture on fundus to apply gentle traction.[1] This avoids the complication of occasional minor bile leak while using a traction suture. One can also make use of stryker mini alligator to provide traction on fundus of the gallbladder.

STRYKER MINI ALLIGATOR

Some studies show no major advantage in reducing one 5 mm right lumbar port as it neither reduces pain nor alters the postoperative recovery and it is cosmetically not superior to the traditional standard four-port LC. Some other studies have showed advantage of three ports LC over four ports LC[2] in terms of less pain,[3,4] shorter hospital stay,[3] and fewer surgical scars.[5] Thus in few selected patients, three-port LC is possible without endangering patient's safety.

Techniques with Reduced Port Size with Reduced Port Numbers in LC

One can use a 5 mm umbilical telescope and a 10 mm epigastric trocar with a 5 mm retraction trocar in the right abdomen with or without suture traction of gallbladder fundus. This technique has little rationale as 10 mm epigastric port presumably causes more pain and avoiding a 10 mm incision in umbilicus has no cosmetic advantage.[1]

One can also use microlaparoscopic instruments, i.e., 3 or 2 mm instruments for performing reduced port

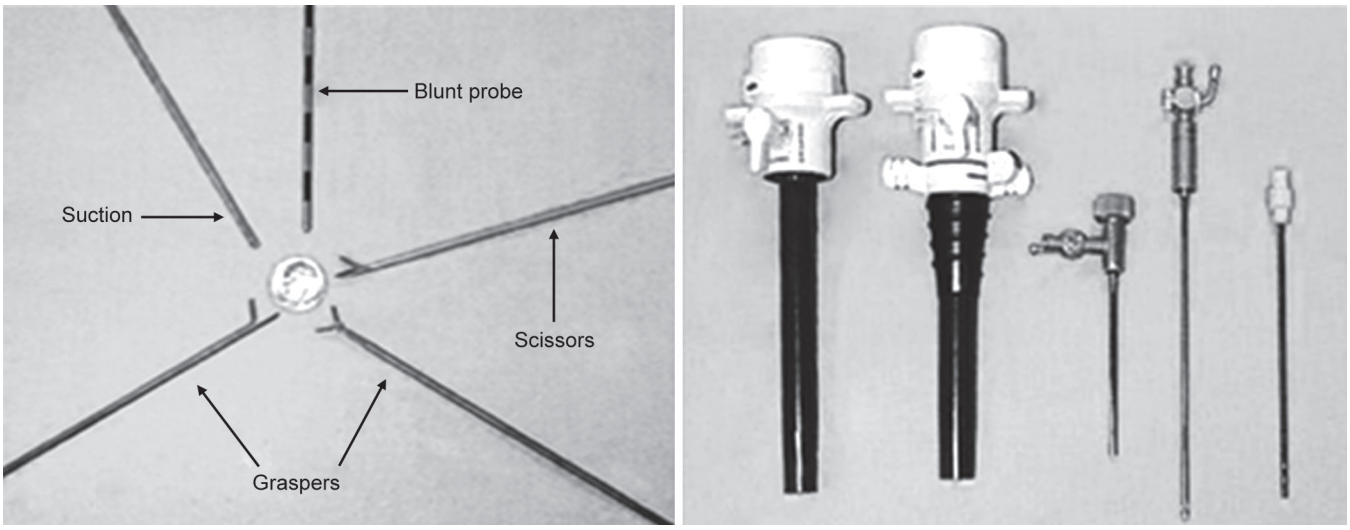


Fig. 2: Instruments in miniport laparoscopic cholecystectomy

(number) LC.[6] Good quality 3 mm instruments, especially dissectors, suction as well as 3 mm telescope for extraction of gallbladder from the 10 mm umbilical port are needed. Only intracorporeal ligation of cystic duct is possible with this technique. The alternative is use of 10 mm clip applicator with 3 mm telescope.

For selected straightforward cases, two-port LC can be done by using two traction sutures; one on the fundus of gallbladder and another on the Hartmann's pouch. Thus with traction on the right lumbar suture, anterior dissection of Calot's triangle is possible, while with an epigastric suture traction posterior dissection is possible. But the quality of traction and countertraction will not be the same as with instrument, as the traction is more or less fixed in axis rather than variable and has a fixed direction of traction (Fig. 3).

Fig. 3: Stryker mini alligator

Some studies have shown that two-port laparoscopic cholecystectomy resulted in less individual port-site pain and similar clinical outcomes but fewer surgical scars compared to four-port laparoscopic cholecystectomy.[7]

Single-site Laparoscopic Surgery or Trans-umbilical Single-site Surgery (TUSS) (Fig. 4)[8]

In single-site laparoscopic surgery all ports are placed at single site; here it is, in or around the umbilicus. Using a single skin and sheath incision, one of the port devices, such as SILS port (Covedien), Tri port or Quad port (Olympus) or X cone (Storz) is introduced. This typically requires a larger skin incision, at least 20 mm.

Several variations in design and types of instruments are available. Instruments are roticulated and will be crossed inside to achieve triangulation. Vision achieved is tubular and violate some principles of base-ball diamond concept

Fig. 4: Single site Laparoscopic surgery

of port positioning in laparoscopy. There is also evidence that there are more chances of incisional hernia when the incision around umbilicus is large. But there are literature to support easy tissue retrieval, decreased pain score,[9] and better patient acceptance compared to standard LC.

Some studies have demonstrated that single-incision LC is a safe procedure for the treatment of uncomplicated gallstone disease, with postoperative outcome similar to that of standard multiport LC.[10]

Hybrid Laparoscopic Cholecystectomy

To get the advantages of triangular dissection of standard multiport LC, some surgeons have developed a hybrid technique[1] of traditional multiport surgery and single-site surgery. In this technique three trocars are placed into the umbilicus, and additional trocars or mini instruments are used in different positions to aid in retraction or dissection. This technique may be used as a bridge to single-site surgery while the surgeon is in a learning curve from a multiport surgery to SSLS.

NOTES Cholecystectomy

Various techniques that have been used are transvaginal,[11] transgastric, or transcolonic.[12,13] One 3 or 5 mm port is placed in the umbilicus as an initial guide to puncture the peritoneum and at the end to assist in closure of the defect. The transgastric and the transcolonic techniques use the flexible endoscope to perform the surgery with a double-channel endoscope for at least two instruments. The major limitation is the light and visual axis travel in the same instruments arm which makes this an unstable platform.

In transvaginal technique a long angle telescope 45° or even a flexible endoscope is used. The umbilical trocar would also assist in retraction or dissection. The final extraction is through the vaginal port and then sutured. The limitations are in terms of instrumentations, the risk of sepsis, dyspareunia in the long-term, and ethical dilemmas in using vagina.[1] Injury to rectum during vaginal puncture has also been reported. Currently NOTES cholecystectomy is under evaluation and not routinely performed.

CONCLUSION

In the era of laparoscopic surgery, less postoperative pain and early recovery are major goals to achieve better patient care and cost effectiveness. Several studies demonstrated that less postoperative pain was associated with reduction in either size or number of ports. But while performing modified LC, whether it is in reduction in number of ports or the size of port it is

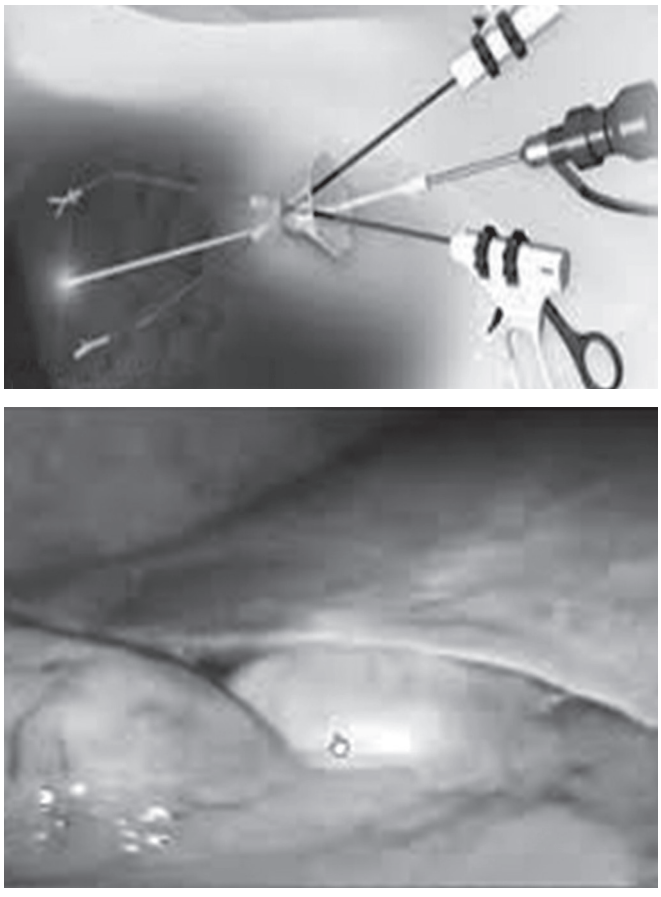


Fig. 5: First view of gall bladder

very important that the standard established principles of LC should not be violated. Compromising the vision and increasing the risk of bile duct injury to the patient with a presumable advantage of better esthetic outcome is not acceptable.

The decision to perform a modified LC may be taken after placing the telescope through first trocar and evaluating the liver and gallbladder, including the Calot's area. The First View (Fig. 5) described by Dr. RK Mishra in his lectures may be helpful in deciding to perform modified LC, i.e., once you enter into the abdomen look for:

- Inferior margin of the liver: If thin and wavy means no fatty infiltration and retraction will be easy.
- Fundus of GB: If projected beyond the inferior edge of the liver, holding and pushing it toward the diaphragm will be easy. In intrahepatic gallbladder retraction will be difficult.
- Distance between the anterior surface of liver and ribcage: If more than 6 cm, more space for retraction.

It is also important that during modified LC if any difficulty is encountered, timely decision should be taken to add an additional trocar or convert to standard LC.

Thus modified LC should be performed by surgeons only after gaining enough experience and in selected group of patients.

REFERENCES

1. Haribhakti SP, Mistry JH. Techniques of laparoscopic cholecystectomy: nomenclature and selection. J Minim Access Surg 2015 Apr-Jun;11(2):113-118.
2. Kumar M, Agrawal CS, Gupta RK. Three-port versus standard four-port laparoscopic cholecystectomy: a randomized controlled clinical trial in a community-based teaching hospital in eastern Nepal. JSLS 2007 Jul-Sep;11(3):358-362.
3. Gurusamy KS, Vaughan J, Ramamoorthy R, Fusai G, Davidson BR. Miniports versus standard ports for laparoscopic cholecystectomy. Cochrane Database Syst Rev 2013 Aug 1;8:CD006804.
4. Al-Azawi D, Houssein N, Rayis AB, McMahon D, Hehir DJ. Three-port versus four-port laparoscopic cholecystectomy in acute and chronic cholecystitis. BMC Surg 2007 Jun 13;7:8.
5. Deveci U, Barbaros U, Kapakli MS, Manukyan MN, Simşek S, Kebudi A, Mercan S. The comparison of single incision laparoscopic cholecystectomy and three port laparoscopic cholecystectomy: prospective randomized study. J Korean Surg Soc 2013 Dec;85(6):275-282.
6. Novitsky YW, Kercher KW, Czerniach DR, Kaban GK, Khera S, Gallagher-Dorval KA, Callery MP, Litwin DE, Kelly JJ. Advantages of mini-laparoscopic vs conventional laparoscopic cholecystectomy: results of a prospective randomized trial. Arch Surg 2005 Dec;140(12):1178-1183.
7. Poon CM, Chan KW, Lee DW, Chan KC, Ko CW, Cheung HY, Lee KW. Two-port versus four-port laparoscopic cholecystectomy. Surg Endosc 2003 Oct;17(10):1624-1627.
8. Piskun G, Rajpal S. Transumbilical laparoscopic cholecystectomy utilizes no incisions outside the umbilicus. J Laparoendosc Adv Surg Tech A 1999 Aug;9(4):361-364.
9. Pan MX, Jiang ZS, Cheng Y, Xu XP, Zhang Z, Qin JS, He GL, Xu TC, Zhou CJ, Liu HY, et al. Single-incision *vs* three-port laparoscopic cholecystectomy: prospective randomized study. World J Gastroenterol 2013 Jan 21;19(3):394-398.
10. Markar SR, Karthikesalingam A, Thrumurthy S, Muirhead L, Kinross J, Paraskeva P. Single-incision laparoscopic surgery (SILS) *vs* Conventional multiport cholecystectomy: systematic review and meta-analysis. Surg Endosc 2012 May;26(5):1205-1213.
11. Zorrón R, Filgueiras M, Maggioni LC, Pombo L, Lopes Carvalho G, Lacerda Oliveira A. NOTES. Transvaginal cholecystectomy: report of the first case. Surg Innov 2007 Dec;14(4):279-283.
12. Phillips MS, Marks JM, Roberts K, Tacchino R, Onders R, DeNoto G, Rivas H, Islam A, Soper N, Gecelter G, et al. Intermediate results of a prospective randomized controlled trial of traditional four-port laparoscopic cholecystectomy versus single-incision laparoscopic cholecystectomy. Surg Endosc 2012 May;26(5):1296-1303.
13. Gurusamy KS, Vaughan J, Rossi M, Davidson BR. Fewer-than-four ports versus four ports for laparoscopic cholecystectomy. Cochrane Database Syst Rev 2014 Feb 20;2.

10.5005/jp-journals-10033-1276

REVIEW ARTICLE

Single-incision Laparoscopic Cholecystectomy *vs* Conventional Laparoscopic Cholecystectomy

BV Sharath

ABSTRACT

Laparoscopic cholecystectomy is the gold standard procedure for gallbladder disease. Single-incision laparoscopic cholecystectomy (SILC) has emerged as an alternative to conventional four-port cholecystectomy as SILC has a better cosmetic appearance with faster recovery and early discharge. This review article was done to analyze SILC its advantages and disadvantages in the treatment of gallbladder disease.

Keywords: Conventional laparoscopic cholecystectomy, Four-port laparoscopic cholecystectomy, Single-incision laparoscopic cholecystectomy.

How to cite this article: Sharath BV. Single-incision Laparoscopic Cholecystectomy *vs* Conventional Laparoscopic Cholecystectomy. World J Lap Surg 2016;9(2):75-77.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

Laparoscopic cholecystectomy has been the gold standard surgery for gallbladder disease in the last two decades. But improvization and innovation in minimal access surgery has led to the evolution of three-port cholecystectomy, two-port cholecystectomy, and recently, the world is mesmerized with the advent of single-incision laparoscopic surgery.

The single-incision laparoscopic cholecystectomy, henceforth referred to as Single-incision laparoscopic cholecystectomy (SILC), was first performed in 1997 by Navarra.[1] Since then SILC has started gaining popularity among the population. The SILC has resulted in less pain and lesser requirement of narcotics, quick return to work, and also shorter hospital stays.

AIMS

This review article aims to evaluate which surgical procedure was associated with less operative time and hospital stay and least postoperative pain. The following parameters were taken into consideration for evaluation.

- Mean age of patient
- Length of stay in hospital
- Operative time
- Cost of procedure
- Postoperative pain
- Complications.

MATERIALS AND METHODS

The articles reviewed in this study were taken using Google search engine, SAGES website, PubMed, Cochrane, HighWire Press, Medscape. The search phrases used were SILS, SILC, four-port laparoscopic cholecystectomy.

OPERATIVE TECHNIQUE

In a SILC, two working ports and one optical port were introduced through a single incision. The incision can be either infraumbilical, at the inferior crease of the umbilicus, transumbilical, or Omega shaped incision. One extracorporeal stay suture is used to achieve the standard anterolateral retraction of the gallbladder fundus. Lateral retraction of the infundibulum is accomplished with a roticulating instrument, allowing optimal exposure of the gallbladder hilum.

A 2-cm incision is needed to access the abdominal cavity. SILS™ port (Fig. 1) is introduced and carbon dioxide is insufflated into the abdomen to a pressure of 15 mm Hg. Optical port of 10 mm is introduced into the

Fig. 1: Single-incision laparoscopic cholecystectomy™ port

Associate Professor

Department of General Surgery, Basaveshwara Medical College Hospital and Research Centre, Chitradurga, Karnataka, India

Corresponding Author: BV Sharath, Associate Professor Department of General Surgery, Basaveshwara Medical College Hospital and Research Centre, Chitradurga, Karnataka India, Phone: +919880599807, e-mail: bandlursharat@gmail.com

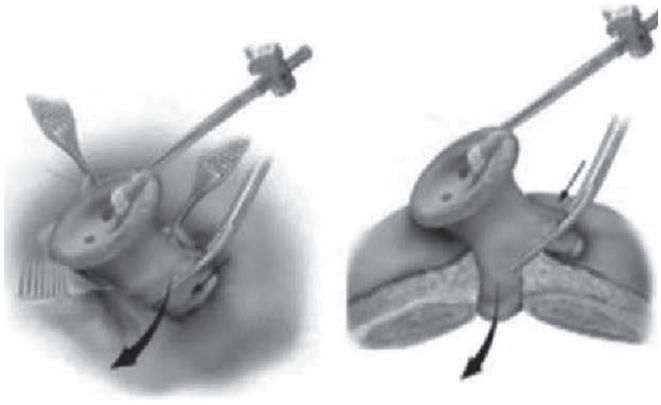


Fig. 2: Technique of insertion of SILS™ port

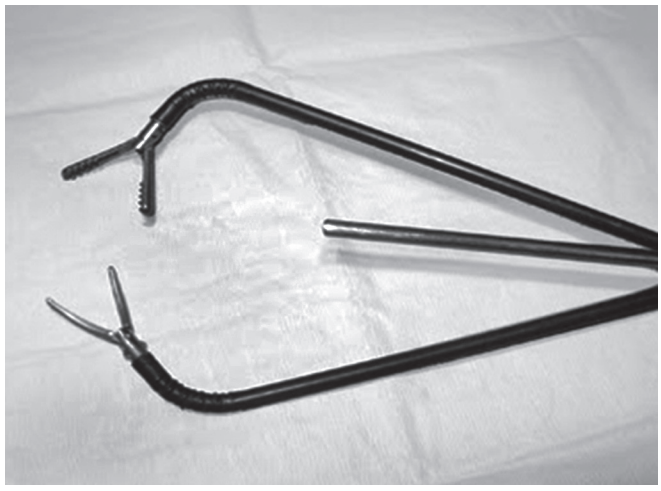


Fig. 3: Roticulating instruments

Fig. 4: Stryker mini alligator

central cannula and diagnostic laparoscopy is done (Fig. 2). Roticulating instruments (Fig. 3) are introduced into two 5 mm cannula. Fundus of the gallbladder is retracted using Stryker mini-alligator introduced separately (Fig. 4). The procedure is carried out in the same way as conventional laparoscopic cholecystectomy (CLC).

RESULTS

This review article is based on the four original articles Culp et al, Karim et al, Linden et al, and Bucher et al (Table 1).

Culp et al[2] study group included 62 patients in SILC group and 63 patients in CLC group. The average length of stay in SILC group was 0.34 days and in CLC group was 0.98 days. Operative time in SILC was significantly higher than in CLC (65 minutes *vs* 51 minutes). The cost was also significantly higher in SILC (average $3700) than CLC ($3450). No operative complications were noted in either groups.

Karim et al[3] studied a total of 183 patients among which 76 patients were excluded from the study. Of the remaining, the numbers in the SILC group included 45 patients and those in CLC group included 62 patients. The median operative time for SILC group was 75 minutes which was significantly more compared to CLC group which was 58 minutes. No major intraoperative complications were encountered in either group. There was no significant difference in postoperative pain score and length of hospital stay. During follow-up one patient in SILC group had superficial wound infection which was managed conservatively with oral antibiotics.

Deveci et al[4] comprised totally 100 patients with 50 in each of SILC and CLC. Average operating time in SILC was significantly longer (73 minutes) compared to CLC (48 minutes). Pain was higher in SILC than in CLC. Length of hospital stay was similar in both the groups. One patient in CLC had biliary leakage for 2 days postoperative because of difficult dissection of gallbladder bed which responded to conservative management. Two patients in each group were readmitted for wound infection.

In the study done by Linden et al,[5] 100 patients belonged to SILC group and the other 100 belonged to CLC group. Contrary to other studies, the operating time in SILC group was significantly shorter (46 minutes) compared to CLC group (62 minutes). Perioperative complications were found in 3 patients in SILC (one perioperative bleeding, two pneumothoraces) and 5 patients in CLC (perioperative bleeding). There was no significant difference in length of hospital stay in either group.

Bucher et al[6] studied a cohort of 150 patients who were randomized to undergo either SILS or CLC. Seventy-five patients underwent SILC and the other 75 underwent CLC. Operating time was similar in both the groups. Operating costs were higher in SILS groups. Intra- and postoperative complications were similar in both the groups. Patients experienced less pain in SILC group.

DISCUSSION

All these studies demonstrate that SILC is welcomed with better cosmesis and decreased length of stay in

Table 1: Different studies comparing SILC and conventional LC

	Mean age		*Length of stay*		*Operative time*		*Cost*		*Postoperative pain*	
Study	*SILC*	*CLC*	*SILC*	*CLC*	*SILC*	*CLC*	*SILC*	*CLC*	*SILC*	*CLC*
Culp et al	45	52	0.34 day	0.98 day	65 min	51 min	$3700	$3450	–	–
Karim et al	46	46.3	22 hours	31 hours	75 min	58 min	–	–	0.34	0.3
Linden et al	45	46	1 day	2 days	46 min	62 min	–	–	–	–
Bucher et al	42	44	0 day	1 day	66 min	64 min	–	–	2	3
Deveci et al	50	50	1.06 days	1.04 days	73 min	48 min	–	–	–	–

the hospital. Pain is also reported less by patients who underwent SILS compared with CLC. Operative time is significantly higher in SILC and is revealed by all the above studies except Linden et al, which surprisingly had lesser operative time for SILC. But as the learning curve of the operating surgeons increases, this will improve in coming days. Postoperative and intraoperative complications were similar in both the groups.

Single-incision laparoscopic cholecystectomy is a good innovation that has a lot of scope in coming days once the learning curve of the operating surgeons improves.

REFERENCES

1. Navarra G, Pozza E, Occhionorelli S, Carcoforo P, Donini I. One-wound laparoscopic cholecystectomy. Br J Surg 1997 May;84(5):695.
2. Culp BL, Cedillo VE, Arnold DT. Single-incision laparoscopic cholecystectomy versus traditional four-port cholecystectomy. Proc (Bayl Univ Med Cent) 2012 Oct;25(4):319-323.
3. Karim MA, Ahmed J, Mansour M, Ali AM. Single incision vs. conventional multiport laparoscopic cholecystectomy: a comparison of two approaches. Int J Surg 2012;10(7):368-372.
4. Deveci U, Barbaros U, Kapakli MS, Manukyan MN, Şimşek S, Kebudi A, Mercan S. The comparison of single incision laparoscopic cholecystectomy and three port laparoscopic cholecystectomy: prospective randomized study. J Korean Surg Soc 2013 Dec;85(6):275-282.
5. Linden Y, Bosscha K, Prins HA, Lips DJ. Single-port laparoscopic cholecystectomy vs standard laparoscopic cholecystectomy: a non-randomized, age matched single center trial. World J Gastrointest Surg 2015 Aug 27;7(8):145-151.
6. Bucher P, Pugin F, Buchs NC, Ostermann S, Morel P. Randomized clinical trial of laparoendoscopic single-site versus conventional laparoscopic cholecystectomy. Br J Surg 2011 Dec;98(12):1695-1702.

10.5005/jp-journals-10033-1277

REVIEW ARTICLE

Transabdominal Cervical Cerclage: Laparoscopy or Laparotomy

Surakshith L Gowda

ABSTRACT

Cervical incompetence is one of the common causes of recurrent pregnancy loss. Transabdominal cervical cerclage is the option where previous vaginal cerclages have failed or in patients with congenital short or absent cervix, a lacerated cervix, severe scarring of the cervix, and multiple deep cervical defects. So this review is aimed to study the effectiveness of laparoscopic cerclage in comparison with cervical cerclage by laparotomy. A literature search was performed using Springer link, BMJ, Journals of Minimal Access Surgery, and major general search engines like Google, MSN, HighWire Press, and Yahoo. The studies between 2000 and 2015 were selected and were reviewed for the prolongation of pregnancy, intraoperative and postoperative complications, operating time, blood loss, postoperative recovery in both the laparoscopic and open procedure. The review concludes that if transabdominal cervical cerclage is preferred then laparoscopic approach is superior to laparotomy as it is as effective as open method with fast postoperative recovery.

Keywords: Abdominal cerclage, Cervical cerclage, Cervical incompetence, Cervical stitch, Laparoscopic cerclage, Laparotomy, Recurrent pregnancy loss.

How to cite this article: Gowda SL. Transabdominal Cervical Cerclage: Laparoscopy or Laparotomy. World J Lap Surg 2016;9(2):78-81.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

The American College of Obstetricians and Gynecologists (ACOG) defines cervical incompetence as the inability of the uterine cervix to retain a pregnancy in the second trimester, in the absence of uterine contractions.[1] Cervical incompetence is customarily treated by transvaginal cervical cerclage, which is normally done under general or regional anesthesia. There are two primary strategies: The Shirodkar method includes putting the stitch high up around the cervix, as close as would be prudent to the level of the inner cervical os, while the McDonald "purse string" procedure includes embedding the line around the intravaginal segment of the cervix.[2] The procedure is normally performed toward the end of the first trimester or the start of the second trimester, and the stitch is generally removed at term. In the event that a past transvaginal cervical cerclage has fizzled or it is not actually conceivable (for instance, if the cervix is short), a transabdominal method might be utilized. This ordinarily includes a laparotomy to put the stitch around the cervix and cesarean section is performed to deliver the baby.[1,2]

With the increase of laparoscopic potential outcomes, laparoscopic transabdominal cerclage (TAC) turned into a choice. This strategy is ideally performed in the nonpregnant state and has the upside of shorter hospitalization and speed recovery with less postoperative morbidity.[3,4] So this review is aimed to study the effectiveness of laparoscopic cerclage in comparison with cervical cerclage by laparotomy.

AIM

The aim of this study was to compare the effectiveness and safety of laparoscopic cervical cerclage *vs* TAC by laparotomy.

MATERIALS AND METHODS

A literature search was performed using Springer link, BMJ, Journals of Minimal Access Surgery, and major general search engines like Google, MSN, HighWire Press, Yahoo, etc. The following search terms were used: Laparoscopic cerclage, recurrent pregnancy loss, abdominal cerclage, cervical incompetence, laparoscopy, laparotomy, and cervical stitch. The studies between 2000 and 2015 were selected and those studies which compared the outcomes after third trimester were selected for review. Prolongations of pregnancy, intraoperative and postoperative complications, operating time, blood loss, postoperative recovery were the parameters evaluated for the effectiveness and safety of the laparoscopic and open procedure.

RESULTS

The available literature consists of cohort studies, small case series, and also some case reports. Fifteen articles

Assistant Professor

Department of Obstetrics and Gynecology, Adichunchanagiri Institute of Medical Sciences and Research Centre, Bellur Karnataka, India

Corresponding Author: Surakshith L Gowda, Assistant Professor Department of Obstetrics and Gynecology, Adichunchanagiri Institute of Medical Sciences and Research Centre, Bellur Karnataka, India, e-mail: surakshithlgowda@gmail.com

Table 1: List of studies comparing the route advocated, time of placement, and outcome

Selected studies	*Sample size*	*Route advocated*	*Time of placement*	*Outcome*
Ades et al[1]	69	51 Laparoscopy 18 Laparotomy	Nonpregnant and during pregnancy	98% viable pregnancy in laparoscopy 100% viable pregnancy in laparotomy
Ades et al[7]	64	Laparoscopy	Nonpregnant and during pregnancy	95.8% viable pregnancy
Umstad et al[8]	22	Laparotomy	Nonpregnant and during pregnancy	91% deliveries > 34 weeks
Thuezen et al[9]	45	Laparotomy	Nonpregnant	97% deliveries > 34 weeks
Davis et al[10]	40	Laparotomy	During pregnancy	90% deliveries > 33 weeks
Whittle et al[6]	65	Laparoscopy	Nonpregnant and during pregnancy	89% deliveries on 35.8 ± 2.9 weeks
Carter et al[5]	19	12 Laparoscopy 7 Laparotomy	Nonpregnant and during pregnancy	75% viable pregnancy in laparoscopy 71% viable pregnancy in laparotomy
Nicolet et al[11]	5	Laparoscopy	Nonpregnant	100% term deliveries
Reid et al[12]	2	Laparoscopy	Nonpregnant	100% deliveries > 34 weeks
Liddell et al[13]	10	Laparoscopy	Nonpregnant	100% deliveries in third trimester
Kjøllesdal et al[14]	1	Laparoscopy	Nonpregnant	100% term delivery
Al-Fadhli, Tulandi[15]	2	Laparoscopy	Nonpregnant	100% deliveries > 34 weeks
Mingione et al[4]	11	Laparoscopy	Nonpregnant	100% deliveries > 34 weeks
Gallot et al[16]	2	Laparoscopy	Nonpregnant	100% term deliveries
Cho et al[17]	20	Laparoscopy	During pregnancy	95% live born infants

were selected for review and the included studies are tabulated in Table 1.[5-17] From these 15 articles, 132 patients underwent laparotomy and 245 patients underwent laparoscopy for transabdominal cervical cerclage. The procedure was performed in both the pregnant as well as in the nonpregnant state.

Carter et al[5] compared a prospective cohort of patients undergoing laparoscopic cerclage with a historical control group of patients who underwent a laparotomy for TAC and there was no difference in outcome for viable pregnancies (75% in laparoscopy and 71% in the laparotomy group). A similar study outline is seen in a study of Whittle et al[6] with a larger sample size. Sixty-five patients underwent a laparoscopic TAC either before or during pregnancy. The outcomes were compared with the traditional laparotomy approach using previously reported cohorts. The success rate in this study was 89% with a mean gestational age of 35.8 ± 2.9 weeks, which is a comparable obstetric outcome with the laparotomy approach.

Also from the selected studies the success rate of live pregnancies after 33 weeks ranges from 71 to 100% in the laparotomy group and 75 to 100% in the laparoscopy group with a mean success rate of 89.8% in the laparotomy group and 96% in the laparoscopic procedures. It can be concluded from these studies that the laparoscopic approach for TAC is as effective as the laparotomy approach and can be safely performed during pregnancy also.

In one of the case series with 11 cases, a small bowel injury was reported[4] and two uterine vessel injuries were reported in two studies.[16,17] In a prospective cohort study by Ades et al,[1] four cases in the laparotomy group and one case in the laparoscopy arm had complications. In the laparotomy group, three cases had intraoperative hemorrhage and one wound infection and in the laparoscopy group perforation of the bladder was noted in one patient. The laparoscopic TAC confers a similar rate of perioperative complications as the laparotomy and is best finished in nonpregnant or in the first trimester.

The operating time in the laparoscopic group was more compared to the laparotomy but did not have any statistical significance and in some studies the laparoscopic cerclage was concomitantly performed[1] with other surgeries. The laparoscopy group had significantly lower surgical morbidity, which was contributed mainly by a reduced hospital stay. Most laparoscopy cases were classified as outpatient procedures and were performed with oral analgesia only, with the patient leaving the hospital on the same day. The difference in blood loss was also not clinically significant and no patient required transfusion.

DISCUSSION

Aside from the more complexity in the procedure of a TAC, there are some points of interest when utilizing this method rather than the transvaginal cerclage, i.e., high situation of the suture, no slippage of the cerclage, absence of the suture material inside the vagina that could bring about infection and preterm labor, and the advantage to leave the tape *in situ* between pregnancies.[3] To utilize this method laparoscopically, the surgeon needs ability in laparoscopic suturing. In contrast with laparotomy, laparoscopy outcomes are less or no hospitalization, less postoperative torment, and quicker recovery.[18,19]

Laparoscopic cervical cerclage can be performed during pregnancy or as an interval procedure in nonpregnant women. It is performed under general anesthesia. In a nonpregnant woman, a dilator may be initially inserted into the cervix through the vagina for uterine

manipulation. The peritoneal cavity is first insufflated with carbon dioxide through a Veress needle inserted into the umbilicus. Optical and secondary ports are created to provide access for the laparoscope and surgical instruments. The bladder is dissected away from the uterus and a ligature of tape or mesh is secured around the cervical isthmus, above the cardinal and uterosacral ligaments. As with the open transabdominal approach, cesarean section is necessary to deliver the baby.[1-3]

The transabdominal cervical cerclage can be done as a prophylactic procedure or as an indicated one. The specific indications include those people in whom an agreeable transvaginal cerclage is not actually feasible with a congenital short or absent cervix, a lacerated cervix, severe scarring of the cervix, and multiple deep cervical defects.[15] Likewise, a past fizzled vaginal cerclage has been regarded as an indication for a TAC.[9,20] Some studies researched the adequacy of a prophylactic cerclage after cervical conization for decreasing the danger of preterm delivery. Regardless of the rise in the rate of preterm delivery after conization, no advantage on the utilization of prophylactic cerclage can be found.[3]

There is a choice of performing this procedure in a pregnant or a nonpregnant state. In the pregnant state, the cerclage is performed toward the end of the first trimester.[21] The benefit of placing the stitch in the nonpregnant state is the reduction in fetal and maternal risk, easy manipulation with good exposure of the uterus and with less chance of bleeding during the procedure. This procedure can be concomitantly performed with other surgeries like excision of endometriosis, dye studies, adhesiolysis, and myomectomy.[1]

The most imperative complication of a TAC is increased bleeding.[4,21] Doing this method in the nonpregnant state and utilizing more up to date techniques of laparoscopic TAC, this complication gets to be rarer; however, no information on the actual frequency are available. Mingione et al[4] reported an initially unrecognized penetrating small bowel injury that occurred during lysis of extensive adhesions involving the bowel and uterus. Subsequently, the patient developed a pelvic abscess that was treated with computed tomography-guided drainage and intravenous antibiotics. The estimated blood loss in cases with intraoperative hemorrhage was 250 to 300 mL; but all of the patients were asymptomatic with regard to anemia, and also no blood transfusions were required and laparoscopic perforation of the bladder was repaired at the time of surgery.

Another complication is the morbidity of the unavoidable resulting cesarean section. There are likewise the intricacies of laparoscopy itself. A portion of the reported complications after transvaginal cerclage, like preterm premature rupture of membranes, chorioamnionitis, and cervical dystocia are not found in the laparoscopic TAC. By and large, one can say that this minimal-invasive method has good success rate and minimal co-morbidities with less complication.

CONCLUSION

Transabdominal cervical cerclage could be either prophylactic or indicated, but has a higher success rate. Transabdominal cerclage cannot be compared with the transvaginal cerclage as the indications and situations of both the procedure differ and also the transabdominal procedure gives an additional advantage to perform concomitant surgery along with the cerclage. Laparoscopic approach for TAC is as effective as the laparotomy and can be safely performed during pregnancy also. Laparoscopic method is preferred over laparotomy as it is associated with less or no hospitalization, less postoperative pain, and quicker recovery so that the morbidity associated with laparotomy can be prevented.

REFERENCES

1. Ades A, Dobromilsky KC, Cheung KT, Umstad MP. Transabdominal cervical cerclage: laparoscopy versus laparotomy. J Minim Invasive Gynecol 2015 Sep-Oct;22(6):968-973.
2. NICE Interventional Procedure Guidance [IPG228]. Interventional procedure overview of laparoscopic cerclage for prevention of recurrent pregnancy loss due to cervical incompetence; 2007 Aug. Accessed from: htpp://nice.org.uk/guidance/ipg228.
3. Gebruers M, Jacquemyn Y, Cornette J. Laparoscopic transabdominal cerclage. Surg Sci 2013 Apr;4(4):231-235.
4. Mingione MJ, Scibetta JJ, Sanko SR, Phipps WR. Clinical outcomes following interval laparoscopic transabdominal cervico-isthmic cerclage placement: case series. Hum Reprod 2003 Aug;18(8):1716-1719.
5. Carter J, Soper D, Goetzl L, Van Dorsten P. Abdominal cerclage for the treatment of recurrent cervical insufficiency: laparoscopy of laparotomy? Am J Obstet Gynecol 2009 Jul;201(1):111.e1-111.e4.
6. Whittle WL, Singh SS, Allen L, Glaude L, Thomas J, Windrim R, Leyland N. Laparoscopic cervico-isthmic cerclage: surgical technique and obstetric outcomes. Am J Obstet Gynecol 2009 Oct;201(4):364.e1-364.e7.
7. Ades A, May J, Cade TJ, Umstad MP. Laparoscopic transabdominal cervical cerclage: a 6-year experience. Aust N Z J Obstet Gynaecol 2014 Apr;54(2):117-120.
8. Umstad MP, Quinn MA, Ades A. Transabdominal cerclage. Aust N Z J Obstet Gynaecol 2010 Oct;50(5):460-464.
9. Thuezen LL, Diness BR, Langhoff-Roos J. Pre-pregnancy transabdominal cerclage. Acta Obstet Gynecol Scand 2009; 88(4):483-486.
10. Davis G, Berghella V, Talucci M, Wapner RJ. Patients with a prior failed transvaginal cerclage: a comparison of obstetric outcomes with either transabdominal or transvaginal cerclage. Am J Obstet Gynecol 2000 Oct;183(4):836-839.
11. Nicolet G, Cohen M, Begue L, Reyftmann L, Boulot P, Déchaud H. Laparoscopic cervico-isthmic cerclage evaluation. Gynecol Obstet Fertil 2009 Apr;37(4):294-399.
12. Reid GD, Wills HJ, Shukla A, Hammill P. Laparoscopic transabdominal cervico-isthmic cerclage: minimally invasive

approach. Aust N Z J Obstet Gynaecol 2008 Apr;48(2): 185-188.

13. Liddell HS, Lo C. "Laparoscopic Cervical Cerclage: a Series in Women with a History of Second Trimester Miscarriage," Journal of Minimally Invasive Gynecology, Vol. 15, No. 3, 2008, pp. 342-345.
14. Kjøllesdal M, Nielsen S, Stjerndahl JH, Ellström Engh MA. Laparoscopic cervico-uterine cerclage using polypropylene mesh for the treatment of cervical incompetence. Acta Obstet Gynecol Scand 2005 Aug;84(8):823-824.
15. Al-Fadhli R, Tulandi T. Laparoscopic abdominal cerclage. Obstet Gynecol Clin North Am 2004 Sep;31(3):497-504.
16. Gallot D, Savary D, Laurichesse H, Bournazeau JA, Amblard J, Lémery D. Experience with three laparoscopic transabdominal cervico-isthmic cerclage and two subsequent pregnancies. BJOG 2003 Jul;110(7):696-700.
17. Cho CH, Kim TH, Kwon SH, Kim JI, Yoon SD, Cha SD. Laparoscopic transabdominal cerclage during pregnancy. J Am Assoc Gynecol Laparosc 2003 Aug;10(3):363-366.
18. Wolfe L, DePasquale S, Adair CD, Torres C, Stallings S, Briery C, Pearce C. Robotic-assisted laparoscopic placement of transabdominal cerclage during pregnancy. Am J Perinatol 2008 Nov;25(10):653-655.
19. Fechner AJ, Alvarez M, Smith DH, Al-Khan A. Robotic-assisted laparoscopic cerclage in a pregnant patient. Am J Obstet Gynecol 2009 Feb;200(2):e10-e11.
20. Zaveri V, Aghajafari F, Amankwah K, Hannah M. Abdominal versus vaginal cerclage after a failed transvaginal cerclage: a systematic review. Am J Obstet Gynecol 2002 Oct;187(4):868-872.
21. Lotgering FK, Gaugler-Senden IP, Lotgering SF, Wallenburg HC. Outcome after transabdominal cervicoisthmic cerclage. Obstet Gynecol 2006 Apr;107(4):779-784.

10.5005/jp-journals-10033-1278

REVIEW ARTICLE

Laparoscopic Surgery in Low-income and Limited-resource Settings: Does It safely add Value? A Review of 2,901 Laparoscopic Gynecologic Procedures

[1]Rafique B Parkar, [2]Leeya F Pinder, [3]JG Wanyoike, [4]Yamal Patel, [5]David Otieno, [6]Yusuf Palkhi
[7]Richard Baraza, [8]Khama Rogo

ABSTRACT

Objectives: Of the 234 million surgeries conducted yearly worldwide, only 3.5% are carried out in low-income countries. Known advantages exist to laparoscopic surgery, and it is widely utilized in high-income countries; however, many barriers exist to uptake in low-income countries. Since 1992, laparoscopic surgery has been successfully undertaken in various rural public hospitals in Kenya. We sought to review outcomes of laparoscopic surgeries performed by our group in these facilities.

Materials and methods: Between 1992 and 2015, 3,119 laparoscopic procedures were performed at 17 rural hospitals in Kenya as a part of the Round Table's "Week of Healing Project." The medical and operative records of all patients who underwent gynecological laparoscopic surgery were retrospectively reviewed for outcomes.

Results: During the reporting period, 2,901 cases performed were gynecologic procedures; the mean age of patients was 34.2. Forty-one complications were encountered (1.41%), and one death (0.03%) occurred secondary to hemorrhage following conversion to laparotomy for an ovarian tumor. The mean hospitalization was 1.9 days.

Conclusion: Laparoscopic surgery is feasible, safe, and cost-effective, and it has important advantages in low-income countries with limited resources. Laparoscopic surgery does add value in low-resource settings, and our activities demonstrate that it is a safe alternative to traditional open modalities of surgery.

Keywords: Global surgery, Gynecologic surgery, Laparoscopic surgery, Low- and middle-income country surgery.

How to cite this article: Parkar RB, Pinder LF, Wanyoike JG, Patel Y, Otieno D, Palkhi Y, Baraza R, Rogo K. Laparoscopic Surgery in Low-income and Limited-resource Settings: Does It safely add Value? A Review of 2,901 Laparoscopic Gynecologic Procedures. World J Lap Surg 2016;9(2):82-85.

Source of support: Nil

Conflict of interest: None

[1]Associate Professor, [2]Instructor and Postdoctoral Research Fellow, [3]Senior Lecturer, [4]Lecturer, [5,8]Consultant, [6,7]Surgeon

[1]Department of Obstetrics and Gynecology, University of Cape Town, Cape Town, South Africa

[2]Department of Obstetrics and Gynecology, Boston University School of Medicine, Boston, Massachusetts, USA

[3]Department of Obstetrics and Gynaecology, University of Nairobi, Nairobi, Kenya

[4]Department of Obstetrics and Gynecology, Aga Khan University Hospital, Nairobi, Kenya

[5]Department of Anesthesiology, The Nairobi Hospital, Nairobi Kenya

[6]Department of General Surgery, Mombasa Hospital Mombasa Kenya

[7]Department of General Surgery, Nairobi Hospital, Nairobi Kenya

[8]Department of Obstetrics and Gynecology, Sagam Community Hospital, Siaya County, Kenya

Corresponding Author: Rafique B Parkar, Associate Professor Department of Obstetrics and Gynecology, University of Cape Town, Cape Town, South Africa, Phone: +2540203740752 e-mail: rafsan254@gmail.com

INTRODUCTION

Until recently, access to surgical interventions has been a neglected global issue despite up to 30% of the world's disease burden requiring surgical intervention.[1] Almost 2 billion people in the world have no access to needed interventions, and of the 234 million surgeries conducted worldwide each year, only 3.5% are conducted in low-income countries.[2] For almost 35 years, there has been a rapid spread and evolution of laparoscopic surgery in the developed world, where this modality is largely regarded as the first choice in 98% of all surgical interventions by adequately trained surgeons.[3]

In low-income countries, restricted access and availability of equipment and lack of adequate training of surgeons have been barriers to establishing successful laparoscopic surgery programs.[3] Gawande reported that lack of clean water, sanitary living conditions, depleted blood facilities, lack of sufficient infection control, and diagnostic imaging techniques have further delayed the uptake of laparoscopic surgery in rural areas.[4] The notable advantages to laparoscopic surgery include smaller, cosmetically acceptable incisions; less scarring and postoperative pain; less utilization of antibiotics and analgesics; reduced overall hospital stay; and less ward congestion.[5]

Faster recovery and quicker return to work make these procedures less expensive in the long run[6,7] which is particularly important in low-income settings.

The cost-effectiveness of laparoscopy continues to be an important consideration in low- and middle-income countries (LMICs) countries and generates regular debate; however, Sculpher et al[8] in their review determined that laparoscopy was in fact significantly (25–30%) cheaper when compared to laparotomies. Chao et al[9] in their systematic review of laparoscopic surgery in LMICs reviewed 1,101 abstracts from 25 LMICs and concluded that laparoscopic surgery was particularly advantageous in LMICs. In the presence of poor sanitation, limited diagnostic and imaging facilities, crowded hospital beds, lack of blood banks, and single-income households, laparoscopy is safe, effective, feasible, and cost-effective when offered in LMICs.

The principal author started his laparoscopic surgery career in 1992, at the Kilifi District Hospital along the Kenyan Coast and with the collaborative efforts of a general surgeon, carried out biannual surgical camps performing 200 surgeries per year. By 2000, The Kenya Society of Endoscopic Specialties (KESES) partnered with Round Table, a young men's charitable club, and laparoscopic surgery was offered as a surgical option for treatment in various rural hospitals in Kenya. Since then, laparoscopy has been successfully undertaken in 17 rural hospitals in Kenya, with more than 3,000 procedures performed. Given the need to expand access to all modalities of surgery including laparoscopy in LMICs, and given the extensive laparoscopy experience in this setting, this assessment was designed to test the hypothesis that laparoscopic surgery, when performed by experienced surgeons, can be successfully and safely implemented as an alternative to laparotomy in rural settings in LMICs.

MATERIALS AND METHODS

The laparoscopic surgery program began with the receipt of laparoscopic tubal ligation kits from Johns Hopkins Program for International Education in Gynecology and Obstetrics (JHPIEGO) in the 1990s. Laparoscopic surgical interventions continued in various rural hospitals with support from Round Table, providing logistics, supplies, preoperative advertising, and patient screening. Additionally, transport and accommodations were provided to all volunteer surgeons through this organization. The laparoscopic surgical camps or "Week of Healing Projects" were organized biannually, and two laparoscopic surgeons – one specializing in Gynecology and the other in General Surgery – performed the procedures.

The patients were screened to determined candidacy for laparoscopic surgical intervention by various clinicians at each hospital hosting the Week of Healing Project. Patients were determined to be a candidate for laparoscopic intervention if they were not obese, had simple pathologies, no previous laparotomies, or any preexisting comorbidities. On average, 400 to 450 surgeries were conducted each year.

The charts of all patients who underwent laparoscopic surgery during the Week of Healing Project surgical camps between 1992 and 2015 were retrospectively reviewed for demographic data, procedure performed, length of hospital stay, morbidity, and mortality. All of the de-identified data were compiled into a secure database and the data categorized and analyzed using. Numbers for Mac (Apple Inc., Cupertino, CA, USA). All General Surgery cases were excluded from the analysis to focus on the use of laparoscopy for gynecologic procedures in this setting. Approval was obtained from the Bomu Hospital's Institutional Review Board.

RESULTS

Seventeen rural, low-income, and resource-limited public hospitals in Kenya were visited between 1992 and 2015, and 2,901 laparoscopic gynecological procedures were undertaken between these institutions. The mean age of patients undergoing a laparoscopic procedure was 34.2, with the majority of patients (70.5%) ranging between ages 18 and 50 (Table 1). The surgeries performed over the reporting period are identified in Table 2. The most common gynecologic procedures performed were ovarian surgery and myomectomy, with 704 (22.8%) and 582 (17.4%) cases respectively. Gynecological laparoscopic

Table 1: Demographic data

	n	*%*
Gender		
Female	2,901	100
Age		
Under 18	39	1.34
18–50	2,046	70.5
Over 50	816	28.1

Table 2: Gynecologic procedures

	n	*%*
Ovarian biopsy, cystectomy, drilling	704	22.8
Myomectomy	676	20.0
Total/subtotal hysterectomy	582	17.4
Adhesiolysis, tuboplasty, salpingectomy	527	17.0
Bilateral tubal ligation	322	11.1
Radical hysterectomy	31	0.99
Oopherectomy	22	0.8
Saccrocolpopexy	21	0.67
Bilateral tubal ligation reversal	14	0.1
Metroplasty	2	0.001
Total gynecology cases	2,901	

Table 3: Laparoscopic surgery growth

Year (n)	*0–5*	*6–10*	*11–15*	*16–20*	*21–23*	*Total*
Total surgeries performed (n)	875	997	1,789	2,013	1,874	7,548
Laparoscopic procedures performed (n)	29	98	684	1,296	1,012	3,119
Laparoscopy percentage	3.3	9.8	38.2	64.4	54.0	41.3

Table 4: Complications

	n	*%*
Sepsis	9	0.31
Ureteral injury	1	0.03
Secondary hemorrhage	22	0.75
Vesicovaginal fistula	3	0.10
Port site herniation	4	0.14
Intestinal obstruction	2	0.07
Conversion to laparotomy*	211	7.27

*Not considered as a complication

procedures increased from 3.3% of total procedures performed at these facilities in 1992 to 41.3% in 2015 (Table 3).

The mean length of hospital stay for laparoscopic surgery patients was 1.9 days. There were 41 known complications out of the 2,901 procedures performed (1.41%). Complications included sepsis, wound dehiscence, secondary hemorrhage, port site herniation, intestinal obstruction, ureteric injuries, and vesicovaginal fistulas (Table 4). Secondary hemorrhage was the commonest complication occurring in 22 (0.75%) cases. One mortality was reported, resulting from uncontrollable hemorrhage during a converted laparotomy for an ovarian tumor. Conversion to laparotomy occurred in 211 (7.2%) cases.

DISCUSSION

The value of laparoscopic surgery in low-income and resource-limited settings has been debated for some time; however, large-scale studies are limited. In an 8-year retrospective analysis of gynecological laparoscopic surgery in a resource-limited setting, Mboudou et al[10] reviewed 9,194 surgeries where only 633 (6.9%) were performed laparoscopically at the University of Yaounde's Teaching Hospital in Cameroon. The mean duration of hospitalization was 3.4 ± 1.8 days and a complication rate of 5.9% was reported.[10] In our review of data from 17 rural hospitals in Kenya, a total of 7,548 surgical procedures have been performed since 1992. Of these, 2,901 gynecologic cases were completed laparoscopically with a complication rate of only 1.41% and a mean hospital stay of 1.9 days. In our series, the complication rate was much lower, which may be attributable to the years of expertise and the number of surgical cases performed.

The costs associated with laparoscopy are a relevant concern in the discussions of laparoscopy in LMIC settings. We note that patients paid a nominal fee equivalent to USD 200 to 600 per procedure to the hosting hospital; however, this fee was waived when it was considered unaffordable. The cost of each surgical case (logistics, expendable supplies) to the organizers did rise from USD 35 per patient in 1992 to USD 386 per patient in 2015; however, all surgeons volunteered their time and expertise at no cost. All of the support for the laparoscopic equipment was provided by local industry partners, while the host hospital provided all additional equipment and supplies and managed postoperative care and follow-up.

The above illustration suggests that lack of equipment and costs should no longer be accepted as limitation to patients having access to minimally invasive surgery. Various adaptations can decrease costs and surmount barriers allowing for more widespread acceptance of laparoscopic surgery in low-income settings including team work, sourcing of donated equipment, training of theater and support staff, encouraging local universities to incorporate laparoscopic surgery in their postgraduate teaching curriculums, developing safe clinical guidelines, and the use of reusable instruments.[11,12] The argument that laparoscopic surgery is expensive is no longer acceptable since the cost-effectiveness of laparoscopic surgery has been reported to be superior in numerous publications.[8,9,11,13]

Laparoscopic surgery has unlimited advantages in resource-limited settings;[14,15] therefore, surgeons have to be encouraged to undergo the required sustained training for safe laparoscopic surgery, which is now available. Concomitant incorporation of skills training in laparoscopic surgery at our existing universities will motivate the younger surgeons to develop a sense of professional accomplishment and confidence to provide this essential service to the community. Additionally, laparoscopic outreach programs can act as a tool for skills training, giving new surgeons an opportunity to refine their skills.

This retrospective assessment provides unique insight into the use of laparoscopy in rural LMIC settings; however, the assessment has some limitations. An attempt was made to see all patients postoperatively during the week of the surgical camps, and continued follow-up was left to the host hospital; nonetheless, we made every effort to be informed of subsequent complications. This analysis is retrospective; albeit, given the volume of cases completed each year, a prospective study with defined characteristics will provide improved insight into the successes and challenges of laparoscopy in this setting.

CONCLUSION

Laparoscopic surgery is a feasible undertaking in low-income countries with all of the known added value of minimally invasive surgeries in this setting. Investment into access to this important surgical intervention by key stakeholders is paramount, and many challenges encountered can be easily overcome by making persistent, standardized training of surgeons and theater support staff a priority. Furthermore, a surgical outcome registry, maintained at the national level, with regular audits conducted by institutions offering laparoscopic surgery in low-resource settings is critical, and a best-practice, safe-oriented clinical guideline should be developed and implemented on a larger scale. Laparoscopic surgery does add value in low-resource settings and is a safe alternative to the traditional open modalities of surgery.

REFERENCES

1. Shrime MG, Bickler SW, Alkire BC, Mock C. Global burden of surgical disease: an estimation from the provider perspective. Lancet Glob Health 2015 Apr 27;3(Suppl 2):S8-S9.
2. Weiser TG, Regenbogen SE, Thompson KD, Haynes AB, Lipsitz SR, Berry WR, Gawande AA. An estimation of the global volume of surgery: a modelling strategy based on available data. Lancet 2008 Jul 12;372(9633):139-144.
3. Gnanara JJ, Xiang X, Khiangte H. High quality surgical care at low cost: the diagnostic camp model of Burrows Memorial Christian Hospital. Indian J Surg 2007 Dec;69(6):243-247.
4. Gawande A. World Health Organization. Patient safety, WHO guidelines for safe surgery 2009: safe surgery saves lives. Geneva (Switzerland): World Health Organization, Patient Safety; 2009. p. 1 [online resource (1 PDF file (124p))].
5. Agha R, Muir G. Does laparoscopic surgery spell the end of the open surgeon? J R Soc Med 2003 Nov;96(11):544-546.
6. Raiga J, Kasia JM, Bruhat MA. Laparoscopic surgery in the Cameroon. Int J Gynaecol Obstet 1999 Apr;65(1):65-66.
7. Murphy AA, Nager CW, Wujek JJ, Kettel LM, Torp VA, Chin HG. Operative laparoscopy versus laparotomy for the management of ectopic pregnancy: a prospective trial. Fertil Steril 1992 Jun;57(6):1180-1185.
8. Sculpher M, Manca A, Abbott J, Fountain J, Mason S, Garry R. Cost effectiveness analysis of laparoscopic hysterectomy compared with standard hysterectomy: results from a randomised trial. BMJ 2004 Jan 17;328(7432):134.
9. Chao TE, Mandigo M, Opoku-Anane J, Maine R. Systematic review of laparoscopic surgery in low- and middle-income countries: benefits, challenges, and strategies. Surg Endosc 2016 Jan;30(1):1-10.
10. Mboudou E, Morfaw FL, Foumane P, Sama JD, Mbatsogo BA, Minkande JZ. Gynaecological laparoscopic surgery: eight years experience in the Yaounde Gynaeco-Obstetric and Paediatric Hospital, Cameroon. Trop Doct 2014 Apr;44(2): 71-76.
11. Tintara H, Leetanaporn R. Cost-benefit analysis of laparoscopic adnexectomy. Int J Gynaecol Obstet 1995 Jul;50(1): 21-25.
12. Clegg-Lamptey JN, Amponsah G. Laparoscopic cholecystectomy at the Korle Bu Teaching Hospital, Accra, Ghana: an initial report. West Afr J Med 2010 Mar-Apr;29(2):113-116.
13. Galukande M, Jombwe J. Feasibility of laparoscopic surgery in a limited resource setting: cost containment, skills transfer and outcomes. East Cent Afr J Surg 2011 Jul/Aug;16(2):112-117.
14. Ryder RM, Vaughan MC. Laparoscopic tubal sterilization. Methods, effectiveness, and sequelae. Obstet Gynecol Clin North Am 1999 Mar;26(1):83-97.
15. Bendinelli C, Leal T, Moncade F, Dieng M, Toure CT, Miccoli P. Endoscopic surgery in Senegal. Benefits, costs and limits. Surg Endosc 2002 Oct;16(10):1488-1492.

10.5005/jp-journals-10033-1279

CASE REPORT

Hysteroscopy in Uterine Anomalies: An Edge

[1]Anshika Lekhi, [2]Rahul Manchanda, [3]Sravani Chithra, [4]Nidhi Jain

ABSTRACT

Hysteroscopy is the inspection of the uterine cavity by endoscopy with access through the cervix. It allows for the diagnosis of intrauterine pathology and serves as a method for surgical intervention at the same time. Congenital uterine anomalies result from abnormal formation, fusion, or resorption of the Müllerian ducts during fetal life. These anomalies have been associated with an increased rate of miscarriage, preterm delivery, and other adverse fetal outcomes. In the past whenever a patient presented with Müllerian fusion defect that was thought to be the cause of recurrent pregnancy loss, a laparotomy was performed. They required lengthy anesthesia. Also the postoperative complications were more besides the trauma of a laparotomy scar. With the use of endoscopy all these problems have vanished. The diagnosis and management for uterine anomalies has become much easier and less cumbersome with the use of hysteroscopy. We report a case series (six cases) of uterine anomalies and their hysteroscopic management. It includes one case of hypoplastic gonads, one of rudimentary horn, two of bicornuate uterus, one of complete septum, and one of complex anomaly. With this, the authors would like to emphasize on the revolutionary role of hysteroscopy in the diagnosis and management of uterine anomalies and would review the literature regarding the same.

Keywords: Hysteroscopy, Infertility, Müllerian duct, Uterine anomalies.

How to cite this article: Lekhi A, Manchanda R, Chithra S, Jain N. Hysteroscopy in Uterine Anomalies: An Edge. World J Lap Surg 2016;9(2):86-91.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

Hysteroscopy is the inspection of the uterine cavity by endoscopy with access through the cervix. It allows for the diagnosis of intrauterine pathology and serves as a method for surgical intervention at the same time. Congenital uterine anomalies result from abnormal formation, fusion, or resorption of the Müllerian ducts during fetal life.[1] These anomalies have been associated with an increased rate of miscarriage, preterm delivery, and other adverse fetal outcomes.[2-7] The prevalence rates of uterine anomalies have varied between 0.06 and 38%.[8-15] This wide variation is likely to be linked to the assessment of different patient populations and the use of different diagnostic techniques with variable, and yet to be determined, test accuracy as well as reliance on nonstandardized classification systems. The endoscopic technique for the management of uterine septa was first proposed by Edstrom and Fernstrom in 1970. In the past whenever a patient presented with Müllerian fusion defect that was thought to be the cause of recurrent pregnancy loss, a Jones, Strassman, or Tompkins procedure would be performed by laparotomy. They required lengthy anesthesia and also the postoperative complications were more. With the use of endoscopy all these problems have vanished. The diagnosis and management for uterine anomalies has become much easier and less cumbersome with the use of hysteroscopy. This review has assessed the ease and accuracy of hysteroscopic diagnosis of uterine anomalies.

[1,3,4]Fellow, [2]Consultant

[1-4]Department of Gynae Endoscopy, Manchanda's Endoscopy Centre, New Delhi, Delhi, India

Corresponding Author: Anshika Lekhi, Fellow, Department of Gynae Endoscopy, Manchanda's Endoscopy Centre New Delhi, India, Phone: +918860241148, e-mail: dranshikalekhi@gmail.com

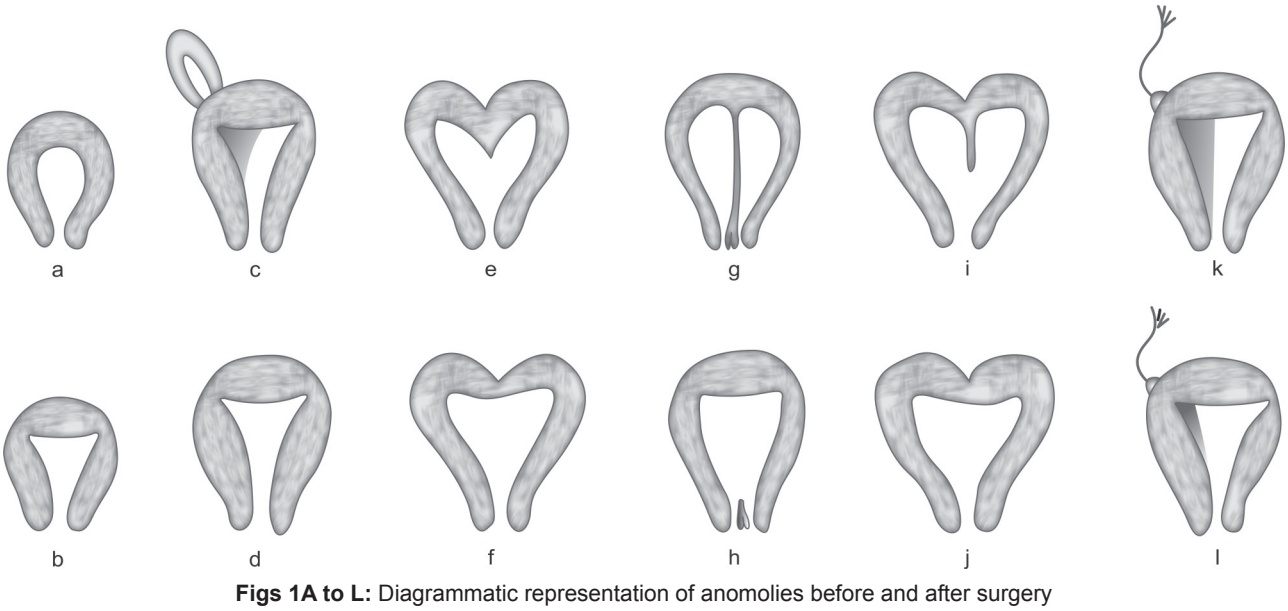
CASE REPORTS

The authors report a series of six cases of uterine anomalies.

1. This 18-year-old was suffering from primary amenorrhea. She came to us with chief complaints of not having started with menses and poorly developed breasts. There was no history to suggest any insidious/ongoing disease process/radiation exposure. Tuberculosis and thyroid illness were ruled out. Her ultrasound and magnetic resonance imaging (MRI) showed smaller ovaries and a hypoplastic uterus (33 mm) with the endometrium not being well defined. Her chromosomal analysis was normal and on examination breasts were a little less developed, but rest of the secondary sexual characters were within the range of development. Hormonal profile was within normal but on the lower side. She was taken up for a hysteroscopy and laparoscopy for further management. Hysteroscopy showed a very small cavity with endometrium being in proliferative phase and thin (Fig. 1A). On laparoscopy ovaries were a tad smaller and the uterus too appeared smaller. Hysteroscopic cutting of septum with bilateral lateral wall metroplasty was done (Fig. 1B). She was put on high doses of sequential estrogen and progesterone therapy and was asked to follow-up. She did very well and got her

first period after her surgery and has been regularly menstruating since then, much to her and her family's joy. Follow-up ultrasonography (USG) was done, which interestingly showed her ovaries' size to be larger and normal than before and a uterus of size $66 \times 40 \times 27$ mm. Endometrium now was being well formed and typically triple layered.

2. A 40-year-old nulliparous lady complaining of chronic pelvic pain and severe dysmenorrhea for the past few years worsened over the past few months. She was also concerned about her future fertility options. Ultrasonography showed a unicornuate uterus with a left-sided uterine horn with an endometrial cavity; these findings were confirmed by MRI (Figs 1C and 2). The patient underwent diagnostic and operative hysteroscopy with lateral meteroplasty, while diagnostic and operative laparoscopy with resection of the rudimentary horn and fulguration of endometriotic lesions. The findings on hysteroscopy were unicornuate small uterine cavity, with right-side ostia visualized. All four walls were normal; cervical canal also normal; on laparoscopy unicornuate uterus with left-sided noncommunicating rudimentary horn with an endometrial cavity was seen; B/L tubes normal; B/L ovaries: Endometriotic spots seen. Endometriotic spots were seen on the utero-sacral ligaments and bowel adherent to left pelvic wall. At the end, the cavity was much larger and adequate for conception (Fig. 1D).
3. A case of 25-year-old lady with history of one spontaneous abortion at 14 weeks, 2 years earlier. Now anxious to conceive. On hysteroscopy both cornua in the lower half were close together, simulating a septate or bicornuate uterus. In the upper part, they were further apart (Figs 1E and 3). A hysteroscopic metroplasty was done and both cavities were enlarged. Lower half of the uterine cavities were unified by cutting the adjoining myometrial tissues of both the horns using a traditional monopolar resectoscope. After the procedure the uterine horns on laparoscopy had come closer. An intrauterine device (after removing copper) was inserted and she was put on sequential hormones. Her 2nd look surgery gave a perfectly normal healed cavity (Fig. 1F).
4. A 33-year-old female came with a complaint of pain in lower abdomen, with history of secondary infertility and two miscarriages, diagnosed as complete uterine septum with two cervices (bicollis) (Fig. 1G). A diagnostic and operative laparoscopy and hysteroscopy was advised. Hysteroscopic septal resection was performed with resectoscope by keeping both cervices intact under general anesthesia in early proliferative phase (Fig. 1H). She conceived and delivered a term healthy baby girl by lower segment cesarean section. Intraoperatively, uterus was normal and no septum was seen.
5. A 26-year-old with history of (h/o) two miscarriages came as a case of secondary infertility. She had two spontaneous abortions at 8 and 9 weeks. Her hysterosalpingography (HSG) revealed partial uterine septum and B/L tubes patent with free spillage (Fig. 1I). Ultrasound showed bicornuate uterus. Thus a diagnostic and operative laparoscopy and hysteroscopy was advised. Hysteroscopic septoplasty was performed with scissors, and intrauterine device was inserted after removing copper coil (Figs 1J and 4). On laparoscopy, uterus was normal in size with broad fundus. Her relook hysteroscopy a month later



Figs 1A to L: Diagrammatic representation of anomolies before and after surgery

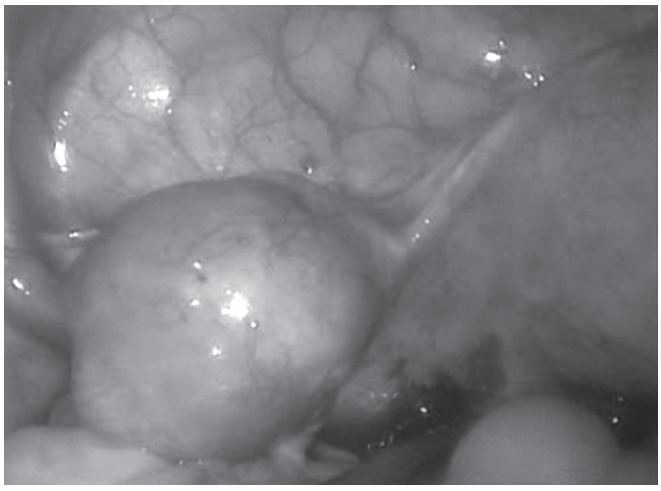


Fig. 2: Uterine horn

Fig. 3: Bicornuate uterus

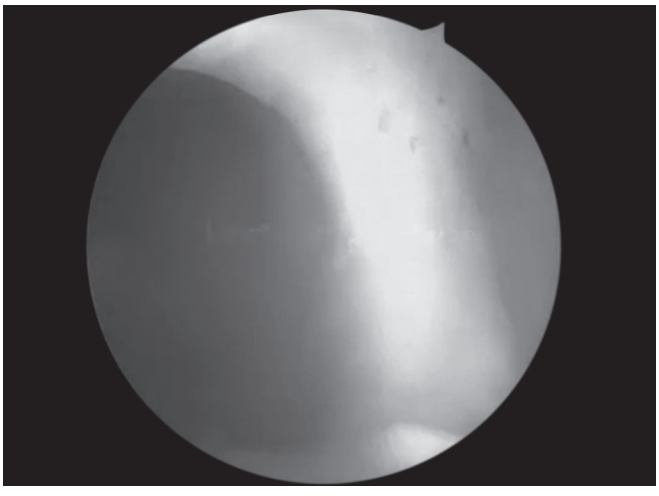


Fig. 4: Uterine septum

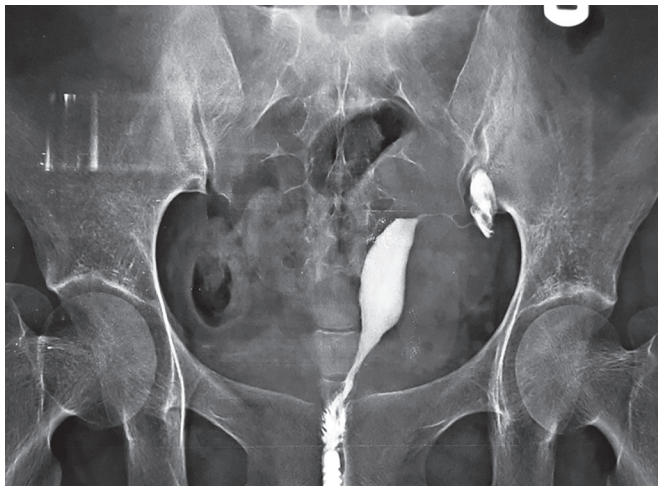


Fig. 5: Hysterosalpingograph

revealed few adhesions for which adhesiolysis was done and the cavity was normalized. She was advised for normal trial of conception. Her intrauterine pregnancy was confirmed at 6 weeks and 4 days after 6 months of surgery.

6. A 26-year-old female presented with secondary infertility. She had h/o one spontaneous abortion at 6 weeks, 3 years prior to presentation. Her HSG revealed single left cornu with free spillage (Fig. 5). The right-side cornu was not visualized. Ultrasonography showed normal study. A diagnostic and operative hysteroscopy and laparoscopy was advised. Her hysteroscopy revealed unicornuate uterus with normal proliferative endometrium. On laparoscopy, astonishing findings of uterus normal in size and shape with noncanalized right half of the uterus were seen; it also showed a noncanalized right-sided fallopian tube (Figs 1K and 6). B/L ovaries were found to be normal. Hysteroscopically, lateral metroplasty with cavity enhancement was done for her (Fig. 1L). She is posted for a relook surgery after a month.

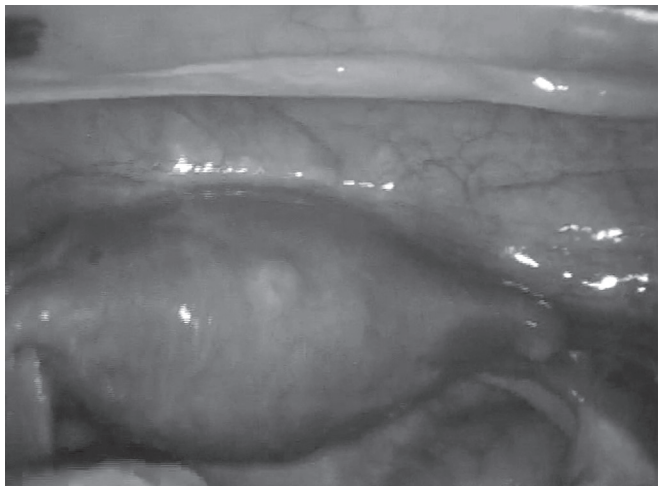


Fig. 6: Complex anomaly

DISCUSSION

Hysteroscopy has revolutionized the uterine morbidity management globally. Its advantages over traditional abdominal approach include less morbidity, less postprocedure pain, and reduced hospital stay, thereby making it

a cost-effective procedure. Given its minimally invasive approach, there is no scar formation or postoperative adhesion, which allows the maintenance of integrity of uterine wall. The recovery time before conception is shortened. Also, the probability of profuse bleeding and trauma is decreased when compared to abdominal approach. All these advantages make hysteroscopy a better option. There are different methods of performing operative hysteroscopy. It may be performed using monopolar, bipolar electrocautery, argon laser, or scissors, none of the particular modality being superior to other.[16,17]

Gomel et al[18] considered the combination of hysteroscopy and laparoscopy to be the gold standard in evaluating congenital uterine anomalies in woman with infertility. Hysteroscopy with laparoscopy offers the added advantage of concurrent treatment, as in the case of a uterine septum resection and often in complex anomalies also.

Maneschi et al[19] performed diagnostic hysteroscopy in women with abnormal uterine bleeding and detected a 10% prevalence of uterine anomalies, which were associated with a significantly higher incidence of spontaneous abortion and lower cumulative live birth rates.

Hamilton et al[20] also suggested hysteroscopy to be the gold standard for the diagnosis of uterine anomalies.

Letterie[21] suggested that hysteroscopy allows direct visualization of the intrauterine cavity and ostia. It is therefore very accurate in identifying congenital uterine anomalies and is often used to establish a definitive diagnosis after an abnormal HSG finding.

Soares et al[22] studied 65 infertile women and concluded that hysteroscopy is very accurate in identifying congenital uterine anomalies and is often used to establish a definitive diagnosis after an abnormal HSG finding. They also found hysteroscopy to be the gold standard for diagnosis.

Homer et al[13] did a review of septate uterus management. They also highlighted that reliable diagnosis of the septate uterus depends on accurate assessment of the uterine fundal contour. At present, the combined use of laparoscopy and hysteroscopy is the gold standard for diagnosis, although recent reports of two-dimensional (2D), transvaginal, contrast ultrasound, and of the three-dimensional (3D) ultrasound appear promising. The prevalence of the septate uterus is increased in women with repeated pregnancy loss. A meta-analysis of published retrospective data comparing pregnancy outcome before and after hysteroscopic septoplasty indicated a marked improvement after surgery. They also concluded that the hysteroscopic approach to treatment, with its simplicity, minimal postoperative sequelae, and improved reproductive outcome, has enabled a more liberalized approach to treatment, i.e., now being extended to include not only patients with recurrent pregnancy loss and premature labor but also patients with infertility, especially if IVF is being contemplated.

Consequently, for the correct differentiation between bicornuate and septate uteri, further investigation is required, most commonly a diagnostic laparoscopy. So, we also suggest that a hysterolaparo approach in such cases is very informative. In our cases also we have used this approach for better and correct diagnosis.

Grimbizis et al[6] considered the combination of hysteroscopy and laparoscopy to be the gold standard in evaluating congenital uterine anomalies. Hysteroscopy with laparoscopy offers the added advantage of concurrent treatment, as in the case of a uterine septum resection. Hysteroscopic treatment seems to restore an almost normal prognosis for the outcome of their pregnancies with term delivery rates of approximately 75% and live birth rates of approximately 85%. It seems, therefore, that hysteroscopic septum resection can be applied as a therapeutic procedure in cases of symptomatic patients but also as a prophylactic procedure in asymptomatic patients in order to improve their chances for a successful delivery.

Woelfer et al,[23] however, concluded that the diagnosis is mainly based on the subjective impression of the clinician performing them, and this is thought to be a limitation in the objective estimation of the anomaly.

Complications are similar to HSG, although rarely air emboli or uterine perforation may also occur. This statement is confirmed by the study of Kupesic et al.[24]

Philbois et al[25] in his study has said that combined application of these endoscopic techniques is thought to be the gold standard in the investigation of women with congenital malformations and especially the uterine ones.

Zlopasa et al[26] conducted operative hysteroscopy on 105 infertile women with uterine anomalies. Compared with their previous pregnancies, the abortion rates were lower and delivery rates were higher in women who conceived following hysteroscopic metroplasty. Resectoscope metroplasty significantly improved pregnancy outcome in women with uterine anomalies.

Bettocchi et al[27] recently proposed a new method for differentiating between a septate and bicornuate uterus with the use of office hysteroscopy alone, in a procedure that may also be performed without the use of anesthesia or analgesia. Three criteria were used while assessing 260 patients with a double uterine cavity: The presence of vascularized tissue, sensitivity of the tissue based on its innervations, and its appearance at incision (if suspected to be a septum). In this series, 93.1% of the patients went on to successfully undergo an office hysteroscopic metroplasty during this procedure. In 15 of 18 (83%) patients who underwent laparoscopy,

the diagnosis of a suspected bicornuate uterus was confirmed. Ultimately, the main disadvantage of hysteroscopy is the invasiveness of the procedure which in the past was usually performed under general anesthetic. Nowadays, hysteroscopy is often performed under local anesthetic.

Saravelos et al[28] reviewed the specificity and sensitivity of different methods in the investigation of patients with uterine malformations. Based on their diagnostic accuracy, the diagnostic methods were categorized into four categories:

1. Class Ia: Those that are capable of identifying congenital uterine anomalies and classifying them into appropriate subtypes with an accuracy of > 90%. Hysteroscopy plus laparoscopy, HSG, and 3D US belong to this class.
2. Class Ib: Those that are capable of identifying congenital uterine anomalies with an accuracy of > 90% without being able to classify them into appropriate subtypes. Hysteroscopy alone belongs to this class.
3. Class II: Those that are capable of identifying congenital uterine anomalies with an accuracy of < 90%. According to the available data, HSG and 2D US belong to this class.
4. Class III: This includes the investigations whose diagnostic accuracy in identifying congenital uterine anomalies are still not exactly known; MRI belongs to this class.

They also concluded based on the data derived from class Ia and b studies that the prevalence of congenital uterine anomalies is approximately 6.7% [confidence interval (CI) 95%, 6.0–7.4] in the general/fertile population and 7.3% (CI 95%, 6.7–7.9) in the infertile population. The prevalence in the infertile population is similar to that of the general/fertile population. However, there seems to be a higher prevalence of septate uteri in the infertile population, suggesting an association.[28]

CONCLUSION

Hysteroscopy has revolutionized the uterine morbidity management globally. Its advantages over traditional abdominal approach include less morbidity, less postprocedure pain, reduced hospital stay, thereby making it a cost-effective procedure. Given its minimally invasive approach, there is no scar formation or postoperative adhesion, which allows the maintenance of integrity of uterine wall. The recovery time before conception is shortened. Direct visualization of the cavity leads to the diagnosis of many uterine anomalies which otherwise go unnoticed. These anomalies can not only be diagnosed but also can be managed at the same time.

REFERENCES

1. Moore KL, Persaud TVN, Torchia MG. The urogenital system. Before we are born: essential of embryology and birth defects. 7th ed. Philadelphia (PA): Saunders/Elsevier; 2008. p. 162-189.
2. Green LK, Harris RE. Uterine anomalies. Frequency of diagnosis and associated obstetric complications. Obstet Gynecol 1976 Apr;47(4):427-429.
3. Rock JA, Schlaff WD. The obstetric consequences of uterovaginal anomalies. Fertil Steril 1985 May;43(5):681-692.
4. Acien P. Reproductive performance of women with uterine malformations. Hum Reprod 1993 Jan;8(1):122-126.
5. Raga F, Bauset C, Remohi J, Bonilla-Musoles F, Simon C, Pellicer A. Reproductive impact of congenital Müllerian anomalies. Hum Reprod 1997 Oct;12(10):2277-2281.
6. Grimbizis GF, Camus M, Tarlatzis BC, Bontis JN, Devroey P. Clinical implications of uterine malformations and hysteroscopic treatment results. Hum Reprod Update 2001 Mar-Apr;7(2):161-174.
7. Tomazevic T, Ban-Frangez H, Ribic-Pucelj M, Premru-Srsen T, Verdenik I. Small uterine septum is an important risk variable for preterm birth. Eur J Obstet Gynecol Reprod Biol 2007 Dec;135(2):154-157.
8. Simon C, Martinez L, Pardo F, Tortajada M, Pellicer A. Müllerian defects in women with normal reproductive outcome. Fertil Steril 1991 Dec;56(6):1192-1193.
9. Makino T, Hara T, Oka C, Toyoshima K, Sugi T, Iwasaki K, Umeuchi M, Iizuka R. Survey of 1120 Japanese women with a history of recurrent spontaneous abortions. Eur J Obstet Gynecol Reprod Biol 1992 Apr 21;44(2):123-130.
10. Makino T, Umeuchi M, Nakada K, Nozawa S, Iizuka R. Incidence of congenital uterine anomalies in repeated reproductive wastage and prognosis for pregnancy after metroplasty. Int J Fertil 1992 May-Jun;37(3):167-170.
11. Clifford K, Rai R, Watson H, Regan L. An informative protocol for the investigation of recurrent miscarriage: preliminary experience of 500 consecutive cases. Hum Reprod 1994 Jul;9(7):1328-1332.
12. Acien P. Uterine anomalies and recurrent miscarriage. Infertil Reprod Med Clin North Am 1996;7:689-719.
13. Homer HA, Li TC, Cooke ID. The septate uterus: a review of management and reproductive outcome. Fertil Steril 2000 Jan;73(1):1-14.
14. Guimaraes Filho HA, Mattar R, Pires CR, Araujo E Jr, Moron AF, Nardozza LMM. Comparison of hysterosalpingography, hysterosonography and hysteroscopy in evaluation of the uterine cavity in patients with recurrent pregnancy losses. Arch Gynecol Obstet 2006 Aug;274(5):284-288.
15. Guimaraes Filho HA, Mattar R, Pires CR, Araujo E Jr, Moron AF, Nardozza LMM. Prevalence of uterine defects in habitual abortion patients attended on at a university health service in Brazil. Arch Gynecol Obstet 2006 Oct;274(6):345-348.
16. Heinonen PK, Saarikoski S, Pystyen P. Reproductive performance of women with uterine anomalies. An evaluation of 182 cases. Acta Obstet Gynecol Scand 1982;61(2):157-162.
17. Colacurci N, De Placido G, Mollo A, Carravetta C, De Franciscis P. Reproductive outcomes after hysteroscopic metroplasty. Eur J Obtet Gynecol Reprod Biol 1996 Jun;66(2): 147-150.
18. Gomel V, Taylor P, Yuzpe AA, Rioux JE, editors. Laparoscopy and hysteroscopy in gynecologic practice. Chicago (IL): Year Book Medical Publishers; 1986. p. 252.

19. Maneschi F, Zupi E, Marconi D, Valli E, Romanini C, Mancuso S. Hysteroscopically detected asymptomatic Müllerian anomalies. Prevalence and reproductive implications. J Reprod Med 1995 Oct;40(10):684-688.
20. Hamilton JA, Larson AJ, Lower AM, Hasnain S, Grudzinskas JG. Routine use of saline hysterosonography in 500 consecutive, unselected, infertile women. Hum Reprod 1998 Sep;13(9): 2463-2473.
21. Letterie GS. Structural abnormalities and reproductive failure: effective techniques of diagnosis and management. New York (NY): Blackwell Science; 1998.
22. Soares SR, Barbosa dos Reis MM, Camargos AF. Diagnostic accuracy of sonohysterography, transvaginal sonography, and hysterosalpingography in patients with uterine cavity diseases. Fertil Steril 2000 Feb;73(2):406-411.
23. Woelfer B, Salim R, Banerjee S, Elson J, Regan L, Jurkovic D. Reproductive outcomes in women with congenital uterine anomalies detected by three-dimensional ultrasound screening. Obstet Gynecol 2001 Dec;98(6):1099-1103.
24. Kupesic S. Clinical implications of sonographic detection of uterine anomalies for reproductive outcome. Ultrasound Obstet Gynecol 2001 Oct;18(4):387-400.
25. Philbois O, Guye E, Richard O, Tardieu D, Seffert P, Chavrier Y, Varlet F. Role of laparoscopy in vaginal malformation. An experience in 22 children. Surg Endosc 2004 Jan;18(1): 87-91.
26. Zlopasa G, Skrablin S, Kalafatić D, Banović V, Lesin J. Uterine anomalies and pregnancy outcome following resectoscope metroplasty. Int J Gynaecol Obstet 2007 Aug;98(2): 129-133.
27. Bettocchi S, Ceci O, Nappi L, Pontrelli G, Pinto L, Vicino M. Office hysteroscopic metroplasty: three "diagnostic criteria" to differentiate between septate and bicornuate uteri. J Minim Invasive Gynecol 2007 May-Jun;14(3):324-328.
28. Saravelos SH, Cocksedge KA, Li T-C. Prevalence and diagnosis of congenital uterine anomalies in women with reproductive failure: a critical appraisal. Hum Reprod Update 2008 Sep-Oct;14(5):415-429.

10.5005/jp-journals-10033-1280

CASE REPORT

Laparoscopic Management of Stump Appendicitis

[1]Vivek Aery, [2]Kishore V Alapati, [3]V Pavan Kumar

ABSTRACT

Stump appendicitis is a rare complication reported both after laparoscopic and open appendectomy. Diagnosis of the condition is usually delayed because of previous history of appendectomy and adequate clinical vigilance on part of treating surgeon is required. It results from incomplete appendectomy. Stump appendicitis is inflammation of residual appendix after appendectomy and has reported incidence of 1 in 50,000. We report a case of 20-year-old male who underwent open appendectomy 7 years back and now presented with features of abdominal wall abscess. The patient was diagnosed with stump appendicitis and laparoscopic completion appendectomy was done.

Keywords: Completion appendectomy, Incomplete appendectomy, Stump appendicitis.

How to cite this article: Aery V, Alapati KV, Kumar VP. Laparoscopic Management of Stump Appendicitis. World J Lap Surg 2016;9(2):92-93.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

Stump appendicitis is inflammation of residual appendix after appendectomy and has reported incidence of 1 in 50,000. Stump appendicitis is a rare and underreported entity, and a thorough review of literature revealed 87 cases reported till now.[1] Stump appendicitis needs to be diagnosed urgently because of increased incidence of complications like perforation, abscess, and sepsis associated with the condition.

CASE REPORT

A 20-year-old male admitted with the complaint of pain in right iliac fossa with swelling and redness since 1 week associated with low-grade fever, no chills. The patient was diagnosed with abdominal wall abscess and was managed with antibiotics at some hospital. After no resolution of symptoms, the patient was referred to our hospital for further management. The patient had a history of open appendectomy 7 years back and was symptom-free until last week. On physical examination vitals were stable, McBurney scar was visible, and 2×3 cm inflammation and tender swelling was visible lateral to scar with positive fluctuation and no mass palpable. Labs showed Hb of 12.5 gm%, total leukocyte count 12,610, platelet 3.28 lac, and electrolytes were normal. Contrast-enhance computed tomography (CT) of abdomen revealed stump appendicitis with 14×13 mm appendicolith at the tip of appendix with localized collection of 63×28 mm and external subcutaneous tracking of collection.

The patient was planned for laparoscopic completion appendectomy with abscess drainage. Operative findings revealed that right colon and terminal ileum was adhered to parieties and appendix stump of approximately 3 cm was seen with faecolith at the tip adhered to right flank along with pus in anterior abdominal wall. Blue stapler of 60 mm was fired at the base of appendix, pus was drained out laparoscopically, followed by small skin incision at an external point to break loculi; internal defect was closed. Postoperatively, the patient improved symptomatically and was discharged under satisfactory condition.

DISCUSSION

Appendectomy is one of the common surgeries performed in emergency scenario worldwide. Claudius Amyand performed first appendectomy in the year 1735, but Rose (1945) first reported stump appendicitis as an entity in two patients who had undergone previous surgery.[2] Various risk factors as described in the literature that include a stump longer than 5 mm, severe inflammation, location of appendix (retrocecal/subcecal), and surgeon's inexperience.[3-7] In various reports, it has been shown that incidence is following more laparoscopic procedure as compared to open due to lack of tactile feedback and limited view leading to long stump left behind in cases with inflammation.[4] It is recommended to verify the base of appendix for residual length which should be kept below 3 mm.

Apart from stump appendicitis, another identity called "duplicated appendix" can confuse the surgeon. This has been reported in the literature at a frequency of 0.004%. Three types of duplicated appendix have been described by Wallbridge: (1) Type A, incomplete duplication with both appendices having common base; (2) one of type B appendix is at usual location and another one anywhere along the colon, and (3) type C, complete

[1,3]Registrar, [2]Consultant

[1,3]Department of Surgical Gastroenterology, Global Hospital Hyderabad, Telangana, India

[2]Department of Colorectal Surgery, Apollo Hospitals, Hyderabad Telangana, India

Corresponding Author: Vivek Aery, Registrar, Department of Surgical Gastroenterology, Global Hospital, Hyderabad Telangana, India, Phone: +919849910055, e-mail: vivekaery1983@gmail.com

duplication of cecum with two appendices.[8] Radiological investigation using either ultrasonography (USG) or CT is performed for the diagnosis of stump appendicitis, CT being more specific in ruling out other causes of abdominal pain.

Completion appendectomy as surgical treatment, either open or laparoscopic, is the treatment of choice. Most of the cases reported in the literature had been done as open procedure, but as experience with laparoscopy is increasing along with added advantage of thorough inspection of the peritoneal cavity, we recommend laparoscopic approach with low threshold for conversion.

REFERENCES

1. Papi S, Pecchini F, Gelmini R. Stump appendicitis: a rare and unusual complication after appendectomy. Case report and review of the literature. Ann Ital Chir 2014 Apr 7;85 (epub).
2. Rose TF. Recurrent appendiceal abscess. Med J Aust 1945;32: 352-359.
3. Gupta R, Gernshiemer J, Golden J, Narra N, Haydock T. Abdominal pain secondary to stump appendicitis in a child. J Emerg Med 2000 May;18(4):431-433.
4. Roberts KE, Starker LF, Duffy AJ, Bell RL, Bokhari J. Stump appendicitis: a surgeon's dilemma. JSLS 2011 Jul-Sep;15(3):373-378.
5. Aschkenasy MT, Rybicki FJ. Acute appendicitis of the appendiceal stump. J Emerg Med 2005 Jan;28(1):41-43.
6. Simon SB, Jacqueline JC, Celia MD. Stump appendicitis after open and laparoscopic appendectomies. Am Surg 2012 Jan;78(1):143-144.
7. Kanona H, Al Samaraee A, Nice C, Bhattacharya V. Stump appendicitis: a review. Int J Surg 2012;10(9):425-428.
8. Wallbridge PH. Double appendix. Br J Surg 1962 Nov;50: 346-347.

10.5005/jp-journals-10033-1281

CASE REPORT

Early Postoperative Small Bowel Obstruction associated with the use of V-loc™ Sutures during Surgery for Pelvic Organ Prolapse

[1]John Tillou, [2]Roger Eduardo, [3]Deborah Nagle, [4]Thomas Cataldo, [5]Janet Li, [6]Roger Lefevre, [7]Vitaliy Poylin

ABSTRACT

Aims: To describe three cases of early postoperative bowel obstruction after use of barbed suture material during surgery for pelvic organ prolapse (POP).

Introduction: The utilization of minimally invasive surgical techniques for the treatment of POP is increasing, with a subsequent increase in the use of barbed, self-anchoring suture material, such as the V-loc™ suture, which facilitates intracorporeal suturing.

Case report: We present three cases of early postoperative small bowel obstruction related to the use of barbed sutures during minimally invasive surgery for POP, as well as a review of the relevant literature.

Conclusion: Surgeons should use barbed suture material judiciously and should have a high index of suspicion for barbed-suture related mechanical obstructions. These obstructions are not likely to resolve with conservative management.

Clinical significance: Barbed suture materials allow for ease of laparoscopic suturing but carry a risk of contributing to early bowel obstruction. Laparoscopic surgeons should be aware of this relatively unknown potential complication.

Keywords: Bowel obstruction, Case report, Prolapse, Surgery, Suture.

How to cite this article: Tillou J, Eduardo R, Nagle D, Cataldo T, Li J, Lefevre R, Poylin V. Early Postoperative Small Bowel Obstruction associated with the use of V-loc™ Sutures during Surgery for Pelvic Organ Prolapse. World J Lap Surg 2016;9(2):94-97.

Source of support: Nil

Conflict of interest: None

[1,2]Resident, [3]Chief, [4,6,7]Surgeon, [5]Section Head

[1-4,7]Division of Colon and Rectal Surgery, Beth Israel Deaconess Medical Center, Boston, Massachusetts, USA

[5]Divison of Urogynecology, Beth Israel Deaconess Medical Center, Boston, Massachusetts, USA

[6]Division of Female Pelvic Medicine and Reconstructive Surgery Beth Israel Deaconess Medical Center, Boston Massachusetts USA

Corresponding Author: Vitaliy Poylin, Surgeon, Division of Colon and Rectal Surgery, Beth Israel Deaconess Medical Center, Boston, Massachusetts, USA, Phone: +6176674159 e-mail: vpoylin@bidmc.harvard.edu

INTRODUCTION

Minimally invasive surgical approaches are being employed more frequently in the treatment of pelvic organ prolapse (POP).[1] The V-loc™ suture (Covidien, Mansfield, MA, USA), a unidirectional, barbed, self-anchoring suture, available in either absorbable or nonabsorbable forms, is frequently utilized during the performance of maneuvers which require intracorporeal suturing, such as peritoneal closure or sutured rectopexy. The advantage of the V-loc™ suture is that multiple rows of barbs allow for the creation of a self-anchoring, running closure without the need for intracorporeal knots.[2] This allows for easier laparoscopic suturing and potentially decreased operative times.[2,3] When using this type of barbed suture, it is considered common practice to leave several centimeters of the cut end of the stitch exposed in order to prevent potential tissue slippage.[3,4] However, as has been demonstrated in several recent case reports,[4-10] a potential downside to this practice and to the use of such suture material is that exposed suture barbs may catch on adjacent small bowel, mesentery, or omentum leading to serosal injury, obstruction, or volvulus. Here, we report three such cases of small bowel obstruction in the early postoperative period related to the use of V-loc™ sutures during minimally invasive POP surgery.

CASE REPORTS

Case 1

A 53-year-old female with a 1-year history of full thickness, reducible rectal prolapse underwent a robotic rectopexy. The rectopexy was performed using 2-0 nonabsorbable V-loc™ sutures on both sides of the sacrum at the level of S3, and the pelvic peritoneum was closed in a running fashion using an additional absorbable 2-0 V-loc™ stitch. On postoperative day number 25, she presented with a several-day history of abdominal pain, distention, emesis, and failure to pass flatus. A computed tomography (CT) scan was notable for a small bowel obstruction with a transition point in the distal ileum at the level of the rectopexy (Fig. 1). She was subsequently taken for a diagnostic laparoscopy, which revealed an adhesive band, entrapping the distal ileum, attached to

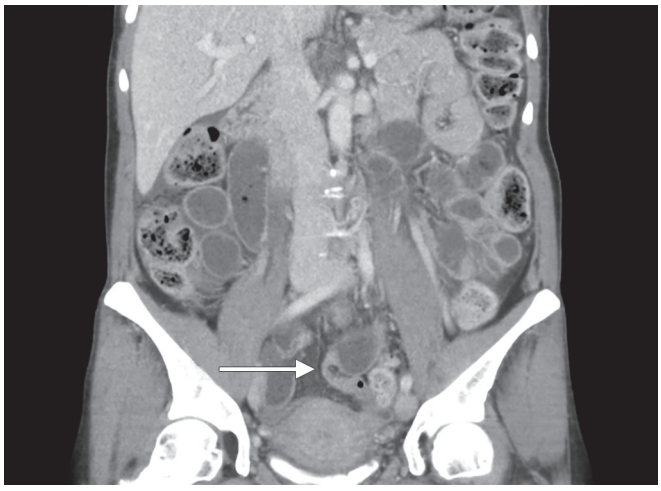


Fig. 1: Small bowel obstruction with a transition point (arrow) in the distal ileum at the level of the rectopexy

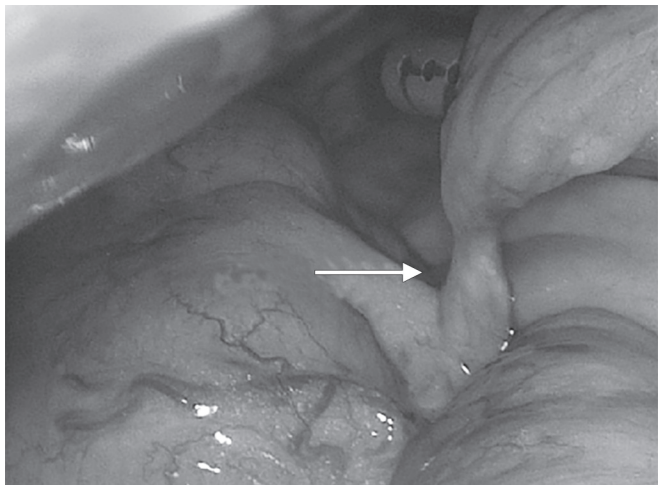


Fig. 2: Adhesive band (arrow) entrapping the terminal ileum with V-loc™ suture nidus

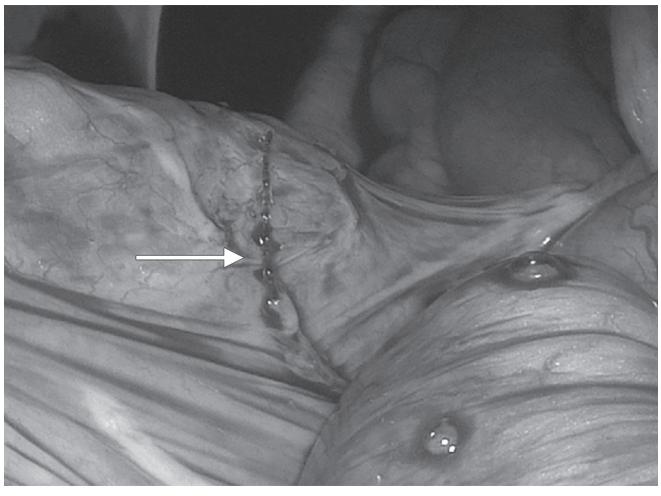


Fig. 3: After release of the adhesive band (arrow), the residual suture end is visible

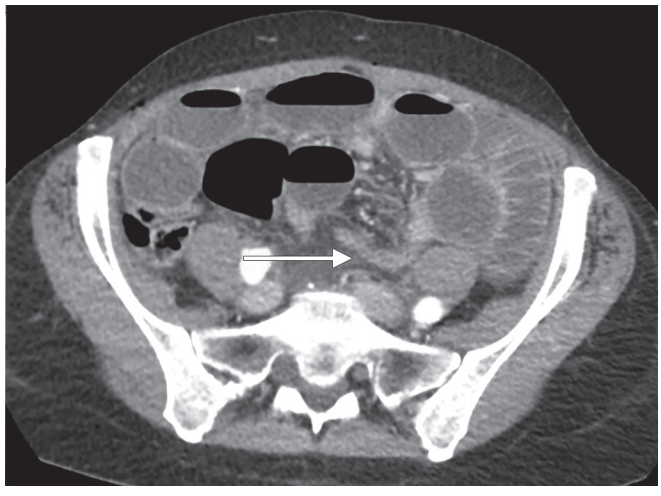


Fig. 4: Transition point (arrow) in the mid-ileum at the level of the rectopexy

the free end of the nonabsorbable V-loc™ suture on the right side of the rectopexy. This band was divided and the V-loc™ was trimmed down to its base (Figs 2 and 3). She was discharged home on postoperative day number 4 after an uneventful postoperative course.

Case 2

A 57-year-old female underwent a robotic hysterectomy and sacro-cervicopexy for clinical Pelvic Organ Prolapse Quantification (POP-Q) stage III uterovaginal prolapse. A Restorelle™ Y-mesh (Coloplast, MN, USA) was sutured to the posterior wall of the vagina and secured to the anterior longitudinal ligament at the level of the sacral promontory. The mesh was retroperitonealized by reapproximating the cut peritoneal edges over the mesh in a running fashion using an absorbable 2-0 V-loc™ suture. She presented 7 days later with abdominal distention, nausea, and vomiting. A CT scan revealed a transition point in the distal ileum at the level of the sacral promontory (Fig. 4). Her symptoms resolved after several days of bowel rest. She represented on postoperative day number 33 with recurrent abdominal distension and emesis. Repeat CT scan again demonstrated a small bowel obstruction with a transition point in the distal ileum at the level of the sacral promontory. She underwent a diagnostic laparoscopy that demonstrated a 3-cm long segment of the V-loc™ suture emanating from the apex of the pelvic peritoneal closure which had unfurled. This elongated free end had penetrated the nearby small bowel mesentery and subsequently formed an adhesion to the distal ileum. The remnant suture end was freed and was cut flush with the peritoneum until no stitch edge was visible. She was discharged home on postoperative day number 2 after an unremarkable postoperative course.

Case 3

A 33-year-old female who underwent a redo robotic ventral rectopexy with sacrohysteropexy for recurrent rectal

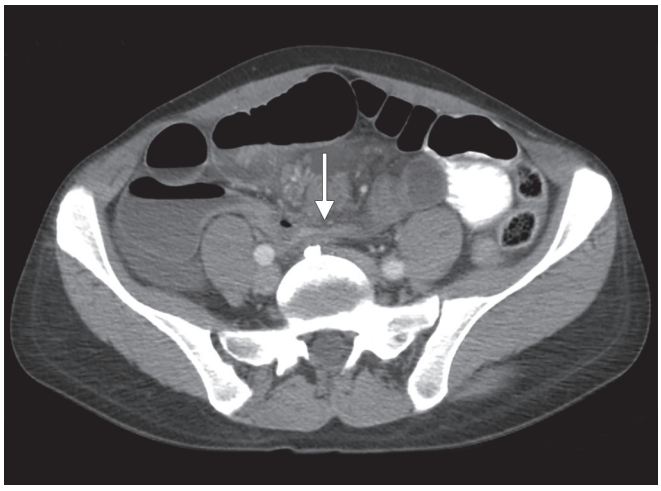


Fig. 5: Transition point (arrow) in the distal ileum at the level of the sacral promontory

prolapse as well as clinical POP-Q stage II uterovaginal prolapse presented on postoperative day number 46 with a multiple-day history of abdominal pain, distention, and emesis. During the redo operation, the previously placed rectopexy mesh was found to be loose and was resecured to the sacrum just below the sacral promontory with tacks, and added support was provided to the rectopexy by using a permanent 2-0 V-loc™ suture to secure the rectum on both sides of the sacrum. The posterior vagina was secured with an additional piece of mesh to the sacral promontory as well. An absorbable 2-0 V-loc™ suture was then used to close the peritoneum over the implanted mesh in a running manner. At the time of presentation to the emergency room, a CT scan was notable for a small bowel obstruction with a transition point in the mid-ileum at the level of the rectopexy (Fig. 5). She was brought to the operating room for diagnostic laparoscopy, which demonstrated a loop of ileum adherent to an exposed portion of the nonabsorbable V-loc™ suture that had been used for the rectopexy. The suture had protruded through the peritoneal closure. The adhesion was lysed and the exposed portion of the stitch was debrided flush with the peritoneum. She was discharged home on postoperative day number 2 after an otherwise uneventful course.

DISCUSSION

We present here three cases of postoperative bowel obstruction requiring reoperation due to the use of barbed suture material during minimally invasive surgery for POP – a complication which has gained relatively little exposure in the current literature and which many surgeons are likely not aware of. While the use of barbed sutures, such as the V-loc™ provides some technical advantages, including the potential for decreased operative time, they are not without drawbacks. As demonstrated in our series, as well as in the few case reports which exist, if free suture ends are left exposed, the barbs have the potential to catch on nearby tissues – such as small bowel, mesentery, or omentum – leading to possible serosal injury, obstruction, or small bowel volvulus.[4-10]

Recently, a group from New York[11] reported two cases of small bowel obstruction 3 to 4 weeks after robotic-assisted sacral colpopexy. At reoperation, both individuals were found to have small bowel loops adherent to exposed barbed suture segments that had been used to retroperitonealize newly implanted mesh. Barbed suture material serving as a nidus for volvulus has been reported as well. Thubert et al[5] reported the case of a 61-year-old female who suffered from a small bowel volvulus 1 month after undergoing laparoscopic sacral colpopexy during which a V-loc V90™ suture had been used to close the pelvic peritoneum. Upon reexploration, the exposed suture end was noted to be adherent to the nearby ileum serving as a rotational axis. In 2014, Salminen et al[3] described three cases of barbed-suture-associated small bowel obstruction in the setting of laparoscopic ventral rectopexy during which a V-loc 180™ suture was utilized for periotoneal closure. The authors deliberately left 2 to 3 cm of the cut barbed suture end exposed in order to ensure adequate peritoneal fixation. In all three instances, the exposed suture was found to be adherent to either small bowel or omentum. Despite these reports, V-loc™ suture-related complications likely remains an under-recognized event.

Due to concerns for barbed-suture-related complications, Salminen et al[3] noted that it is author's standard practice to trim the suture back to be flush with the peritoneum. Whether this has made a difference in the long run was not reported. Interestingly, based on recent animal models, trimming the cut end of the barbed suture flush with the tissue or burying the end under peritoneum may not reduce the likelihood of these complications[4,12,13] as the barbs may become exposed if there is slippage of tissue. At the beginning of their experience with the V-loc™ device for peritoneal closure during laparoscopic ventral rectopexy, Sakata et al[4] typically left several centimeters of the cut barbed suture end exposed. However, after managing the resultant barbed-suture-related small bowel obstruction in four postoperative patients, the authors modified their technique and trimmed the cut barbed end flush with the peritoneum in subsequent cases. Despite this change in technique, they reported several additional early postoperative small bowel obstructions related to the use of the barbed suture. On reoperation, previously buried barbed suture segments were noted to be exposed. The authors theorize that over time the closed peritoneum contracts, leading to potentially exposed suture material. As we

noted in our second case, there is also the potential for the stitch itself to unravel from the peritoneum leading to stitch exposure.[13] Despite this, based on our findings of obstruction related to remnant suture ends in all three of the cases presented here, we would advocate for minimization of the exposed length of remaining barbed suture.

CONCLUSION

Although our earliest patient presented on postoperative day number 3, obstructive complications after the use of barbed sutures have been reported as early as 1 day after the initial operation.[7] Surgeons should be judicious in their use of barbed suture devices and should have a high index of suspicion for barbed-suture related bowel obstruction in the early postoperative period with the knowledge that these forms of mechanical obstruction will likely not be amenable to conservative management.

CLINICAL SIGNIFICANCE

While barbed suture materials, such as the V-loc™ suture allow for easier laparoscopic suturing and potentially decreased operative time, exposed suture material may catch on adjacent tissues potentially serving as a nidus for early mechanical obstruction. It is important for laparoscopic surgeons to be aware of this relatively unknown potential complication.

REFERENCES

1. Consten EC, van Iersel JJ, Verheijen PM, Broeders IA, Wolthuis AM, D'Hoore A. Long-term outcome after laparoscopic ventral mesh rectopexy: an observational study of 919 consecutive patients. Ann Surg 2015 Nov;262(5):742-748.
2. Patri P, Beran C, Stjepanovic J, Sandberg S, Tuchmann A, Christian H. V-loc, a new wound closure device for peritoneal closure – is it safe? A comparative study of different peritoneal closure systems. Surg Innov 2011 Jun;18(2):145-149.
3. Salminen HJ, Tan WS, Jayne DG. Three cases of small bowel obstruction after laparoscopic ventral rectopexy using the V-loc® suture. Tech Coloproctol 2014 Jun;18(6):601-602.
4. Sakata S, Kabir S, Petersen D, Doudle M, Stevenson AR. Are we burying our heads in the sand? Preventing small bowel obstruction from the V-loc® suture in laparoscopic ventral rectopexy. Colorectal Dis 2015 Sep;17(9):180-183.
5. Thubert T, Pourcher G, Deffieux X. Small bowel volvulus following peritoneal closure using absorbable knotless device during laparoscopic sacral colpopexy. Int Urogynecol J 2011 Jun;22(6):761-763.
6. Köhler G, Mayer F, Lechner M, Bittner R. Small bowel obstruction after TAPP repair caused by a self-anchoring barbed suture device for peritoneal closure: case report and review of the literature. Hernia 2015 Jun;19(3):389-394.
7. Vasudevan SP, Dworkin MJ. Small bowel obstruction following laparoscopic ventral mesh rectopexy. Colorectal Dis 2013 Dec;15(12):1543-1544.
8. Lee ET, Wong FW. Small bowel obstruction from barbed suture following laparoscopic myomectomy: a case report. Int J Surg Case Rep 2015;16:146-149.
9. Buchs NC. Intestinal obstruction following use of laparoscopic barbed suture: a new complication with new material? Minim Invasive Ther Allied Technol 2011 Sep;21(5):369-371.
10. Quibel S, Roman H, Marpeau L. Volvulus following barbed suture. Gynecol Obstet Fertil 2012 Jun;40(6):382-383.
11. Vahanian SA, Finamore PS, Lazarou G. Delayed small bowel obstruction after robotic-assisted sacrocolpopexy. Female Pelvic Med Reconstr Surg 2015 Jan-Feb;21(1):e11-e13.
12. Api M. Peritoneal closure over barbed suture to prevent adhesions: a randomized controlled trial in an animal model. J Minim Invasive Gynecol 2015 May-Jun;22(4):619-625.
13. Kindinger L, Setchell T, Miskry T. Bowel obstruction due to entanglement with unidirectional barbed suture following laparoscopic myomectomy. Gynecol Surg 2012 Sep;9(3):357-358.

10.5005/jp-journals-10033-1282

CASE REPORT

Laparoscopic Management of a Volvulus Secondary to Midgut Malrotation in an Adult with an Incidental Meckel's Diverticulum

[1]SY Lim, [2]Tikfu Gee, [3]Zubaidah Hanifah

ABSTRACT

Volvulus is the twisting of the intestine around the axis of its mesentery resulting in ischemia and eventual gangrene. Among the pediatric population, volvulus is common due to midgut malrotation. However, this is a rare etiology of volvulus among adults. Unlike in the pediatric population, midgut malrotation in an adult does not present typically with bilious vomiting. The symptoms are often nonspecific and commonly manifest as chronic abdominal pain which may be mistakenly diagnosed as acute gastritis or cholecystitis. A 25-year-old man presented with a sudden episode of abdominal pain, distension, and vomiting. Abdominal X-ray and computed tomography scan revealed dilated small bowel and a high location of the vermiform appendix. There were ascites but no pneumoperitoneum. A diagnostic laparoscopy was then performed, as the cause of the intestinal obstruction could not be determined. The small intestine was grossly dilated until the distal ileum, where the jejunum was twisted along its mesenteric axis several times. A short segment of the jejunum appeared gangrenous. The terminal ileum was completely collapsed, and a Meckel's diverticulum was incidentally discovered. The twisted jejunum was rotated counterclockwise laparoscopically while freeing the adhesions around it. A limited enterectomy with primary anastomosis was made using staplers. The postoperative period was marked by a brief period of ileus, but the patient was discharged well a week after the surgery. Volvulus and intestinal obstruction in a young adult may occasionally have a congenital etiology. Although intestinal obstruction is a relative contraindication for laparoscopy, it may be feasible in the early presentation of obstruction especially where a preoperative diagnosis is uncertain.

Keywords: Laparoscopy, Meckel's diverticulum, Midgut malrotation, Volvulus.

How to cite this article: Lim SY, Gee T, Hanifah Z. Laparoscopic Management of a Volvulus Secondary to Midgut Malrotation in an Adult with an Incidental Meckel's Diverticulum. World J Lap Surg 2016;9(2):98-100.

Source of support: Nil

Conflict of interest: None

[1]Trainee Lecturer, [2]Head, [3]Senior Lecturer and Consultant

[1-3]Department of Surgery, Universiti Putra Malaysia, Serdang Selangor, Malaysia

Corresponding Author: SY Lim, Trainee Lecturer, Department of Surgery, Universiti Putra Malaysia, Serdang, Selangor Malaysia, Phone: +0123302008, e-mail: surgeryupm@gmail.com

INTRODUCTION

Malrotation of the midgut is a congenital condition due to an embryonic anomaly in the fetal gut rotation occurring in about 1 in 500 live births.[1] The exact incidence is unknown as some cases are asymptomatic. It is usually present in the first month of life and remains an important cause of volvulus and intestinal obstruction in the pediatric age group.[2] Symptoms include abdominal distension, cramp-like pain, and vomiting.

Some cases rarely remain undetected until adult life, although the majority of them are incidentally diagnosed during imaging or abdominal surgery for other unrelated conditions.[3,4] A minority of adult malrotation present with either acute or chronic abdominal pain, bloatedness, and distension. Most of the time, surgeons mistakenly diagnose these patients as having acute gastritis or cholecystitis.

Volvulus is the twisting of the intestines around the axis of its mesentery. It may be intermittent and readily untwist on its own, or the condition may persist to the point of strangulation and gangrene. In the adult, volvulus is either primary or secondary to adhesions, bands, or congenital malrotation.

We reported a case of an acute volvulus secondary to a midgut malrotation with an incidental Meckel's diverticulum in an adult with the diagnosis made preoperatively with a computed tomography (CT) scan and managed using the laparoscopic approach.

CASE REPORT

A 25-year-old man presented to the emergency department with an acute episode of abdominal pain, distension, and vomiting. He had similar complaints throughout the year before, and his attending surgeon diagnosed him with repeated episodes of acute cholecystitis. Incidentally, he had gallstones, and he underwent laparoscopic cholecystectomy. During the operation, the surgeon had then found a "congenital anomaly of the intestine" but did not proceed to correct or further diagnose the condition.

Abdominal X-ray revealed dilated small bowel, and although a suspicion of adhesions from the previous surgery was a possibility, a contrasted CT scan of the abdomen was performed given the history of a small intestinal anomaly. The findings confirmed the small intestinal obstruction and a high location of the vermiform appendix and cecum below the right lobe of the liver. Free fluid was present in the abdomen without any signs of perforation or pneumoperitoneum. A diagnosis of a midgut malrotation and small intestinal obstruction was made.

A diagnostic laparoscopy was then performed with the findings of grossly dilated small intestines until the distal ileum. The distal ileum was twisted along its mesenteric axis several times and the bowel appeared dusky and congested. The terminal ileum was collapsed but remained viable. A Meckel's diverticulum was discovered incidentally. The volvulus was untwisted laparoscopically in a counterclockwise direction, and the mesenteric pedicles were widened by releasing adhesions between the cecum and the duodenum around the superior mesentery artery (SMA). Ladd's bands were released. As the bowel appeared ischemic, an enterectomy was performed extracorporeally through a small incision in the right hypochondrium. A stapled side-to-side primary anastomosis was made. Caecopexy was performed using nonabsorbable sutures, and appendicectomy was prophylactically performed. The postoperative period was marked by a brief period of ileus, but the patient was ambulating on the first day following surgery and had experienced tolerable pain. He was discharged a week after the surgery.

DISCUSSION

Midgut malrotation is a congenital anomaly due to a failure in the normal counterclockwise rotation of the embryonic gut. There are varying degrees of this anomaly and may be characterized by the right-sided location of the small intestines, displacement of the cecum toward the right hypochondrium and the ligament of Treitz inferiorly, the presence of Ladd's bands, and a narrow base of the small intestinal mesentery. The latter may result in a volvulus of the small intestines which can manifest acutely or chronically. Internal herniation and duodenal obstruction may also take place due to the presence of the anomalies.[1,2]

However, most of the complications arising from midgut malrotation manifest in the pediatric age group. Some remained asymptomatic until adult life. Adult manifestations of midgut malrotation differ from the pediatric group. More often, symptoms tend to be chronic rather than acute, characterized by cramp-like abdominal pain, bloating, and vomiting over a period of months to years.[2] Frequently, these symptoms are mistaken for another condition. The commonest cause of an acute presentation of midgut malrotation in an adult is a volvulus or an internal herniation due to Ladd's bands.[3]

Preoperative diagnosis of midgut malrotation is currently possible with the increasing use of preoperative imaging. A plain abdominal X-ray may show a nonspecific bowel dilatation, but it may help lead to subsequent investigations. The upper gastrointestinal contrast study remains to be a gold standard for the diagnosis of midgut malrotation.[3] Ultrasound abdomen has also been described with a typical presentation of the "whirlpool sign."[3,4] However, in the acute or emergency setting, especially with the presence of an intestinal obstruction, ultrasound or contrast studies are rarely being performed. Contrasted CT scans, on the contrary, may be the preferred choice of imaging.[3] The twisting of the intestines around its axis gives the appearance of the "whirlpool sign."

Elective surgical correction of symptomatic midgut malrotation is recommended to prevent acute presentations and complications like bowel ischemia and gangrene.[3-5] Resolution of symptoms was seen in most patients following elective surgical repair.[2-5] In acute presentations of midgut malrotation or intestinal obstruction, surgical repair is performed by correction of the malrotation by freeing the adhesions around the SMA, a counterclockwise rotation of the small intestines, a release of the Ladd's bands, and fixation of the cecum and right colon to the abdominal wall. The laparoscopic approach has been described to be safe and feasible, and equally as effective as the open procedure in the absence of a midgut volvulus.[3]

In conclusion, midgut malrotation may be a rare but important cause of volvulus in adults. Its presentation may vary from a chronic to an acute setting. An index of suspicion should be present in the adult patient having nonspecific abdominal symptoms or intermittent intestinal obstruction. Symptomatic midgut malrotation should be electively repaired before potential complications like bowel ischemia and volvulus occur as evident in this patient. Early diagnosis followed by an immediate repair may prevent a fatality. The laparoscopic approach is feasible and safe even in the acute setting and may result in less postoperative pain and early ambulation.

REFERENCES

1. Wang C, Welch C. Anomalies of intestinal rotation in adolescents and adults. Surgery 1963 Dec;54:839-855.
2. Dietz DW, Walsh RM, Grundfest-Broniatowski S, Lavery IC, Fazio VW, Vogt DP. Intestinal malrotation: a rare but important cause of bowel obstruction in adults. Dis Colon Rectum 2002 Oct;45(10):1381-1386.
3. Matzke GM, Dozois EJ, Larson DW, Moir CR. Surgical management of intestinal malrotation in adults: comparative results for open and laparoscopic Ladd procedures. Surg Endosc 2005 Oct;19(10):1416-1419.
4. Emanuwa OF, Ayatunde AA, Davies TW. Midgut malrotation first presenting as acute bowel obstruction in adulthood: a case report and literature review. World J Emerg Surg 2011 Jul 29;6(1):22.
5. Von Flüe M, Herzog U, Ackermann C, Tondelli P, Harder F. Acute and chronic presentation of intestinal nonrotation in adult. Dis Colon Rectum 1994 Feb;37(2):192-198.

10.5005/jp-journals-10033-1283

CASE REPORT

Laparoscopic Removal of a Giant Gastroduodenal Bezoar

[1]Jignesh Gandhi, [2]Saneya Pandrowala, [3]Sadashiv Choudhari, [4]Suryaprakash Bhandari

ABSTRACT

In today's era of laparoscopic surgery, removal of giant gastric trichobezoar laparoscopically has become a common parlance. However, removal of gastroduodenal bezoar laparoscopically *en masse* is extremely rare. We present a case of 15-year-old female with gastroduodenal bezoar, which was removed laparoscopically without any complications, stressing on the fact that adequate preoperative evaluation to know the extent of bezoar and good laparoscopic technique to prevent it from breaking intraoperatively are necessary for a good outcome.

Keywords: Bezoar, Gastroduodenal, Giant, Laparoscopic.

How to cite this article: Gandhi J, Pandrowala S, Choudhari S, Bhandari S. Laparoscopic Removal of a Giant Gastroduodenal Bezoar. World J Lap Surg 2016;9(2):101-103.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

Bezoars are concretions of human or vegetable fibers that accumulate in the gastrointestinal tract. In humans, the most common type of bezoar is the trichobezoar, which is mostly made of hair. However, bezoars can also be made of vegetable or fruit fiber (phytobezoars), milk curd (lactobezoars), or any indigestible material. Trichobezoars, unlike other bezoars, are not associated with alterations in gastrointestinal motility but with underlying psychiatric disorders, and these are most commonly present in adolescents and during the second decade of life. Rapunzel syndrome is an unusual and rare form of trichobezoar extending into the small intestine.[1]

In the era of minimal access surgery, laparoscopic surgeries are the rule and not the exception. All kinds of surgeries are being reported to have lesser morbidity when performed laparoscopically. We report a case of complete laparoscopic excision of a gastroduodenal bezoar en masse without a duodenal incision in a young female which has not yet been reported.

[1]Associate Professor, [2]Postgraduate Student, [3]Assistant Professor, [4]Consultant

[1,3]Department of General Surgery, King Edward Memorial Hospital and Seth Gordhandas Sunderdas Medical College Mumbai, Maharashtra, India

[2]Department of General Surgery, Seth Gordhandas Sunderdas Medical College, Mumbai, Maharashtra, India

[4]Department of Gastroenterology, Global Hospitals, Mumbai Maharashtra, India

Corresponding Author: Jignesh Gandhi, Associate Professor Department of General Surgery, King Edward Memorial Hospital and Seth Gordhandas Sunderdas Medical College Mumbai, Maharashtra, India, Phone: +919920443433, e-mail: jigneshkem@gmail.com

CASE REPORT

A 15-year-old female came with progressively increasing complaints of pain in abdomen and vomiting since last 1½ years. The clinical symptoms worsened since last 7 days with severe abdominal pain and intractable vomiting, including difficulty to swallow the saliva. She had history of loss of appetite and gradual loss of weight during this clinical period. She had neither history of fever nor any other prodromal symptoms. She was an introvert child in the school. On further inquiry, the mother gave a history of noticing alopecia in select area of the scalp which was attributed to poor nutrition status.

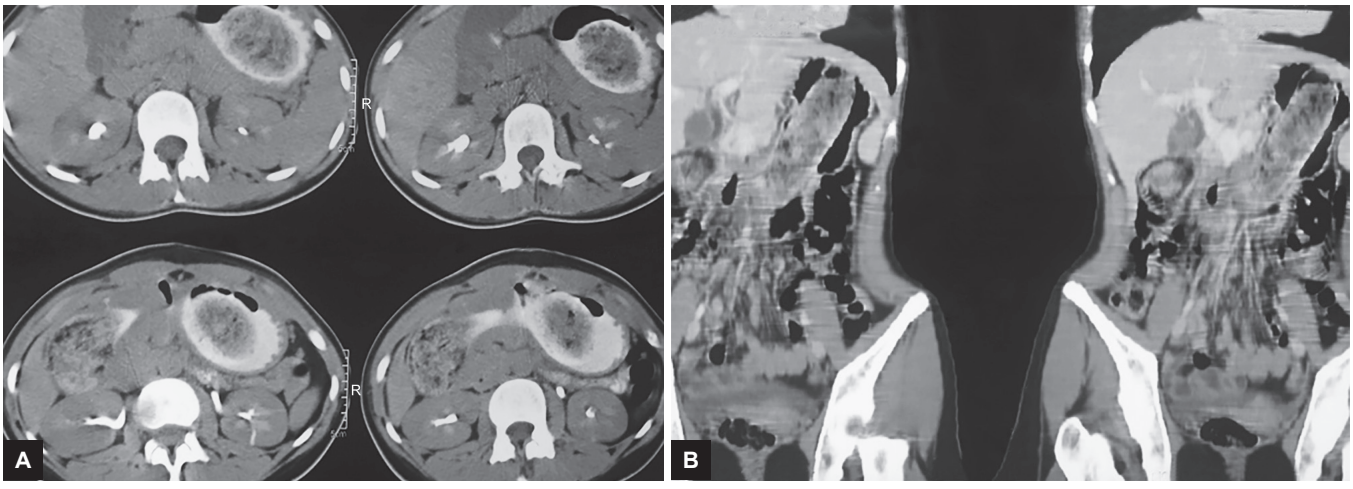
On examination, the patient was vitally stable with pulse 82 beats per minute, blood pressure 110/70 mm Hg, afebrile with respiratory rate 14 cycles/minutes. On systemic examination, the patient has a large 15 × 10 cm large lump in the epigastrium, reaching up to umbilicus which was firm, nontender, and moving with respiration. Her laboratory investigations were normal except for a low hemoglobin of 9.2 gm%. Computed tomography (CT) scan was asked for which showed a large-size foreign body occupying the whole of the stomach extending up to the second part of duodenum, as shown in Figures 1A and B.

A clinical diagnosis of trichobezoar was made after confirming with the mother and the child, both later confided the history of ingesting her hair on daily basis for last 1½ years secondary to mood disorder.

OPERATIVE TECHNIQUE

Laparoscopic removal of this giant trichobezoar was done with three port technique as shown in Figure 2.

A gastrostomy was performed in the body of the stomach after mobilizing the entire greater curvature of the stomach, so as to facilitate the removal of the proximal portion of the trichobezoar in the region of fundus and body of stomach. The challenge was to remove the distal tail and duodenal part of the trichobezoar. This was facilitated by first mobilizing the hepatic flexure of the



Figs 1A and B: Computed tomography findings suggestive of foreign body in the stomach extending up to the second part of duodenum

Fig. 2: Placement of ports as seen postoperatively

Fig. 3: Specimen as seen postlaparoscopic removal

colon to have a control on the duodenum so as to prevent the migration of the distal part.

Further, lubricating jelly was pushed between the space intervening the pyloroduodenal bezoar and the pyloric ring to aid an easy traction on the trichobezoar, and intravenous administration of injection hyoscimine helped to dilate the pyloric ring. These steps along with the gradual push and pull technique helped in extracting the distal portion of the bezoar, as shown in Figure 3.

The entire specimen was placed in a previously placed large-size retrieval bag, and it was removed from the 12 mm port without any contamination of the port. The size of the entire trichobezoar was around 20×8 cm.

The gastrostomy was closed with laparoscopic stapler and a nasogastric (NG) tube was placed for decompression.

POSTOPERATIVE COURSE

Postoperatively, the NG tube was removed after 24 hours, and the patient started on liquid diet which was further supplemented with soft diet after 2 days. Drain was removed on postoperative day 2 without significant drain output. The patient was discharged uneventfully on the 4th postoperative day.

DISCUSSION

Rapunzel syndrome, as seen in this case, occurs in young females suffering from psychiatric disorders.[1-3] Large gastric bezoars may result in numerous complications – most commonly intestinal obstruction, failure to thrive, and iron deficiency anemia.[4]

Although nonsurgical interventions exist, including NG lavage or suction, prokinetic agents, enzymatic fragmentation, and endoscopic retrieval, they are often unsuccessful in treating large trichobezoars that cause obstructive symptoms, and therefore, surgery is required.[5] The standard surgical approach consists of open gastrostomy via an upper abdominal laparotomy. This procedure leaves patients with a large abdominal incision and increased propensity to develop wound complications.

The first successful laparoscopic removal of a gastric bezoar was reported in 1998 by Nirasawa et al.[4]

Since then, several successful laparoscopic cases have been reported, primarily in adults and adolescents.[6-8] Though mainly limited to case reports, comparison of laparoscopic and open surgical treatment of bezoars causing small bowel obstruction found fewer postoperative complications and reduced hospital stay in those patients treated laparoscopically.[9] One reason for the decreased complication rate may be related to incision size. Incision size affects recovery time, cosmesis, and the potential for wound complications. Case reports of laparoscopic gastric trichobezoar removal describe incision sizes ranging from mini-laparotomy incisions extending from a suprapubic port site[4] to 4 cm extension of 10 mm abdominal trocar sites.[10]

It is important to note in our case that it is the first case reporting a complete laparoscopic removal of a giant gastroduodenal bezoar en masse through stomach without the need for extension or a separate incision on the duodenum or conversion to laparotomy. Laparoscopic removal apart from requiring skill also requires the knowledge. Moreover, it is important to stress on the fact that extra traction on the distal part of the bezoar can break the tail part of the trichobezoar in the pyloric region, which can add to performing a duodenotomy or open exploration which could be completely avoided as seen in this patient.

In conclusion, laparoscopic removal of giant gastroduodenal bezoars, if done appropriately, can lead to short hospital stay and less morbidity.

REFERENCES

1. Gonuguntla V, Joshi DD. Rapunzel syndrome: a comprehensive review of an unusual case of trichobezoar. Clin Med Res 2009 Sep;7(3):99-102.
2. Naik S, Gupta V, Naik S, Rangole A, Chaudhary AK, Jain P, Sharma AK. Rapunzel syndrome reviewed and redefined. Dig Surg 2007;24(3):157-161.
3. West WM, Duncan ND. CT appearances of the Rapunzel syndrome: an unusual form of bezoar and gastrointestinal obstruction. Pediatr Radiol 1998 May;28(5):315-316.
4. Nirasawa Y, Mori T, Ito Y, Tanaka H, Nobuo S, Atomi Y. Laparoscopic removal of a large gastric trichobezoar. J Pediatr Surg 1998 Apr;33(4):663-665.
5. Hoover K, Piotrowski J, St Pierre K, Katz A, Goldstein AM. Simultaneous gastric and small intestine trichobezoars—a hairy problem. J Pediatr Surg 2006 Aug;41(8):1495-1497.
6. Song KY, Choi BJ, Kim SN, Park CH. Laparoscopic removal of gastric bezoar. Surg Laparosc Endosc Percutan Tech 2007 Feb;17(1):42-44.
7. González Rojas M, Delgado Godos A, Espejo Romero H. Trichobezoar and gastric ulcer in pediatrics: a case report. Rev Gastroenterol Peru 1990;10(3):121-125.
8. Yao CC, Wong HH, Chen CC, Wang CC, Yang CC, Lin CS. Laparoscopic removal of large gastric phytobezoars. Surg Laparosc Endosc Percutan Tech 2000 Aug;10(4):243-245.
9. Erzurumlu K, Malazgirt Z, Bektas A, Dervisoglu A, Polat C, Senyurek G, Yetim I, Ozkan K. Gastrointestinal bezoars: a retrospective analysis of 34 cases. World J Gastroenterol 2005 Mar 28;11(12):1813-1817.
10. Shami SB, Jararraa AA, Hamade A, Ammori BJ. Laparoscopic removal of a huge gastric trichobezoar in a patient with trichotillomania. Surg Laparosc Endosc Percutan Tech 2007 Jun;17(3):197-200.

10.5005/jp-journals-10033-1284

CASE REPORT

Novel Technique in Laparoscopic Staple-line Reinforcement

Hanan M Alghamdi

ABSTRACT

Bleeding prevention and control can be very challenging in laparoscopic surgery. The author describes a new and less expensive technique to lower the incidence of staple-line bleeding in laparoscopic surgery.

Keywords: Laparoscopic, Laparoscopic hemostasis, Laparoscopic staple line, Laparoscopic staple-line reinforcement.

How to cite this article: Alghamdi HM. Novel Technique in Laparoscopic Staple-line Reinforcement. World J Lap Surg 2016;9(2):104-106.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

Minimally invasive surgery offers a variety of advantages over the open approach; these include, but are not limited to, less postoperative pain, faster physiological function, shorter length of stay and better cosmoses. However, a continuous challenge for the laparoscopic surgeon and the most common cause of conversion to open surgery is to keep the surgical field almost free of bleeding. Moreover, blood absorbs light causing darkness and suboptimal intra-abdominal working field, and it is difficult to control bleeding by laparoscopic means as compared with the open technique. Subsequently, massive bleeding allows no opportunity for the efficient application of the open approach maneuver, as an example direct compression or tying. A number of commercial buttressing materials have been described to give more hemostasis to the staple line whether it is used for bowel resection, organ resection or vascular control. The buttressing material also had questionable leak prevention advantage. Unfortunately, these materials are expensive, with limited shelf life and the need for training to apply them.[1]

Assistant Professor and Surgeon

Department of Surgery, King Fahad Hospital, University of Dammam, Dammam, Saudi Arabia

Corresponding Author: Hanan M Alghamdi, Assistant Professor and Surgeon, Department of Surgery, King Fahad Hospital, University of Dammam, Dammam, Saudi Arabia, Phone: 00966502828333, e-mail: hmalghamdi@uod.edu.sa

DESCRIPTION OF THE TECHNIQUE

In laparoscopic surgery (mostly sleeve gastrectomy), the staple line is reinforced with hemostatic material using one piece of SURGICEL SNoW® (4 × 4 inches) or large SURGICEL® Original absorbable Hemostat folded once, and cut in the exact size of the stapler cartridges (usually one piece cut for five to six loads of cartridges). After loading the cartridges (any cartridge thickness depending on the indication) onto the stapler handle (Echelon® or Endo GIA™), the piece of hemostatic material is tied twice with 3-0 or 2-0 absorbable suture (VICRYL® Ethicon). The tie could be one or two loops (Fig. 1). The distal tie has to be at least 10 mm before the last staple to guarantee complete cut; likewise, the proximal tie has to be applied 10 mm after the blade site to allow free initial movement of the blade (Fig. 2). The stapler with enforced hemostatic material is applied to the tissue (stomach) or vascular pedicle, e.g. splenic pedicle, then after waiting for 15 to 20 seconds as the stapler manufacturer recommendations, the stapler is fired and removed. The two crossing threads are cut with a scissor (Fig. 3). If it is sleeve gastrectomy, the whole process is repeated until the last load. To save time, a trained nurse or an assistant surgeon can do the hemostatic material application.

DISCUSSION

Bleeding has been reported to be a major complication of laparoscopic surgery. This has become more worrisome

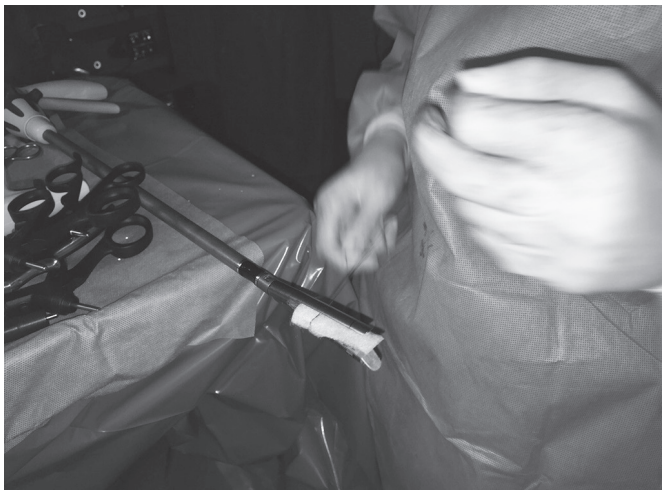


Fig. 1: Powered-Echelon® and fixing the SURGICEL® SNoW® to it by 2-0 VICRYL® Ethicon suture

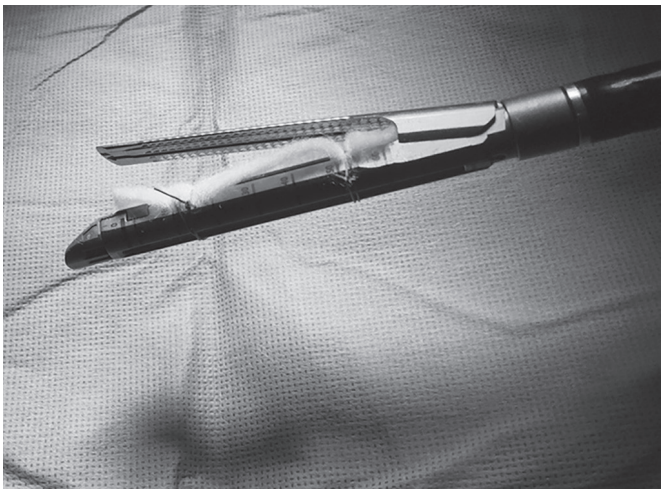


Fig. 2: Final fixation of the hemostatic material to the stapler load with two ties

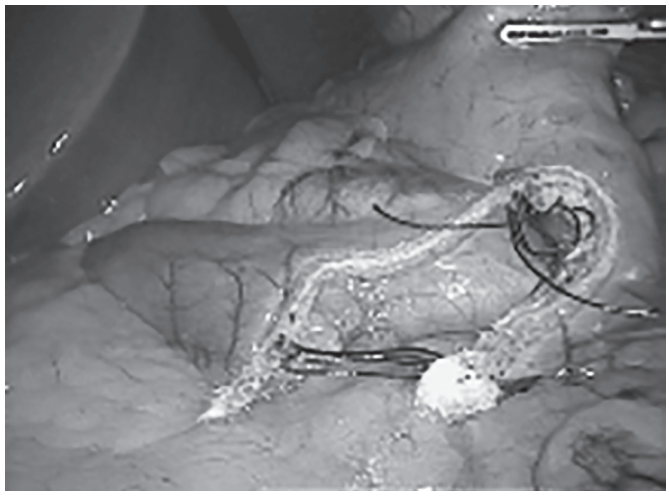


Fig. 3: Sleeve gastrectomy using the new technique of SNoW® reinforce stapler

in the era of increasing demand on bariatric surgery due to the increasing epidemic of obesity worldwide.

Three different techniques have mainly been proposed in the literature to prevent staple-line bleeding including oversuturing, buttressing material and application of tissue glue or sealant agent. Dapri et al[2] have published the only randomized clinical trial comparing the outcome of three different reinforcements: No enforcement, Gore Seamguard® and staple-line oversewing with polydioxanone; the study demonstrated significantly lower blood loss in the buttressing group with Gore Seamguard® but with longer operative time and higher cost (640–890 euros). Other studies in the literature are low in power and do not address cost *per se*.[3] Buttressing material is becoming widely used as a means of lowering intraoperative as well as postoperative complications[4,5]; moreover, it is associated with lower complication in early surgeon experience.[6] A number of staple-line buttressing reinforcements described in the literature include bioabsorbable polyglycolic acid and trimethylene carbonate (Gore Seamguard®), nonabsorbable bovine pericardium (Peri-Strips Dry®) and small bowel submucosa (Surgisis®).

Gagner and Buchwald[7] reported Gore Seamguard® to be the best hemostatic material with possible added benefit of decreasing staple-line leaks to 1.1% in a study of 8,900 sleeve gastrectomy as compared with 2% in oversuture, 2.2% in nonreinforcement and 3.3% in Peri-Strips group.

Unfortunately, these materials are expensive, costing US$280 in the author's country for each load with approximate total cost in laparoscopic sleeve gastrectomy equal to US$1,500 for one operation, while the net cost of the used Surgicel® and the ties is around US$200.

The buttressing material needs to be preloaded onto the stapler handle and become incorporated into the staple line on firing. Features of ideal buttressing material should include enhancement of the strength of the staple line during healing process and the material should also be flexible and thin enough for easy cutting by the stapler blade.

A similar technique has been described in the literature by using Surgicel® Nu-knit® (considered to be too thick for white load) reinforcement with glue fixation (usually difficult to find) and has been done in Roux-en-Y gastric bypass, but there is no study in sleeve gastrectomy or other applications.[8]

CONCLUSION

Stapler-line reinforcement with SURGICEL SNoW® or SURGICEL® Original fixed with suture in this novel technique is safe, practical, convenient and affordable.

REFERENCES

1. Lattouf JB, Beri A, Klinger CH, Jeschke S, Janetschek G. Practical hints for hemostasis in laparoscopic surgery. Minim Invasive Ther Allied Technol 2007;16(1):45-51.
2. Dapri G, Cadiere GB, Himpens J. Reinforcing the staple line during laparoscopic sleeve gastrectomy; prospective randomized clinical study comparing three different techniques. Obese Surg 2010 Apr;20(4):462-467.
3. Albanopoulos K, Alevizos L, Flessas J, Menenakos E, Stamou KM, Papailiou J, Natoudi M, Zografos G, Leandros E. Reinforcing the staple line during laparoscopic sleeve gastrectomy: prospective randomized clinical study comparing two different techniques. Preliminary results. Obes Surg 2012 Jan;22(1):42-46.
4. Rosenthal RJ, International Sleeve Gastrectomy Expert Panel, Diaz AA, Arvidsson D, Baker RS, Basso N, Bellanger D, Boza C, El Mourad H, France M, et al. International sleeve gastrectomy expert panel consensus statement best practice guidelines based on experience of >12,000 cases. Surg Obes Relat Dis 2012 Jan-Feb;8(1):8-19.

5. Gagner M, Deitel M, Erickson AL, Crosby RD. Survey on laparoscopic sleeve gastrectomy (LSG) at the fourth international Consensus Summit on Sleeve Gastrectomy. Obes Surg 2013 Dec;23(12):2013-2017.
6. Daskalakis M, Berdan Y, Theodoridou S, Weigand G, Weiner RA. Impact of surgeon experience and buttress material on postoperative complications after laparoscopic sleeve gastrectomy. Surg Endosc 2011 Jan;25(1):88-97.
7. Gagner M, Buchwald JN. Comparison of laparoscopic sleeve gastrectomy leak rates in four staple-line reinforcement options: a systematic review. Surg Obese Relat Dis 2014 Jul-Aug;10(4):713-723.
8. Moon R, Teixeira A, Varnadore S, Potenza K, Jawad MA. Reinforcing the staple line with Surgicel® Nu-knit® in Roux-en-Y gastric bypass: comparison with bovine pericardial strips. Obes Surg 2013 Jun;23(6):788-793.