World Journal of Laparoscopic Surgery

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

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Editorial

Minimal access surgery is now reaching even in the remote areas of developing countries and it is no more a luxury. For the millions of people worldwide who truly suffer from some type of surgically treatable diseases, minimal access surgery is now a necessity. There is no need to speak about its advantages as even decades back William Shakespeare observed, when we encounter: 'A wretched soul, bruised with adversity' do 'We bid be quiet when we hear it cry'? This is especially true for the enduring nature of pain which patients were suffering from in the past when maximum number of surgeries were by open technique.

We have explored in previous issues of World Journal of Laparoscopic Surgery (WJOLS) that, due to lack of fundamentals of minimal access surgery and lack of proper surgical skill, complication rates are increasing. Increasing number of lawyers want to see the technique introduced as evidence in court, to help patients to prove that they are not treated properly. Start-up insurance companies are charging ahead to scan hospital documentation to analyze settlement of claim and compensation.

This development makes many surgeons and gynecologists nervous. By human reliability analysis in healthcare, many of the methods have not yet been tested on enough patients to prove that these iatrogenic injuries are accurate and possible to prevent. In response, lawyers argue—fairly enough—that even if the complications are not statistically indisputable, there is no harm in providing one more piece of evidence to back up their clients' claims.

Legal systems and society as a whole persist with the idea that always the healthcare providers are responsible for all the complication. Laws and attitudes of society have simply not evolved with the scientific understanding of the laparoscopic surgery and its inherent risk. Prevention of these complications, patient education and informed consent are more important than ever as the incidence of medicolegal issues continues to increase. In WJOLS, we are now adding new articles and case reports to make surgeons and gynecologists aware of this new emerging problem of minimal access surgery, and I hope the readers will like it.

RK Mishra
Editor-in-Chief

10.5005/jp-journals-10033-1227

ORIGINAL ARTICLE

Two Port Laparoscopic Cholecystectomy: An Initial Experience of 25 Cases with a New Technique

[1]Aswini Kumar Misro, [2]Prakash Sapkota

ABSTRACT

Background: In Nepal, it is quite common to find patients with large stone burden and thick gallbladder wall which often leads to incision extension. We have used this extended incision to our advantage. The present technique of two port laparoscopic cholecystectomy not only helps overcoming the specimen extraction difficulties but also contributes to better cosmesis.

Patients and methods: A total of 25 patients underwent the surgery in 2008 to 2010.

Results: The mean operating time was 50 minutes. None had significant procedural blood loss, iatrogenic injury, perforation of gallbladder, bile spillage, significant gas leak or subcutaneous emphysema at either port site. All patients were comfortable in the postoperative period and were routinely discharged on 2nd postoperative day except for two patients who has surgical site infection and fever respectively. Although three cases were converted to standard 4 port technique, none required conversion to open cholecystectomy. Out of 25 patients, 7 cases have completed 3 months follow-up and did not show any complication like port site hernia.

Conclusion: The described method of performing two port laparoscopic cholecystectomy is safe, simple and inexpensive yet cosmetically rewarding.

Keywords: Laparoscopy, Gallbladder, Cholecystectomy, Port.

How to cite this article: Misro AK, Sapkota P. Two Port Laparoscopic Cholecystectomy: An Initial Experience of 25 Cases with a New Technique. World J Lap Surg 2014;7(3):103-106.

Source of support: Nil

Conflict of interest: None

BACKGROUND

In Nepal, it is quite common to find patients with large stone burden and thick gallbladder wall which often leads to specimen extraction difficulties. Out of all the available methods to facilitate the extraction like fascial dilatation, stone crushing, ultrasonic high-speed rotary, or laser lithotripsy, we prefer to use incision extension since it has been described as the optimal method and does not aggravate postoperative pain.[1] Many of the 11 mm epigastric wounds land up in a dimension of 13 to 14 mm or more at times at the completion of the procedure. However, we have used this wound extension to our advantage by introducing another 5 mm port through the epigastric wound from the outset. This not only obviates the need for any additional port insertion but also aids in specimen extraction. This forms the rationale behind two port laparoscopic cholecystectomy. With the technique described in this article, one will be able to perform laparoscopic cholecystectomy with only 2 incisions leading to a more cosmetic scar and less postoperative pain. Last decade has seen many innovations like SILS, NOTES from healthcare industries driven by an ever increasing demand for cosmesis. However, the cost factor keeps them out of the reach of a common man in developing countries. This technique certainly adds to cosmesis still fitting to the budget of a common man.

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PATIENTS AND METHODS

Twenty-five patients underwent the operation in 2008 to 2010 after the hospital ethical committee approval. Informed consent was obtained from all the patients. All the surgeries were performed by the same team of surgeons. Every single patient had investigation proven gall stone or related complications. Operative time, hospital stay and complications were recorded in each case.

The patient characteristics are mentioned below. There were 10 males and 15 females patients and none of the patients had any abdominal surgery in the past. The mean age was 40.5 years (27-55 years). All the patients had BMI below 30.14 patients were ASA I and 11 were ASA II (8 patients were controlled hypertensives and 3 were controlled diabetics).

OPERATIVE TECHNIQUE

Peritoneal entry is done by open technique with insertion of a 10 mm port through the umbilicus. After creating pneumoperitonium, a 1 cm transverse skin incision is taken in the midline at a level 1 inch cephalad to the level of inferior border of liver for the epigastric port. A 10 mm port is inserted through the later incision vertically till it pierces the rectus sheath (This will be referred henceforth as port 2). Afterwards, a slight right side angling of the port is done to bring it through the angle

between falciform ligament and the anterior peritoneum. A 5 mm grasper (with reducer) is introduced through the port 2 and the fundus of the gallbladder is grasped and traction is applied toward the right shoulder. This step displays the gallbladder anatomy in entirety. Now an intraoperative assessment is done to determine if the 2 port laparoscopic cholecystectomy can be done safely (patient suitability has been described in discussion). If conditions are found to be favorable, with the traction maintained in the described way, a 5 mm port is inserted through the existing epigastric skin incision (but through a separate stab traversing a different path to the peritoneal cavity) little away from the port 2 pointing toward the Hartman's pouch of the gallbladder (This will be referred henceforth as port 3) (Figs 1 and 2). Prior to this step, the skin incision may be extended 3 to 5 mm or more as required.

Now appropriate traction is applied to the Hartman's pouch in lateral direction by the port 3 instrument, and this widens up the Calot's triangle. With a suitable instrument (preferably a Maryland introduced through the port 2), Calot's triangle dissection is done. The traction and dissection instruments are used interchangeably through the port 2 and 3 as per requirement. The rotational freedom of the port 3 around port 2 helps in traction and dissection to be done at various points and depth (However the rotation of the port should never be attempted with the instrument inside the port) (Figs 2 and 3). The cystic artery and duct is circumferentially skeletonized. With double clips placed on the body side and a single clip on the specimen side, both the structures are divided. This step is completed by traction through the port 3 instrument and clip application through port 2. With continued traction applied to the Hartman's pouch in the upward and right direction (this open up the interface between the gallbladder and the gallbladder fossa of the liver), the gallbladder is separated from the gallbladder fossa by electrodissection with an appropriate instrument (either a monopolar hook, Maryland or scissor). Before the final detachment of gallbladder from liver, the hemostasis of the gallbladder bed is achieved and the cystic pedicle (artery and duct) security is confirmed. The 5 mm port is now withdrawn and the specimen extracted through the epigastric port. Generous amount of peritoneal wash is given and 100 ml of normal saline mixed with bupivacaine is left in the subdiaphragmatic space. Pneumoperitonium is evacuated and the wounds closed in 2 layers.

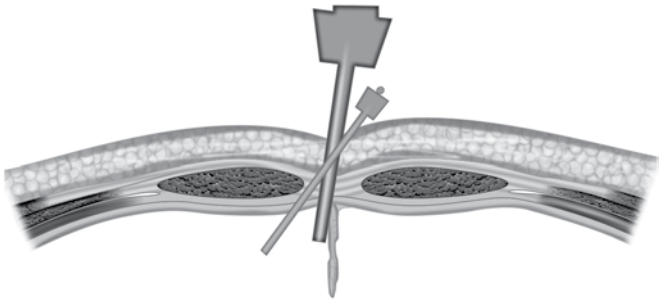

Fig. 1: A schematic diagram depicting the epigastric port assembly. Port 3 must be inserted through the existing epigastric wound but through a separate stab with a different angle, pointing toward the Hartman's pouch

Due to the presence of two ports in the same wound the range of their movement is likely to be affected. Hence, careful attention should be paid to proper alignment of the ports at the epigastric site. The chamber of the 5 mm port should be as close to the skin as possible where as that of 10 mm port should be as far away from the skin as possible (Figs 1 to 3). The maneuverability and the freedom of a port depend on the rotational capacity or the swing of the ports. With the measures mentioned above, we have observed that there is adequate overall maneuverability including range of movement and reach of the instrument to complete the procedure safely. The right and left hand instruments work in close harmony

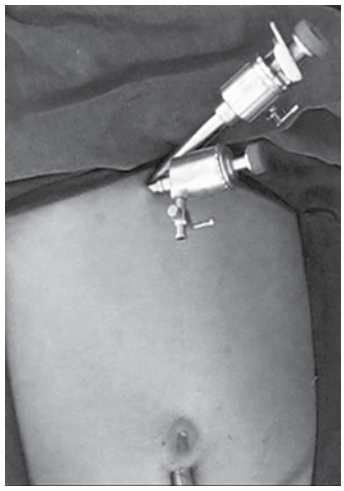

Fig. 2: Epigastric port assembly (top view)

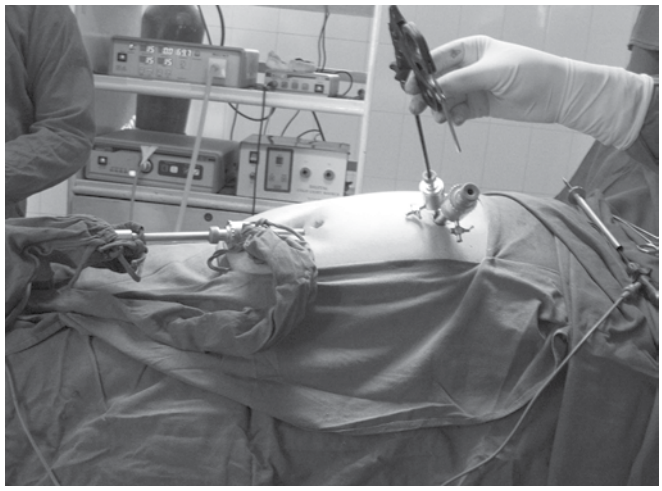

Fig. 3: Epigastric port assembly (side view)

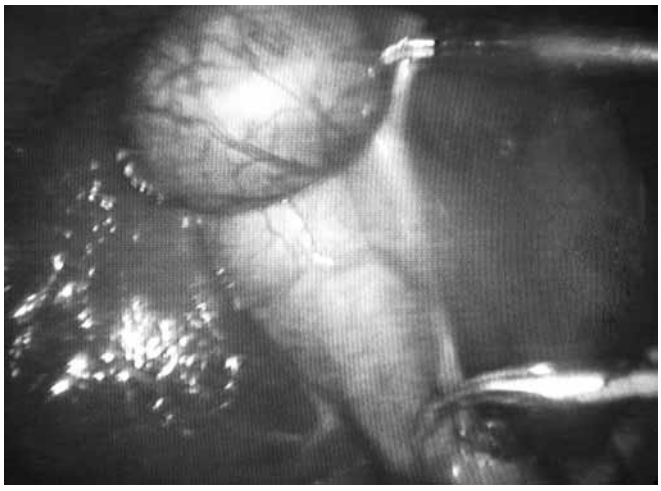

Fig. 4: Intraoperative photograph demonstrating the right and left hand instruments

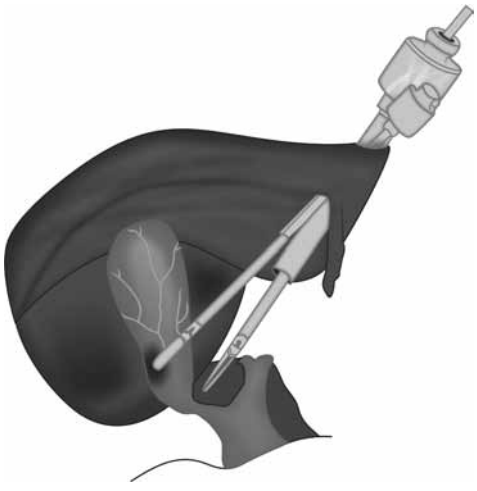

Fig. 5: A schematic diagram of right and left hand instruments working in close harmony

Fig. 6: Final appearance of the postoperative wounds following closure

as an assembly, with one grasping/retracting at a short distance from the other one (Figs 4 and 5). They move in tandem performing the dissection bit by bit sequentially from Calot's triangle to the fundus till the point of complete separation of the organ.

RESULTS

There was no incidence of bile duct or vascular injury, bile leak, iatrogenic injury, intraoperative perforation of gallbladder, bile spillage, significant procedural blood loss, significant gas leak or subcutaneous emphysema at either port site. The mean operating time was 50 minutes (40-155 minutes).

We have converted 3 cases from the two port technique to the standard four port technique. One was due to technical difficulty arising out of bleeding and the other 2 due to difficult intraoperative findings. These 2 cases had dense adhesions in the Calot's triangle and gallbladder fossa respectively. However, none of them required conversion to open cholecystectomy.

Patients were allowed orally as early as 6 hours following surgery. All patients were routinely discharged on 2nd postoperative day except for two patients. One had severe abdominal pain and later developed surgical site infection, which subsided with wound drainage and the other patient developed fever in postoperative period. All the patients were happy and satisfied due to rapid and comfortable recovery and of course, about their small wound. Many patients were astonished small incision used to perform the surgery and hence were curious to know the procedure details (Fig. 6). Patients were advised follow-up on 10th day, 3 month and 1 year following surgery. Out of 25 patients, 23 patients visited the hospital for 10th day follow-up and were fine at that point of time. However only 7 have completed 3 months follow-up at the point of data collection and none of them had any complications including port site hernia.

DISCUSSION

Although laparoscopic cholecystectomy has been practiced as a day care surgery, it is far from reality in our set-up as most of the patients are from remote rural and hilly areas with poor access to healthcare. That is the reason for patient being discharged routinely on 2nd post operative day. Secondly, the follow-up of the patients has remained far from ideal. Many of them, once discharged, tend to avoid hospital follow-up unless they are unwell. The geographic and telecommunication barriers are other factors which has prevented us from reaching out to them.

Two port laparoscopic cholecystectomy has been practiced by many surgeons successfully and has been reported to be safe and superior to 4 port cholecystectomy in terms of pain, cosmesis and patient acceptance.[2,3] Various techniques and special instruments like innovative extracorporeal knot by Mishra et al, 'Twin-port' system (that allows a 5 mm camera and a forceps through

a single port) by T Kagaya et al, 2 or 3 mm endograspers by Lee KW, have been used to accomplish the procedure without the need of additional ports. However, traction sutures on gallbladder may end up in tearing of the organ leading to stone spillage and associated consequences like abscess, fistula formation and other septic complications later on.[4-7] This possibility further increases in patients with high stone burden. So, we aim at gentle handling of gallbladder and take preventive steps to avoid intraoperative spillage and hence do not use sutures for traction.[8,9] However, the present technique requires no special instrument or complex technique.

Although, the present technique is safe, there are some inherent limitations. This should not be used for cases where technical difficulty is anticipated or encountered for example in acute cholecystitis, empyema, dense adhesions in Calot's triangle, intrahepatic gallbladder, anatomic abnormality in the hepatobiliary system, Mirrizzi's syndrome, cirrhosis of liver, etc. Drain insertion in the subcostal region nullifies all the purported advantages of the procedure. Hence, it is better to perform a feasibility assessment before attempting this two port technique and difficult cases should routinely be done in four port fashion. If there is bleeding during the procedure, low threshold should be maintained to convert to the standard four port technique. Meticulous dissection and gentle handling of instruments are sine qua non for safe and successful completion of the procedure. One should not expect the freedom of a 4 port technique in this method. With careful case selection coupled with precise technique and patience, one can make this 2 port laparoscopic cholecystectomy an amazing reality in one's own surgical practice.

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10.5005/jp-journals-10033-1228

ORIGINAL ARTICLE

Clinical Experiences of Trans-Trocar Appendix Removal in Laparoscopic Appendectomy

Jung Min Bae

ABSTRACT

Purpose: Most of laparoscopic instruments are disposable and not reusable. Therefore, laparoscopic surgery is more ineffective according to environment conservation and recycling of resources than open surgery.

Trans-trocar appendix removal method was shown instead of using disposable specimen vinyl bag. Advantages of trans-trocar removal are cost-effective and decrement of disposable instrument. But, there has not been cited in the literature about clinical experiences and outcomes.Therefore, this study was conducted to analyze the clinical outcomes.

Materials and methods : Uncomplicated appendicitis patients were reviewed retrospectively in 2013. The enrolled patients were divided as trans-trocar appendix removal group (TTAR) and disposable specimen vinyl bag group (DSVB). Clinical data and outcomes were analyzed and compared.

Results: A total of 119 patients undergoing laparoscopic appendectomy were enrolled. Fifty-nine patients belonged to TTAR and 60 patients were DSVB. In the both groups, there were no significant differences in postoperative outcomes. Success rate of trans-trocar removal was 89.3%. According to body mass index (BMI), success rate is 100% below 20 kg/m^2, 87.8% in patients between 20 kg/m^2 and 25 kg/m^2 and 61% above 25 kg/m^2.

Conclusion: Although, it is difficult to generalize the results, it is thought that trans-trocar appendix removal is alternative and feasible on basis of our study. But in BMI > 25 kg/m^2, it is thought to be technically careful to perform trans-trocar appendix removal. It is also necessary to make comparison the efficacy of appendix removal methods through prospective randomized clinical study to establish the better method for laparoscopic appendectomy.

Keywords: Appendectomy, Laparoscopy, Specimen removal.

How to cite this article: Bae JM. Clinical Experiences of Trans-Trocar Appendix Removal in Laparoscopic Appendectomy. World J Lap Surg 2014;7(3):107-110.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

Acute appendicitis is one of the most frequent emergency operations in general surgery. Traditionally, acute appendicitis was treated in open surgery. But, after laparoscopic appendectomy was performed firstly in 1983,[1] laparoscopic appendectomy is most popular method in treatment of acute appendicitis.

There are many laparoscopic surgical instruments in laparoscopic appendectomy. Most of all in laparoscopic instruments are disposable and not reusable. Therefore, laparoscopic surgery is more ineffective surgery according to environment conservation and recycling of resources than open surgery. So, many method and reusable laparoscopic instruments are developed to improve environment conservation and recycling of resources.[2,3]

Among this effort, when resected appendix in laparoscopic appendectomy was removed, trans-trocar removal method was shown instead of using disposable specimen vinyl bag.[4-9]

Advantages of trans-trocar appendix removal method are cost-effective and decrement of disposable instrument because specimen vinyl bag is not needed in appendix removal.

But, although trans-trocar appendix removal method was introduced 10 years ago, there has not been cited in the literature about clinical experiences and outcomes.

Therefore, this study was conducted to compare the clinical outcomes between trans-trocar appendix removal group (TTAR) and disposable specimen vinyl bag group (DSVB) and to identify the better way to removal of resected appendix in laparoscopic appendectomy.

MATERIALS AND METHODS

The subjects were the patients in this hospital who diagnosed acute appendicitis between January 2013 and December 2013. Complicated appendicitis patients that diagnosed as perforated appendicitis or periappendiceal abscess by preoperative abdominal computed tomography, abdominal ultrasonography or intraoperatively operative findings were excluded.

Retrospective analysis was carried out based on the records made after surgery regarding clinical characteristics such as operative time, hospital stay, complications, readmission and additional analgesics.

SPSS 12.0 (SPSS Inc, Chicago, IL, USA) used for statistical analysis. Student t-test for average analysis and Fisher's exact test for cross tabulation analysis was used.

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Statistical significance was determined when p-value is below 0.05 in all analysis.

All of laparoscopic surgeries were performed by specialized laparoscopic surgeons. Laparoscopic surgery was performed to all patients in supine position under the general anesthesia. Three port maneuver were used. One 11 or 15 mm trocar for laparoscope entered at the inferior margin of umbilicus with either a vertical or semicircular transverse skin incision. There was not selection criteria for TTAR or DSVB preoperatively or intraoperatively. The usage of 15 or 11 mm trocar were selected randomly regardless of gender, age and body mass index (BMI) of patients and were performed in almost identical ratios.

A 5 mm laparoscope was inserted to visualize the abdominal cavity. Two additional 5 mm ports entered at the left lower quardrant and the suprapubic area.

Subsequently, the laparoscopic appendectomy was performed using procedures identical to those of conventional laparoscopic surgery.

In patients in using 15 mm trocar, after appendix specimen was divided from appendiceal base, trans-trocar removal method was performed. In trans-trocar removal method, 5 mm camera was inserted to 5 mm trocar port and laparoscopic specimen grasper was inserted to 15 mm trocar port and resected appendix was grasped by laparoscopic specimen grasper and was performed trans-trocar appendix removal (Figs 1 to 4).

In patients in using 11 mm trocar and failure of trans-trocar removal, specimen removal was performed by disposable specimen vinyl bag identical to conventional laparoscopic method.

In all of patients, patient controlled analgesic system was applied postoperatively.

RESULTS

The total number of patients was 119 people. Fifty-nine patients were in the TTAR and 60 patients were in the DSVB and the male *vs* female ratio was 0.9:1 and 2:1 respectively. The age in TTAR and DSVB ranged 42.5 ± 35.5 and 47.0 ± 34.0. The average BMI of the TTAR was 22.3 kg/m^2 and that of DSVB was 23.5 kg/m^2 showing no significant difference (Table 1).

The average operation time of TTAR was 85.4 minutes and that of DSVB was 92.5 minutes. The average of length of hospital stay (days) in both groups were 3.59 and 4.06 (Table 2).

In both groups, superficial incisional site infections were developed in 5 persons. But, intra-abdominal abscess was none.

Fig. 1: The appendix was grasped by laparoscopic specimen grasper

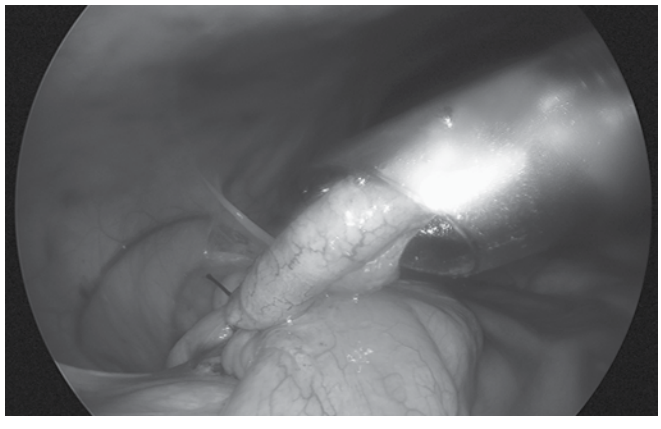

Fig. 2: The appendix was retracted into 15 mm trocar

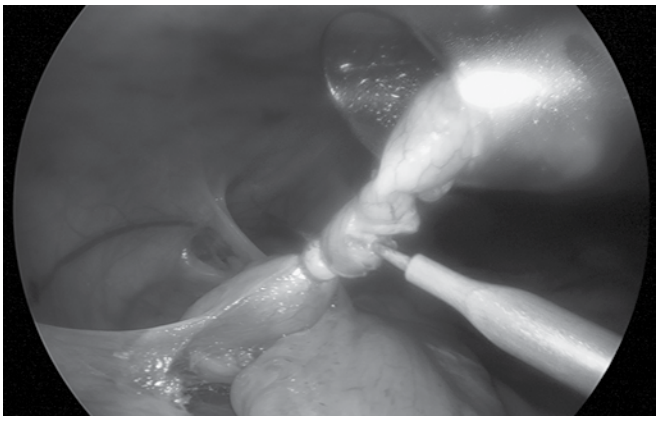

Fig. 3: The appendix was divided from appendiceal base

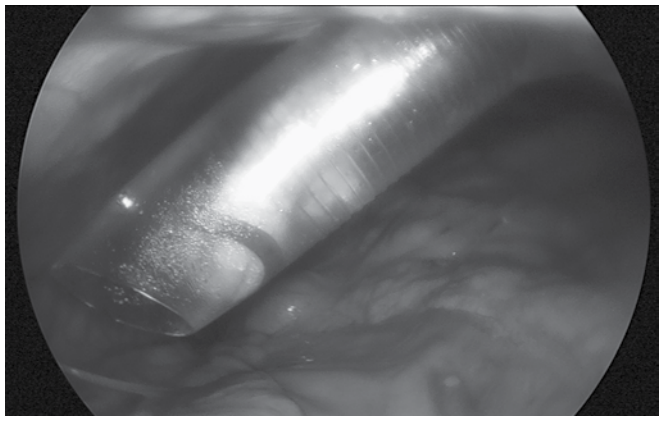

Fig. 4: The resected appendix was removed in trans-trocar space

In both groups, readmission were developed in each one person. Each person in TTAR and DSVB were admitted due to recurrent right quardrant pain without intra-abdominal abscess in abdominal ultrasonography or abdominal computed tomography and treated conservatively for few days.

DISCUSSION

The advantages of laparoscopic surgery are minimal wound, better cosmesis, less pain and quicker recovery. Because of these advantages, laparoscopic surgery is very popular method in most of surgery. In laparoscopic surgery, there are needed variable laparoscopic instrument. These laparoscopic instruments are almost disposable and expensive. Therefore, variable methods were showed by many clinicians to decrease to use disposable instrument.[6,10,11]

Disposable specimen vinyl bag have several advantages. These are minimal contamination of the abdominal cavity or wound tract when removing the specimen and prevention of tumor cell spillage from resected specimen. But commercial specimen vinyl bag is expensive and limited size and design based on gallbladder in laparoscopic cholecystectomy. So, there is not adequate for variable laparoscopic surgery.[11,12] Therefore, there are several effort to renovation of specimen vinyl bag or minimize to cost of commercial specimen vinyl bag.[4-7,10,11]

Trans-trocar appendix removal method in laparoscopic appendectomy was showed by several investigators instead of disposable specimen vinyl bag.[6-8] But clinical experiences and outcome were not reported in literature.

Trans-trocar appendix removal method may be more risky that there are bacterial contamination in abdominal cavity and tumor cell spillage from resected appendix than using disposable specimen vinyl bag. But, actually, there has not been studied risk of trans-trocar removal method about bacterial contamination and tumor cell spillage.

Recently, the study about trans-trocar appendix removal is reported. Jung and Bae said that adequate trocar size of trans-trocar appendix removal in laparoscopic appendectomy was determined according to preoperative patient's BMI.[13]

In the Jung and Bae's study, when postoperative trans-trocar appendix removal test in 15 mm trocar was performed, predictive success rate was 88% in all patients. According to BMI, predictive success rate is 100% in patients below 20 kg/m^2, 94% in patients between 20 kg/m^2 and 25 kg/m^2 and 61% above 25 kg/m^2 In our study, success rate of 15 mm trans-trocar appendix removal is 89.3% in all patients.[13] In 59 patients of 66 patients, trans-trocar appendix removal was successfully performed. And according to BMI, success rate is 100% below 20 kg/m^2, 87.8% in patients between 20 kg/m^2 and 25 kg/m^2 and 61% above 25 kg/m^2 (Table 3).

Although, it is difficult to generalize the result of this study, it is thought to be technically feasible to perform trans-trocar appendix removal in BMI <25. But, in BMI >25, it is thought to be technically careful to perform trans-trocar appendix removal.

In our study, the patients that had perforation, abscess formation and coexistence of appendiceal tumor were excluded, so that prevent to bacterial contamination and spillage of tumor cell. Therefore, surgical site infection rate was not significant in both groups.

This study is retrospective but, there are no selection bias by physician and no patient selection criteria between trans-trocar removal and specimen vinyl bag group. Therefore, there are no significant differences to age, gender and BMI between trans-trocar removal and specimen vinyl bag group. Furthermore, in operation time and hospital stay, there are no significant differences too.

There are possibility of more wound pain and larger scar in 15 mm trocar inserted patients than 11 mm trocar

Table 1: Patient demographics

	TTAR (n = 59)	*DSVB (n = 60)*	*p-value*
Age (year)	42.5 ± 35.5	47.0 ± 34.0	NS
Gender (male/female)	28/31	40/20	NS
Body mass index (kg/m^2)	23.8 ± 8.1	27.6 ± 5.1	NS

NS: nonspecific

Table 2: Postoperative clinical data

	TTAR (n = 59)	*DSVB (n = 60)*	*p-value*
Operation time (min)	117.5 ± 82.5	102.5 ± 57.5	NS
Hospital stay (day)	4.0 ± 2.0	4.5 ± 2.5	NS
Incisional site infection	3	2	NS
Intra-abdominal abscess	0	0	NS
Additional analgesics use	10	12	NS
Readmission within 30 days	1	1	NS

NS: nonspecific

Table 3: Review of the literature for trans-trocar appendix removal in laparoscopic appendectomy

		Our results	
	Predictive success rate in Jung and Bae (n = 62)	*Success/fail (n = 66)*	*Success rate (%)*
Total patients	88.7	59/7	89.3
BMI (kg/m^2)			
<20	100	19/0	100
20~25	94.3	29/4	87.8
25<	61.5	11/3	78.5

inserted patients in umbilicus. But, in single incision laparoscopic appendectomy (SILA), there are larger wound in umbilicus than 11 mm trocar site in conventional laparoscopic appendectomy (CLA). In most literatures of SILA, there is 15 mm or adult index finger size skin incision in umbilicus. Although, there is larger skin incision than 11 mm, there are no additional analgesics use and poor cosmesis in SILA compared to CLA.[14-17] Therefore, it is thought that possibility of wound pain and cosmesis problem is very low in TTAR.

Although, it is difficult to generalize the results of this study, it is thought that trans-trocar appendix removal is alternative and feasible method on basis of our study. But in BMI > 25, it is thought to be technically careful to perform trans-trocar appendix removal.

It is also necessary to make comparison the efficacy of appendix removal methods through well-designed prospective randomized clinical study to establish the better method for laparoscopic appendectomy.

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10.5005/jp-journals-10033-1229

ORIGINAL ARTICLE

Our Experience in Laparoscopic Appendectomy in Federal Teaching Hospital, Gombe

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ABSTRACT

Background: Federal Medical Centre, Gombe is one of the tertiary hospitals located in the north east of Nigeria. It serves as a referral center to neighboring state and also giving secondary care to the immediate environment. The institution has evolved in giving minimal access surgery services in appendicectomies, cholecystectomies, diagnostic laparoscopy, endourology, etc. We are presenting our experience in laparoscopic appendectomies.

Objective: To share our experience in laparoscopic appendectomy.

Materials and methods: One year review (May, 2013 to February, 2014) of patients that underwent laparoscopic appendectomy were made. Recruitment for the procedure is done via presentations at the emergency department (ED) or at the surgical outpatient department (SOPD). All cases that had complications and previous abdominal surgeries or had cardiopulmonary disease are excluded. Patients were counseled and taken written consent for conversion to open.

Results: Twenty patients were reviewed that had laparoscopic appendectomy. All had successful surgery; there was no conversion to open. Mean operative time is 34.2 minutes; mean recovery period is 181 minutes (3 hours), mean pain perception was 2.55 (mild pains), mean hospital stay was 22 hours. They were followed up at the SOPD and none of them had ports sites wound infection or clinical evidence of other complications.

Conclusion: Laparoscopic appendectomy is a favorable option in the treatment of uncomplicated appendicitis. Early recovery, reduced pain and hospital stay are the outcome observed.

Keywords: Laparoscopy, General surgery unit, Federal teaching Hospital, Gombe, Experience.

Abbreviations: MOT: Mean operative time; PP: Pain perception; RT: Recovery time; HS: Hospital stay.

How to cite this article: Mshelia NM, Obiano SK, Guduf MI, Gital YS, Khalifa S. Our Experience in Laparoscopic Appendectomy in Federal Teaching Hospital, Gombe. World J Lap Surg 2014;7(3):111-115.

Source of support: Nil

Conflict of interest: None

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INTRODUCTION

Laparoscopic appendectomy has recently been introduced to our nation though the speed is slow but quite a number of procedures have been done as reported in Nnewi and Oweri.[1] Until now all procedures of appendectomy were open. Semme K, a gynecologist was the first to remove appendix in 1983[2] and Schreiber remove an inflamed appendix in 1987.[3] The acceptance of the use of laparoscopy to treat appendicitis has been slow. This may be attributed to its longer operating time, cost and observation made on higher rate of intra-abdominal abscesses.[4] More laparoscopic appendicectomies are being performed than open in Australia.[5] The trend is toward[5] a single incision laparoscopy surgery using the umbilicus to perform procedures. Navarra et al started the single incision to perform cholecystectomy in 1997[6] and since the many other surgeries like appendectomy among others are done with successes.[7]

Those that will benefit from a laparoscopic appendectomy are:

a. Acute or chronic right lower abdominal pain with doubtful diagnosis of acute appendicitis. A diagnostic laparoscopy is done.
b. Vague lower abdominal pains suspected to be appendicitis in immune compromised individual.
c. Obese patient which larger wound is needed to perform appendectomy.
d. Young females where it may be difficult to differentiate other pathology of the pelvis from appendicitis.

MATERIALS AND METHODS

Twenty patients had laparoscopic appendectomy within the period of review, 8 are males and 12 are females. They were counseled on the procedure and written consent was signed including the option of converting to open appendectomy. Under general anesthesia, intubated and fully relaxed in supine position, surgical team in their position (Fig. 1), in the female, they may be need to placed them in lithotomy position for uterine manipulation when the need is required.[8] Formal pneumoperitoneum were achieved. First, laparoscopic visualization were carried out then placement of second and third ports

under vision in the left lower and right upper quadrants (Figs 2 to 4) for dissection and holding the appendix respectively are done. The appendix is identified and lifted at the tip with a grasper from the right port (Fig. 5). Adhesions were freed and mesoappendix is cauterized with a bipolar diathermy closed to the appendix and cut with scissor this continued till the base of the appendix is reached. A pre tied Meltzer's knot is applied to ligate the base (Fig. 6) and is tightened with the use of a knot pusher. Similar knotting is done at about 10 mm from the base knot. The appendix is severed and the area is sucked. Review of the peritoneum is done before the appendix is extracted, hidden in the cannula. The umbilical port site is closed with vicryl suture (Fig. 7).

All the patients are followed up in the surgical outpatient department after discharge from hospital stay. They are examined after subjective assessment of the port sites (Fig. 8) and remarkably, non-had infection. They expressed satisfaction of the procedure.

Data extracted on time taken to operate, recover, hospital stay, and pain perception was analyzed using Microsoft Excel 2010.

RESULTS

Summary of values obtained is as follows:

S. no.	*Parameters*	*Mean*	χ^2
1.	Operative time in minutes	34.2	12.10
2.	Recovery time in minutes	181	36.15
3.	Pain perception (VAS)	2.55	1.96
4.	Hospital stay in hours	22.1	4.00

DISCUSSION

There is general acceptance of laparoscopic appendicectomy worldwide however, still disputed to be a gold standard in appendectomy.[9] The development of laparoscopy surgery is slow in Nigeria compared to other developing nations like India. From reports of successes recorded across the globe, it is encouraging to dedicated resources to establish the services efficiently in our institutions of learning.

The uses of laparoscopy has been long by the department of obstetrics and gynecology for the purpose of investigating infertility until recently we had a visiting

Fig. 1: Positions of the team and monitor

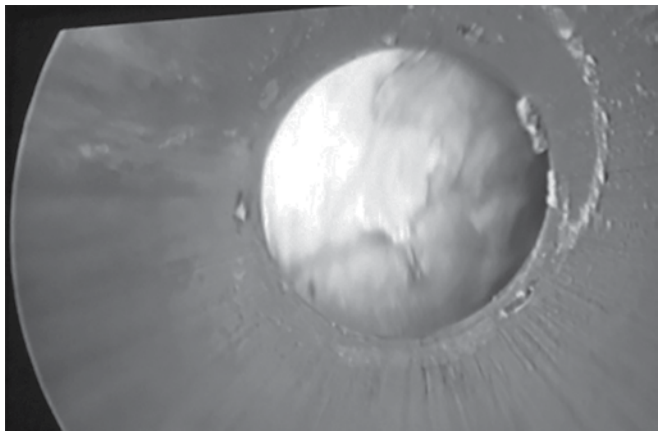


Fig. 2: Entry of the peritoneal cavity

Fig. 3: Insertion of ports under vision

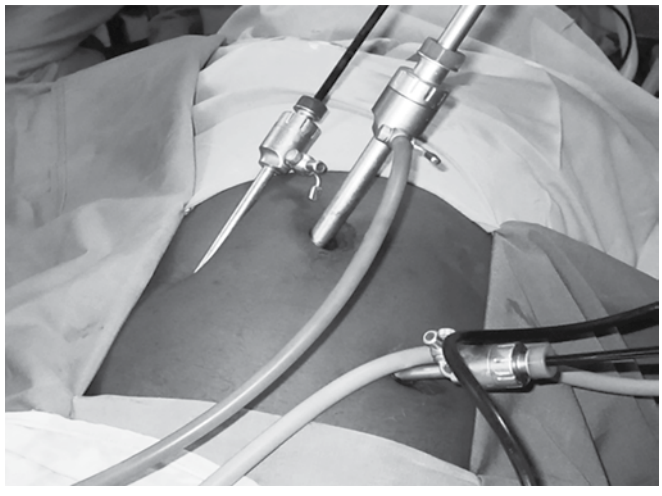


Fig. 4: Ports are in place

Fig. 5: Appendix picked

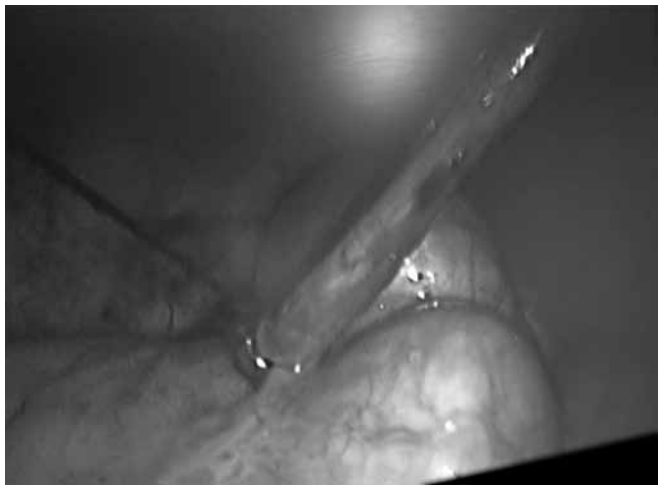


Fig. 6: Ligation of the appendix after cauterization of the mesoappendix

Fig. 7: Port closure

Fig. 8: Five days after operation

general surgeon who pioneered the act in our unit. Appendicectomies, though hand-assisted were done and cholecystectomy. Now, have a surgeon that had a basic training in minimal access surgery and doing most of the surgeries with good outcome.

Table 1: Summary

S. no.	*Age in years*	*Sex*	*Operative time in minutes*	*Recovery time in minutes*	*Pain perception (VAS)*	*Hospital stay in hours*
1.	27	M	45	180	2	19
2.	19	F	31	180	2	18
3.	18	F	42	210	3	22
4.	22	M	33	150	3	19
5.	29	F	35	150	3	22
6.	18	F	35	180	2	26
7.	18	F	28	180	3	23
8.	19	F	30	240	2	22
9.	27	F	32	180	3	22
10.	20	F	28	180	2	23
11.	28	M	30	150	3	22
12.	19	F	32	180	3	23
13.	24	M	38	190	2	24
14.	26	M	33	180	3	23
15.	34	F	36	150	2	25
16.	17	M	32	180	3	19
17.	29	F	40	180	2	20
18.	21	M	36	210	3	23
19.	37	F	38	180	3	24
20.	22	M	30	190	2	23
Mean	23.7		34.2	181	2.55	22.1

Our experiences correspond with other work done in south east of Nigeria1 and reports from Kenya where Patel et al reported a 106 case series of laparoscopic appendectomy over a 6-year period from 1996 to 2002.[10] Our mean operative time is 34.2 minutes. The pain experienced was mild (2.55 on average) based on visual analogue scale and that is a great advantage of the laparoscopic appendicectomy. The average hospital stay postoperatively was 22 hours so early discharged and patient's satisfactory remarks are the hallmark of our joy and experience (Tables 1 to 5 and Graph 1).

Table 2: Operative time and χ^2

S. no.	RT observed (O)	RT expected (E)	O-E	χ^2
1.	45	34.2	10.8	3.24
2.	31	34.2	– 3.2	0.29
3.	42	34.2	7.8	1.77
4.	33	34.2	– 1.2	0.04
5.	35	34.2	0.8	0.01
6.	35	34.2	0.8	0.01
7.	28	34.2	– 6.2	1.12
8.	30	34.2	– 4.2	0.51
9.	32	34.2	– 2.2	0.14
10.	28	34.2	– 6.2	1.12
11.	30	34.2	– 4.2	0.51
12.	32	34.2	– 2.2	0.14
13.	38	34.2	3.8	0.42
14.	33	34.2	– 1.2	0.04
15.	36	34.2	1.8	0.09
16.	32	34.2	– 2.2	0.12
17.	40	34.2	7.8	1.88
18.	36	34.2	1.8	0.09
19.	38	34.2	3.8	0.42
20.	30	34.2	– 2.2	0.14

$\chi^2 = \Sigma(O-E)^2/E = 12.1$; p-value = (C-1) (D-1) = 19

Table 3: Recovery time and χ^2

S. no.	RT observed (O)	RT expected (E)	O-E	χ^2
1.	180	181	– 1	0.01
2.	180	181	– 1	0.01
3.	210	181	29	4.64
4.	150	181	– 31	5.31
5.	150	181	– 31	5.31
6.	180	181	– 1	0.01
7.	180	181	– 1	0.01
8.	240	181	59	4.64
9.	180	181	– 1	0.01
10.	180	181	– 1	0.01
11.	150	181	– 31	5.31
12.	180	181	– 1	0.01
13.	190	181	9	0.44
14.	180	181	– 1	0.01
15.	150	181	– 31	5.31
16.	180	181	– 1	0.01
17.	180	181	– 1	0.01
18.	210	181	29	4.64
19.	180	181	– 1	0.01
20.	190	181	9	0.44

$\chi^2 = \Sigma(O-E)^2/E = 36.15$

Table 4: Pain perception and χ^2

S. no.	PP observed (O)	PP expected (E)	O-E	χ^2
1.	2	2.55	– 0.55	0.12
2.	2	2.55	– 0.55	0.12
3.	3	2.55	0.45	0.08
4.	3	2.55	0.45	0.08
5.	3	2.55	0.45	0.08
6.	2	2.55	– 0.55	0.12
7.	3	2.55	0.45	0.08
8.	2	2.55	– 0.55	0.12
9.	3	2.55	0.45	0.08
10.	2	2.55	– 0.55	0.12
11.	3	2.55	0.45	0.08
12.	3	2.55	0.45	0.08
13.	2	2.55	– 0.55	0.12
14.	3	2.55	0.45	0.08
15.	2	2.55	– 0.55	0.12
16.	3	2.55	0.45	0.08
17.	2	2.55	– 0.55	0.12
18.	3	2.55	0.45	0.08
19.	3	2.55	0.45	0.08
20.	2	2.55	– 0.55	0.12

$\chi^2 = \Sigma(O-E)^2/E = 1.96$

Table 5: Hospital stay and χ^2

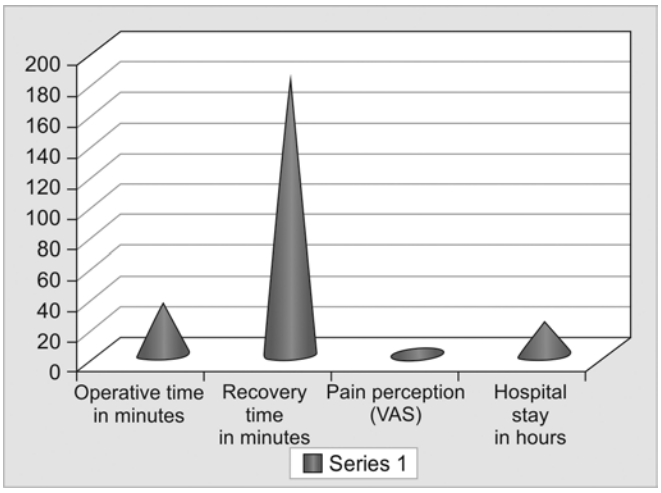
S. no.	HS observed (O)	HS expected (E)	O-E	χ^2
1.	19	22.1	– 3.1	0.43
2.	18	22.1	– 4.1	0.76
3.	22	22.1	– 0.1	0.04
4.	19	22.1	– 3.1	0.43
5.	22	22.1	– 0.1	0.04
6.	26	22.1	3.9	0.68
7.	23	22.1	0.9	0.03
8.	22	22.1	– 0.1	0.04
9.	22	22.1	– 0.1	0.04
10.	23	22.1	0.9	0.03
11.	22	22.1	– 0.1	0.04
12.	23	22.1	0.9	0.03
13.	24	22.1	1.9	0.16
14.	23	22.1	0.9	0.03
15.	25	22.1	2.9	0.38
16.	19	22.1	– 3.1	0.43
17.	20	22.1	– 2.1	0.19
18.	23	22.1	0.9	0.03
19.	24	22.1	1.9	0.16
20.	23	22.1	0.9	0.03

$\chi^2 = \Sigma(O-E)^2/E = 4.00$

CONCLUSION

In our experience of a year review, the result does point to a switch to a laparoscopic approach over open methods. There is general acceptance from the public as indicated by their quest for scar less surgeries. We have more work to compare the conventional laparoscopy to single incision surgeries. We hope to institute the minimal access surgery approach to appendicectomy as a training tool to our residents in that it is safe to practice in our local environment.

There is still more room to improve in the quality and management of time in the acts of laparoscopic surgeries.



Graph 1: Mean operative time, recovery time, pain perception, and hospital stay

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10.5005/jp-journals-10033-1230

ORIGINAL ARTICLE

Laparoscopic Appendectomy: Is it the Gold Standard Approach for Management of Acute Appendicitis?

MA Bahram

ABSTRACT

Aim: Evaluation of laparoscopic approach for management of patients with confirmed or suspected acute appendicitis.

Background: Although appendicitis is the most common condition requiring surgery in patients with right lower abdominal pain, this pain can be indicative of a vast list of differential diagnoses and is thus a challenge for clinicians. A definite diagnosis is obtained in 96% of patients undergoing laparoscopic appendectomy (LA) compared with 72% of those undergoing open procedures so patients can avoid the disadvantages of misdiagnosis beside other benefits of LA.

Study design: A prospective outcome analysis was done for 573 patients over the last 6 years, from 2008 to 2013. All patients were planned to go for LA. Modified Alvarado scoring system was used as a guide in diagnosing all patients. The following were recorded: operative time, conversion to open procedure, intraoperative findings, infection complications and length of hospital stay.

Results: The mean operative time in this study was 42 ± 17.54 minutes. Nonappendiceal pathology was found in 31 patients (5.4%). Conversion to open procedure was done in 11 patients (1.9%). The accurate pathology was detected in 535 (93.3%) patients. The infection complications had occurred in 16 patients (2.6% of all patients). The mean hospital stay in this study was 1 ± 0.21 days.

Conclusion: Laparoscopic appendectomy is safe and can provide less postoperative morbidity, accurate method in diagnosing abdominal pathology other than acute appendicitis, and drawbacks of undiagnosed or misdiagnosed pathology that mimic acute appendicitis can be avoided.

Keywords: Appendicitis, Laparoscopy, Right lower abdominal pain.

Abbreviations: OA: Open appendectomy; LA: Laparoscopic appendectomy; CT: Computed tomography; ECG: Electrocardiography; SPSS: Statistical package for the social sciences; DM: Diabetic mellitus; HCV: Hepatitis C virus; IAA: Intra-abdominal abscess.

How to cite this article: Bahram MA. Laparoscopic Appendectomy: Is it the Gold Standard Approach for Management of Acute Appendicitis? World J Lap Surg 2014;7(3):116-120.

Source of support: Nil

Conflict of interest: None

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INTRODUCTION

Right lower abdominal pain is one of the most common causes of patients visit to the emergency department. Although appendicitis is the most common condition requiring surgery in those patients, this pain can be indicative of a vast list of differential diagnoses and is thus a challenge for clinicians. Other causes of right lower quadrant pain aside from appendicitis include inflammatory and infectious conditions involving the ileocecal region, diverticulitis, malignancies, conditions affecting the epiploic appendages, omentum, and mesentery.[1]

The differential diagnosis of most of those patients is based on clinical ground, laboratory data and diagnostic imaging. The problem, however, is to obtain a correct diagnosis even in sure cases, to determine surgical indications and to decide the best surgical approach.[2]

During open appendectomy (OA) when the appendix looks apparently normal, the exact diagnosis of abdominal pain may not be reached and the management of these patients represents a dilemma for the surgeon and so far, no guidelines are available in this field.[3] Also if the cause cannot be managed through ordinary McBurney's incision, it is imperative to shift to another incision for management of the surgical problem.[4]

McBurney's procedure represented the gold-standard for acute appendicitis until 1981, when Semm, 1993,[5] performed the first laparoscopic appendectomy (LA) in Germany. The number of LA has progressively increased. But is LA the best choice for appendectomy? Are there selected groups of patients in which laparoscopic approach should be preferred?[6]

The aim of this study is to evaluate the laparoscopic approach for management of patients with confirmed or suspected acute appendicitis.

PATIENTS AND METHODS

This prospective study was conducted over the last 6 years, from 2008 to 2013. Five hundred and seventy-three patients were included in this study. Patients presented with acute right lower abdominal pain either suspected or confirmed acute appendicitis were included in the study (total 573 patients).

Exclusion criteria: Patients unfit for general anesthesia, children below 10 years, pregnancy (second and third trimester), chronic medical diseases, such as cirrhosis, coagulation disorders and previous laparotomy for bowel obstruction.

Preoperative workup in the form of complete history taking, complete clinical examination, laboratory (complete blood picture and urine analysis), and radiological examination includes abdominal ultrasonography for all patients and CT abdomen was done for some patients with unproved diagnosis. Modified Alvarado scoring system (Table 1) was used as a guide in diagnosing all patients.[7] Written fully informed consent was given by all patients.

Technique of the procedure: A 10 mm trocar was placed just above the umbilicus for the camera and 2 additional working 5 mm trocars were inserted, one suprapubic and the site of the other trocar depends on the pathology detected and abdominal configuration of the patient mostly left iliac fossa (sometimes this trocar was replaced by 10 mm depending on the size of the appendix as it is the extraction port). The patient was placed in a Trendelenburg position, with right side slightly up (a slight rotation to the left). The abdominal cavity was thoroughly inspected in order to exclude other intra-abdominal or pelvic pathology. The mesoappendix was transected by diathermy after applying titanium hemoclip early in this study but later on, blood vessel sealing device was used (ligasure 5 mm). The bases of the appendix were ligated with two endo-loops constructed with a Roeder's knot on a no-1 vicryl thread. The specimen was directly extracted or placed in an endo-bag and then extracted. All specimens were sent for histopathology. Drain was inserted in patients with pus in the peritoneal cavity or with abscess formation.

Prior to the surgery, all the patients received a standard regimen of intravenous antibiotics (1.5 gm of cefuroxime). Further antibiotic regimen was determined according to the operative findings.

The parameters examined in this study included: operation time (from skin incision to wound closure), conversion to open procedure, intraoperative findings and length of hospital stay. Complications included wound infections, intra-abdominal abscess, as well as 30 day readmission for complications.

The discharge criteria included: afebrile patient with audible bowel sounds and were able to tolerate a liquid diet.

Statistical analysis was performed using SPSS statistical software, version 12.0 (SPSS Inc, Chicago, IL). The data were expressed as mean and standard deviation.

RESULTS

In this study, all patients were planned to go for LA. The demographic data (age, gender), comorbidities and clinical presentation of the patients were included in Table 2.

In the present study, out of total 573 patients, appendiceal pathology was found in 504 patients (87.9%). No pathology was observed in the appendix after histopathological examination in 38 (6.7%) patients. Non appendiceal pathology was found in 31 patients (5.4%). Conversion to open procedure was done in 11 (1.9%) patients. The causes of conversion were: right hemicolectomy in five patients, small intestinal resection (minilaparotomy for Mickle's diverticulitis in four patients and appendicular mass in two patients (in one case the appendix was amputated from the cecum during dissection and the stump cannot be identified and the other case due to suspected cecal injury but on open procedure it was negative). The mean operative time in this study was 42 ± 17.54 minutes (Table 3).

Wound infection had occurred in 16 patients (2.8%). One patient developed postoperative intra-abdominal abscess (IAA), she was from the start appendicular abscess and the drain was removed after 4 days but she

Table 1: Modified Alvarado score (Ganesh Babu et al, 2012)

		Score
Symptoms	Migratory right iliac fossa pain	1
	anorexia	1
	Nausea and or vomiting	1
Signs	Tenderness in right iliac fossa	2
	Rebound tenderness	1
	Elevated temperature	1
	Extra signs; cough test, Rovsing sign	1
Laboratory	Leukocytosis	2
Total score		10

Interpretation: Score 1 to 4: Acute appendicitis very unlikely; Score 5 to 7: Acute appendicitis probable; Score 8 to 10: Acute Appendicitis definitive

Table 2: Demographic data, clinical presentation and comorbidities of the patients

Age	*Range*	*12-65 years*	
	Mean ± SD	23 ± 11.65 years	
Sex	Male	151	
	Female	422	Total = 573
Clinical presentation	Alvarado score ≥8	466	
	Alvarado score 5-7	107	Total = 573
Comorbidities	DM	34	
	HCV	25	
	Pulmonary disease	18	Total = 77

Table 3: Operative finding of laparoscopic appendectomy in all patients

			No.	*Percentage*
Pathology detected	Appendiceal pathology (no. = 504)	Acute appendicitis	456	87.9
		Gangernous appendicitis	25	
		Perforated appendicitis	2	
		Appendiceal abscess	12	
		Appendicular mass	9	
	No pathology detected (no. = 38)	Normal appendix	38	6.7
	Nonappendiceal pathology (no. = 31)	Inflamed Mickle's diverticulum	4	5.4
		Inflamed cecal diverticulum	3	
		Inflamed sigmoid diverticulum	1	
		Omental infarction	4	
		Ileoceal TB	1	
		Chron's disease	1	
		Complicated ovarian cyst	16	
		Perforated gallbladder	1	
		Total number	31	
Conversion to open procedure			11	1.9
Operative time	Range		25-150 minutes	
	Mean ± SD		42 ± 17.54 minutes	

Table 4: Postoperative complications

			No.	*Percentage*
Hospital stay		Range	0.5-10 days	
		Mean ± SD	1 ± 0.21 days	
Post-operative infection	Wound infection	Surgical incision	2	2.8
		Drain site	9	
		Extraction port site	4	
	Intra-abdominal abscess		1	
	Readmission		1	
Total			16	

developed IAA after 3 weeks and readmitted again for open drainage of the abscess and the same patient developed wound infection. The mean hospital stay in this study was 1 ± 0.21 days (Table 4).

DISCUSSION

Laparoscopic appendectomy has become the approach of choice by many surgeons in the treatment of both simple and complicated cases of acute appendicitis. The rate of LA between 1998 and 2008 has significantly increased from 20.6 to 70.8%. A definite diagnosis was obtained in 96% during LA compared with 72% in OA.[8]

Despite the obvious advantages of LA described in many studies,[8-10] LA still remains a matter of debate because of concerns about possible longer operative time and higher rate of postoperative IAA compared to OA.

In this study, the mean operative time was 42 ± 17.5 minute. throughout the study and it is comparable to the time recorded in study done by Minutolo et al,[8] 2014 who recorded 52 minute for LA, Saeed Kargar et al,[9] 2010, who recorded 34.4 minute and Ioannis at,[11] 2008, who recorded 47 minute. The following studies[8,9,11-13] recorded that statistically there is no significant difference between LA and OA. This was attributed to the world-wide spread of training in laparoscopic techniques that lead to a significant reduction in difference of operative time compared to open procedures.

The infection complications had occurred in 16 patients (2.8%), most of them were patients with complicated appendicitis (12 from 16 patients: 75%).

Kehagias et al, 2008[11] and Tsai et al, 2012,[14] who evaluated LA in all stages of appendiceal inflammation, had recorded wound infection rate of 5.3% and 4.7 respectively but both of them recorded lower rate of wound infection in LA in comparison to OA. Moreover, Ohtani et al 2012,[15] recorded 1.6% rate of wound infection in LA that was significantly lower than OA. This can be explained with the use of the extraction bag in LA, which prevents the direct contact between the infected appendix and the wound during its removal.[13,15]

Intra-abdominal abscess is a serious complication following appendectomy and can potentially be life-threatening; many investigators pay close attention to this complication and still there is no definite conclusion about this complication.

Old studies done by some authors reported that the incidence of IAA was higher with LA.[16-21] It had been suggested that carbon dioxide insufflation may promote mechanical spread of bacteria in the peritoneal cavity, especially in cases of ruptured appendix, also improper laparoscopic technique, such as aggressive manipulation of the infected appendix and increased use of irrigation

fluid, possibly producing greater contamination of the peritoneal cavity, might have an impact on IAA formation after LA.[19]

However, recent meta-analysis of randomized controlled trail published by Wei et al, 2011,[22] shows a low incidence of intra-abdominal infections, with no significant difference between LA and OA. A multivariate analysis has shown that development of abscesses has a higher correlation with the initial diagnosis rather than with the type of surgical approach.[6,14]

Intra-abdominal abscess had occurred in one patient (0.02) in this study. This is comparable to the result recorded by Ching et al,[14] 2012 who did not record cases with IAA and Brümmer et al,[21] 2009, who recorded rate of IAA with LA 0.31% of their patients. Katkhouda et al (2000)[23] and Vincenzo Minutolo et al,[8] 2014, believed that mastery of the learning curve and the use of standardized surgical techniques reduced the incidence of IAA after LA.

Laparoscopy can be considered the first choice in suspected appendicitis allowing correct evaluation of intra-peritoneal pathology.[6,15,24,25]

The correct pathology was detected in 535 or 93.3% of the patients, while another pathology rather than acute appendicitis was detected in 31 or 5.4% of the patients. From those 31 patients, 27 patients gained extra benefit from laparoscopic approach: eight patients avoided undiagnosed pathology, 15 patients avoided wound extensions and excess tissue manipulation for pathology management and four patients avoided adding another surgical incision to McBurney incision (Table 5).

The results in this study concedes with the results in the study conducted by Ma et al,[26] from 271 patients with a normal appendix, extra-appendiceal pathology was found in 71 (4.8% of all appendectomies).

Conversion from LA to OA is one of the drawbacks of laparoscopic approach as it prolongs the operative time, hospital stay and may even increase the morbidity especially if the conversion was due to improper surgical laparoscopic technique.

Table 5: Benefits of laparoscopic approach in detecting nonappendiceal pathology

Patients avoided misdiagnosis	Sigmoid diverticulitis	1	
	Omental infarction	3	
	Left ovarian cyst	4	
Patients avoided extension of McBurney incision	Ovarian cyst	12	4.7%
	Ileo-cecal disease	3	
Patients avoided shift to another incision	Perforated GB	1	
	Ileo-ceal TB	1	
	Cecal diverticulum	2	
Total		27	

The conversion rate in this study was in 11 (1.9%) of patients and the main cause of conversion was due to non appendiceal pathology detected (9 from 11) and the other two patients were due to appendiceal inflammation. This rate of conversion is nearly equal to the result recorded by Minutolo et al, 2014,[8] who recorded a rate of conversion 1.4% (2 from 139 patients).

Higher conversion rate may be due to gaining experiences with the laparoscopic procedure so surgeons might attempt to perform LA for complicated cases of appendicitis, most of which might have been treated previously by open approach.[13]

Another advantage of LA is shorter hospital stay, in this study; the mean hospital stay was 1 ± 0.21 days. This differs from the results recorded by Minutolo et al, 2014[8] who recorded mean hospital stay in LA 2.75 days and also Ioannis et al, 2008, recorded hospital stay for LA 2.2 days but both of them stated that there was a significant difference between both LA and OP regarding hospital stay.

CONCLUSION

Laparoscopic appendectomy is safe with accepted postoperative morbidity. Most cases of acute appendicitis can be treated laparoscopically. LA is an accurate method in diagnosing abdominal pathology other than acute appendicitis, avoiding patients the drawbacks of undiagnosed or misdiagnosed pathology that mimic acute appendicitis. With better training in laparoscopic surgery and availability of equipment: LA will be sooner the gold standard for acute appendicitis.

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10.5005/jp-journals-10033-1231

ORIGINAL ARTICLE

Remission of Type 2 Diabetes Mellitus after Laparoscopic Sleeve Gastrectomy

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ABSTRACT

Introduction: Type 2 diabetes mellitus (T2DM) comprises 90% of diabetics and is largely the result of excess body weight. There is rising evidence in the literature to suggest that laparoscopic sleeve gastrectomy (LSG) produces effective weight loss and improves obesity-related comorbidities, such as T2DM. The purpose of the study is to observe the effectiveness of LSG in the remission of T2DM.

Materials and methods: A retrospective study of 107 diabetic obese patients who underwent LSG at Alamiri Hospital, from October 2008 to 2012 was conducted. The pre- and postoperative diabetic status, body mass index, and percent excess weight loss (%EWL) of the patients were retrieved and analyzed.

Results: The mean age of the patients was 42 years ± 10.4 and 68% were females. Median preoperative BMI was 46 kg/m^2 (30-87) and median postoperative follow-up period was 18 (2-48) months. Pre- and postoperative fasting blood glucose and HbA1C were measured. Resolution and improvement of T2DM was 53.3% (n = 57) and 38.3% (n = 41), respectively. The %EWL was 72% at 1 year and 73% at 4 years and median postoperative BMI was 33 kg/m^2 (20-61). Duration based analysis showed that most of the resolved patients had diabetes for less than 5 years.

Conclusion: LSG resulted in total remission of T2DM in more than half of the patients and is more effective for the treatment of patients with short-term duration of the disease.

Keywords: Bariatric surgery, Sleeve gastrectomy, Diabetes mellitus.

How to cite this article: Al-Sabah S, Almazeedi S, Alosaimi S, Al-Mulla A, Ali DA, Al-Elewah A, Algooneh A. Remission of Type 2 Diabetes Mellitus after Laparoscopic Sleeve Gastrectomy. World J Lap Surg 2014;7(3):121-124.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

Obesity has recently gained the attention of many physicians over the world as the numerous morbidities associated with a high body mass index (BMI) have become evident. Over a span of 20 years, namely between 1980 and 2008, the recorded percentage of overweight adults has reached 1.4 billion people worldwide (35% of the world's population), of those 200 million men and 300 million women are considered obese (11% of the population).[1] When in view of the health hazards linked to obesity, these numbers are somber. They translate as health risks, such as diabetes mellitus type 2 (T2DM), insulin resistance, heart disease, dyslipidemia, hypertension, stroke, venous thrombus formation, osteoarthritis, and psychosocial effects.[2] Furthermore, all-cause mortality and cardiovascular disease related mortality are particularly increased in the overweight populace.[3]

As of 2011 bariatric surgery is formally considered a component of the early management of T2DM to decelerate the progression of the disease and, thereby reduce mortality, morbidity and cost of treatment, thereby improving the quality of life.[4] The exact influential mechanism of bariatric surgery on glucose metabolism is uncertain; however, it is thought to be secondary to the effects of hormones, principally: ghrelin, peptide YY (PYY3-36), and glucagon-like peptide 1 (GLP-1).[5]

It remains to be said that despite this, bariatric surgery is usually only considered once medical therapy has failed or glycemic control cannot be achieved adequately. In this study, we aim to observe the effectiveness of laparoscopic sleeve gastrectomy (LSG) in the management and definite treatment of T2DM.

MATERIALS AND METHODS

A retrospective study was conducted of the patients who underwent LSG at Al-Amiri Hospital, Kuwait from October 2008 to December 2012. From those, the diabetic patients were isolated and their files with pre- and postoperative laboratory investigations were retrieved. LSG was performed in a standard split-leg French position using five laparoscopic ports. Devascularization of the greater curvature of the stomach was carried out starting from 4 to 6 cm from the pylorus and up to the angle of His. A 36-Fr calibrating bougie was then passed through the stomach to the duodenum before creating the gastric sleeve. The sleeve was performed with a linear laparoscopic stapler using green or black cartridges

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for the antrum and blue cartridges for the body and fundus, aiming for a final gastric pouch size of 100 ml. The calibrating bougie was then pulled proximally and 100 ml of methylene blue were injected through it to assess for leak. No intrabdominal drains were placed.

Diabetes was defined in accordance with the International Diabetes Federation as a fasting blood glucose (FBG) level of more than 7.0 mmol/l, and HBA1C more than 6.5%. The primary outcome measures were T2DM resolution, defined as FBG of less than 7 mmol/l and HBA1C less than 6.5% in the absence of any hypoglycemic medications, and T2DM improvement, defined as a reduction in the dosage of hypoglycemic medications. The resolution and improvement of diabetes were also grouped and analyzed in terms of time since T2DM onset and treatment type: diet, oral hypoglycemic agents (OHA), insulin, and insulin + OHA. Secondary outcomes measures included change in FBG and HBA1C levels pre and postoperative, percent excess weight loss (%EWL), and change in BMI.

The study was approved by the Kuwait Institute for Medical Specialization and Kuwait Ministry of Health ethical committees. Statistical analysis of the data was carried out using SPSS software. Statistical significance was calculated using Fisher's exact test and was set at a p-value less than 0.05.

RESULTS

The data from a total of 1,202 patients who underwent LSG at Al-Amiri Hospital was retrieved and analyzed. A total of 185 (15.4%) patients were found to be diabetic, 107 of whom had the required laboratory investigations and anthropomorphic data available and were used for this study. The mean age of the diabetic patients was 42 ± 10.4 years and 127 patients (68.8%) were females. Median preoperative BMI was 46 kg/m^2 (30-87) and median postoperative follow-up period was 18 months (2-48).

Remission of T2DM was seen in 53.3% (n = 57) of the patients and improvement of T2DM was seen in 38.3% (n = 41). Median pre- and postoperative FBG was 11 mmol/l (4-27) and 6 mmol/l (3-18), respectively. Similarly, median HBA1C levels decreased by 2.9% between the pre- and postoperative period, from 9.5% (6-17) to 6.6% (3-11). Diabetes status during interval follow-up periods is depicted in Table 1. No significant difference was found in T2DM remission and improvement in terms of patient gender (p = 0.985) and age (p = 0.933).

The median preoperative duration of diabetes among the patients was 9 years (0.1-24). Duration based analysis showed an inverse relationship between the duration of preoperative diabetes and likelihood of diabetes remission postoperatively (p < 0.001). Most of the patients in whom diabetes resolved had the disease for less than 5 years, with the best results found in those with duration of T2DM of 1-3 years (Table 2).

Preoperatively, 2 patients were managed by pure diet control, 68 were taking OHA, 15 were on insulin therapy, and 13 with a combination of insulin + OHA. In terms of treatment based outcomes, patients who were on diet control and OHA showed better remission of the disease than those on insulin and OHA + insulin (Table 3). The difference between them however lacked statistical significance.

Median %EWL was 60% (10-239) and was found to be 72% at 1 year and 73% at 4 years (Graph 1). A significant association was found between the %EWL and complete remission compared to just improvement of T2DM (Graph 2). The median postoperative BMI was 33 kg/m^2 (20-61).

DISCUSSION

The findings of this study clearly point to the fact that LSG can play a significant role in managing T2DM. The fact that the vast majority (91.6%) of patients showed either complete remission or improvement of the disease is in keeping with the emerging literature focusing on LSG as a potential option for the management of diabetes. Most current studies comprise of a substantially small patient population but show significant improvement in blood glucose levels, almost reaching near normal figures in known T2DM.

In a 2010 systemic review of 27 studies with 673 patients, LSG was shown to resolve diabetes in 66.2% of the subjects, with 97.1% experiencing resolution or improvement.[6] The drop in baseline FBG (11 mmol/l to 6 mmol/l)

Table 1: Diabetes status and percentage excess weight loss during interval follow-up periods

Post-op follow-up interval	*n (%)*	*Type 2 diabetes status*			*% EWL*
		Not improved	*Improved*	*Resolved*	
6 months	6 (5.6)	0 (0)	2 (33.3)	4 (66.7)	54
12 months	22 (20.6)	2 (9.1)	7 (31.8)	13 (59.1)	72
18 months	34 (31.8)	3 (8.8)	17 (50.0)	14 (41.2)	75
24 months	13 (12.1)	1 (7.7)	1 (7.7)	11 (84.6)	75
36 months	27 (25.2)	3 (11.1)	13 (48.1)	11 (40.7)	65
48 months	5 (4.7)	0 (0)	1 (20)	4 (80)	73

p = 0.232 (Fisher's exact test)

Table 2: Duration-based outcome of T2DM after LSG

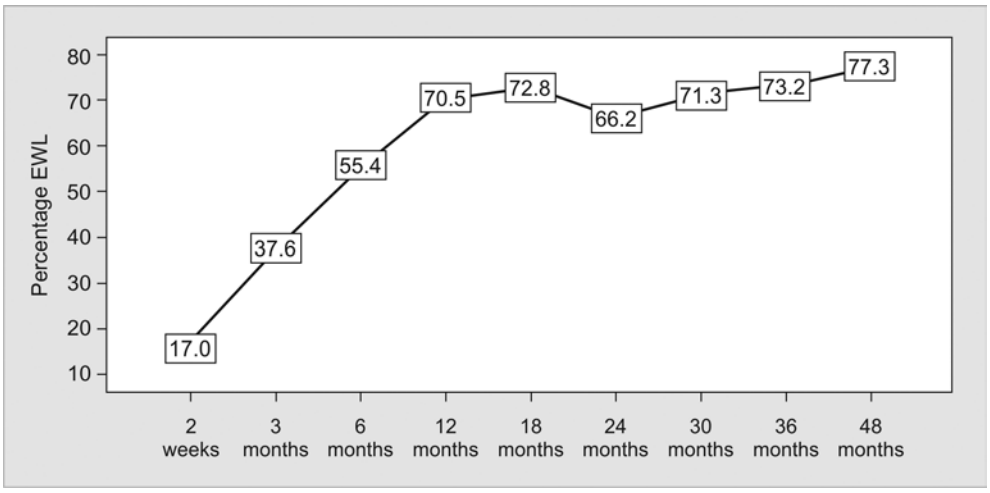
Duration of DM in years (pre-op)	*Total n (%)*	*Not improved n (%)*	*Improved n (%)*	*Resolved n (%)*
< 1	4 (5.3)	0 (0)	1 (25.0)	3 (75.0)
1-3	19 (25.0)	1 (5.3)	3 (15.8)	15 (78.9)
3-5	16 (21.1)	1 (6.3)	4 (25.0)	11 (68.8)
5-10	20 (25.8)	0 (0)	9 (45.0)	11 (55.0)
> 10	17 (23.7)	1 (5.9)	14 (82.4)	2 (11.8)

p = 0.001 (Fisher's exact test)

Table 3: Treatment-based outcome of T2DM after LSG

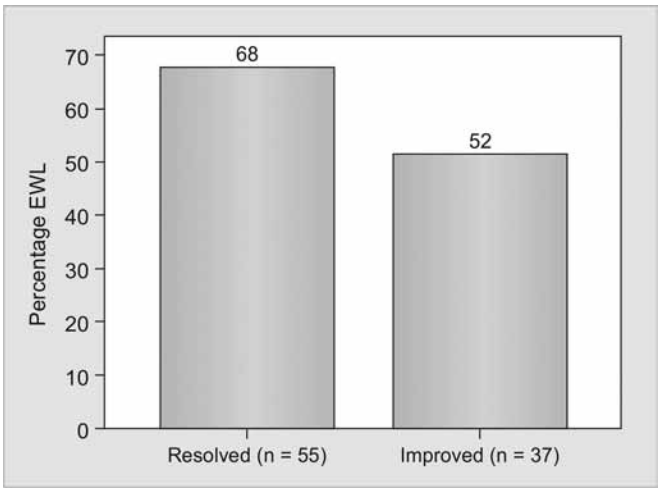
	Treatment				
Results	*Diet (%)*	*OHA (%)*	*Insulin (%)*	*(OHA + Insulin) (%)*	*Total (%)*
Resolved	2 (100)	43 (63.2)	6 (40)	5 (38.5)	56 (57.1)
Improved	0 (0)	19 (27.9)	9 (60)	7 (53.8)	35 (35.7)
Not improved	0 (0)	6 (8.8)	0 (0)	1 (7.7)	7 (7.1)
Total	2 (2.0)	68 (69.4)	15 (15.3)	13 (13.3)	98 (100)

p > 0.05 (Fisher's exact test)



Graph 1: Percentage of EWL over first 48 months

and improvement in HBA1C level (9.5% to 6.6%) found in this study is also in keeping with that of the systemic review (FBG drop from 10 mmol/l to 6.6 mmol/l, and HBA1C from 7.9 to 6.2%). Newer publications also point to the same findings, with Abbatini et al observing an 80.9% cure of diabetes in just 3.3 months after LSG.[7] Another study by Wei-Jei Lee et al showed that out of 20 patients the median reduction of HbA1c was from 10.1 to 7.1%[8] and a net HBA1C decrease of 2.175% was observed in another.[9] Furthermore, an interesting study by Omana et al even showed a 100% resolution and improvement of T2DM after LSG.[10]



Graph 2: Percentage of EWL and T2DM resolution *vs* improvement only, p = 0.009 (Fisher's exact test)

Observing factors, such as disease duration and treatment regimes, might help in analyzing which patients can benefit the most form surgery and better predict outcomes.[11] The finding that patients with a duration of diabetes less than 5 years preoperatively showed a significantly superior resolution from the disease further proves this point. In addition, the interesting finding that there was no statistically significant difference between T2DM resolution among the different treatment regimens proposes that LSG might prove to treat the disease regardless of the severity.

There is no longer speculation that bariatric surgery is fast becoming a viable treatment option for T2DM, with recent large scale randomized control trials showing its superiority over traditional medical therapy.[12] However, there is still a lack of large-scale studies observing LSG in particular when it comes to diabetes resolution. This is due to the fact that Roux-en-Y gastric bypass (RYGB) remains the gold standard bariatric procedure, with a T2DM remission rate reaching as high as 60%.[13,14] However, recent evidence has been emerging showing no significant difference between LSG and RYGB in terms of efficacy in treating T2DM, with both procedures showing comparable results in diabetes control.[15,16] LSG, though considered by many as a novel procedure, continues to show its efficacy, not only in the treatment of the obesity pandemic, but as a potential cure for diabetes.

ACKNOWLEDGMENTS

The authors would like to convey their humble thanks to all those who made this study possible, most notably Dr Lukman Thaleb, Ms Reena Thomas and Dr Hind Almazeedi.

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10.5005/jp-journals-10033-1232

REVIEW ARTICLE

A Review of Comparing Laparoscopic Roux-en-Y *vs* Minigastric bypass for the Morbid Obesity

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ABSTRACT

Obesity is a major problem in whole over the world especially in urban countries. Surgical treatment for morbid obesity is now considered as a well accepted one compared to medical treatment. Now the commonly performed surgeries are Roux-en-Y gastric bypass and minigastric bypass. A literature review was performed using Springer link, BMJ, Journal of MAS and major general search engine like Google, MSN, and Yahoo, etc. The following search terms were used: laparoscopic treatment of morbid obesity; laparoscopic Roux-en-Y gastric bypass (LRYGBP) and minigastric bypass for morbid obesity. Reviews and meta-analysis, editorial letters or comments, case reports, animal or *in vitro* studies, comparisons with medical treatment, comparisons with open (nonlaparoscopic) procedures were excluded. All the studies showed that both procedures are equally good solving obesity related metabolic problems. But regarding the technique, simplicity and safety minigastric bypass is superior to Roux-en-Y gastric bypass. We believe that patients should be informed in detail on the advantages and disadvantages of each available procedure, possibly in several interviews and always accompanied by a specialized interdisciplinary team, warranting long-term follow-up.

Keywords: Laparoscopic Roux-en-Y gastric bypass, Minigas -tric bypass, Morbid obesity, Metabolic syndrom.

How to cite this article: Karatparambil AA, Sidhic C. A Review of Comparing Laparoscopic Roux-en-Y *vs* Minigastric bypass for the Morbid Obesity. World J Lap Surg 2014;7(3):125-128.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

Both in developed and developing countries, obesity is considered as an endemic problem. Medical treatment of obesity is greatly disappointing. Surgery is considered as the most effective treatment for morbid obesity as per the National Institute of Health Consensus Conference in 1991.[1] From there, major development has occurred in the bariatric surgery field including laparoscopy. In 2004, a consensus conference was sponsored by the American Society for Bariatric Surgery (ASBS), which updated the evidence and the conclusions of the NIH panel. They concluded that gastric bypass is considered as one of the operation for morbid obesity; laparoscopy is equally effective as open surgery. With advances in minimally invasive technology, laparoscopic Roux-en-Y gastric bypass (LRYGBP) has been reported as a safe alternative to open RYGBP.[2-4] However its associated with steep learning curve, longer operation time and more perioperative complications.[5,6] Laparoscopic minigastric bypass (LMGBP), first reported by Rutledge from USA in 1997, was proposed as a simple and effective treatment of morbid obesity.[7] However, controversies about the relative safety of this procedure remain, mainly the incidence of marginal ulcer and reflux esophagitis.[8]

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AIM

The aim of the study was to compare the safety and effectiveness of LRYGBP and LMGBP in the treatment of morbid obesity. The following parameters were used for both the procedures:

- Time taken
- Conversion rate
- Blood transfusion
- Mortality and morbidity
- Postoperative complications (anastamotic leak, ileus, GI bleeding, reoperation)
- Postoperative recovery
- BMI
- Excess weight loss
- Normalization of metabolic syndromes
- Quality of life assessment.

MATERIALS AND METHODS

A literature review was performed using Springer link, BMJ, Journal of MAS and major general search engine like Google, MSN and Yahoo, etc. The following search terms were used: laparoscopic treatment of morbid obesity; laparoscopic Roux-en-Y gastric bypass and minigastric bypass for morbid obesity. Sixty-one thousand and three hundred citations found in total selected papers were screened for further references. Criteria for selection of literature were the number of cases (excluded if it is less than 20), method of analysis (statistical or nonstatistical), operative procedure (only universally accepted procedures were selected). And the institution were the study

was done (specialized laparoscopic bariatric institution were given the preference).

PATIENT SELECTION

A history of obesity of > 5 years' duration; BMI > 40 kg/m^2 or BMI > 35 kg/m^2 with comorbidities; documented weight loss attempts in the past; and good motivation for surgery. The age was restricted to patients from 18 to 59 years of age. Exclusion criteria were previous obesity surgery, previous gastric surgery, large abdominal ventral hernia, pregnancy, psychiatric illness, or BMI > 60 kg/m^2.

OPERATIVE TECHNIQUES

The gastric bypass procedure consists of:

- Creation of a small, (15-30 ml/1-2 tbsp) thumb-sized pouch from the upper stomach, accompanied by bypass of the remaining stomach (about 400 ml and variable). This restricts the volume of food which can be eaten. The stomach may simply be partitioned (typically by the use of surgical staples), or it may be totally divided into two parts (also with staples). Total division is usually advocated to reduce the possibility that the two parts of the stomach will heal back together (fistulize) and negate the operation.
- Reconstruction of the GI tract to enable drainage of both segments of the stomach. The particular technique used for this reconstruction produces several variants of the operation, differing in the lengths of small intestine used, the degree to which food absorption is affected, and the likelihood of adverse nutritional effects.

VARIATIONS OF THE GASTRIC BYPASS

Gastric Bypass, Roux-en-Y (proximal) (Fig. 1)

This variant is the most commonly employed gastric bypass technique, and is by far the most commonly performed bariatric procedure in the United States. The small intestine is divided approximately 45 cm (18") below the lower stomach outlet and is rearranged into a Y-configuration, enabling outflow of food from the small upper stomach pouch via a 'Roux limb'. In the proximal version, the Y-intersection is formed near the upper (proximal) end of the small intestine. The Roux limb is constructed using 80 to 150 cm (31-59") of the small intestine, preserving the rest (and the majority) of it for absorbing nutrients. The patient will experience very rapid onset of the stomach feeling full, followed by a growing satiety (or 'indifference' to food) shortly after the start of a meal.

Gastric Bypass, Roux-en-Y (distal)

The small intestine is normally 6 to 10 m (20-33') in length. As the Y-connection is moved further down the gastrointestinal tract, the amount available to fully absorb nutrients is progressively reduced, traded for greater effectiveness of the operation. The Y-connection is formed much closer to the lower (distal) end of the small intestine, usually 100 to 150 cm (39-59") from the lower end, causing reduced absorption (malabsorption) of food: primarily of fats and starches, but also of various minerals and the fat-soluble vitamins. The unabsorbed fats and starches pass into the large intestine, where bacterial actions may act on them to produce irritants and malodorous gases. These larger effects on nutrition are traded for a relatively modest increase in total weight loss.

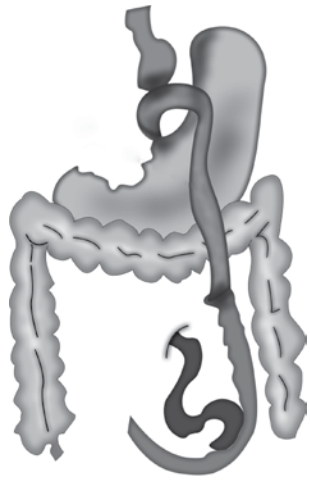

Fig. 1: View of completed retrocolic, retrogastric laparoscopic Roux-en-Y gastric bypass[12]

Minigastric Bypass (Fig. 2)

The minigastric bypass procedure was first developed by Dr Robert Rutledge from the USA in 1997, as a modification of the standard Billroth II procedure. Minigastric bypass involves making of a long narrow tube of the stomach along its right border, the lesser curvature. A loop of the small gut is brought up and hooked to this tube at about 180 cm from the start of the intestine (ligament of Treitz).

Numerous studies show that the loop reconstruction (Billroth II gastrojejunostomy) works more safely when

Fig. 2: View of completed laparoscopic minigastric bypass[12]

placed low on the stomach, but can be a disaster when placed adjacent to the esophagus. Today thousands of 'loops' are used for surgical procedures to treat gastric problems, such as ulcers, stomach cancer, and injury to the stomach. The minigastric bypass uses the low set loop reconstruction and thus has rare chances of bile reflux.

The MGB has been suggested as an alternative to the Roux-en-Y procedure due to the simplicity of its construction, which reduces the challenges of bariatric surgery. The surgery is becoming more and more popular because of low risk of complications and good sustained weight loss. It has been estimated that 15.4% of weight loss surgery in Asia is now performed via the MGB technique.[9]

RESULTS

Preoperative Parameters

As far as the preoperative parameters like age, sex, BMI, metabolic syndromes (as defined by ATPIII criteria)[10] concerned no specific advantage of one procedure over other or both are equally effective in all the groups.

Operation Time

As far as LMGB is considered operation time, postoperative stay, analgesic used are minimal compared to LRYGB. Conversion rate is also nil in case of LMGB. But the operative blood loss and passage of flatus both are comparable. No mortality detected in both the procedures.

Operative Morbidities

Postoperative major complication in terms of anastomotic leak and minor complication like wound infection, GI bleeding, ileus, is more with LRYGB. There is also minimal increase in reoperation rate with LRYGB. But with LMGB major complication are nil but minor leakage is there but less chance compared to LRYGB.

Follow-up

As far as the BMI, weight loss, morbidities related to obesity are concerned all were improved with surgery without a significant difference between two except for the weight loss its more for LMGB in the first year after that both are same. As per Reinholds classification excess weight loss is more for patient in LMGB.

Quality of Life Assessment

There were significant improvement in the domains of general life including physical, social and emotional functions equally in both the groups. But there were GI symptoms like belching, gurgling sound in the abdomen, distension are same in both the groups in spite of great improvement in eating and relief of acid peptic disorder. These are assessed by gastrointestinal quality of life index.[11]

DISCUSSION

Although a growing number of adjustable gastric banding operations have been reported NIH approved bariatric surgical operations are currently only VBG and Roux-en-Y gastric bypass. RYGBP is considered as the gold standard surgery in us as the weight reduction is more with this than VBG. As per the 1999 survey, RYGB is considered as the most commonly performed bariatric surgery. As the perioperative complications are high this techniques needs more experience. The reported major complication rate of LRYGBP varied from 3.3 to 15%, and the late complication rate from 2.2 to 27% conversion rate from 0.8 to 11.8%. Leakage ranged from 1.5 to 5.8% and is one of the most common complication.[12]

Technical difficulty of RYGB is mainly due to high anastomosis near gastroesophageal junction. Earlier retrocolic approach was used that itself added the technical difficulty.But some surgeons now prefer antecolic approach with bivalving of the omentum to reduce tension on mesentery.Theoretically, LMGB is low antecolic and one less anastomosis makes it more easier compared to RYGB and provides better blood supply thereby reducing the chance of leakage. The technical difficulty and postoperative complications in terms of leakage, hospital stay, pain and time taken are more for RYGB compared to LMGB. Operative time for RYGB is 27.8% more than LMGB even though five port technique is used for both more dissection and anastomosis make its more time consuming procedure.

All most all the studies are of shorter postoperative follow-up and the postoperative criteria for discharge is also standardized in order to avoid bias. None of the studies included extremely obese patient that is BMI more than 60 in order to avoid technical difficulty.

Studies have shown that major and minor complications are less for LMGB compared to RYGB and in the range of 0 and 7.5% comparing with 5 and 15%. But one of the limiting factor may be the learning curve. Because RYGB learning curve is very steep. Hence, the incidence may vary in highly specialized centers. The major complication of LMGB is mainly anastomotic bleeding because of high blood supply to stomach tube some time makes reoperation. Hence, it is advisable to check the anastomotic line after clipping and if needed seromuscular sutures can be put.

One of the drawback of LMGB is bile reflux gastritis and the carcinogenic effect which is still controversial.[13-15] High incidence of biliary gastritis is mainly because of Roux-en-Y loop anastomosis but it is technically lower in LMGB because of its low anastomosis. But for all this needs long-term follow-up with endoscopy but most of the studies are of short-term and endoscopy has not adviced in regular follow-up. Most of the results are based on the gastrointestinal quality of life assessment. Based

on this both groups have got better outcome as far as quality of life is concerned. However, long-terms studies are needed to evaluate this hypothesis including endoscopy. The other adverse effect of LMGB is occurrence of marginal ulcer here the incidence is more compared to RYGB. But it can be well-controlled with proton pump inhibitors. Main reason for the occurrence is because of volume of gastric tube and ulcerogenic drugs.

The effect on BMI and weght loss is more with LMGB compared to RYGB this is mainly because of long bypass limb of bowel. That will add nutritional deficiency also like folate, iron and vitamin B_{12}. But in both group, iron deficiency anemia was only detected.[16-18] But the effect of micronutrient deficiency and bone disease needs regular follow-up and a long-term study. LRYGBP is very effective in weight reduction and resolution of the metabolic syndrome for morbidly obese patients. Tailoring of the bypass limb in LMGBP according to the BMI may allow the need for weight reduction to be balanced against the need to minimize the risk of resulting micronutrient deficiencies. The results suggest that use a bypass limb of 150 cm in those with BMI below 40, with a 10 cm increase in the bypass limb with the every BMI category related to obesity instead of using a fixed 200 cm limb for all patients may provide better results.

In one of the trial 56% of patients had metabolic syndrome and 100% were cured at 1 year after gastric bypass.[12] Obesity surgery should therefore be recommended as the definitive treatment of morbidly obese patients with metabolic syndrome. Recent advances in laparoscopic surgery have made laparoscopic bariatric surgery a minimally invasive procedure and have generated renewed interest in obesity surgery. The results of this study indicated that LMGBP has a better safety profile that LRYGBP and thus is the preferred gastric bypass treatment of patients with metabolic syndrome. Current indications for surgery in morbidly obese patients include BMI greater than 40 or greater than 35 if comorbidities are present.[3] However, for patients with moderate obesity (BMI between 30 and 35) but complicated with metabolic syndrome, the low risk of laparoscopic gastric bypass surgery suggests that it might be included in the choices of treatments. Further cost-effectiveness study of laparoscopic gastric bypass surgery in the treatment of moderate obesity with metabolic syndrome is needed.

CONCLUSION

This review article has demonstrated that both LRYGBP and LMGBP are effective treatments for morbid obesity. Both procedures can significantly resolve obesity-related metabolic complications and increase quality of life for morbidly obese patients. LMGBP was shown to be a simpler and safer procedure than LRYGBP with similar efficacy at the 1 and 2 year follow-up. LMGBP is thus an acceptable alternative treatment to standard LRYGBP for morbidly obese patients.

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10.5005/jp-journals-10033-1233

PROSPECTIVE CLINICAL STUDY

Role of Hysteroscopy in Gynecological Conditions

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ABSTRACT

Introduction: Hysteroscopy offers a valuable extension of the gynecologist armamentarium, as uterine cavity can be explored in detail for making exact diagnosis. Hysteroscopy can be used for diagnosis as well as management of various gynecological problems. A study was conducted to evaluate the role of hysteroscopy in gynecological conditions.

Materials and methods: A prospective clinical study was conducted in the Department of Gynecology, Hindu Rao Hospital. Total 69 patients with abnormal uterine bleeding attending gynecology outpatient department were selected and subjected to hysteroscopic examination after detail history, examination and consent. Subjects were divided into six groups as per their history and examination.

Observation: In group I (DUB) 40.5%, in group II (infertility) 21.7%, in group III (postmenopausal bleeding) 11.6%, in group IV (suspected leiomyoma) 11.6%, in group V (lost IUCD) 7.3% and in group VI (secondary amenorrhea) 7.3% patients were there. Abnormal hysteroscopic findings were observed as follows, in group I: 85.71%, group II: 80%, group III: 80%, group IV: 62.5%, group V: 60%, group VI: 60% had. Out of 69 patients, in 73.91% patient's intrauterine pathology was seen on hysteroscopic examination. In our study commonest cause of abnormal bleeding was endometrial hyperplasia (28.5%), endometrial polyp (18%), proliferative endometrium (28.59%), endocervical polyp (3.6%), submucous myoma (3.6%) and atrophic endometrium (3.6%) patients. In patients with lost IUCD, removal of IUCD was done and adhesionolysis was performed in patient with secondary amenorrhea.

Conclusion: Hysteroscopy is simple, safe, quick, and economical technique which allows exploration of uterine cavity in precise manner with speed and safety. Diagnostic and operative procedures can be performed in the same time.

Keywords: Hysteroscopy, Endometrial cavity, Dysfunctional uterine bleeding, Submucous myoma, Endometrial polyp.

How to cite this article: Arora P, Mendiratta SL, Mittal M, Kumari P. Role of Hysteroscopy in Gynecological Conditions. World J Lap Surg 2014;7(3):129-132.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

Endoscopy has helped the medical science to improve and make more accurate diagnosis. It can pick up morphological and functional changes in the organ more accurately. Evaluation of the epithelial surfaces of endocervical canal and endometrium, internal os, shape of the uterine cavity, tubal ostia is needed for proper diagnosis and observation of histological changes during menstrual cycle.

The curette has been the main tool in the hands of the gynecologist to feel and search for pathology in the uterine cavity. Hysteroscopy can be considered as a perfected curettage which can see and decide, because the uterine cavity can be observed and the area in question can be curettaged under direct vision. It also helps in avoiding the risks and difficulties of the alternative investigating procedures. After hysteroscopy the elective surgery of the patient can be better planned.

The hysteroscopy can be used in the diagnosis and treatment of gynecological patients which includes evaluation of abnormal uterine bleeding, uterine anomalies, abnormal hysterograms, and management of intrauterine adhesion, location and removal of misplaced IUDs, biopsy of potentially malignant lesions, verification of results of treatment. Performing a biopsy under vision gives a more accurate diagnosis. Therapeutic hysteroscopy is utilized in the removal of submucous leimyomas, thick connective tissue adhesions, uterine septae, tubal insufflations and sterilization by tubal coagulation. The present study aims to evaluate the role of hysteroscopy in gynecology as an inexpensive, easy, diagnostic procedure by which pathological lesion can be directly visualized and managed especially, where there is difficulty in visualizing and reaching the diagnosis otherwise.

MATERIALS AND METHODS

This study was conducted in the Department of Obstetrics and Gynecology of Hindu Rao Hospital, New Delhi, over a period of 1 year after obtaining approval ethical clearance. The cases were selected from outpatient department as well as those, admitted in gynecology wards.

A total of 69 patients were included in the study and these patients were classified into 6 groups (Table 1) as per their clinical history and diagnosis as follows:

Group I: Dysfunctional uterine bleeding
Group II: Infertility
Group III: Postmenopausal bleeding
Group IV: Suspected leiomyoma uteri
Group V: Lost IUDs with missing filament
Group VI: Secondary amenorrhea.

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Preparation

All patients were admitted in the hospital prior to the procedure. Patients were kept nil orally since morning on the day of hysteroscopy. The patients were divided into 2 groups:

Group A: Patients were given injection pethidine 50 mg IV and injection phenargan 25 mg IM.

Group B: General anesthesia—This group included patients who were very uncooperative or those who needed concomitant surgery.

All hysteroscopy examinations were carried out in operation theater with 4 mm olympus telescope with full aseptic precautions Saline was used as distending medium. The anesthetist was available in the theater to provide general anesthesia if required. Once the hysteroscope was introduced, inspection of cervical canal and uterine cavity was done. Uterine fundus, each tubal ostium and the remaining cavity were inspected. Video camera was used for diagnostic purpose. In the end hysteroscope was removed under vision. A curettage was done and specimen sent for histopathology.

OBSERVATION

The age of patients varied from 21 to 70 years, maximum patients, i.e. 26 (37.7%) were 31 to 40 years and 25 patients (36.3%) were in 21 to 30 age group. Out of 69 patients 18 patients (26.15%) were nullipara. The highest parity noted was para 6 (1.4%) in one case only. Nine patient (13.05%) were para 1, 12 patient (17.4%) were para 2, 12 patient (17.4%) were para 3, 12 (17.4%) were para 4 and 5 patient (7.2%) were para 5.

Minimum time taken for procedure was 15 minutes, including the time needed for cleaning and draping the parts. Maximum time taken was 30 minutes, these were the patients, where other concomitant surgical procedure had to be carried out along with the hysteroscopy.

Sixty patients where hysteroscopy was carried under pethidine + phenargan, were observed in the hospital for 4 hours. Those where general anesthesia was given were kept in the hospital for a duration of 24 hours. Patients were called to attend the OPD after an interval which depended upon case to case and further treatment planned.

Various indications for hysteroscopy are shown in Table 1. The common indication was DUB (40.50%), other indications for hysteroscopy were infertility (21.70%), Postmenopausal bleeding (11.60%), suspected leiomyoma (11.60%), Lost IUCD with irregular bleeding (07.30%) and secondary amenorrhea (07.30%).

In group 1 (DUB) 24 patient (85.71%) out of 28 had abnormal hysteroscopic finding (Table 1). Various pathological hysteroscopic findings observed in 28 patients is shown below (Table 2).

In group II (Infertility) 12 (80%) out of 15 had shown abnormal hysteroscopic finding as shown in Table 3. The commonest finding observed on hysteroscopy was blocked tubal ostia in 10 (66.6%) patients. In these cases, distending media was not seen passing through the ostia. In 9 out of these 10 patients diagnostic laparoscopy was carried out, the tubes were confirmed to be blocked in 7 (77.7%).

In group III (Postmenopausal bleeding) 4 patients (80%) out of 5 showed abnormal hysteroscopic findings. Atrophic endometrium was seen in 3 (37.5%) patients and endometrial polyp was seen in 1 (12.5%) patients. In

Table 1: Indications for hysteroscopy and abnormal findings in different groups

Groups	*Indications*	*No. of patients*	*Abnormal findings*
I	Dysfunctional uterine bleeding	28 (40.50%)	24/28 (85.71%)
II	Infertility	15 (21.70%)	12/15 (80%)
III	Postmenopausal bleeding (PMB)	08 (11.60%)	04/08 (50%)
IV	Suspected leiomyoma	08 (11.60%)	05/08 (62.5%)
V	Lost IUCD with irregular bleeding	05 (07.30%)	03/05 (60%)
VI	Secondary amenorrhea	05 (07.30%)	03/05 (60%)
	Total patients	69	

Table 2: Various hysteroscopic findings in group I (DUB) (n = 28)

Sl. no.	*Observations*	*No. of cases*	*Percentage*
I	Abnormal findings	24	85.7
	Hyperplastic endometrium	8	28.5
	Endometrial polyp	5	17.8
	Proliferative endometrium	8	28.5
	Endocervical polyp	1	3.6
	Submucous fibromyoma (Fig. 1)	1	3.6
	Atrophic endometrium	1	3.6
II	Normal finding	4	14.3

Table 3: Various hysteroscopy findings in group II (infertility) (n = 15)

Sl. no.	*Observations*	*No. of cases*	*Percentage*
A	Hysteroscopic observation		
	(i) Abnormal findings	12	80
	Tubercular endometritis	1	6.7
	Leiomyoma uterus	1	6.7
	Blocked tubal ostia	10	66.7
	(ii) Normal findings	3	20
B	Histopath observation		
	— Proliferative endometrium	1	6.7
	— Secretory endometrium	14	93.3
C	Diagnostic laparoscopy observation		
	— Blocked tubes	7	77.7
	— Patent tubes	2	22.3

Group IV (suspected leiomyoma uteri) in 3 (37.5%) out of 8 patients leiomyoma was diagnosed, however in rest of the patients no myoma was revealed on hysteroscopy.

In group V (lost IUCD with irregular bleeding) in 3 patients (60%) out of 5 cases hysteroscopy revealed Cut in the uterine cavity. In one patient arms of copper T were embedded into the myometrium (Fig. 2). In all these 3 cases copper T was removed vaginally. In the 2 cases where IUD was not present in the cavity, IUD was seen to be lying in the abdominal cavity. In one patient IUD was removed laproscopically and in other patient by minilaparotomy as the IUD was found to be perforating the myometrium into the bladder. Rest of the 2 patients had expelled the IUCD per vaginally unnoticed. In group VI (secondary amenorrhea) 3 (60%) out of 5 had abnormal hysteroscopic findings. All these 3 patients had atrophic endometrium.

In the present study on 69 patients, the procedure failed on first attempt in 4 patients (7.25%). In 3 of these cases there was cervical stenosis and in 1 patient visualization of the uterine cavity was not very clear due to uterine bleeding provoked by the passage of the instrument. In all 4 cases, procedure was successful on 2nd attempt, however one patient required general anesthesia.

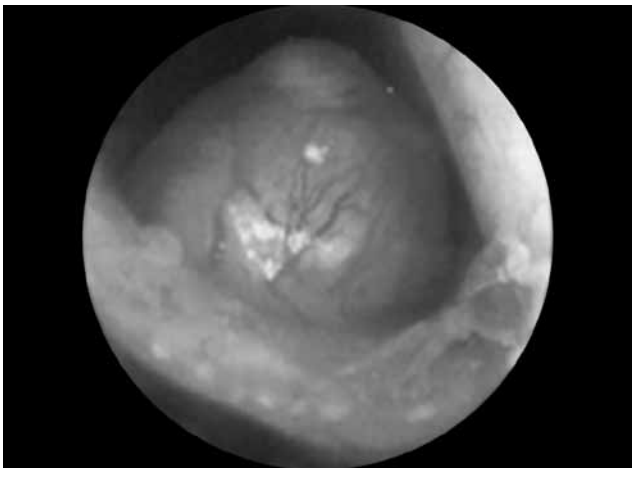

Fig. 1: Submucous myoma

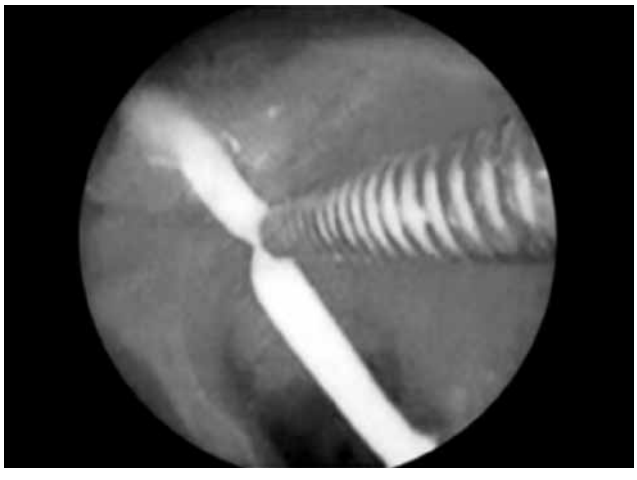

Fig. 2: Arms of IUD embedded into the myometrium

DISCUSSION

Fritz Nagele et al[1] evaluated the feasibility and acceptability of outpatient diagnostic hysteroscopy and found that most common indication for hysteroscopy was abnormal uterine bleeding (87%). Ariel Reviel et al[2] found hysteroscopy revealed more information than curettage in cases of abnormal uterine bleeding.

Garuti G et al[3] found that hysteroscopy showed sensitivity and specificity of 94.2 and 88.8% respectively in predicting normal or abnormal histopathology of endometrium. Arslan S et al[4] reported hysteroscopy has a positive predictive value of 71.4% and negative predictive value of 95.4% in diagnosing hyperplasia.

In the present study on 69 patients significant findings were detected in 74% patients. Among 69 patients, there were 28 patients (40.5%) with dysfunctional uterine bleeding. Dysfunctional uterine bleeding was the commonest indication for hysteroscopy in the present study. Lasmar RB et al[5] studied 4044 patients with abnormal uterine bleeding.

Dysfunctional uterine bleeding has been the commonest indication for hysteroscopy because it is difficult to make the correct diagnosis by pelvic examination. In the present study, 85.7% significant findings were observed in DUB group and in 14.29% no pathology was seen. Normal uterine cavity and cervical canal were found in 814 (20.1%) patients in Lasmar RB et al[5] study.

In our series the commonest cause of bleeding has been hyperplastic endometrium found in 28.50% cases, the endometrial polyp seen in 18% and proliferative endometrium was observed in 28.9% of patients. Endocervical polyp, submucous myoma and atrophic endometrium were the cause of bleeding in 3.6% patients. Lasmar RB et al[5] in their large study on 4044 patients with abnormal uterine bleeding found endometrial polyp as the most frequent hysteroscopic finding, accounting for 1,374 (33.9%) cases. Endometrial hyperplasia was diagnosed in 613 (15.1%) patients only.

In the present study, 15 patients were included in the group of infertility. Uterine and tubal pathology taken together were responsible for infertility in 80% patients. The uterine pathology was observed in 13.4% and ostial pathology in 66.6% in the present study. Tubercular endometritis was diagnosed in 6.7% cases which were proved on histopathological examination. Alwani et al[6] have also reported tubercular endometritis in 9.09% of his infertility patients in India.

In the present study, submucous leiomyoma uterus were detected in 6.7% infertility patients, Valle RF (1980)[7] observed myoma in 7.7% and Roll and Hilgrath[8] in 10% of cases. The results of the above authors are quite near to our study.

In the present study, tubal ostia were found to be blocked in 66.6% of cases. In 10 patients tubal blockage

was found on hysteroscopy, the diagnosis of blocked ostia by hysteroscopy was further evaluated by diagnostic laparoscopy with chromopertubation in 9 patients. In 7 patients, the hysteroscopic findings were confirmed by diagnostic laparoscopy. But in 2 patients (22.22%), diagnostic laparoscopy with chromopertubation revealed patent tubes, where ostia were seen to be blocked on hysteroscopy.

In can be concluded, that diagnostic laparoscopy with chromopertubation is probably the best way at present to find out the tubal patency, but the lumen of the fallopian tube can only be delineated by hysterogram. Hysteroscopy is the method to detect intrauterine cause of infertility. Therefore the above 3 tests are complementary to each other in evaluating the uterine and tubal cause of infertility. Koskas et al[9] proposed office hysteroscopy as part of first line examination infertile women.

In postmenopausal bleeding hysteroscopy is invaluable, especially in confirming or ruling out the suspicion of endometrial carcinoma.[10]

In the present study, atrophic endometrium was the commonest finding seen on hysteroscopy in 37.5% cases in postmenopausal group. Alwani et al[6] observed atrophic endometrium in 60% of his cases.

Endometrial polyp was detected on hysteroscopy in 1 patient (12.5%) in our study. Lasmar RB et al[5] in their study found endometrial polyp in 1,374 (33.9%) cases.

Gorostiaga D et al[11] reported atrophic endometrium in 44% of cases in his study. Metello J et al[10] studied the diagnostic accuracy of hysteroscopy with endometrial biopsy for diagnosing endometrial carcinoma and found high accuracy in the diagnosis of endometrial neoplsia and its precursors. None of the patient had endometrial carcinoma in our study.

Diagnosis of leiomyoma can be established either by USG, HSG and curettage. However, these techniques can give false positive and false negative results. Hystroscopy is more precise and confirmatory procedure. Hysteroscopy was carried out in the present series on 8 patients (11.6%) with the clinical diagnosis of leiomyoma uteri. Submucous myoma was confirmed in 37.5% patients only on hysteroscopy and in 62.5% patients cavity revealed no fibroid.

In the present study, 5 patients (7.3%) with missing filaments (group V) were included. Device was located in 60% of the cases and was removed in all the cases. Though X-ray abdomen and pelvis, and ultrasonogram can locate the IUD, but the exact localization of the device is difficult. Hysteroscopy protects the patient from the hazards of radiation. Moreover, it is easier and convenient than the radiological procedures. Hysteroscopy also obviates the need for blind and dangerous manipulations.

In our study in secondary amenorrhea group (group VI), In 60% of cases, atrophic endometrium was seen on hysteroscopy. Khandwala[12] has studied 7 patients. He described synechia in 4 patients and normal uterine cavity in three patients.

The procedure failure rate in the present study was 7.25%. Hilgarth[13] and Khandwala[12] have reported low failure as 1.9 and 3.1% respectively. Patil et al[14] and Pellicano M et al[15] used normal saline as distending media in their study and observed that it is better tolerated by patients. We also used isotonic saline as distending media, which provides good visualization and better tolerated by patients.

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10.5005/jp-journals-10033-1234

CASE REPORT

Scoliosis as a Rare Risk Factor for Colon Perforation during Colonoscopy: The Second Reported Case and Literature Review

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ABSTRACT

Background: Colonoscopy has been accepted as the best method for the screening, diagnosis, treatment and follow-up of colorectal pathologies. It is an invasive procedure with many recognized complications such as iatrogenic colonic perforation (CP). Knowledge of the factors influencing (CP) is of decisive importance, especially with regard to the avoidance or minimization of the perforations. This is the second case in the literature with such unreported and rare risk factor for iatrogenic colonoscopic perforation.

Case summary: We reported a 66-year-old female, not known to have any medical problems, underwent colonoscopy screening. No abnormalities detected up to the rectosigmoid junction when the gastroenterologist noted sudden and massive abdominal distension, the patient started complaining of severe generalized abdominal pain, however, she was hemodynamically stable. The procedure abandoned. Abdominal X-ray showed severe scoliotic deformity of the lumber spine with massive pneumoperitoneum. Diagnostic laparoscopy showed a small perforation at the anterior wall of sigmoid colon which was repaired, no fecal soiling of the peritoneal cavity was found as she was prepared for colonoscopy. Her course was unremarkable, and she was discharged 7 days later. A 2-week follow-up showed her to be asymptomatic with healed laparoscopic surgery scars and normal bowel motion.

Conclusion: Patients with skeletal deformity such as scoliosis undergoing colonoscopy have a higher risk of iatrogenic colonoscopic perforation. Symptoms of abdominal pain and distension during colonoscopy in this group of patients should alert the treating doctor for the possibility of colon injury which should be managed accordingly.

Keywords: Colon perforation, Iatrogenic perforation, Scoliosis, Skeletal deformity, Colonoscopy.

How to cite this article: AlOsaimi S, Ekrouf S, AlMulla A. Scoliosis as a Rare Risk Factor for Colon Perforation during Colonoscopy: The Second Reported Case and Literature Review. World J Lap Surg 2014;7(3):133-135.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

Colonoscopy is a common procedure for the diagnosis, treatment and follow-up of colorectal pathologies. However, this invasive procedure is performed with some risk of hemorrhage, perforation and even death.[1,2]

Colonoscopic perforation (CP) has become one of the most fearsome complications of routine or therapeutic gastrointestinal endoscopy. The incidence of iatrogenic perforation is reported to range between 0.01 and 0.8% for diagnostic and routine colonoscopy, and from 0.15 to 3% for therapeutic colonoscopy,[1,3-6] with rectosigmoid as the most common site of colonic perforation.[7-11]

Major complications such as perforation and hemorrhage occur 2.4 times more often in the right than in the left colon during therapeutic endoscopy.[12] Knowing risk factors, recognizing early signs of perforations, and giving early and optimal treatment may reduce the probability of complications and death.[11]

We are describing an iatrogenic CP where the mechanism of CP is related to patient's skeletal deformity that precipitated the injury, the CP managed surgically. The first case with such injury was described in 2010,[13] and still in publishing process.[14] This is the second case in the literature with such unreported and rare risk factor for iatrogenic colonoscopic perforation.

CASE REPORT

We reported a 66-year-old female, not known to have any medical problems, underwent colonoscopy screening. No abnormalities detected up to the rectosigmoid junction when the gastroenterologist noted sudden and massive abdominal distension, the patient started complaining of severe generalized abdominal pain, however, she was hemodynamically stable. The procedure was abandoned and was taken immediately to resuscitation room, abdominal examination showed peritonitis. Chest X-ray revealed air under the diaphragm (Fig. 1). Abdominal X-ray showed severe scoliotic deformity of the lumber spine with massive pneumoperitoneum (Fig. 2). Diagnostic laparoscopy showed a small perforation of 1.0 cm at the anterior wall of sigmoid colon which was repaired laparoscopically, no fecal soiling of the peritoneal cavity was found as she was prepared for colonoscopy. She was covered with antibiotics postoperatively. Her course was unremarkable, and she was discharged 7 days later. A 2-weeks follow-up showed her to be asymptomatic with healed laparoscopic surgery scars and normal bowel motion.

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DISCUSSION

The CP may occur as a result of direct mechanical penetration with the instrument tip, sharp flexion of the colonoscope over distended bowel or due to thermal or electrical injury during therapeutic intervention, such as polypectomy.

Anderson et al[15] discussed the risks of perforation after either sigmoidoscopy or colonoscopy. The study compared 10486 colonoscopies with 49501 sigmoidoscopies done over 10 years (1987-1996) at Mayo Clinic, they found two deaths secondary to perforation from colonoscopy, corresponding to an overall mortality rate after a colonoscopy of 0.02% and an incidence of death after a perforation of 10%.

Gatto et al[16] explored a large population-based database to compare the incidence of perforation associated with both of these flexible endoscopic procedures and to investigate what factors predict the occurrence of this complication, they found that the risk of perforation after colonoscopy was statistically significantly increased among patients with diverticulosis and obstruction, whereas the risk of perforation after sigmoidoscopy was increased among patients with diverticulosis and abdominal pain. In their study, there were 77 perforations after 39286 colonoscopies and 31 perforations after 35298 sigmoidoscopies procedures. Further more, risk of CP from either procedure increased in association with increasing age and the presence of two or more comorbidities.

Lohsiriwat et al[17] prospectively reviewed 10124 patients undergoing either colonoscopy or flexible sigmoidoscopy between January 2005 and July 2008. Over a 3.5-year period, there were 15 colonic perforations, they found that patient gender, emergency endoscopy, anesthetic method, and the specialty or experience of the endoscopist were not significantly predictive of CP rate. In the other hand, patient age of over 75 years and therapeutic colonoscopy were two important risk factors for CP. Pelvic adhesions following previous pelvic operation or infection also contribute to a high incidence of sigmoid perforation.[9,18] Some authors have also suggested that patients with multiple comorbidities are at greater risk of perforation.[16,19] Furthermore, that advanced age of patients and endoscopy performed by a trainee shown to increase the risk of CP.[16,20] It was found that mechanical stress is the most common mechanism of perforation, the other perforations were associated with cone biopsy, electrocautery and pneumatic causes.[21]

Similar to the first reported case,[13,14] we think scoliosis with sever skeletal deformity can interfere with the usual path of introducing the colonoscope, thus causing CP.

Colonoscopic perforations may be managed operatively or nonoperatively. Several large series have reported that many patients with perforations may be treated successfully without operations. Conservative treatment includes bowel rest, intravenous fluids, and antibiotics to allow the perforation to seal.[15,22-25]

In Korean study, it is reported that 36% of the patients were managed conservatively. Nine patients underwent endoscopic perforation closure using hemoclips. Twenty-nine percent of those patients underwent colonic resection with anastomosis. In a retrospective review of laparoscopic repair of colonic perforations, the mean colonic perforation size was 2.7 cm.[26]

Operative treatment is most often necessary in patients with generalized peritonitis, large injuries, or failed conservative treatment.[27]

In our case, the perforation located at the anterior wall of sigmoid colon, the patient was in peritonitis, with radiological evidence of viscus perforation, so surgical intervention was required. As she was hemodynamically stable, we chose diagnostic laparoscopy to diagnose and proceed with surgical management.

The specific operative procedures used will depend on the size of perforation, the degree of peritoneal soilage,

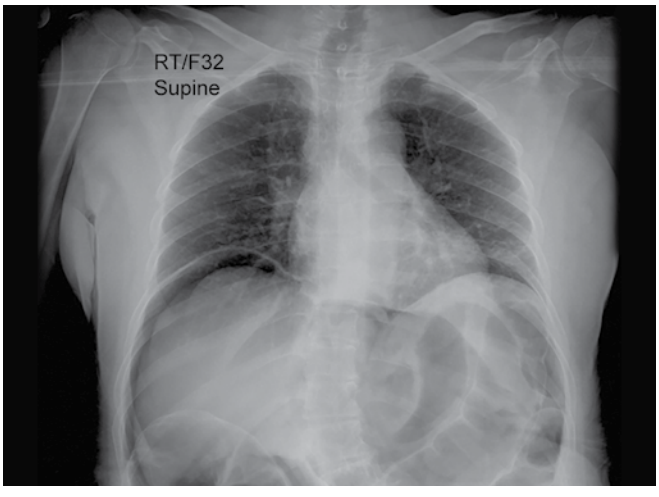

Fig. 1: Chest X-ray showing air under the diaphragm

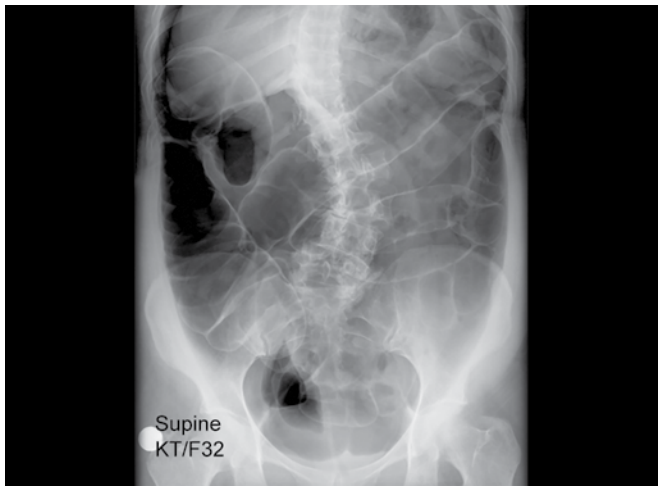

Fig. 2: Abdominal X-ray showed severe scoliotic deformity of the lumbar spine with massive pneumoperitoneum

the presence of associated colonic pathology, the stability of the patient and the overall underlying condition of the patient. Primary repair of the colon is reserved for limited injury with no coexisting pathology. Surgical resection with primary anastomosis should be attempted if abdominal contamination or concomitant pathology is present.[23,24,27]

In our case, the perforation was small (1.0 cm), with no fecal soiling of the peritoneal cavity and the perforation repaired laparoscopically using absorbable sutures.

CONCLUSION

Patients with skeletal deformity such as scoliosis undergoing colonoscopy have a higher risk of iatrogenic colonoscopic perforation. Symptoms of abdominal pain and distension during colonoscopy in this group of patients should alert the treating doctor for the possibility of colon injury which should be managed accordingly. This is the second reported case, aiming to alert surgeons and endoscopists about such rare risk factor.

CONSENT

Written informed consent was obtained for publication of this case report and accompanying images.

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10.5005/jp-journals-10033-1235

MY VIEWPOINT

Training in Advanced Laparoscopic Surgery in India

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ABSTRACT

More and more evidence are supporting superiority or non-inferiority of laparoscopic surgery. It seems that laparoscopic surgery has a prominent future. In India, there are very few centers which provide advanced laparoscopic service to patients. The reason for this is a lack of adequate training and training options in India. It is a high time to realize that advanced laparoscopic surgery is a necessity for gastrointestinal (GI) surgeons. It is important to compulsorily include the training of advanced laparoscopic surgery in the curriculum of GI surgery training. There should be a structured program with well designed training module to improve healthcare caliber in our country.

Keywords: Laparoscopy, Training, Advanced laparoscopic surgery, India.

How to cite this article: Haribhakti SP, Mistry JH. Training in Advanced Laparoscopic Surgery in India. World J Lap Surg 2014;7(3):136-137.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

Laparoscopic surgery has become an integral part of the armamentarium of general and gastrointestinal (GI) surgeons. Some of the laparoscopic procedures have become the standard of care now. Plenty of recent literature support either superiority or noninferiority of certain advanced laparoscopic procedures; like laparoscopic colorectal surgeries.[1-3] Laparoscopic surgery may offer better cosmesis, lesser pain and wound complications, shorter hospital stay and other short-term benefits.[1,4] The era has now arrived where surgeon has to provide the best option to the patient as patients have become well-aware and inquire for better available options. At present option of hardcore advanced laparoscopic surgery is available at very few centers in India. One of the reasons for this gap is that not many surgeons are trained in advanced laparoscopic surgery and there are very few recognized options for the training is available in India. There is lot more to improve in training of advanced laparoscopic surgery including the structure of the program in our country.

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CURRENT SCENARIO IN INDIA: TRAINING AND PRACTICE

Basic laparoscopic surgery is routinely performed by majority of the general and GI surgeons. For advanced laparoscopic surgery; either surgeon needs to have formal training of GI surgery or an extensive experience of open GI surgery. Currently, some of the GI surgeons and very few general surgeons perform advanced laparoscopic surgeries. Without adequate exposure of open surgery it is difficult to expand the field of advanced laparoscopic surgery for a particular surgeon especially general surgeon. Currently, available recognized training options for GI surgery in India are Master of Chirurgical (MCh) (total seats 32)[5] and Diplomate of National Board (DNB) (total seats 31)[6] in GI surgery. Majority of MCh centers are government centers, most of these centers provide excellent exposure of open surgery with variable exposure of advanced laparoscopic surgery. These centers were started in an open era and have given some of the best leaders of GI surgery to this country. But the adaptation of advanced laparoscopic surgery has lagged behind in these centers and is one of the reasons for limited development of advanced laparoscopic surgery in India. Majority of DNB centers are private centers; few of them provide good hands on training. Exposure of open and laparoscopic surgery varies a lot from center to center. At either of these centers hands on training of advanced laparoscopic surgery is quite limited because even for some of the consultants; advanced laparoscopic surgery is in a learning phase. Fellowship program by National Board of Examination (FNB) in minimal access surgery is a 2 year fellowship program provided by National Board of Examination. Few centers which confer FNB are doing majority of laparoscopy work. So after MS in general surgery for a surgeon with inadequate exposure of open advanced GI surgery it is difficult to grasp advanced laparoscopy and majority of them adapt basic laparoscopic surgery and some of the advanced procedures. They also have fear about their limitations of open conversion if requires or any complications. Certain

centers offer unrecognized fellowship and training program in laparoscopic surgery to the general surgeons. In view of limited recognized options available; these options are worth having but how much quality training that would provide is questionable. Some of the associations also furnish fellowship in minimal access surgery, which includes 3 to 4 days training by didactic lectures followed by practical examination on endotrainer which seems inadequate for surgeons who are not adequately trained previously. So, overall options to learn advanced laparoscopic surgery in India are limited.

WHERE IS THE GAP?

The few training courses for advanced laparoscopy available currently in India, and they are not well organized. The curriculum is not well structured. Many of the fellowships are unrecognized. Majority of these training programs provide exposure of basic laparoscopic surgery with very limited training in advanced laparoscopic surgery. Advanced laparoscopic surgery is not just a replication of open surgery; it needs understanding of different ergonomics and concepts. The laparoscopic anatomy is quite different from open surgery. Majority of the surgeons try self-learning; but they either fail to learn or they learn certain limited procedures and cannot expand this field fully. Many of them compromised the quality of surgery while trying to perform advanced procedures with laparoscopy without formal training. Those who learn by their selves need longer learning curve. There are very few surgeons who catch up the real advanced laparoscopy by their own. Another hurdle in training of the advanced laparoscopic procedures is that many of the senior teachers at academic institutions those who are excellent in providing open surgery training have not adopted advanced laparoscopic surgery. This factor also restricts the development of advanced laparoscopic procedures in the department.

THE WAY FORWARD

Ways to learn laparoscopic surgery are practice on endotrainer, training on simulator, animal and cadaver model training and supervised hands on training on patients. Endotrainer practice is good to develop hand eye co-ordination but not enough to perform surgery on humans. Facility of training on simulator, animal and cadaver model is available at very few places in India.[7] Although there are some ethical issues, but the best training module would be supervised hands on training.[8]

The way forward to develop advanced laparoscopic surgery in our country is to train surgeons to perform minimal invasive surgery. Every center which provides GI surgery training should be performing advanced laparoscopic procedures. The training program should be well structured and trainees must get adequate exposure and hands on training in open surgeries, basic and advanced laparoscopic procedures. There should be a list of surgeries prepared by an authorized body; the trainee must have minimum exposure to those procedures and minimum hands on training for listed surgical procedures. The training courses should be recognized by authorized body and there should be a well-organized assessment program for trainees and institution as well. The institution must have a faculty who is well verse with the advanced laparoscopic surgery; for which there is also a need to train the trainers.

SUMMARY

Advanced laparoscopic surgery is the future and will become a necessity for the surgeon in coming time. A well designed structured training in advanced laparoscopic surgery is the need of the time. It will raise the standard of healthcare system in our country. Formal proper training reduces the learning curve of the surgeon and in turn will reduce the complications.

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