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Editorial

Since the beginning, larger surgical incisions were an absolute necessity to a successful procedure and specially for tissue retrieval. Exposure was the key to a safe and successful tissue retrieval without contaminating the abdominal wound. Minimal Access Surgery is growing fast but it is facing many ups and down with important instruments. Power morcellation is one of the useful instrument used by laparoscopic surgeons and gynecologists which has given the capacity to perform fibroid removal and supracervical hysterectomy through a small incision.

However, in recent years, several plaintiffs have alleged they emerged from a morcellation procedure with a cancer diagnosis when no risk factors were present prior. Based on an FDA analysis of currently available data, FDA state that approximately 1 in 350 women undergoing hysterectomy or myomectomy for the treatment of fibroids is found to have an unsuspected uterine sarcoma, a type of uterine cancer that includes leiomyosarcoma. At this time, there is no reliable method for predicting or testing whether a woman with fibroids may have a uterine sarcoma.

Because of this risk and the availability of alternative surgical options for most women, the FDA is warning against the use of laparoscopic power morcellators in the majority of women undergoing myomectomy or hysterectomy for treatment of fibroids.

Limiting the patients for whom laparoscopic morcellators are indicated, the strong warning on the risk of spreading unsuspected cancer, and the recommendation that Minimal Access Surgeon share this information directly with their patients, are part of FDA guidance to manufacturers of morcellators.

Since the FDA warning, Johnson & Johnson pulled the device called a laparoscopic power morcellator from the market; many hospitals. But a group of gynecologist believe that the risks of unknown cancer have been overblown and the government should not interfere with patient treatment. The number of gynecologists still employing morcellators is difficult to estimate. According to many gynecologist it is skepticism that the FDA acted too quickly. Although morcellator can be used keeping inside a surgical bag, a controversial solution that some believe could prevent stray bits of tissue.

The American College of Obstetricians and Gynecologists argues that with more stringent patient selection, the device remains an important tool. Let us see what comes ultimately in guideline but in our opinion till new safe technique comes we should stop using power morcellator.

RK Mishra
Editor-in-Chief

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ORIGINAL ARTICLE

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

[1]Aswini K 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: Total of 25 patients were 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 2 patients who has surgical site infection and fever respectively. Although 3 cases were converted to standard four-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 2 port laparoscopic cholecystectomy is safe, simple and inexpensive yet cosmetically rewarding.

Keywords: Cholecystectomy, Gallbladder, Laparoscopy, Port.

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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 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 two incisions leading to a more cosmetic scar and less postoperative pain. The last decade has seen many innovations like single-incision laparoscopic surgery, natural orifice transluminal and endoscopic surgery from the health care industries driven by an ever-increasing demand for cosmesis. However, the cost factor keeps them out of the reach of the common man in developing countries. This technique certainly adds to cosmesis still fitting to the budget of the common man.

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PATIENTS AND METHODS

A total of 25 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 gallstone or related complications. Operative time, hospital stay, and complications were recorded in each case.

The patient characteristics are mentioned below. There were 10 male and 15 female 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 body mass index below 30. A total of 14 patients were American Society of Anesthesiologists (ASA) grade I and 11 were ASA grade 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 pneumoperitoneum, a 1 cm transverse skin incision is taken in the midline at a level 1 inch cephalad to the level of the inferior border of liver for the epigastric port. A

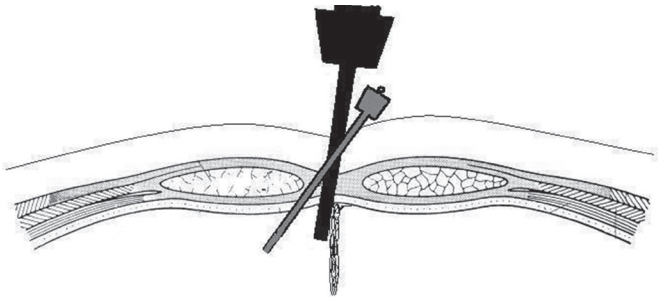

Fig. 1: A schematic diagram depicting the epigastric port assembly. Port 3 must be inserted through the existing epigastric wound but through a separate stab with a different angle, pointing toward Hartmann's pouch

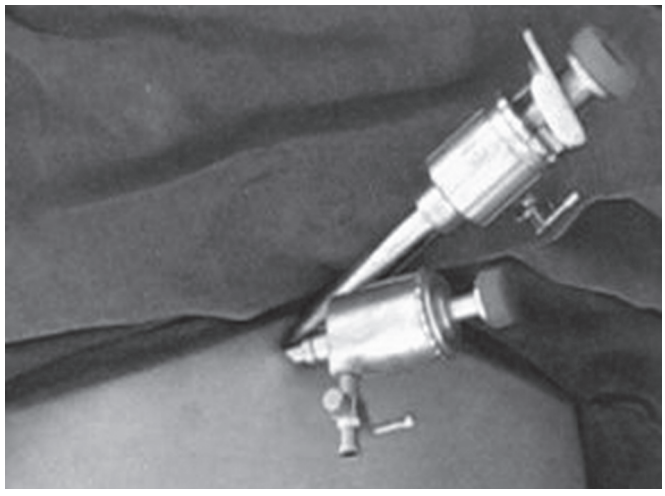

Fig. 2: Epigastric port assembly (top view)

10 mm port is inserted through the later incision vertically till it pierces the rectus sheath. (This will be referred henceforth as port 2.) Afterward, 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 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 its entirety. Now an intraoperative assessment is done to determine if two-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 as described earlier, 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 port 2 pointing toward Hartmann's pouch of the gallbladder (This will be referred henceforth as port 3.) (Figs 1 to 3). 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 Hartmann'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 port 2), Calot's triangle dissection is done. The traction and dissection instruments are used interchangeably through ports 2 and 3 as per requirement. The rotational freedom of 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 4 and 5). The cystic artery and duct are 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 port 3 instrument and clip application through port 2. With continued traction applied to Hartmann'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 electro-dissection with an appropriate instrument (a monopolar hook, Maryland or scissor). Before the final detachment of gallbladder from the liver, hemostasis of the gallbladder bed is achieved and the cystic pedicle

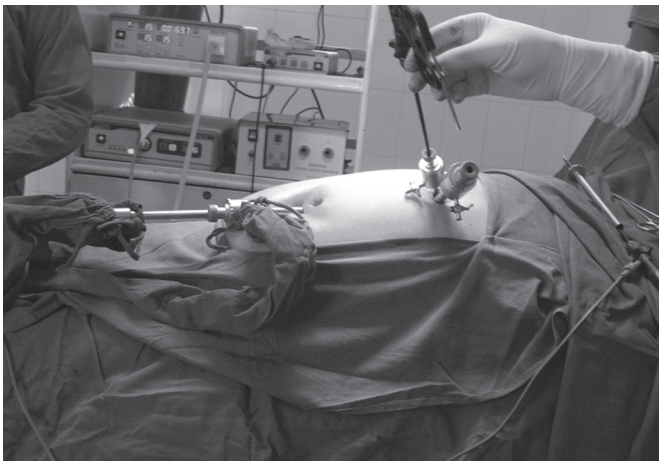

Fig. 3: Epigastric port assembly (side view)

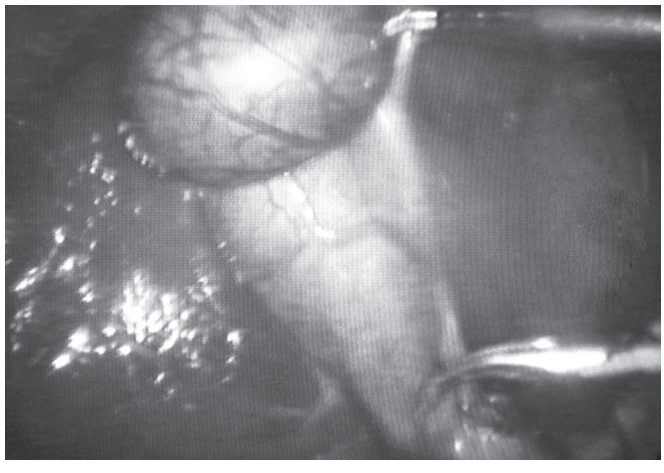

Fig. 4: Intraoperative photograph demonstrating the right- and left-hand instruments

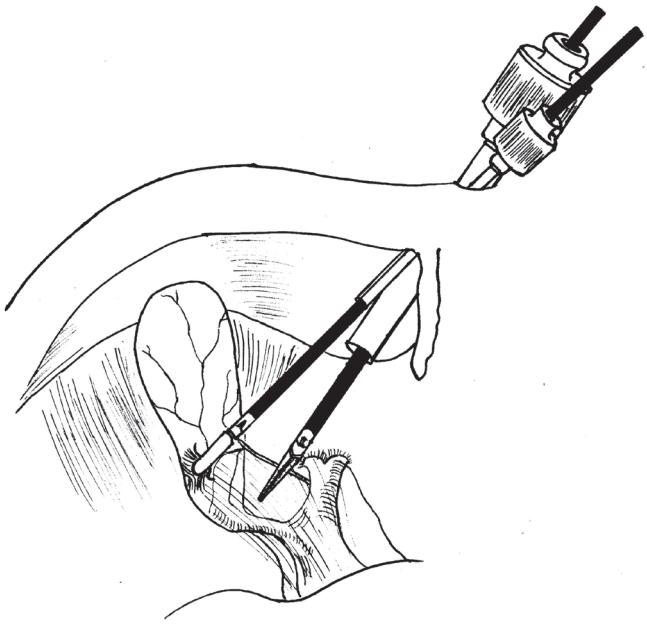

Fig. 5: A schematic diagram of right- and left-hand instruments working in close harmony

(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. Pneumoperitoneum is evacuated and the wounds closed in two layers.

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 whereas that of the 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 (please watch the video). 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 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).

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

We have converted three 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 two due to difficult intraoperative findings. These two 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 oral intake as early as 6 hours following the surgery. All patients were routinely discharged on the 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 the 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 because of the small incision used to perform the surgery and hence were curious to know the procedure details (Fig. 6). Patients were advised follow-up on the 10th day, 3 months 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 seven 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 setup as most of the patients are from remote rural and hilly areas with poor access to health care. This is the reason for patients being discharged routinely on the 2nd postoperative 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 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 four-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 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 hepato-biliary system, Mirizzi'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 four-port technique in this method. With careful case selection coupled with precise technique and patience, one can make this two-port laparoscopic cholecystectomy an amazing reality in one's own surgical practice.

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ORIGINAL ARTICLE

Can Intraperitoneal Tramadol decrease Pain in Patients undergoing Laparoscopic Cholecystectomy in the Postoperative Period? A Randomized controlled Trial

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ABSTRACT

Aim: To evaluate the analgesic effect of intraperitoneal tramadol in patients undergoing laparoscopic cholecystectomy.

Settings and design: Prospective, double blind, randomized study

Materials and methods: A total of 100 patients undergoing laparoscopic cholecystectomy were randomized into two groups I and II of 50 patients each: Group I received intraperitoneal tramadol 100 mg (diluted in 20 ml of distilled water) immediately after induction of pneumoperitoneum and just before removal of trocars. Similarly, Group II received 20 ml of intraperitoneal normal saline. All patients had a standard anesthetic. Rescue analgesia was with diclofenac sodium. Postoperatively, visual analog scale scores, 1 and 24 hours diclofenac consumption, postoperative hospital course, and adverse effects were recorded.

Statistical analysis used: Student's t test and Epi Info statistical software.

Results: Pain intensity is significantly less in group I than in group II in the first 4 hours, while requirement of analgesic postoperatively is significantly less in group I than in group II in the first 8 hours except at 30 and 60 minutes. Better control of blood pressure and respiratory rate was seen in group I in the first 4 hours. There was no significant difference between the two groups regarding postoperative hospital course and incidence of adverse effect.

Conclusion: Intraperitoneal tramadol provides superior postoperative analgesia in the early postoperative period after laparoscopic cholecystectomy compared with normal saline in patients undergoing laparoscopic cholecystectomy.

Keywords: Intraperitoneal tramadol, Laparoscopic cholecystectomy, Pain, Visual analog scale.

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INTRODUCTION

Laparoscopic cholecystectomy has become the treatment of choice for gallbladder stone disease[1] as it offers many advantages compared with the open cholecystectomy, the major advantage being shorter duration of hospital stay and early convalescence,[2] but some patients still experience considerable pain in the postoperative period. The site of most severe pain is in the right upper quadrant and port site during first 24 hours,[3] which can be due to traumatic traction on the nerves, release of inflammatory molecules, trauma to the abdominal wall, maintenance of high abdominal pressure, and irritation of the phrenic nerve.[4,5] While laparotomy results mainly in parietal pain, laparoscopy has a visceral component, a somatic component, and shoulder pain secondary to diaphragmatic irritation.[6] In laparoscopic cholecystectomy, visceral pain predominates in first 24 hours, whereas shoulder pain, less on the 1st day, increases and becomes significant on the following days.[7] The degree of pain after laparoscopic procedure is influenced by factors, such as the volume of residual gas, the type and temperature of gas used for pneumoperitoneum, and the pressure created by pneumoperitoneum.[8] The peritoneal origin of the pain suggests that analgesia delivered locally to the peritoneal cavity may be of benefit postoperatively.[9] While some studies show that intraperitoneal instillation of drugs for pain relief is more effective if used before creation of pneumoperitoneum,[10] others suggest it to be more effective at the end of the surgery.[11] So, considering these facts, the present study was undertaken to evaluate analgesic effect of intraperitoneal tramadol in patients undergoing laparoscopic cholecystectomy.

MATERIALS AND METHODS

After approval from the ethical committee, the study was conducted on 100 patients scheduled for elective laparoscopic cholecystectomy under a standardized general anesthesia technique after informed consent. Uncooperative and unwilling patients, those with history of anaphylaxis to opioids, drug abuse, narcotic use or previous abdominal surgery, American Society of Anesthesiologists grade III, IV, V, or any other significant

comorbidity, and those needing conversion to open cholecystectomy were excluded from the study.

After preoxygenation with 100% oxygen for 3 minutes, induction of anesthesia was achieved with thiopentone sodium (2.5%) 4 to 6 mg/kg intravenous (IV) slowly (till the abolition of eye lash reflex) along with injection of fentanyl 1.5 µg/kg IV. Intubation is with an appropriate sized endotracheal cuffed tube, that is, facilitated by neuromuscular blocker suxamethonium 1.5 mg/kg IV.

Anesthesia was maintained using controlled ventilation with isoflurane (0.5–1.5%) and nitrous oxide (N_2O) 66% + oxygen (02) 33% using Bain's circuit. Neuromuscular blockade was achieved with atracurium besylate. All patients were given metoclopramide 0.5 mg/kg IV injection intraoperatively at the end of procedure. Patients were randomly allocated in a double blind manner using computer-generated random numbers to one of the two groups comprising 50 patients each and use of coded syringe which is prepared by anesthesiologist not involved in study. Patients with group I labeled syringe (Study group) received intraperitoneal tramadol 100 mg (diluted in 20 ml of distilled water), while patients in group II coded syringe (control group) received 20 ml of intraperitoneal normal saline. In both groups, 10 ml of the study drug was injected into the hepatodiaphragmatic space, 5 ml into the area of the gallbladder, and 5 ml into the space between the liver and the kidney under direct vision by the surgeon immediately after induction of pneumoperitoneum and just before removal of trocars; so in both groups a total of 40 ml drug was instilled. Postoperatively patients were extubated and shifted to recovery room where observations were made, recorded, and analyzed, such as postoperative pain scores at 0, 15, 30, 60 minutes, 4, 8, 12, 24 hours, cumulative 1 and 24-hour analgesic consumption, postoperative hospital course (monitoring of heart rate (HR), blood pressure (BP), respiratory rate (RR), arterial oxygen saturation (SpO_2), temperature at 0, 4, 8, 16, and 24 hours), and incidence of adverse effect (nausea, vomiting, shoulder pain, itching, and shivering) at 0, 4, 8, 16, and 24 hours.

Intensity of pain was measured by visual analog scale (VAS).[12] Patients showing a VAS ≥ 3 or patients who request for analgesia were administered a supplemental dose of an analgesic (diclofenac sodium; 3 ml, 75 mg). Results were reported as mean ± standard deviation. The sample size has been calculated based on a study[13] where mean pain score of the normal saline (3.9 ± 2.7) has been consulted. The sample size per group has been calculated to be 50 with 5% level of significance. The 20% reduction in pain at 0 minute has been assumed to be significant reduction. This sample size will maintain at least 89% power of the study. Data were collected and analyzed using Student's t test. Epi Info statistical software was used for all analyses.

RESULTS

For this study, 100 patients were recruited. There were no significant differences between two groups according to age, sex, and body weight (Table 1).

The mean intensity of postoperative pain was significantly lower in group I than in group II ($p < 0.05$) at 0, 15, 30 minutes, 1, and 4 hours after the operation. There was no statistical difference between the two groups thereafter (Graph 1).

The supplementary mean dose of rescue analgesic (diclofenac sodium, 3 ml, 75 mg) in the 1 and 24 hours was significantly higher in group II (76.47 ± 10.39 and 213 ± 41.11 mg) as compared with group I (0 and 84 ± 59.92 mg) respectively (Graph 2).

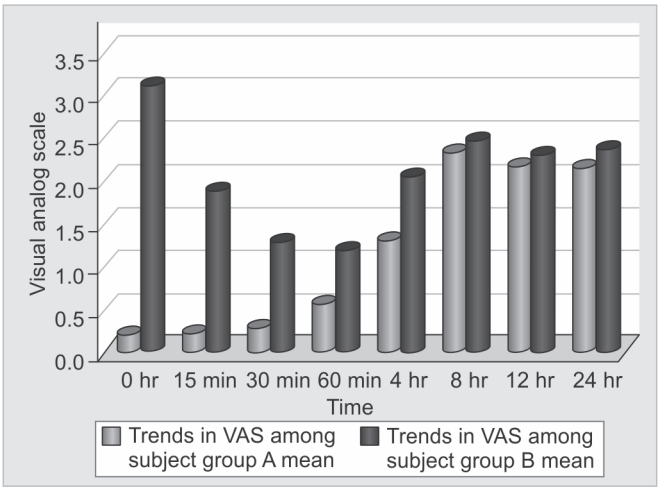
There is no significant difference between mean HR, SpO_2, and temperature between the two groups at any point of time during our study. Mean systolic BP (Table 2) and RR (Table 3) were lower in group I than in group II at all time intervals but the difference is significant statistically at 0 and 4 hours attributed to better pain control in the early postoperative period.

There was no significant difference in the incidence of shoulder pain, nausea, vomiting sensation, itching, and shivering in the two groups (Graph 3). No patient experienced muscle rigidity.

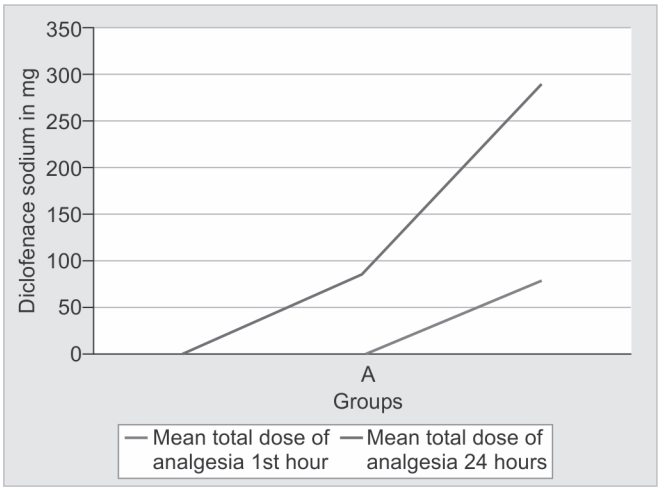
Table 1: Data from 100 patients who received intraperitoneal saline (group II), tramadol (group I), during laparoscopic surgery

Parameter	*Group I*	*Group II*
Age (years)	39.20 ± 11.53	42.04 ± 13.14
Sex ratio (F:M)	34:16	34:16
Body weight (kg)	68.98 ± 11.96	69.72 ± 11.39

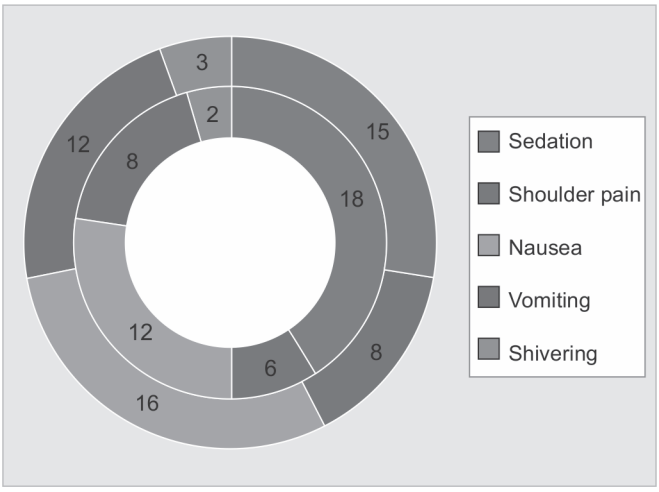
Values are mean ± SD. *$p < 0.05$ was considered statistically significant; SD: Standard deviation



Graph 1: Trends in visual analog scale among subjects



Graph 2: Cumulative requirement of analgesic



Graph 3: Trend in incidence of adverse effect

Table 2: Trends in systolic blood pressure

	Group I		*Group II*		
Time (hours)	*Mean*	*SD*	*Mean*	*SD*	*p-value*
0	131.44	16.54	146.08	18.02	0.0001
4	125.00	11.86	132.16	11.84	0.003
8	124.44	10.93	124.52	10.03	0.970
16	121.48	9.96	125.24	11.71	0.087
24	122.44	8.83	124.28	11.49	0.371

SD: Standard deviation

Table 3: Trends in respiratory rate

	Group I		*Group II*		
Time (hours)	*Mean*	*SD*	*Mean*	*SD*	*p-value*
0	21.56	1.42	22.88	1.35	0.0001
4	20.88	1.15	21.84	1.06	0.0001
8	21.12	1.67	21.64	1.05	0.065
16	20.48	1.49	20.56	1.28	0.774
24	20.24	1.70	20.32	1.58	0.808

SD: Standard deviation

DISCUSSION

In our study, we showed that intraperitoneal administration of tramadol resulted in much lower postoperative pain scores, cumulative postoperative analgesic consumption without significant increase in incidence of adverse effect, or adverse hemodynamic changes in patients undergoing laparoscopic cholecystectomy.

In our study, the mean VAS scores in group I were significantly lower in the first 4 hours postoperatively than in group II due to effect of tramadol given intraperitoneally. The maximum mean VAS score was observed at the 8th hour (2.32 ± 0.96 cm). Administration of rescue analgesic thereafter leads to downward trend in subsequent pain scores. The results are consistent with the findings of Golubovic et al[14] who showed this significant reduction for the first 6 hours.

Our study also showed significant reductions in cumulative postoperative analgesic requirement in group I than in group II in 0 and 24 hours, which is consistent with the study done by Golubovic et al[14] and Golubovic et al[15] who demonstrated that intraperitoneal administration of tramadol had valuable implication in reducing VAS score/pain in patients undergoing laparoscopic cholecystectomy.

Peripheral antinocicepive effect of opioids occurs due to interaction of opioids with opioid receptor which are located on peripheral intact perineurium. While hydrophilic opioid molecules (i.e., morphine) does not diffuse across perineural barrier, lipophilic opioids, such as tramadol, buprenorphine can diffuse freely across the intact perineural barrier resulting in better analgesia on intraperitoneal administration. Secondly, duration of action of parenterally administered tramadol is 6 to 8 hours and this explains low VAS scores and less need for rescue analgesic in the early postoperative period.[16]

Mean systolic BP and RR were lower in group I than in group II at all time intervals, but the difference is significant statistically at 0 and 4 hours attributed to better pain control in the early postoperative period. As there were no differences in the incidence of adverse effect, tramadol can be used safely at doses as in our study intraperitoneally, which can be correlated with the study done by Akinci et al.[13]

CONCLUSION

Intraperitoneal tramadol significantly reduces pain scores in early postoperative period (4 hours in our study) and requirement of rescue analgesic for first 8 hours without significantly increasing incidence of adverse effect or hemodynamic complications. So, it can be safely introduced for control of postoperative pain in patients undergoing laparoscopic cholecystectomy.

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ORIGINAL ARTICLE

Comparative Study of Single-incision Laparoscopic Cholecystectomy with Four-port Conventional Laparoscopic Cholecystectomy: A Single-center Experience

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ABSTRACT

Aims and objective: To assess the feasibility of single-incision laparoscopic cholecystectomy (SILC) with conventional laparoscopic instruments and to compare it with four-port conventional laparoscopic cholecystectomy (LC) regarding various intraoperative and postoperative factors.

Materials and methods: This is a prospective randomized controlled study carried out at Santosh Medical College and Hospitals, Ghaziabad from March 2014 to September 2015. This study included 60 patients with cholelithiasis who were divided into two groups of 30 patients each. Group I was offered four-port conventional LC and group II underwent SILC.

Results and observations: Cholelithiasis was commonly seen in young females. Single-incision laparoscopic cholecystectomy took more operating time than conventional LC due to more operative difficulty. Outcome of SILC was 79.6% (23 of 30). However, postoperative complications and pain (measured by visual analog scale scoring system) were almost the same in both groups. Cosmetic outcome was better in SILC group.

Conclusion: Single-incision laparoscopic cholecystectomy has no added advantage over conventional LC, but it can be performed in selected patients for better cosmetic results.

Keywords: Cholelithiasis, Intraoperative factors, Laparoscopic cholecystectomy, Postoperative factors, Single-incision laparoscopic cholecystectomy.

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INTRODUCTION

Laparoscopic cholecystectomy (LC) is the gold standard treatment for cholelithiasis all over the world. This operation is conventionally performed using four ports into the abdomen.[1] The tendency of minimizing surgical trauma encourages the use of new approaches in laparoscopic surgery.[2] In recent years, successful attempts to reduce the number of traditionally used four ports have been reported. Reducing the number of ports has been shown to improve cosmetic outcomes.[3,4] Later, three-port and two-port LC were described, which have been reported as safe and feasible.[3,4]

In the new era of minimal access surgery, the preferred outcomes under consideration are not only the safety, but also the quality, which is often defined by pain and cosmetic results. Scarless surgery is the ultimate goal of laparoscopic surgery.[5-7] Single-incision laparoscopic cholecystectomy (SILC) can be performed using refinements of existing technology, and surgeons can perform SILC without any new instruments, specific competence, or training.[5-7] Natural orifice transluminal endoscopic surgery (NOTES)[8,9] is now being performed at many centers across the globe, which eliminates all possibility of scar formation.

Single-incision laparoscopic cholecystectomy was described as early as 1992 by Pelosi et al,[10] who performed a single-puncture laparoscopic appendectomy, and in 1997, by Navarra et al,[11] who performed an LC via two transumbilical trocars and three transabdominal gallbladder stay sutures. The objective of this study was to compare conventional four-port LC with SILC regarding various intraoperative and postoperative factors.

AIMS AND OBJECTIVE

To assess the feasibility of SILC with conventional laparoscopic instruments and to compare it with four-port conventional LC regarding various intraoperative and postoperative factors.

MATERIALS AND METHODS

This prospective randomized controlled study was conducted in the Department of General Surgery at

Santosh Medical College and Hospital, Ghaziabad from March 2014 to September 2015. During the study, 60 patients with symptomatic gallstones were included and divided into two groups by chit method. Patients with acute attack of cholecystitis and gallbladder carcinoma were excluded. Group I patients (n = 30) were treated by standard four-port LC and group II patients (n = 30) were treated by SILC. Patients were informed about the SILC technique and consent was obtained regarding conversion to standard four-port LC/open cholecystectomy. All patients were evaluated for intraoperative complications, difficulty encountered during operation, postoperative pain, operative time, postoperative complications, hospital stay, and cosmetic outcome. We used IBN Statistical Package for Social Sciences (SPSS) version 17.0 for data analysis. Pain was measured as continuous variable using visual analog scale (VAS, a 0–10 cm scale). Cosmetic outcome was assessed on the basis of examination of scar seen on outpatient department basis at an interval of 1st, 6th, and 12th week.

The surgery in both the groups was performed by a general surgeon having more than 10 years of experience in minimal access surgery. In group I standard four-port LC was performed. All cases were operated under general anesthesia.

In group II, a single infraumbilical 20 mm incision was made through which one 10 mm camera port and two 5 mm working ports were sent by open technique. An additional 2/0 polypropylene suture on straight needle was introduced through the abdominal wall to retract the fundus of gallbladder. The gallbladder was removed from the camera port by using a 5 mm telescope through the adjacent working port. Abdominal wall was closed with interrupted vicryl 2/0 and skin was closed by subcuticular technique using 3-0 prolene.

OBSERVATIONS AND RESULTS

Out of 60 patients, 49 were females. There were 23 (76.6%) and 26 (86.67%) females in groups I and II respectively. The mean age of the patients was 38.53 ± 8.46 years and 38.46 ± 7.15 years in groups I and II respectively.

Various intraoperative factors were studied and comparative analysis was done (Table 1). Intraoperative complications, such as bile/stone spillage and bleeding were seen more in group II ($p < 0.05$). Operative difficulty parameters like instrument crowding, insufficient retraction, and compromised vision were significantly higher in group II ($p < 0.05$). Difficulty in gallbladder extraction was higher in group II ($p < 0.05$). Mean operative time was 48.36 minutes and 64.33 minutes in groups I and II respectively. Thus, there was significantly higher mean operative time in group II than in group I ($p < 0.05$). Two patients in each group were converted to open cholecystectomy, and five cases of group II were converted to standard four-port LC in view of operative difficulty and inability to proceed with SILC ($p < 0.05$). Successful outcome of SILC was 79.6% (23 of 30).

Table 1: Comparative analysis of single-incision laparoscopic cholecystectomy with laparoscopic cholecystectomy in terms of intraoperative factors

Intraoperative factors	*Standard four-port lap cholecystectomy (n = 30)*	*SILC (n = 30)*	*p-value*
Bile/stone spillage	2	4	<0.05
Bleeding	2	7	<0.05
Instrument crowding	0	15	<0.05
Insufficient Gallbladder retraction	2	9	<0.05
Compromised vision	1	9	<0.05
Difficult Gallbladder extraction	4	7	<0.05
Conversion to open cholecystectomy	2	2	>0.05
Conversion to four post lap cholecystectomy	0	5	<0.05
Mean operative time in minutes	48.30	64.60	<0.05

Incidence of postoperative complications like nausea/vomiting, dyspepsia, fever, jaundice, and surgical site infection was almost similar in both the groups ($p > 0.05$) (Table 2). Mean hospital stay in both groups was similar and statistically insignificant ($p > 0.05$). There was no incidence of bile duct injury and port-site hernia in both groups. Cosmetic outcome at 6th and 12th week was significantly better in group II ($p < 0.05$), judged on the basis of appearance of scar (Table 2).

Table 2: Comparative analysis of single-incision laparoscopic cholecystectomy with laparoscopic cholecystectomy in terms of postoperative factors

Postoperative factors	*Standard four-poat lap cholecystectomy (n = 30)*	*SILC (n = 30)*	*p-value*
Nausea/vomiting/ dyspepsia	2	3	>0.05
Mean Hospital stay in number of days	1.1	1.07	>0.05
Wound infection	2	3	>0.05
Postoperative jaundice/fever	0	0	–
Cosmetic outcome at 6 weeks	fair	good	<0.05
Cosmetic outcome at 12 weeks	fair	excellent	<0.05

Table 3: Comparative analysis of single-incision laparoscopic cholecystectomy with laparoscopic cholecystectomy in terms of postoperative pain

Pain analysis by VAS scoring	*Standard four port lap cholecystectomy*	*SILC (n = 30)*	*p-value*
Mean VAS at 12 hrs	3.23	3.33	>0.05
Mean VAS at 24 hrs	2.20	2.40	>0.05
Mean VAS at 3rd Day	1.20	1.1	>0.05

The mean VAS score for analysis of pain in postoperative period was almost similar in both the groups done at 12 hours, 24 hours and on 3rd postoperative day ($p > 0.05$) (Table 3).

DISCUSSION

Cholelithiasis is a common condition in India, especially in Northern India. Conventional open cholecystectomy is known for decades, but with advent of laparoscopic surgery, LC has now become the gold standard treatment for cholelithiasis.[1] In the present era, newer techniques have been introduced and now scarless surgery in the form of SILC and NOTES is possible.[5,8,9]

This study showed a female predominance with a mean age of 38.5 years (18–60), which is comparable to various studies conducted on the similar topic.[6,7]

Intraoperative complications like biliary spillage and bleeding were significantly higher in the SILC group. Previous studies showed safety and feasibility of SILC with no significant intraoperative complications.[12-14] Few studies showed increased rate of intraoperative complications in SILC, but these are statistically insignificant.[15] Operative difficulty, such as compromised vision, insufficient retraction, difficult gallbladder extraction, and difficult instrumentation was noticed significantly higher in SILC. Previous few studies had reported similar observations.[15]

Mean operative time was significantly higher for SILC as compared with LC due to more operative difficulty in SILC. Few studies and meta-analysis had shown similar results as our study, and some studies had shown similar operative time in SILC.[12,14,16]

Postoperative complications and mean hospital stay were similar in both groups. There was no incidence of bile duct injury and port-site hernia in both groups. Surgical site infection rates were similar in both groups. These findings are comparable to most of previous studies and meta-analysis available in literature.[17-20] Postoperative pain was similar in both SILC and LC in 12 hours, 24 hours, and 3rd postoperative day.[21] Cosmetic outcome of our cases in SILC group was significantly better than LC at 6th week and 12th week. Most of the observations made during this study were comparable to previous studies.[12,15,18] Though SILC seems an good alternative to LC in terms of cosmetic outcome, there are added benefits when compared with LC in terms of postoperative complications, mean hospital stay, and pain. LC has definitely less operative difficulty and mean operative time than SILC. Single-incision laparoscopic cholecystectomy can be offered to selected group of patients.

CONCLUSION

Single-incision laparoscopic cholecystectomy is a promising alternate method for uncomplicated cholelithiasis in terms of cosmetic outcome, but it does not have any major benefits when compared with conventional LC.

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ORIGINAL ARTICLE

Laparoscopy in Gynecology: Experience from a Rural Hospital

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ABSTRACT

Introduction: Laparoscopy as a modality for the diagnosis of pelvic pathology has been well-established in recent times. Besides aiding in diagnosis, it is an important tool for management in the same sitting preventing unnecessary laparotomy in many cases.

Aim: The aim of the article was to know the common indications of performing diagnostic laparoscopy, intraoperative findings, and various interventions done during surgery. It was also aimed to highlight the importance of laparoscopy as a minimum basic requirement for diagnosing many common pelvic pathologies.

Materials and methods: Indications for laparoscopy, intraoperative findings, and interventions done during surgery were studied in 75 patients who underwent laparoscopy between January 2012 and December 2014 at Gian Sagar Medical College and Hospital.

Results: Maximum number of patients (75; 76%) were in the age group of 21 to 30 years. The main indication for laparoscopy was infertility in 58 cases (77.33%) followed by chronic pelvic pain in 4 cases (5.3%). Tubal factor was the commonest cause of infertility seen in 19 (32.75%) cases. In majority of patients with previous history of tuberculosis, adhesions were found to be the cause of chronic pain and infertility. Ovarian drilling was the most common intervention done in 12 cases and adhesiolysis in another 11 cases.

Conclusion: Laparoscopy is an essential intervention in detecting many pelvic pathologies which are difficult to diagnose on clinical examination. Its diagnostic and therapeutic potential has made it a safe, feasible, and less invasive modality for evaluation of infertility, chronic pelvic pain, and endometriosis.

Keywords: Chronic pelvic pain, Infertility, Laparoscopy.

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INTRODUCTION

Laparoscopy as a modality for the diagnosis of pelvic pathologies has been well-established in recent times. Besides aiding in diagnosis, it is an important tool for management in the same sitting preventing unnecessary laparotomy in many cases. It has a role both in elective cases and in patients diagnosed with acute abdominal gynecologic emergencies who are hemodynamically stable and can be effectively managed with minimally invasive technique.

Infertility is one of the common indications for diagnostic laparoscopy where it has been suggested as a mandatory step to preclude the existence of peritubal adhesions and endometriosis as its cause.[1] Also it is an important tool to make a diagnosis of unexplained infertility.

Besides infertility, the other common indication for diagnostic laparoscopy is chronic pelvic pain (CPP). An estimated 4 to 20% of women between the age of 15 and 45 years suffer from CPP.[2,3] According to Gelbaya and El-Halwagy,[4] CPP is the cause for approximately 40% of laparoscopies. To assess the presence of endometriotic lesions in CPP, laparoscopy is the gold standard.[5]

Our study was aimed to know the common indications of performing diagnostic laparoscopy, intraoperative findings, and various interventions done during the surgery. Another aim was to highlight the importance of laparoscopy as a minimum basic requirement for diagnosing many common pelvic pathologies.

MATERIALS AND METHODS

This cross-sectional study was carried out in the Department of Obstetrics and Gynecology from January 2012 to December 2014 at Gian Sagar Medical College and Hospital, which mainly caters to the rural population.

All patients who underwent elective/emergency diagnostic laparoscopy irrespective of the indication were included in the study. Patients for elective laparoscopic hysterectomy, hemodynamically unstable patients, and those unfit for procedure because of any medical or surgical condition were excluded from the study. A total of 75 patients underwent diagnostic laparoscopy during the study period.

After a detailed history and thorough general physical examination including per speculum and per vaginal examination and preanesthetic checkup, a

written informed consent was taken and patients were taken up for procedure under general anesthesia.

Preoperative findings were noted. Patients were assessed regarding indications for laparoscopy, intraoperative findings, and various interventions done during the procedure. Tubal, ovarian, uterine, and peritoneal factors were assessed and further interventions were done accordingly. Study was approved by the ethical committee of the institution.

RESULTS

A total of 75 women underwent laparoscopy during the study period. The mean age of study group was 28.44 years and majority of women were in the age group of 21 to 30 years (Table 1).

The main indication for laparoscopy was infertility followed by CPP and ovarian cysts. In three cases each of ectopic pregnancy and ruptured corpus luteal cyst where laparoscopy was carried out, patients were hemodynamically stable. There were six patients of primary infertility who had previous history of tuberculosis (TB). One patient with previous tubal ligation failure was managed laparoscopically with bilateral salpingectomy (Table 2).

In patients with infertility, tubal factor was the commonest cause seen in 19 (32.75%) patients. Other causes were ovarian in 13 (22.4%), peritoneal (tubercular, endometrial, adhesions) in 15 (25.9%) and uterine causes (hypoplastic and unicornuate uterus with rudimentary horn) in only 2 (3.44%) patients. Nine (15.5%) cases had unexplained infertility (Table 3).

In majority of cases with previous history of TB and those with CPP, adhesions were found to be the reason for pain and infertility (Table 4).

Table 1: Age distribution of patients

Age (years)	*Number of patients (n) = 75 (%)*
21–25	20 (26.67%)
26–30	37 (49.33%)
31–35	12 (16%)
36–40	4 (5.33%)
41–45	2 (2.67%)

Table 2: Indications for laparoscopy (n = 75)

Factor	*Number of patients (n) = 75 (%)*
Infertility	58 (77.33%)
Primary infertility	45 (77.6%)
Secondary infertility	13 (22.4%)
Chronic pelvic pain	4 (5.3%)
Ectopic pregnancy	3 (4%)
Ruptured corpus luteal cysts	3 (4%)
Ovarian cysts	6 (8%)
Previous Tubal ligation failure	1 (1.33%)

Table 3: Intraoperative findings in cases of infertility (n = 58)

Main cause of infertility	*Number of patients (%)*
Tubal factor	19 (32.75%)
Ovarian	13 (22.4%)
Normal pelvic findings	9 (15.5%)
Peritoneal factor	15 (25.9%)
(a) Tubercular	4
(b) Endometriosis	
Grade 1–2	6
Grade 3–4	2
(c) Peritoneal adhesions	3
Uterine causes	2 (3.44%)

Table 4: Findings in cases with history of tuberculosis and chronic pelvic pain

In cases with previous history of TB	*Number of patients (n = 6)*
1. Adhesions	2 (33.33%)
2. Endometriosis and adhesions	2 (33.33%)
3. Hydrosalpinx	1 (16.67%)
4. Polycystic ovaries	1 (16.67%)
In cases with CPP	*Number of patients (n = 4)*
1. Adhesions	2 (50%)
2. Normal	1 (25%)
3. Endometriosis	1 (25%)

Table 5: Interventions done during laparoscopy

Procedure	*Number of patients**
Salpingo-oophorectomy (unilateral or bilateral)	7
Tubal ligation	6
Ovarian drilling	12
Lysis of adhesions	11
Salpingectomy	5
Cauterization of endometriotic spots	10
Cystectomy	10
Fimbrial dilatation	1

*More than one procedure was done on some patients

Table 5 shows various interventions done during laparoscopy. Ovarian drilling and adhesiolysis were the most commonly done procedure. In four cases, procedure was converted into laparotomy because of dense adhesions and difficulty in approaching the pelvic organs.

DISCUSSION

In our study of 75 patients, 49.3% patients fell in the age group of 26 to 30 years and 26.7% in the age group of 21 to 25 years. This was probably because of infertility turning out to be the most common indication for laparoscopy. Similarly in a study by Roupa al[6], 64.5% of patients with infertility were in the age group of 20 to 29 years.

Of the total 58 patients with infertility, 77.6% had primary infertility and only 22.5% had secondary infertility. The results were similar to the study of Avasthi et al[7] where 75% patients had primary infertility. In our study

there were nine (15.8%) cases of unexplained fertility. In a study by Samal et al[8] no obvious cause could be found in 18% cases of infertility.

In patients with CPP who underwent diagnostic laparoscopy, one-fourth had endometriosis. This incidence was higher in a study by Triolo et al[9] where one-third of cases who underwent laparoscopy for CPP were found to have endometriosis. Only adhesions were found in 50% of patients in our study with CPP. According to Neis and Neis[10] in nearly one-third of the cases the reason for pain is endometriosis, and in another one-third, adhesions are responsible for pain. In 1 (25%) case, no cause could be found for pain. The reason for pain in these cases of normal pelvic findings could be pelvic congestion. Gelbaya and El-Halwagy[4] have even labeled the role of laparoscopy in CPP as controversial as in 40% of cases no obvious etiology is found when it is done. However, in a study by Sharma et al,[11] the commonest finding on laparoscopy was adhesions in 40%, endometriosis in 18%, and pelvic congestion syndrome in 20%, while 10% of patients had normal pelvis.

Samal et al[8] studied 100 infertile women who underwent laparoscopy. Tubal cause was found in 34% cases, ovarian in 27% and peritoneal factor (endometriosis, genital TB, adhesions) in 7% cases. Uterine cause was seen in 14% cases and 18% were found to have no obvious cause. Similar findings were seen in our study where tubal factor was seen in 32.75% and ovarian in 22.4%. In our study, peritoneal factor (25.9%) was much more common than uterine factor (3.44%).

Regarding intraoperative findings in patients with previous history of TB, we had two (33.33%) patients with adhesions only, two (33.33%) with adhesions along with endometriosis, and hydrosalpinx in another one (16.67%) patient. The results were very similar to the study by Sharma et al[12] in which 85 women with previous history of genital TB were studied and various grades of pelvic adhesions were found in 65.8% patients and hydrosalpinx in 17.6% patients.

Of the interventions, the most common procedure performed during laparoscopy in our study was ovarian drilling (12) followed by adhesiolysis in 11 cases and cystectomy and cauterization of endometriotic spots in ten patients each. A total of 12 patients underwent laparoscopic ovarian drilling (LOD) in our study. These were the cases where either polycystic ovary syndrome (PCOS) was incidental finding during laparoscopy or they had anovulatory cycles. Although in a Cochrane database review[13] there was no significant difference in rates of clinical pregnancy, live birth, or miscarriage in women with clomiphene-resistant PCOS undergoing LOD compared to medical treatment, the decrease in number in multiple pregnancies in patients undergoing LOD makes it an attractive option. Additionally in clomiphene-resistant patients who can't come for stringent follow-up which is required in cases of gonadotropin treatment, LOD is a safe option.

Half of our cases with CPP showed adhesions. Hao et al[14] concluded in their study that pelvis adhesions are characteristic lesions of endometriosis, the site and degree of which are closely correlated with pain symptoms. Adhesiolysis of deep/dense adhesions has been shown to be of proven benefit.[15,16]

In a study by Eltabbakh et al,[17] laparoscopic management of benign ovarian cysts (mucinous/serous cystadenoma, dermoid cysts, endometriosis, etc.) with cystectomy or oophorectomy is a feasible and safe option for women with a short hospital stay. Ten patients in our study underwent laparoscopic cystectomy safely.

Cauterization of endometriotic spots was another common intervention done in our study group. Seiler et al[18] have also concluded in their study that electrocautery is safe and effective in the treatment of moderate endometriosis. According to a study by Osuga et al,[19] minimal/mild endometriosis benefited the most from laparoscopic manipulation when tubal adhesions are present.

Role of laparoscopic salpingectomy for management of ectopic pregnancy has been emphasized in many studies till date.[20-22] In our study all three ectopic pregnancies and one patient with previous tubal ligation failure and another with bilateral massive pyosalpinx (not responding to medical management) were managed with laparoscopic salpingectomy. Seven patients in our study underwent salpingo-oophorectomy and fimbrial dilatation was done in one patient who had fimbrial block on hysterosalpingography. In four patients, the procedure had to be converted to open laparotomy in view of dense adhesions and difficult approach to pelvic organs.

CONCLUSION

Laparoscopy succeeds in detecting many pelvic pathologies which are difficult to diagnose on clinical examination. It has strengthened its position as a gold standard in evaluation of infertility, CPP, and endometriosis. Management in the same sitting makes it a safe, feasible, economical, and less invasive modality for diagnosis and treatment of many gynecological conditions.

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ORIGINAL ARTICLE

Our Experience in Laparoscopic Appendicectomy in Federal Teaching Hospital in Gombe

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ABSTRACT

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

Objective: To share our experience in general surgery unit in laparoscopic surgery.

Materials and methods: One-year review (May 2013 to February 2014) of patients who underwent laparoscopic appendicectomy was made. Recruitment for the procedure was done from patients who presented at the Emergency Department (ED) or at the Surgical Outpatient Department (SOPD). All patients who had complications and previous abdominal surgeries or had cardiopulmonary disease were excluded. Patients were counseled and written consent for conversion to open surgery was obtained.

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

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

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

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INTRODUCTION

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

Patients who will benefit from a laparoscopic appendicectomy are as follows:

- Patients with acute or chronic right lower abdominal pain with doubtful diagnosis of acute appendicitis. A diagnostic laparoscopy is done.
- Patients with vague lower abdominal pain suspected to be appendicitis in immune-compromised individuals.
- Obese patients in whom larger wound is needed to perform appendicectomy.
- Young females where it may be difficult to differentiate other pathology of the pelvis from appendicitis.

MATERIALS AND METHODS

A total of 20 patients had laparoscopic appendicectomy within the period of review, 8 males and 12 females. They were counseled on the procedure and written consent was obtained including the option of converting to open appendicectomy. Under general anesthesia, with the patient intubated and fully relaxed in supine position, the surgical team is shown in their position (Fig. 1). Female patients may be placed in lithotomy position for uterine manipulation when the need arises.[8] Formal pneumoperitoneum was achieved. First, laparoscopic visualization was carried out and then placement of second and third ports under vision in the left lower and right upper quadrants (Figs 2 to 4) for dissection

Fig. 1: Positions of the team and monitor

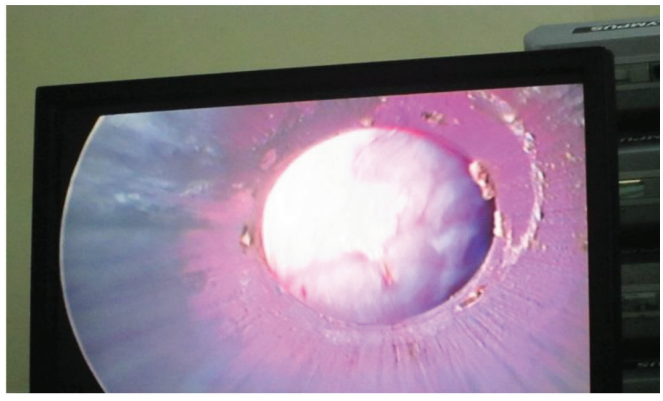


Fig. 2: Entry of the peritoneal cavity

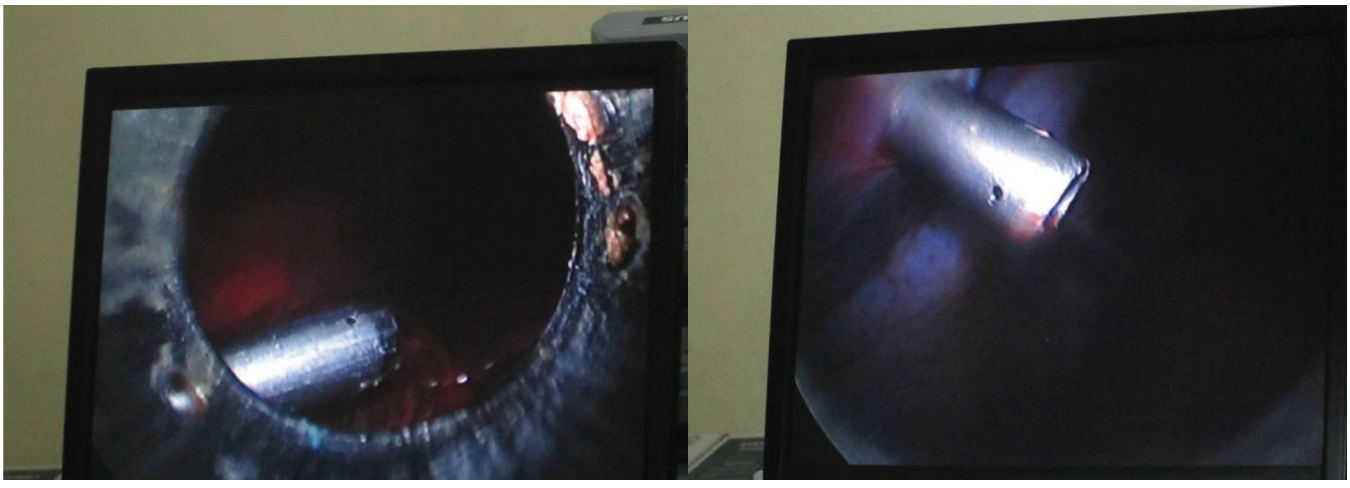


Fig. 3: Insertion of ports under vision

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, which is continued till the base of the appendix is reached. A pretied 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, none had infection. They expressed satisfaction of the procedure.

Fig. 4: Ports are in place

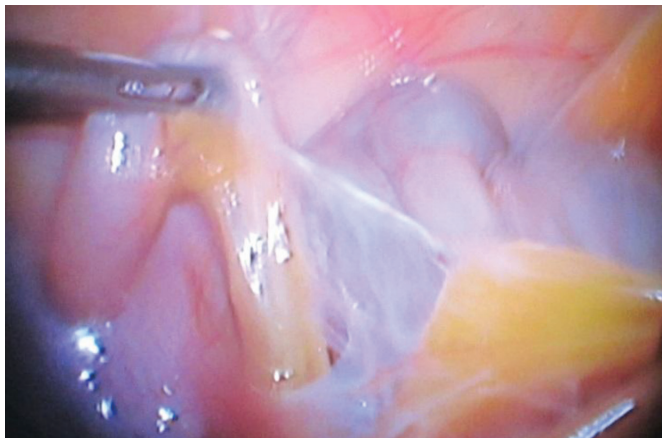


Fig. 5: Appendix picked

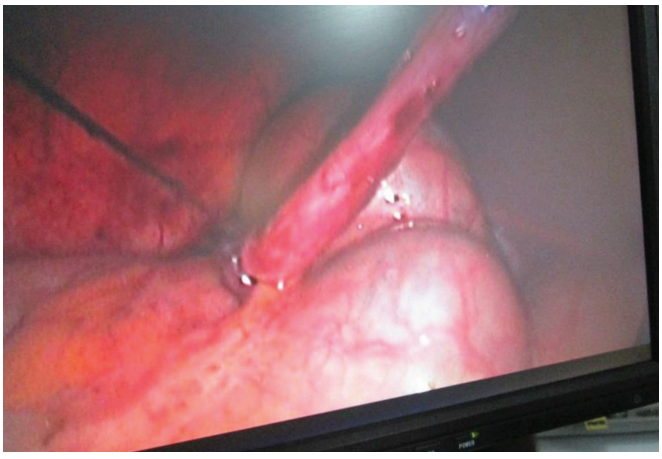


Fig. 6: Ligation of the appendix after cauterization of the mesoappendix

Fig. 8: Five days after operation

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

RESULTS

Summary of values obtained is given below:

Sl. 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

VAS: Visual analog scale

DISCUSSION

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

Fig. 7: Port closure

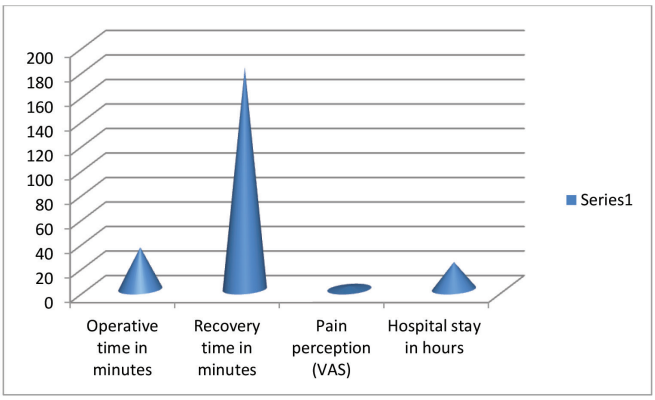
Laparoscopy has long been used by the Department of Obstetrics and Gynecology for the purpose of investigating infertility. Until recently we had a visiting general surgeon who pioneered the procedure in our unit. Appendicectomies, though hand assisted, and cholecystectomy were done. Now, we have a surgeon who has a basic training in minimal access surgery and who does most of the surgeries with good outcome.

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

Table 1: Summary of pain experienced based on visual analog scale

Sl. no.	*Age (years)*	*Sex*	*Operative time (minutes)*	*Recovery time (minutes)*	*Pain perception (VAS)*	*Hospital stay (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

VAS: Visual analog scale



Graph 1: Mean operative time, recovery time, pain perception, hospital stay (VAS: Visual analog scale).

Table 2: Operative time and χ^2

Sl. 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

RT: Recovery time
$\chi^2 = \Sigma(O-E)^2/E = 12.1$ p-value = (C−1)(D−1) = 19

Table 3: Recovery time and χ^2

Sl. 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

RT: Recovery time
$\chi^2 = \Sigma(O-E)^2/E = 36.15$

Table 4: Pain perception and χ^2

Sl. 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

PP: Pain perception
$\chi^2 = \Sigma(O-E)^2/E = 1.96$

Table 5: Hospital stay and χ^2

Sl. 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

HS: Hospital stay
$\chi^2 = \Sigma(O-E)^2/E = 4.00$

CONCLUSION

In our yearly experience 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 scarless surgeries. We have more work to compare conventional laparoscopy with 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 laparoscopic surgeries.

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ORIGINAL ARTICLE

Ropivacaine Hydrochloride Instillation *vs* Parenteral Analgesia (Tramadol) for Pain Control following Laparoscopic Cholecystectomy

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ABSTRACT

Background: The use of laparoscopic techniques in general surgery has gained increasing popularity in the last few decades. Patients undergoing laparoscopic cholecystectomy do experience postoperative pain mainly in the upper abdomen, back, and shoulder region that needs narcotic injection as a pain reliever. Intraperitoneal injection of local anesthetic has been proposed to minimize postoperative pain after laparoscopic cholecystectomy.

Aim: The aim of this study is to compare the effectiveness of intraperitoneal ropivacaine hydrochloride installation with intramuscular tramadol injection for postoperative pain.

Materials and methods: In this study, 400 patients of either sex in the age group of 23 to 62 years with American Society of Anesthesiologists grade I and II, who were scheduled to undergo elective laparoscopic cholecystectomy, were allocated to two groups of 200 patients each with regard to postoperative analgesia. In group I (n = 200) the patients received ropivacaine (0.5%), instilled in gallbladder bed and the undersurface of diaphragm and infiltration of port wounds. In group II (n = 200) the patients were provided with postoperative analgesia with tramadol (100 mg) given intramuscularly (IM) at the completion of procedure. The intensity of postoperative pain using visual analogue scale (VAS) and shoulder pain was evaluated and also other pain-related sequelae were recorded.

Results: Both VAS and shoulder pain score had significantly improved postoperatively in group I in comparison with group II. At the same time, ropivacaine instillation in group I lowers significantly postoperative nausea and vomiting resulting from either postoperative pain or tramadol injection.

Conclusion: Intraperitoneal installation of ropivacaine hydrochloride reduces the intensity of visceral, parietal, and shoulder pain in comparison with IM tramadol injection.

Keywords: Cholecystectomy, Laparoscopy, Pain.

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INTRODUCTION

Laparoscopic cholecystectomy has been proven to reduce postoperative pain significantly and shorten the recovery period, therefore reducing discharge time from 1 to 3 days to same day discharge with an earlier return to normal activities.[1]

After laparoscopic cholecystectomy, 35 to 63% of patients complain more of visceral pain as a result of stretching of the intra-abdominal cavity, peritoneal inflammation, and phrenic nerve irritation caused by residual carbon dioxide in the peritoneal cavity. Postoperative abdominal pain usually occurs during the first 24 hours, while shoulder pain most commonly appears the second day after laparoscopic cholecystectomy.[2]

Perioperative analgesia has traditionally been provided by opioid analgesics. However, extensive use of opioids is associated with a variety of perioperative side effects, such as respiratory depression, drowsiness, postoperative nausea and vomiting, ileus, and constipation that can delay hospital discharge.[3]

Intraperitoneal administration of some drugs can be effective for relief of pain after laparoscopic cholecystectomy.[2] Clinical studies have investigated the use of regional local anesthetics, in combination with other modalities for pain relief following laparoscopic cholecystectomy to avoid the adverse effects of opioids.[4]

This study (double-blind, prospective controlled study) was designed for patients undergoing elective laparoscopic cholecystectomy to compare the degree of postoperative pain relief, nausea, and vomiting following intraperitoneal ropivacaine hydrochloride instillation and parenteral analgesia (tramadol).

MATERIALS AND METHODS

After obtaining written consent, 400 patients with American Society of Anesthesiologists physical status

I and II, scheduled to undergo elective laparoscopic cholecystectomy, were enrolled in this study, which was approved by the hospital ethics committee. Patients were excluded if they had clinical diagnosis of acute pancreatitis, had acute preoperative pain other than biliary colic, required chronic pain treatment or antiepileptic drugs, had history of alcohol or drug addiction, had severe hepatic or renal impairment, had allergy to the study drugs, or had cognitive impairment or communication problems [i.e., who did not understand visual analog scale (VAS)].

Preanesthetic check-up was done the day before surgery and included a detailed history and complete general physical and systemic examination. Baseline values of pulse, blood pressure, and respiratory rate were recorded. Basic demographic characteristics like age, sex, and weight were noted. Routine investigations included hemoglobin, clotting time, bleeding time, X-ray chest, electrocardiogram, renal function tests, serum electrolytes, blood glucose level, and liver function tests. Patients were kept fasting overnight and were premedicated with tablet diazepam 10 mg at bed time.

At the same visit (preanesthetic check-up) patients were instructed on how to use a 100-cm VAS, with anchors ranging from "no pain" to "worst possible pain."

Patients were randomized into two groups using a computer-generated randomization sequence. Patients in the instillation group (Group I) received intraperitoneal instillation of ropivacaine 0.5%, 10 ml (50 mg) on the gallbladder surgical bed, and ropivacaine 0.5%, 10 ml (50 mg) solution was sprayed on the upper surface of the liver and on right subdiaphragmatic space, to allow it to diffuse into the hepatodiaphragmatic space, near and above the hepatoduodenal ligament and above gallbladder before finishing the procedure. This was done using a catheter inserted into the subcostal trocar under direct laparoscopic control and the patient was kept in the Trendelenburg position. In addition, each four-portal site was infiltrated with ropivacaine 0.3%, 3 ml after completion of the surgery. Patients in group II received 100 mg tramadol intramuscularly (IM) at the end of procedure.

The degree of postoperative pain was assessed using VAS in case of spontaneous pain upon patient's arrival in the recovery room, immediately postoperatively, and thereafter every 1 hour for a period of first 4 hours then every 4 hours for the rest of the first 24 hours postoperatively. Shoulder pain was evaluated at immediate postoperative time, and at 12 and 24 hours from the termination of surgery. Those patients with VAS more than 40 were administered diclofenac sodium 75 mg IM as rescue analgesia. Time to first analgesic requirement, total analgesic consumption in the first 12 hours postoperatively, and occurrence of adverse events were also recorded.

RESULTS

After obtaining written consent, 400 patients with American Society of Anesthesiologists physical status I and II, who were scheduled to undergo elective laparoscopic cholecystectomy, were included in this study. No significant difference between both groups as regarding their age and sex ratio was observed (Table 1).

During the early postoperative assessment of pain, the score on the VAS scale was highly significantly lower in group I than in group II just immediately postoperative in the recovery area and remained significant till 4 hours postoperatively. After 4 hours, there was no significant difference between both groups (Table 2).

The timing of first dose of rescue analgesia needed was significantly longer in group I than in group II. Also the dose of nonsteroidal anti-inflammatory drugs (NSAIDs, in mg) needed as rescue analgesia was significantly lower in group I than in group II. Also shoulder pain was significantly lower in group I than in group II (Table 3).

Table 1: Age and sex of both groups

		Group I (n = 200)	*Group II (n = 200)*
Age (years)	Mean range (min-max)	27.51 years 18–65 years	29.07 years 21–64 years
Sex	Male: Female Ratio	71:129 (1:2)	64:146 (1:2)

Table 2: Postoperative visual analog scale for patients in both groups

	VAS ≤ 40		*VAS < 40*		
	I	*II*	*I*	*II*	*p-value*
Immediate postoperative	169	66	31	134	HS
After 1 hour	157	98	43	102	S
After 2 hours	152	107	48	93	S
After 3 hours	145	112	55	88	S
After 4 hours	124	119	76	81	NS
After 8 hours	132	135	68	65	NS
After 12 hours	141	144	49	56	NS
After 16 hours	159	163	41	37	NS
After 20 hours	171	170	29	30	NS
After 24 hours	181	178	19	22	NS

HS: Highly significant; S: Significant; NS: Nonsignificant; VAS: Visual analog score

Table 3: Shoulder pain postoperative analgesia for both groups

		Group I	*Group II*	*p-value*
Shoulder pain		47 (23.5%)	117 (58.5%)	S
Mean timing after surgery to give first analgesic requirement (in minutes) ± SD		115 ± 38.36 min	16 ± 9.43 min	S
No. of NSAIDs	Min–Max	75–150 mg[2]	75–225 mg	S
Mean	45 ± 10.5 mg	85 ± 25.2 mg		

S: Significant; SD: Standard deviation; NSAID: Nonsteroidal anti-inflammatory drug

Table 4: Postoperative complications in both groups

	Group I	*Group II*	*p-value*
Nausea	27	105	S
Vomiting	4	56	S
Bradycardia	0	3	NS
Respiratory depression	0	2	NS
Hospital stay	1 ± 0.12 days	1 ± 0.42 days	NS
Intra-abdominal infection	1	0	NS

S: Significant; NS: Nonsignificant

During hospital stay and early postoperative follow-up, the incidence of nausea and vomiting was significantly lower in group I than in group II. There was no significant difference between both groups regarding complications and hospital stay (Table 4).

DISCUSSION

The establishment of laparoscopic cholecystectomy as an outpatient procedure has accentuated the clinical importance of reducing early postoperative pain and nausea as both are the most common complications of laparoscopic surgery, including cholecystectomy. Both, particularly pain, prolong recovery and discharge times and contribute to unanticipated admission after ambulatory surgery. Pain also contributes to postoperative nausea and vomiting.[1]

Interestingly, the type of pain after laparoscopy differs considerably from that seen after laparotomy. Although it is the belief of patients that laparoscopy has ushered a pain-free era, the fact remains that patients complain more of visceral pain after laparoscopy in contrast to parietal pain experienced in laparotomy.[5]

Visceral pain is caused by inflammation or local irritation around the gallbladder bed, liver, diaphragm, or peritoneum. Also, the incidence of postoperative shoulder pain due to diaphragmatic irritation by residual carbon dioxide following laparoscopic surgery may reach up to 80%.[6]

Intraoperative use of large bolus doses or continuous infusions of potent opioid analgesics may actually increase postoperative pain as a result of their rapid elimination and/or the development of acute tolerance. Also, opioid analgesics are associated with a variety of perioperative side effects, such as respiratory depression, drowsiness, bradycardia, postoperative nausea, and vomiting.[7]

Therefore, anesthesiologists and surgeons are increasingly turning to nonopioid analgesic techniques as adjuvant for managing pain during the perioperative period to minimize the adverse effects of analgesic opioids.[8]

This study showed that VAS scores are highly significantly lower in group I in comparison to group II immediately postoperative and remained significant up to 4 hours postoperative. However, the difference was not significant between both groups after 6 hours; this may be due to the rescue analgesia doses of NSAIDs given to patients in group II. The results in this study conform with the results in the study done by Singh et al[9] and Golubovi et al.[2]

A study done by Gupta et al[10] also showed that intraperitoneal instillation of fentanyl (100 µg) along with bupivacaine (0.5% 20 ml) significantly reduces immediate postoperative pain. It also reduces intensity of pain even after 24 hours.

In group II, about two-thirds of the patients required a first dose of rescue analgesia immediately postoperatively and the remaining third of the patients required this dose within the next 6 hours, whereas in patients in group I receiving ropivacaine, 25% of the patients required the first dose immediate postoperatively and the remaining 75% of patients required analgesia within 24 hours postoperatively. There was a significant difference between both groups regarding timing of first dose of rescue analgesia. Further requirement of rescue doses of analgesia was significantly lower in group I than in group II.

Shoulder pain is a common outcome after laparoscopic cholecystectomy and can delay return to normal activities. The proposed mechanism of shoulder pain seems to be a diaphragmatic stretching with phrenic nerve neuropraxia, which is possibly due to increased concavity of diaphragm induced by pneumoperitoneum and reference of pain from the traumatized area.[10]

Shoulder pain was significantly lower in group I than in group II early in the postoperative period, but was not significant after 6 hours postoperatively. The reason could be the blocking of nociceptive inputs generated by inflamed diaphragm peritoneum caused by instillation of ropivacaine. Joris et al[8] obtained similar results using ropivacaine and showed that use of ropivacaine decreased incidence of shoulder pain even after 24 hours postoperatively.

Studies by Gupta et al[10] using bupivacaine and Kim et al[11] using ropivacaine showed similar results, which further supports these results.

In this study, the incidence of nausea, vomiting, bradycardia, respiratory depression, and intra-abdominal infection was recorded in both groups. There was a significantly lower incidence of postoperative nausea and vomiting in group I than in group II, but no significant difference between both groups as regarding bradycardia, respiratory depression, or postoperative intra-abdominal infection. This shows ropivacaine instillation reduces the incidence of nausea and vomiting. The cause could be lower incidence of pain and avoiding the side effect

of intravenous tramadol injection. Similar results were obtained by Kucuk et al,[12] Trikoupi et al,[13] and Gupta et al.[10]

CONCLUSION

Intraperitoneal ropivacaine instillation reduced postoperative abdominal pain and shoulder pain significantly in comparison to postoperative tramadol injection, reflected on the number of rescue postoperative analgesia doses which was significantly lower with intraperitoneal ropivacaine. At the same time, it lowers significantly postoperative nausea and vomiting resulting from either postoperative pain or tramadol injection, but does not affect significantly the duration of hospital stay.

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ORIGINAL ARTICLE

Smartphone/Tablet-based Laparoscopy Simulation System: A Low-cost Training Module for Beginners in Minimally Invasive Surgery

Ashish Saxena

ABSTRACT

Laparoscopic surgery is a well-established domain of surgery and it has become essential for surgical practitioners to be well versed in the technique. It has a steep learning curve which exists because of a number of additional skills required for a successful transition from open surgery to minimally invasive procedures. Hence, it is desirable that a trainee should practice laparoscopy upon simulation devices before attempting an actual procedure on a patient. Two types of simulators are currently available in the market: box type and virtual reality type. The major limitation in their use is the cost factor involved. These simulators are relatively expensive, which the trainees in developing countries can ill afford. My efforts were directed at developing a low-cost simulator that is easy to assemble, requires minimal investment, and helps in improving depth perception and ambidexterity at the same time. I devised a simulation system based on smartphone/tablet. These gadgets (smartphone/tablet) are easily available everywhere at a reasonable cost. In the apparatus devised by me, the rear camera of a smartphone works as a laparoscopic camera and its screen works as the monitor. Light-emitting diode flash of the device functions as the light source. The smartphone has to be attached to a specially designed box fitted with accessories to perform various tasks. The practice sessions can be recorded and used for monitoring and evaluation by experts. A satisfactory level of elementary laparoscopy training can be imparted at a lower cost using smartphone-based simulation system.

Keywords: Box-type trainer, Depth perception, Laparoscopy training, Simulation system, Smartphone, Virtual reality trainer.

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INTRODUCTION

Laparoscopic surgery is a well-established domain of surgery. It has largely become the standard approach and has gradually surpassed open surgery for most of the abdominal conditions.[1] Therefore, expertise in the laparoscopy technique has become indispensable for the optimum career growth of practicing surgeons and surgical trainees alike.

A steep learning curve exists for beginners in laparoscopy.[2] This learning curve is attributed to various newer skills required for a minimally invasive procedure. These skills include depth perception, adjustment to fulcrum effect, hand–eye coordination, bimanual manipulation, handling of laparoscopic instruments, and ambidexterity.[3] Normally, the human eye is adapted to three-dimensional (3D) vision, that is, it can appreciate the depth or distance of an object, along with its length and width. But during laparoscopy, the monitor provides only a two-dimensional (2D) visual field. The perception of depth or distance is lost. It results in severe impairment in hand–eye coordination, which in turn leads to the difficulty in instrument handling and may also lead to inadvertent visceral organ damage.

With repetitive exposure to the laparoscopic procedures, the surgeon's eyes get acclimatized to 2D vision, and gradually attain the dexterity required to handle the instruments smoothly and perform a procedure safely. However, it is preferable that the above-mentioned skills are acquired outside the operation theater on simulation devices.

Studies have shown that experience gained upon simulators results in an increase in operator comfort and patient safety and also reduction in healthcare expenditure.[4] It has also been demonstrated that surgeons who regularly play video games learn laparoscopic skills faster than their nongamer colleagues.[5] Therefore, it is obvious that the importance of simulator-based training cannot be overemphasized.

AIM

Training in laparoscopy is traditionally imparted with box-type trainer or with virtual reality trainer. Both of these have been proven to be effective tools for

laparoscopic training.[3] However, their utility is severely impaired by exuberant prices. Virtual reality trainers, in particular, by the virtue of their high original cost and maintenance expenditure are beyond the reach of a surgical trainee in developing nations.[6] Box-type trainers, while being relatively cheaper than virtual reality one, still require a conventional laparoscopic camera or webcam and a monitor, contributing significantly to the financial burden.

My efforts were directed at developing a low-cost simulator that is easy to assemble, requires minimal investment, and effectively imparts laparoscopic skills to the trainee. Smartphone-based laparoscopy simulation system uses the camera of the smartphone as laparoscopic camera, its light-emitting diode (LED) flash as light source, and screen as the monitor, thereby reducing the cost of the apparatus considerably. The apparatus was intended to instill the essential laparoscopy skills, such as depth perception, adjust to fulcrum effect, hand–eye coordination, bimanual manipulation, and ambidexterity in the trainees' psyche.

MATERIALS AND METHODS

A plastic box with dimensions of 26 × 20 × 12 cm was taken and modified into a laparoscopy simulation box (Fig. 1). Its lid was fixed in partially open position to provide an inlet for instruments as well as for visualization through the smartphone camera (Fig. 2). The floor of the box was covered with cardboard and two pillars were installed near the rear wall of the box to act as landmarks for maneuvering of objects. A slot was created in the front wall of the box to keep the smartphone in optimum position. This optimum position was determined by visualizing the interior of the box with the camera of smartphone running in video mode. Two rubber disks with a central aperture were fixed in the front wall of the box to work as the entry ports. The hook-shaped instruments were contrived by using common household objects. Multicolored rubber bands were put in the box to be used as movable objects to be manipulated by the instruments.

Practice session began by keeping the smartphone camera in video mode with LED flash on, so that the interior of the box was clearly visible in the screen of smartphone (Fig. 3). Two hooks were now used to transfer the rubber bands between themselves and to maneuver them over the pillars. These sessions were duly recorded and later on evaluated to appreciate the efficiency gained in laparoscopy skills (Fig. 4).

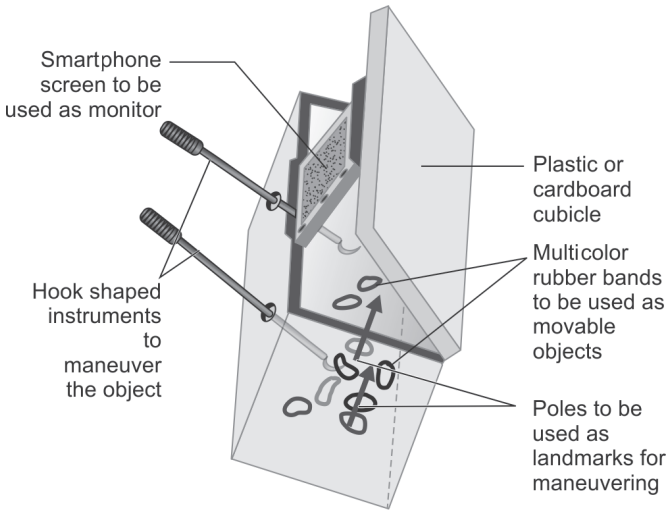

Fig. 1: Schematic diagram of the apparatus

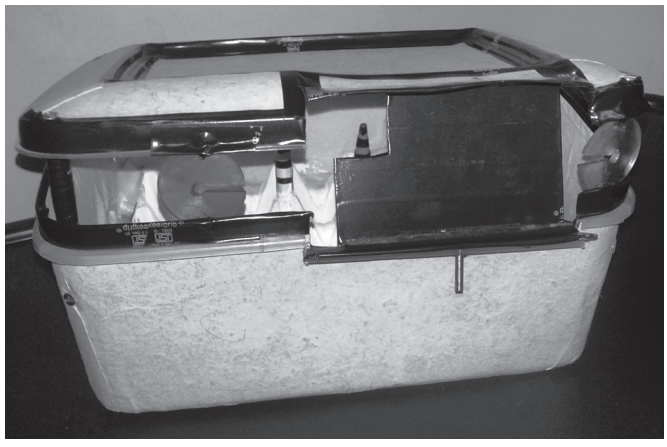

Fig. 2: Prototype of the apparatus

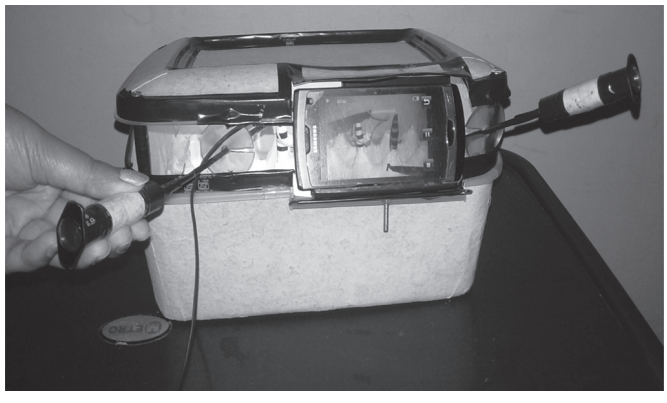

Fig. 3: Apparatus while in use

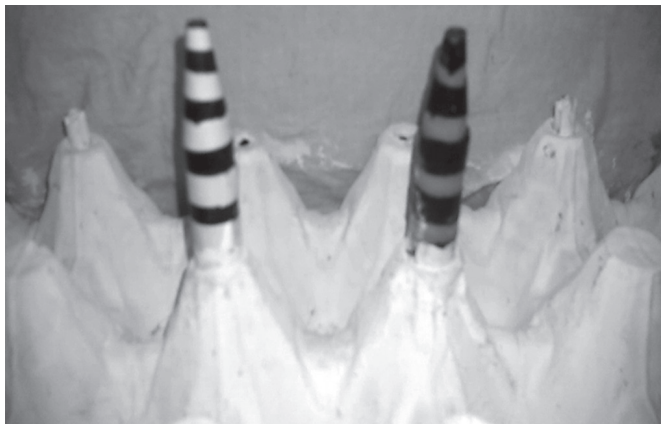

Fig. 4: Interior of the apparatus as seen on smartphone screen

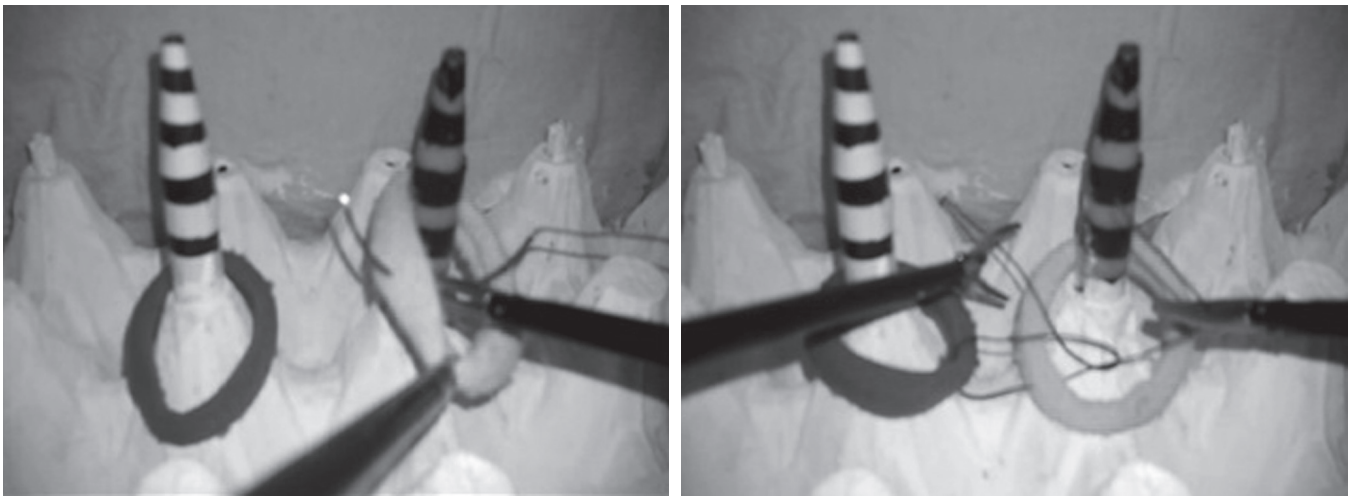

Fig. 5: Images depicting the laparoscopic suturing practice

With further improvisation, newer exercises with increasing complexity can be designed and installed in the simulator box to raise the level of challenge for trainees. With actual laparoscopic instruments, such as needle holder and Maryland forceps, trainees can also refine their suturing skills (Fig. 5).

DISCUSSION

Simulation is the imitation or modeling of a real-life situation for training or instruction.[6] It is an important tool for the training of novices. It works largely by way of a reduction in learning curve.[3] One industry that has largely benefited from the use of simulation technology is aviation industry, where pilots have long been trained to tackle real life-like scenarios before entering into the cockpit.[7] Surgical endeavors are not much different from the aviation industry as both the fields demand high levels of technical skill and allow small margins for error.[3]

The need for a simulation-based training program arose when surgeons found that their skills in open surgery did not transfer to the newer domain of laparoscopy.[8] Principles of laparoscopic surgery became the subject of extensive research. Gallagher et al[9] identified a set of special skills that were deemed essential to perform a laparoscopic procedure: (i) depth perception: the ability to perform 3D maneuvers with a 2D view; (ii) adjustment to fulcrum effect: to resolve the conflict between visual and proprioceptive feedback; (iii) hand–eye coordination; (iv) bimanual manipulation; (v) handling of laparoscopic instruments; and (vi) ambidexterity: The ability to use both left and right hands with equal ease.

Minimally, invasive surgery had already been ushered into the era of simulation-based training by Markman,[10] when he introduced endoscopic simulation system for proctosigmoidoscopy in 1969. Gradually, various simulators, such as mechanical simulators, live animal models, and computerized or virtual reality devices were launched in the market. While detailed description of these modalities is beyond the scope of this article, it is obvious that all of them require separate telescope, light source, and monitor.

Further studies recognized that complicated functioning of operative tools degrades a surgeon's performance, and extensive training is necessary to gain expertise in handling a tool, thus validating the need of simulator-based learning.[11,12]

While simulator training is suggested to be useful for acquiring psychomotor skills, these skills do not transfer to the operation theater immediately. An actual surgical experience under good supervision is necessary to increase the effectiveness of training.[13]

Considering the cost of commercially available simulators, a number of low-cost alternatives have been developed using mirrors, digital camera, web camera, spy camera, etc., the cost of which varies from 43 to $116.[14]

At an approximate cost of $3–4, smartphone-based simulation system devised by me is most economical when compared to other low-cost simulators. The whole apparatus is constructed of nonexpensive material, such as plastic box, ballpoint pens, rubber bands, etc., which are easily obtainable. The practice materials do not get consumed during sessions and need not be refurbished. It is simple in its design, durable, and easy to assemble. The maintenance cost is virtually zero.

The smartphone is fixed in its slot while practicing upon the apparatus, thus obviating the need of a camera-holding assistant. One can practice for long duration without being dependant on anybody else. The smartphone slot can be rotated around a vertical axis to focus upon different parts of the visual field. Interior of the box is coated with white color to maximize the illumination obtained from LED flash of smartphone.

It can effectively impart training in most of the elementary laparoscopic skills, such as depth perception, adjustment with fulcrum effect, hand–eye coordination, bimanual manipulation, and ambidexterity. Trainees can also practice handling of laparoscopic instruments if they have access to them. Adaptability of the apparatus with the conventional laparoscopy instruments is another salient feature that makes it useful for training of more complex maneuvers such as intracorporeal suturing and knot tying.

The practice sessions are by default recorded in video format, and can therefore be subjected to critical analysis by the experts. Recent studies have demonstrated that feedback provided by these experts can go a long way in improving the laparoscopic skills of trainees.[15]

CONCLUSION

A simulator-based system is a widely recognized method to train novices in minimally invasive surgical skills. They are proved to be beneficial for instructor, trainee, and patient alike. However, their utility is severely compromised because of high cost, which is beyond the means of beginners in the discipline. The smartphone/tablet-based laparoscopy simulation system is a cheaper and easy-to-assemble version of existing simulators. One can easily construct an apparatus at home and practice all the basic laparoscopic skills at negligible expenditure using his or her smartphone device. However, regular monitoring and instruction by experts is essential to acquire and sustain skills that are transferable to the operation theater.

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ORIGINAL ARTICLE

The Effect of Tranexamic Acid on Blood Loss during Laparoscopic Sleeve Gastrectomy

Hana Alhomoud

ABSTRACT

Background: Tranexamic acid (TXA) is an antifibrinolytic drug that has the property to reduce intraoperative and postoperative bleeding. This study was intended to establish the effect of TXA in minimizing the intraoperative and postoperative blood loss in laparoscopic sleeve gastrectomy.

Materials and methods: This was a prospective follow-up study conducted in Sabah Hospital, Kuwait, over 4 months from September 2014 to December 2014. A total of 50 patients who underwent laparoscopic sleeve gastrectomy were included in this study; 25 patients were given tranexamic acid during induction and 25 did not receive. Selection of patients was done on a random basis. Intraoperative blood loss, visibility of field of surgery, and amount of blood collected in suction apparatus used during surgery.

Results: Each group consisted of 25 patients. Preoperative intravenous bolus administration of TXA at 10 mg/kg reduces blood loss.

Conclusion: Tranexamic acid is an antifibrinolytic agent that inhibits the action of plasmin. There is also reduction in blood level of D-dimer. It is seen to significantly reduce intraoperative blood loss during surgery. Additionally, there seems to be no alterations of coagulation parameters or untoward systemic effects. This should prompt further trials.

Keywords: Blood loss, Laparoscopic sleeve gastrectomy, Tranexamic acid.

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Conflict of interest: None

INTRODUCTION

Tranexamic acid (TXA) is an antifibrinolytic agent and its predecessor epsilon aminocaproic acid has been used to treat postoperative bleeding in healthy adults for over 30 years (Fig. 1). Tranexamic acid has also been used in the prophylaxis and treatment of patients at high risk of intra- and postoperative hemorrhage such as hemophiliacs and patients on thrombolytic therapy and has been found to be highly effective, without significant side effects.[1-6]

To reduce intraoperative blood loss and the need for blood transfusion, new pharmacologic agents have been developed. The clinical efficacy of these agents has been reviewed, and it has been reported that antifibrinolytic agents such as aprotinin and TXA are effective in reducing packed red blood cell transfusion.[7] The lysine analog inhibitor TXA is particularly effective in reducing perioperative blood loss in various surgical procedures, with no reported adverse effects.[8]

The intravenous and tropical TXA formulations have been reported to be effective in decreasing blood loss in some studies.[9-11]

The aim of this study was to assess the effect of single intravenous preoperative dose of TXA on blood loss during laparoscopic sleeve gastrectomy.

SITE OF ACTION

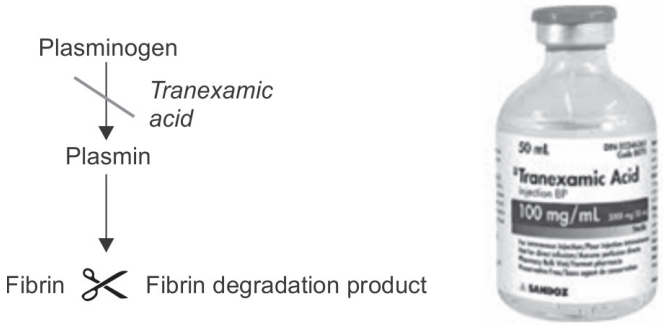

Fig. 1: Source: Wikipedia

MATERIALS AND METHODS

This is a prospective randomized study. The study period is 4 months from September 2014 to December 2014. A total of 50 patients who underwent laparoscopic sleeve gastrectomy were included in the study. The patients were grouped as treatment (case) group and control group. The randomization was done by the rules of odd and even. In 25 patients of treatment group, a single dose of TXA, 10 mg/kg bodyweight was given

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intravenously during induction. The second group included the remaining 25 patients in whom TXA was not given and was considered as control group. Injection TXA was administered in a dose of 10 mg/kg as bolus injection (treatment group) given intravenously over 5 minutes. The heart rate, respiratory rate, and blood pressure were checked and charted intraoperatively and postoperatively.

A single brand of TXA from a reputed firm was used in all cases in order to minimize the brand-related bias and for standardization. Intraoperative blood loss was calculated by galanometric method, weighing the sponges used and soiled by blood during surgery and measuring the amount of blood collected in suction apparatus used during the surgery. Postoperatively, the drained fluid collected in the drain was measured till the drain was removed.

The hemoglobin level was assessed postoperatively and was compared with preoperative hemoglobin level. The data were collected in an excel sheet. The patients were followed up till they were discharged from the hospital and were followed up in outpatient department.

RESULTS

There were 50 patients in our study of whom 25 (50%) patients who received TXA were in the treatment group and remaining 25 (50%) patients who did not receive the drug were in the control group (Table 1).

Table 1: Distribution of patients

Drug	*Total*	*Percentage*
Control	25	50
Treatment	25	50
Total	50	100

There were 42 females and 8 males

Intraoperative Blood Loss

In the treatment group, 20 patients out of 25 had blood loss below 300 ml, and 2 patients had blood loss of more than 400 ml. In the control group, 5 patients out of 25 had blood loss below 300 ml, and 20 patients had blood loss of more than 400 ml (Table 2).

Table 2: Intraoperative blood loss

	Less than 300 ml	*300–400 ml*	*More than 400 ml*	*Total*
Treatment	20	3	2	25 patients
Control	5	15	5	25 patients
Total				50 patients

Postoperative Blood Loss

Drain was kept for all patients who underwent laparoscopic sleeve gastrectomy. Most of the drains were removed within 72 hours. The fluid collected in the postoperative drains was measured. In the treatment group, 20 patients out of 25 patients had blood drain below 100 ml on 1st postoperative day. In the control group, 16 patients out of 25 patients had drained blood more than 100 ml on the 1st postoperative day (Table 3).

Table 3: Postoperative blood loss

	50–100 ml	*100–150 ml*	*150–200 ml*	*Total*
Treatment group	20	2	3	25
Control group	2	16	7	25
Total	22	18	10	50

Change in Hemoglobin Level

In patients who had laparoscopic sleeve gastrectomy, 23 patients out of 25 patients in the treatment group had preoperative and postoperative hemoglobin difference of less than 1 mg/dl. In the control group, 18 patients out of 25 patients had preoperative and postoperative hemoglobin difference of more than 1 mg/dl (Table 4).

Table 4: Measurement of hemoglobin level

Preoperative hemoglobin	*Treatment*	*Control*	*Total*
Less than 1	23	2	
1.1–2	2	18	
2.1–3	0	3	
More than 3	0	2	
Total	25	25	50

DISCUSSION

Reduction of bleeding during laparoscopic sleeve gastrectomy is a major benefit for the operating surgeon. Tranexamic acid inhibits plasminogen activity and fibrinolysis and thereby reduces capillary ooze. It thus increases clot formation and decreases blood loss. The added advantage is no postoperative alteration of patient's coagulation profile and absence of major side effects.

A randomized controlled trial (RCT) was conducted in 274 hospitals in 40 countries. This RCT named clinical randomization of an antifibrinolytic in significant hemorrhage-2 (CRASH-2) assessed the efficacy and safety of TXA by investigating 20,211 adult trauma patients who had or were at risk of significant hemorrhage. In the trial, the injured patients were randomly separated into two groups within 8 hours of injury. One group received an initial dose of 1 gm of TXA and a second dose of 1 gm as infusion over 8 hours. The other group received a matching placebo. A total of 10,096 patients received TXA and 10,115 received placebo; of these

10,060 and 10,067, respectively were analyzed. The CRASH-2 RCT established the safety and efficacy of TXA administration for trauma patients. It showed a significant reduction in mortality without any significant increase in thromboembolic events.[12] Tranexamic acid is thus both safe and effective in reducing the risk of death due to blood loss in trauma cases.[13]

Though the safety and the efficacy of the drug have been established, there is no consensus about the dosage and the best time for administration of this drug. The prescribed dosage is 1–1.5 gm or 15–25 mg/kg two to four times daily. The dosage of TXA advocated ranges from 1 gm[14] to 100 mg/kg transfused over 15 minutes with a second infusion of 10 mg/kg/hour transfused until wound closure is achieved.[15]

The dose administered in the CRASH RCT was 2 gm with 1 gm as bolus and 1 gm as continuous infusion over the next 8 hours.[12,13] In general surgical conditions and in trauma where life-threatening hemorrhages are anticipated, a continuous infusion is advocated. However, since laparoscopic sleeve gastrectomy is of much shorter time duration, we have employed a single bolus administration, preoperatively, in order to prevent intraoperative blood loss.

A total of 148 patients undergoing cardiac surgery with extracorporeal circulation were divided into six groups. One group did not receive TXA. The other five received loading doses before incision ranging from 2.5 to 40 mg/kg, and one-tenth, the loading dose was infused hourly for 12 hours. The quantity of blood collected by test tubes over 12 hours represented blood loss. This prospective, randomized, double blind study concluded that the group that received prophylactic administration of 10 mg/kg of TXA, followed by continuous infusion of 1 mg/kg/hour, had the least hemorrhage. Larger doses did not provide additional hemostatic benefit.[16]

Since TXA has a plasma half-life of 1.9 hours,[17] and our anticipated duration of surgery averaged 2 hours, a bolus injection of 10 mg/kg weight was chosen as the dosage to maintain a therapeutically effective concentration between 5 mg/dl. Though 30% of the intravenous dose of 10 mg/kg of TXA was detected in the urine during the first hour after administration and the total excretion rose to 45% after 3 hours, approximately 55% remains in circulation up to 24 hours.[18] Therefore, laparoscopic sleeve gastrectomy surgery does not require a continuous infusion since postoperative hemorrhage is of lesser concern than management of immediate hemorrhage in order to clear the field during surgery.

Our results have shown that none of the TXA patients needed a transfusion and the average fall in hemoglobin and the volume of blood lost is much less in the TXA group. This concludes that a single preoperative dose (10 mg/kg) of TXA given intravenously immediately before surgery reduced blood loss during laparoscopic sleeve gastrectomy. No thromboembolic incidents, adverse reactions, or complications were encountered with the administration of TXA in this study.

SUMMARY

The aim of this study was to see if TXA given as a short-term dose reduced blood loss in laparoscopic sleeve gastrectomy.

Tranexamic acid reduces capillary oozing, thus increasing the operative field visibility. It does not alter the coagulation profile and no lasting systemic or hemodynamic effects were seen in our study.

Tranexamic acid may well be an efficient and cheap method to control bleeding during laparoscopic sleeve gastrectomy.

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REVIEW ARTICLE

Stump Cholecystitis

Abhilash Jayachandran

ABSTRACT

Laparoscopic cholecystectomy is most commonly performed minimal access surgery by general surgeons. But still, some post-operative patients are not getting relieved from their symptoms. Most retrospective studies show that presence of stone is mostly in the cystic duct or in the common bile duct and some also show the presence of cystic stump (1–1.5 cm). Most of the patients with complaints were thoroughly evaluated and subjected to completion cholecystectomy. These patients were followed-up from 6 months to 1 year and all patients were asymptomatic.

Keywords: Common bile duct stone, Gallbladder stone disease, Laparoscopic cholecystectomy, Remnant gallbladder, Stump cholecystitis.

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Source of support: Journal of Minimal Access Surgery, PUBMED, HINDAWI, Asian Journal of Endoscopic surgeon, Hepato-Pancreato- Biliary HPB) Surgery Cystic.

Conflict of interest: Remanant stones in CBD may lead to stump cholecystitis

INTRODUCTION

Erich Muhe performed the first laparoscopic cholecystectomy in 1982; he used a modified operating laparoscope and placed it at the umbilicus after establishing pneumoperitoneum. Laparoscopic cholecystectomy becomes the gold standard treatment for cholelithiasis in that era. In 1987, Philippe Mouret performed first video laparoscopic cholecystectomy by attaching a camera to his laparoscope. Various causes are described for the postoperative symptoms and together they are kept under one group known as postcholecystectomy syndrome. The remnants of the cystic duct or gallbladder in subtotal cholecystectomy has historically been implicated as the source of pain, nausea and vomiting in postcholecystectomy patients. An increase in choledochal pressure results in cystic stump distension, inflammation. Stone obstruction within remnants of the cystic duct or gallbladder and an increase in the sphincter of Oddi pressure have all served as causes of postcholecystectomy problems[1]. The entire sphincteric system of the distal bile duct and the pancreatic duct is commonly referred to as the sphincter of Oddi.

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Follow-up

Maximum patients followed-up while some have not even turned back. But followed-up patients were doing well.

MATERIALS AND METHODS

Data were collected retrospectively from 1991 to 2014 regarding postcholecystectomy syndrome in patients and after completion cholecystectomy they were relieved of symptoms. Out of these patients some were referred with common bile duct (CBD) calculus with gallbladder stump and some with cystic duct calculi as per their ultrasound reports (Table 1). There were also patients who suffered due to stump cholecystitis because of inadequate removal of gallbladder. Revision cholecystectomy was performed in all patients with symptoms even after cholecystectomy. In laparoscopic cholecystectomy, the optical port was introduced in the umbilical area, whereas in postoperative history first port was introduced through the palmer's point to rule out adhesions. Nowadays, the port placement is on the basis of baseball diamond technique.

Port Positioning

- Camera port of size 10 mm was introduced in the umbilicus (Fig. 1).
- A 5 mm port was inserted below the costal margin in midclavicular line.
- Liver refractor of 5 mm was placed in mid to the anterior axillary line at the level of the umbilicus.

RESULTS

Among these patients, some patients had a direct radiological finding of calculi in the common bile duct and some were having both calculi in CBD and stump cholecystitis. All patients were not benefited with endoscopic retrograde cholangiogram, as the size of the calculi were large and proceeded with surgery. In some patients along with laparoscopic completion cholecystectomy, CBD exploration was also done. Those patients who underwent CBD exploration, intraoperative choledochoscopy was also performed and CBD closure was done after placing a stent.

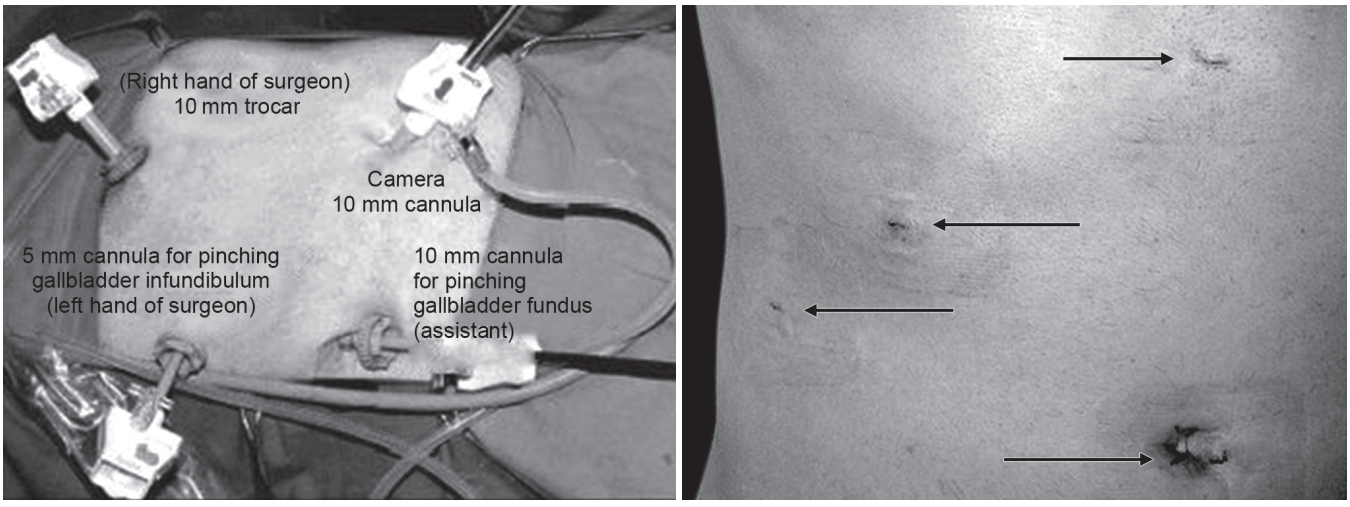


Fig. 1: Port positioning

Out of these patients, some were expected to have CBD obstruction (due to calculi) based on biochemical and radiological findings, but these patients turn out to be normal with CBD without stones and only with stump cholecystitis. In rest of the participants in this retrospective study after laparoscopic cholecystectomy symptoms may persists, but no evidence of CBD dilatation or CBD stone was found. All patients were relieved from their symptoms after completion cholecystectomy. The outcome of this study was that after completion cholecystectomy, patients became asymptomatic and adequate investigations, such as imagining modalities were carried out in selected

Table 1: Source of support

Name of journals	*Topic*	*Number of patients who came with stump cholecystitis in the study*	*Year of publication*
Journal of Minimal Access Surgery	Post-cholecystectomy syndrome: Role of cystic duct stump and re-intervention by laparoscopic surgery Tantiao, Jain M, Khanna S, Sen B	7 patients underwent completion cholecystectomy	2008 July
PubMed	Cystic duct remnant and the post-cholecystectomy syndrome Shaw C, O'Hanlon DM, Fenlon HM, McEntee GP	4 patients	2004 January
Hepato-Pancreato-Biliary Surgery	Cystic duct syndrome and minimally invasive surgery [Article in Hungarian] Rozsos I, Magyaródi Z, Orbán P	8 patients over 7 years	1997 September
PubMed	Retained gallbladder/cystic duct remnant calculi as a cause of post cholecystectomy pain Walsh RM, Ponsky JL, Dumot J	7 patients	2002 January
PubMed	Retained gallbladder/cystic duct remnant calculi as a cause of postcholecystectomy pain Walsh RM, Ponsky JL, Dumot J	One patient after 25 years of surgery	1999
PubMed	Laparoscopic re-intervention for residual gallstone disease Chowbey PK, Bandyopadhyay SK, Sharma A, Khullar R, Soni V, Baijal M	5 patients managed re-laparoscopically	1998-2001
HINDAWI	Stump holecystitis: Laparoscopic completion cholecystectomy with basic laparoscopic equipment in a resource poor setting Cawich SO, Wilson C, Simpson LK, Baker AJ	01	2014
Asian Journal of Endoscopic Surgeon	Laparoscopic completion cholecystectomy: A retrospective study of 40 cases Parmar AK, Khandelwal RG, Mathew MJ, Reddy PK	Studied in 40 patients	2012 December

cases to rule out the status of the CBD and cystic duct. The average time taken for the completion laparoscopic cholecystectomy was 1 to 1.5 hours.

DISCUSSION

Now, laparoscopic cholecystectomy is the gold standard treatment for gallbladder stone disease. Around 80 to 85% of patients become asymptomatic postoperatively but 15 to 20% of patients still persist with their prior symptoms.[2] These symptoms were due to an increase in the choledochal pressure which results in cystic stump distension, inflammation and stone obstruction within the remnants of the cystic duct or gallbladder, recurrent biliary calculi. Length of the cystic duct more than 1 cm remaining post cholecystectomy can lead to stump cholecystitis with or without stones.[3] The role of remnant cystic duct length was further studied by Rogy et al[4] in 322 patients undergoing bile duct operation after cholecystectomy and found that 35 patients (10.8%) were left with a cystic duct length of more than 1.5 cm. Out of these, 24 patients were having pathological findings besides the long stump like pancreatitis. Of the remaining, few had stones in the retained gallbladder, suture granuloma while other patients were having fistula between the remnant cystic duct and duodenum. In the end, only one patient was left with long cystic duct as the sole pathological finding. They concluded that cystic duct stump was hardly ever a cause of recurrent symptoms in itself and complete excision of cystic duct does not eliminate the existence of postcholecystectomy syndrome. Another study conducted by Walsh et al[5] revealed that retained calculi in gallbladder and cystic duct (Fig. 4A) can be the source of the postcholecystectomy syndrome. These problems can be prevented by:

- When the anatomy of calot`s triangle (Fig. 2) is unclear, blind dissection should not be proceeded (Fig. 3).

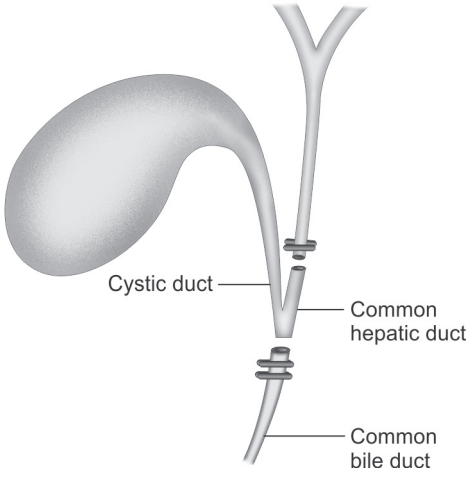


Fig. 2: Anatomy of biliary tract

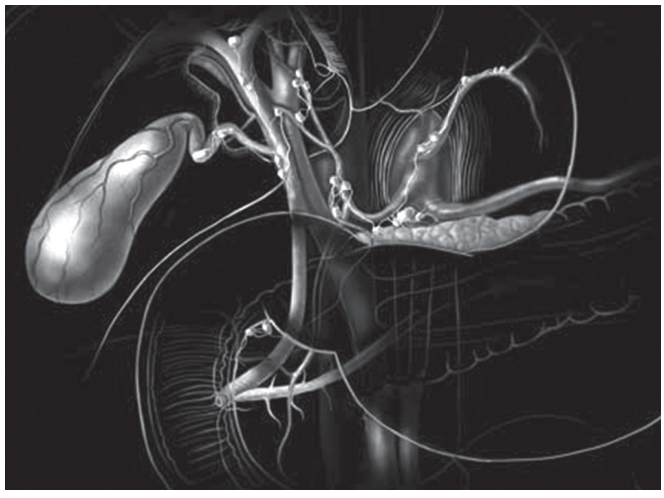
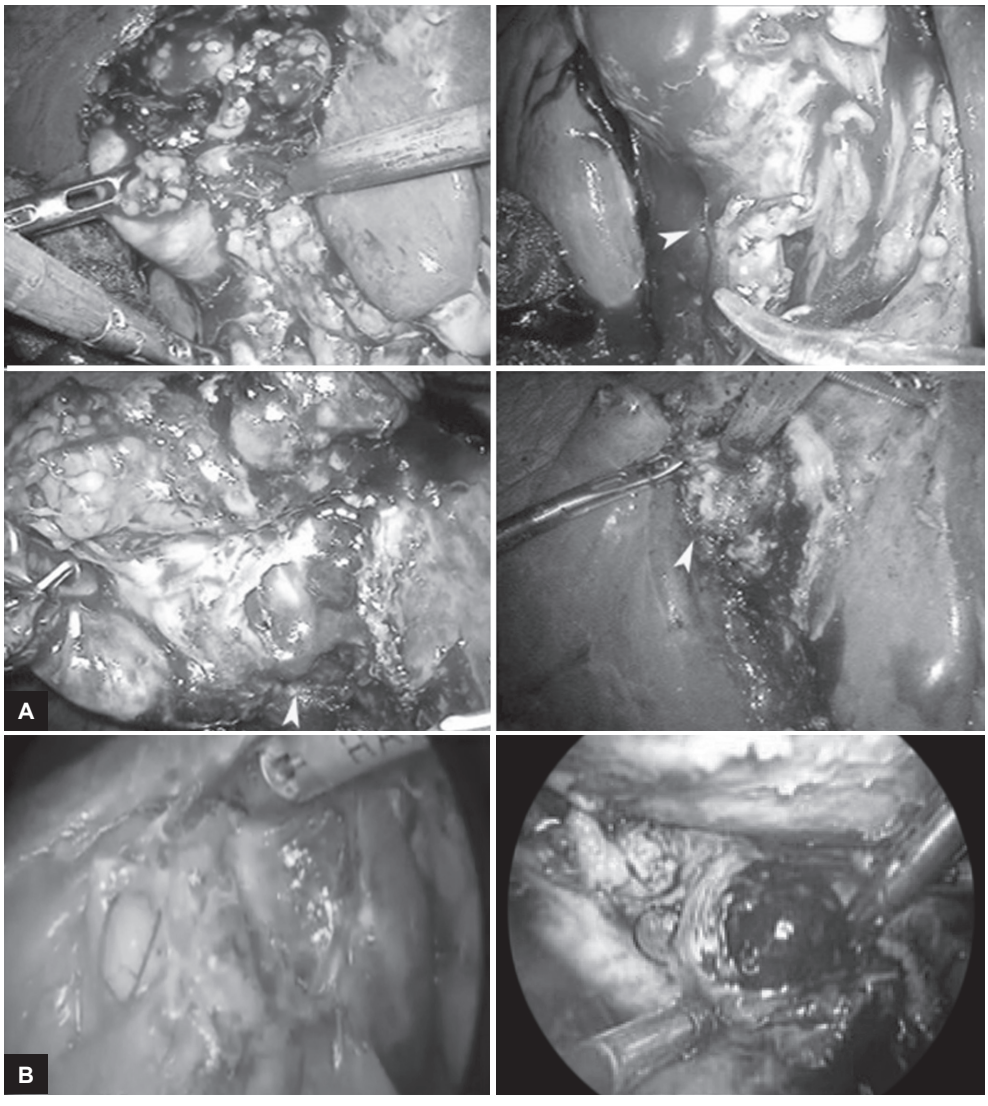


Fig. 3: Anatomy of calots triangle

- When any doubt about the anatomy, a fundus first cholecystectomy dissection on gallbladder wall down to the cystic duct can be helpful.
- Bleeding adjacent to the calot's triangle should be controlled by pressure and not by clipping or clamping.
- If the cystic duct is densely adherent to the CBD and there is possibility of Mirizzis syndrome, the infundibulum of the gall bladder should be opened, the stone should be removed and infundibulum oversewn.
- Always restrict the dissection within rouviere's sulcus. But it is present in only 40% of patients.

In the field of minimal access surgery (MAS), one should always be aware of the chances of cystic duct stones as the major possibility of postcholecystectomy syndrome.[2] So in selected cases, noninvasive investigations, such as magnetic resonance cholangiopancreatography (MRCP) can be considered to evaluate the biliary tree. Postcholecystectomy, the cystic stump was found embedded in scar tissue (Fig. 4) and it explored that laparoscopic technique was of high risk. But now with the most advanced instruments and with experienced surgeons even these can be operated laparoscopically. It has been said that now in these patients laparoscopical management is better.[6] This concept of re-operating laparoscopically was supported by Chowbey et al, Clemente et al[6,7] recently reported five patients who underwent reintervention after previous surgery of cholelithiasis. Their mean operative time was 42 minutes. They concluded that intervention may be required for patients with residual gallstones.

In this series of study, completion cholecystectomy with complementary CBD exploration was needed for some of the cases. We also conclude that for reintervention, laparoscopic approach was more beneficial.



Figs 4A and B: Remnant calculi (A) omental adhesions over stump cholecystitis and (B) CBD stone

CONCLUSION

We would like to highlight the importance of thorough identification of the calot's triangle with the neck of gall bladder cystic duct and not to cross rouviere's sulcus. Patients with persisting symptoms should be evaluated and reintervention should be considered. For reintervention, the laparoscopic mode is the most accurate one as the field of minimal access surgery is advancing. We would like to emphasise the importance of proper dissection and identification of gallbladder-cystic duct junction to completely remove the GB and prevent recurrent symptoms. Cystic duct stump calculi diagnosed on ultrasound as a cause of these symptoms may actually be in the remnant gallbladder, and requires re-operation for stump cholecystitis.[8]

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REVIEW ARTICLE

Complications as a Result of Entry Techniques for creating Pneumoperitoneum and Recommendations to minimize Them in Laparoscopic Surgery: A Review of Literature

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ABSTRACT

It is an evidence-based fact that laparoscopic surgery is superior to conventional open surgery. Any laparoscopic surgical procedure has many advantages for the patients, health care system, and society, although it is not devoid of disadvantages.

Advantages of Minimal Access Surgery

Minimal access surgery often offers better visualization than conventional surgery, particularly better visualization of the hiatus and deep structures in the pelvis.

- Laparoscopic surgery offers dramatic advantages in terms of the quality of life after the operation.
- Postoperative pain is less, which decreases postoperative analgesic (narcotic) use and its complications. This also aids in lower respiratory complications.
- Smaller wounds are associated with fewer wound complications, less scarring, and better cosmesis.
- Laparoscopic procedure results in reduction of postoperative adhesions.
- Patients stay in the hospital for a shorter period and recover faster.
- Patients are able to return to their normal activities faster (e.g., feeding, school, office).

Disadvantages of Minimal Access Surgery

- Operating time is longer.
- The complication rate is higher during the learning curve of the procedure.
- Loss of tactile sensation occurs.
- With current technology, the video camera can provide only a two-dimensional image, although three-dimensional views are becoming available.
- Controlling bleeding laparoscopically is difficult.
- The number of instruments and angles in which they can be applied are limited. Robotic applications using wrist technology is improving this problem.

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Numerous new techniques, technologies, and guidelines have been introduced to eliminate/decrease the risks associated with entry techniques in laparoscopy.[1] The two major entry techniques widely carried out include the closed technique (Veress) and open technique (Hasson). The other techniques employed include use of direct trocar insertion, use of disposable shielded trocars, radially expanding trocars, and visual entry systems. No single method or equipment has been proven to eliminate laparoscopic entry-associated injury.

Materials and methods: A systematic electronic search was conducted and various articles were studied and reviewed and this review article was prepared.

Keywords: Complications, Entry, Laparoscopy, Trocars.

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Conflict of interest: None

INTRODUCTION

Minimal Access Surgery (MAS) is a specialized form of surgery that allows surgeons to operate without making large incisions as are done in conventional (open) surgery. As laparoscopy is carried out with the help of small incisions, patients have less postoperative pain, spend shorter time in the hospital, and recover significantly faster than after open surgery. Access into the abdomen is associated with injuries to the gastrointestinal tract or major blood vessels, and 50% of these complications occur before the beginning of the surgery. The majority of these injuries are due to insertion of primary umbilical trocar. Increased morbidity and mortality result when surgeons do not recognize injuries early and do not address them quickly.[2] Methods of primary trocar insertion are split between "open" and "closed" techniques.

To minimize entry-related injuries, several techniques, instruments, and approaches have been introduced in recent years.

Common Entry Complications during Mas

The three main complications during creation of pneumoperitoneum in MAS are bowel injuries, vascular injuries, and urological injuries. Up to 50% of all major

intraoperative complications associated with laparoscopy occur at the time of surgical entry. The most devastating among these is major vascular injury, and half of all bowel injuries occur during entry, with the small intestine at highest risk.

Bowel Injury

Bowel injury during MAS is a rare but serious complication. A cautery injury to the bowel can cause delayed perforation of the viscus, thus increasing the possibility of a preventable morbidity. Patients presenting with features of perforation peritonitis within 24 hours and up to 2 to 3 weeks after laparoscopic Bovie injury to the bowel have been reported in the literature.

Cautery injury to the bowel has a hidden depth, causing a slow transmural tissue necrosis, and it might also impair local healing and eventually lead to perforation. Thus, the patient may present later than the usual period for wound healing and remodeling as previously reported. Given the disastrous consequence, it is imperative to perform a good surgical repair of even a minor cautery injury to the bowel.[3]

The small intestine was most frequently injured (55.8%), followed by the large intestine (38.6%). In most of these cases the diagnosis was made during the laparoscopy or within 24 hours thereafter. Laparoscopy-induced bowel injury is associated with a high mortality rate of 3.6%.[4]

Vascular Injury

Vascular injuries are usually induced by the insertion of the Veress needle or the first/primary trocar, because both are usually introduced blindly. The insertion of the secondary trocars has a lesser risk, because they are placed under direct vision. During access into abdominal cavity the most dangerous complications of entry are to great vessels like aorta, vena cava, and common iliac vessels. Vascular injury is one of the major causes of mortality from laparoscopy, with a reported mortality of 15%. The reason of these injuries is the close proximity of anterior abdominal wall to the retroperitoneal vascular structures. The most common minor vascular injury is to the inferior epigastric vessels and superior epigastric vessels occurring in up to 2.5% of lap hernia repairs.[5]

Urological Injuries

The incidence of bladder injury during laparoscopic procedures ranged from 0.02 to 8.3% as is evident from various studied articles. Most frequently, these injuries occurred during laparoscopic-assisted vaginal hysterectomy. Sharp electrosurgical dissection was the leading instrument causing injury. Ureteral injuries during laparoscopic gynecological surgeries typically occur during laser ablative endometriosis surgery or laparoscopic-assisted vaginal hysterectomy. There are reports of ureteral injuries during laparoscopic tubal ligation, adnexectomy, and lap uterosacral ligament ablation.

Ureteral injuries were identified with incidence rates ranging from 0.025 to 2%.[6,7]

RECOMMENDATIONS FOR SAFE ENTRY

- In case of a patient with history or presence of periumbilical hernia, periumbilical adhesions, three failed insufflation attempts at the umbilicus, left upper quadrant point known as Palmer's point should be considered for entry.[8] Other sites that can be used are transuterine, trans cul-de-sac, 9th or 10th intercostal space.
- Waggling of Veress needle from side to side must be avoided as this can enlarge a small puncture injury to a bigger one.[9]
- Various Veress needle tests can be done, though these provide very little information on the placement of needle.
- Attach the carbon dioxide source to the Veress needle on entry as Veress intraperitoneal pressure is a reliable indicator of correct intraperitoneal placement of Veress needle.
- The angle of the Veress needle insertion should vary according to the body mass index of the patient, from 45° in nonobese women to 90° in obese women.[10]
- Adequate pneumoperitoneum should be determined by a pressure of 20 to 30 mm Hg and not by predetermined CO_2 volume.
- Hasson's method of entry can be used as an alternative to Veress needle technique, although there is no evidence that the open entry technique is superior to or inferior to the other entry techniques currently available.
- Direct insertion of the trocar is associated with less insufflation-related complications, e.g., gas embolism and its insertion without prior pneumoperitoneum is considered as a safe alternative to Veress needle technique.
- Shielded trocars may be used in an effort to decrease entry-related injuries.[11,12]
- After introduction of the telescope, the bowel should be inspected for obvious injury and abdomen visualized for presence of adherent bowel around the umbilicus.

CONCLUSION

Any surgical procedure whether open/conventional or laparoscopic has its respective risks and associated complications. Complications can occur even at the best of hands and it is vital that these are recognized promptly

and immediately taken care of. The importance of proper training and the value of expertize are clear. It must be our primary aim to inculcate in ourselves the necessary skills and encourage the development of specially designed training programs for those performing the most advanced procedures.

It is important for every laparoscopic surgeon to follow the recommended steps and guidelines to minimize various entry-related complications of laparoscopy and for excellent outcome of the procedure done.

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CASE REPORT

Proximal Small Intestinal Obstruction: A Rare Presentation of Splenosis

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ABSTRACT

Splenosis is a benign condition caused by heterotrophic autotransplantation of splenic pulp following splenic trauma or surgery. Splenosis is rare and intestinal obstruction due to splenosis is even rarer. Most of the patients with splenosis are asymptomatic. There are few reports of large bowel obstruction due to splenosis, but reports of small bowel obstruction due to splenosis are scanty. We report a case of proximal small bowel obstruction due to postsplenectomy splenosis treated by laparoscopic surgery. Index of suspicion with radiological evaluation is the key to preoperative diagnosis of splenosis. Laparoscopic surgery is an effective means of treating such patients with good long-term outcome.

Keywords: Intestinal obstruction, Postsplenectomy complications, Splenosis.

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CASE REPORT

We present the case of a 55-year-old male who presented with acute colicky, nonradiating pain in the umbilical region, gradually increasing in intensity since 15 days and associated with multiple episodes of nonprojectile, nonbilious vomiting, 3 to 4 times a day, which used to relieve the pain. He had constipation since 3 days associated with gradually increasing abdominal distension. He had similar episodes of abdominal pain and multiple bilious vomiting since last 5 years, which were treated conservatively. He had a history of blunt abdominal trauma 40 years back for which laparotomy was performed for hemoperitoneum, details of which were not available. History of loss of weight is also present. On examination, he had tachycardia. Abdomen was distended with tenderness localized to the periumbilical region. Bowel sounds were sluggish. There was no evidence of any free fluid or palpable mass in the abdomen.

Contrast-enhanced computed tomography of the abdomen showed dilated proximal bowel loops with dilated duodenum and stomach (Fig. 1). Multiple hyperdense lesions were noted in the peritoneal cavity, compressing proximal jejunum with dilated proximal jejunum, duodenum, and stomach with collapsed distal bowel.

Diagnostic laparoscopy showed omento-parietal adhesions, proximal dilated bowel loops, narrowing in the proximal part of jejunum with multiple splenunculi at the area of transition (Fig. 2). Distal small bowel was collapsed. Adhesiolysis, resection of the strictured jejunal part with the compressing splenunculi, and end-to-end anastomosis were done. Postoperative recovery was uneventful. He was discharged on postoperative day 5. On follow-up up to 1 year, he was comfortable with no recurrence in pain or vomiting.

DISCUSSION

We reported the case of an uncommon presentation of splenosis. Very few cases of small bowel obstruction secondary to splenosis are reported, but proximal small bowel obstruction is still rare. Rectosigmoid and small bowel obstruction due to splenunculi has been reported by Gincu et al[1] and Sirinek et al.[1,2] High index of suspicion

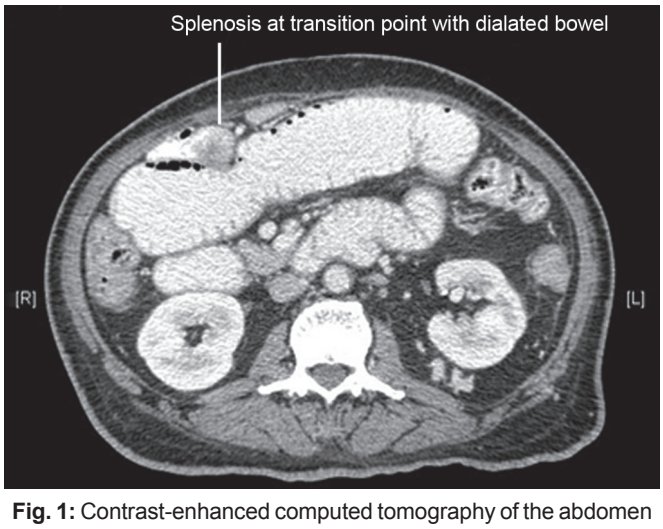

Fig. 1: Contrast-enhanced computed tomography of the abdomen suggesting splenosis with transition point of intestinal obstruction

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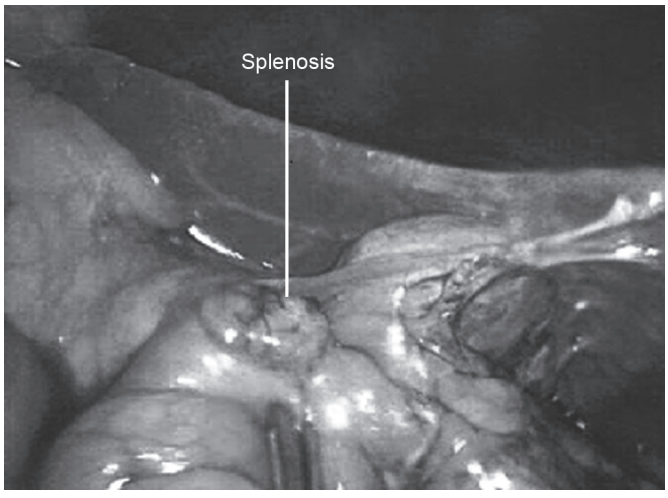

Fig. 2: Splenosis obstruction of small intestine

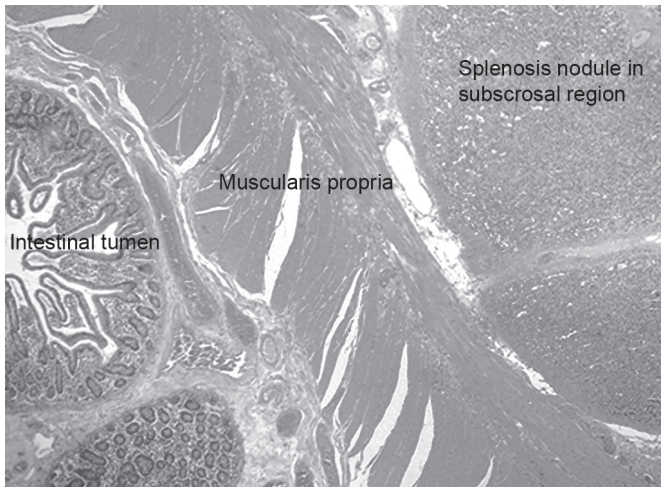

Fig. 3: Histopathology showing subscrosal splenosis

required in such patients with splenic trauma presenting with subacute intestinal obstruction needs further evaluation for definitive diagnosis.

Splenosis, a term first used by Buchbinder and Lipkopf in 1939,[3] and first presented by Von Kuttner in 1910[4] during autopsy, is heterotrophic autotransplantation of splenic pulp after splenic trauma, iatrogenic injury, or splenectomy.[5] The exact incidence of splenosis is unknown, but reported incidence after elective splenectomy for hematological disorders is 16 to 17%, for traumatic splenectomy it is approximately 33 to 76% for intraperitoneal splenosis, whereas it is 18% for thoracic splenosis. The known mechanism for intraperitoneal and intrathoracic splenosis with diaphragmatic injury is direct implantation of viable splenic tissue. Intrahepatic and intracranial implantation can be explained by hematogenous spread of splenic pulp.[5] One theory also suggests that splenic erythrocytic progenitor cells enter the liver via the portal vein and then grow in response to tissue hypoxia.[6] The average interval reported between trauma and abdominal or pelvic splenosis was 10 years, with a range of 5 months to 42 years.

The commonly reported sites for splenosis in the literature are abdominal cavity, thorax including pericardium, subcutaneous tissue, pelvis, intrahepatic portion, renal, mesoappendix, pancreas, or even intracranially. Splenosis is usually asymptomatic and diagnosed incidentally on computed tomography (CT) scan, magnetic resonance imaging (MRI), or during surgical procedure. Occasionally, patients present with nonspecific abdominal pain, an enlarging abdominal mass with associated infection, intestinal obstruction due to adhesive bands of the implants, gastrointestinal hemorrhage, hydronephrosis or pelvic pain, dysmenorrhea, dyspareunia secondary to pelvic deposits, or rarely as a recurrence of previously treated hematological disease.[7] But preoperative diagnosis of splenosis may be made using radiological and nuclear imaging studies, such as scintigraphy with (99m) Tc-labeled heat-denatured erythrocytes, while adding single-photon emission computed tomography/CT can help in correct localization.[8] Ferumoxide-enhanced magnetic resonance has also been used for diagnosis. Splenosis tissue on histology often shows abnormal architecture with no hilum and poorly formed capsule with lack of trabecular structure[5] (Fig. 3). Sometimes histology and immunohistochemistry are indistinguishable from the normal spleen. But signs of thrombosis, infarction, and scarring lead to the atypical imaging findings on CT and MRI.

It can mimic tumors in variable viscera. Recurrence of Felty's syndrome or idiopathic thrombocytopenic purpura[9] also has been reported as a complication of splenosis, because usually splenic implants resume splenic function in 1 to 3 months. When preoperative diagnosis is done, minimally invasive surgery, such as laparoscopy is the ideal treatment for patients with symptomatic splenosis.

In this case, since the diagnosis was preoperative, laparoscopic adhesiolysis and excision of splenic deposits were done to relieve the obstruction. But it should be borne in mind that splenosis nodules need to be removed completely and spillage should be prevented by using an end bag. Laparoscopic approach was reported to be a successful diagnostic and interventional tool.

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CASE REPORT

Retrorectal Schwannoma

Hana Alhomoud

ABSTRACT

Schwannoma is a benign encapsulated nerve sheath tumor. These tumors are more frequently located in the head, neck, extremities, and trunk. Retroperitoneal pelvic localization of schwannoma accounts for 0.5 to 5% of all cases, while the incidence of retrorectal tumors is estimated at 1 in 40,000 to 63,000 cases in the general population, which we report here.

Keywords: Retrorectal tumors, Schwannoma, Surgery.

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CASE REPORT

A 50-year-old male presented with a feeling of heaviness in the pelvic floor associated with change in bowel habits and tenesmus for the last 5 years.

On digital rectal examination, an irreducible firm mass posteriorly on the right side was felt. Mucosa was intact. Rigid sigmoid scope up to 20 cm was normal. Routine laboratory tests and tumor markers were within normal limits. Computed tomography (CT) of the chest, abdomen, and pelvis showed a large right lower pelvic mass, whose nature was not clear (Fig. 1). Magnetic resonance imaging (MRI) of the abdomen and pelvis showed a large right presacral mass, whose appearance suggested a neurogenic tumor (Fig. 2). Endorectal ultrasound was done which showed a mass suggestive of sarcoma or a duplicated cyst (Fig. 3).

The patient was operated on April 2, 2012, through an arcuate incision in the right buttock. The patient was placed in the prone jack-knife position. An oval well-circumscribed encapsulated mass 10 × 8 cm was removed.

Histology revealed the presence of compact spindle cells arranged in short bundles and a peripheral lymphoid cuff with some germinal centers (Fig. 4). At

Fig. 1: Computed tomography of the chest, abdomen, and pelvis showing a large right lower pelvic mass, whose nature is not clear

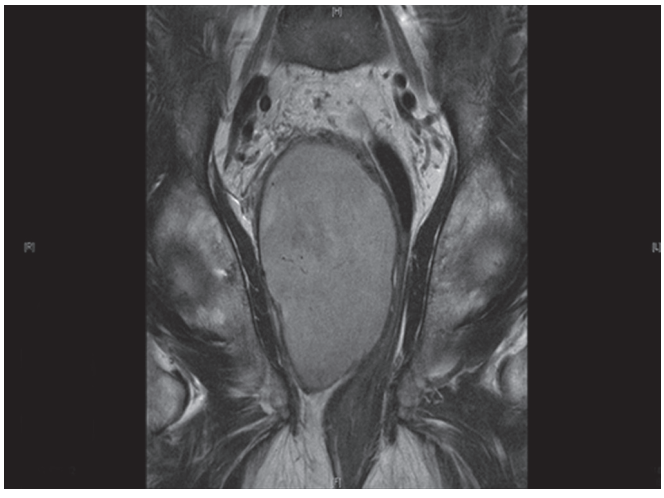

Fig. 2: Magnetic resonance imaging of the abdomen and pelvis showing a large right presacral mass, whose appearance could suggest a neurogenic tumor

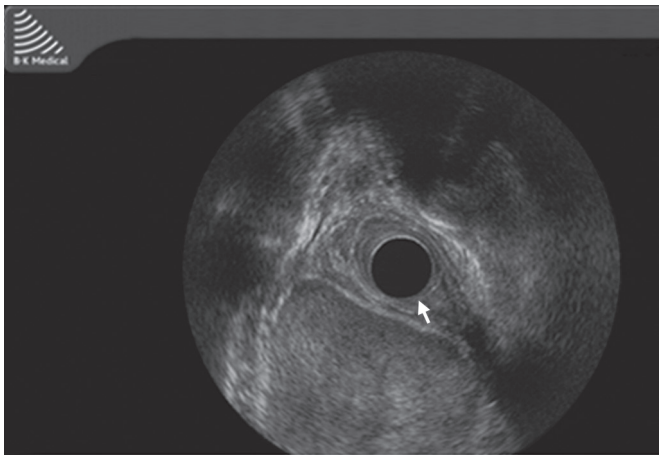

Fig. 3: Endorectal ultrasound (showing a mass suggestive of sarcoma or a duplicated cyst)

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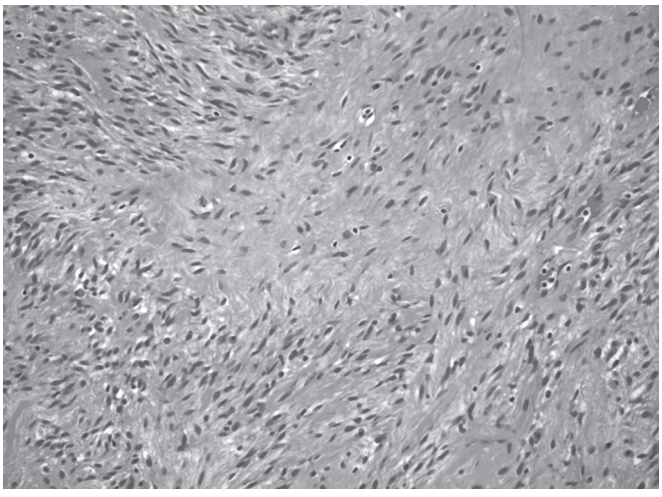

Fig. 4: Histology revealing the presence of compact spindle cells arranged in short bundles and a peripheral lymphoid cuff with some germinal centers

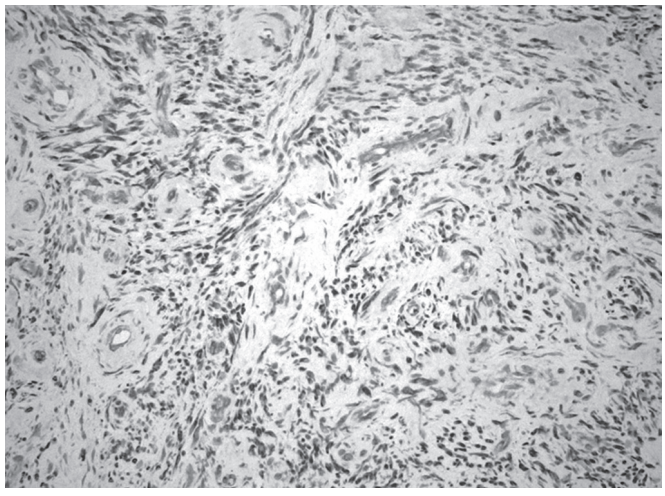

Fig. 5: At immunohistochemistry, the spindle cells were positive for S-100 protein and negative for α-smooth muscle actin and CD34

immunohistochemistry, the spindle cells were positive for S-100 protein and negative for α-smooth muscle actin and CD34 (Fig. 5).

The histological and immunohistochemical features were compatible with a diagnosis of schwannoma.

The patient's recovery was uneventful and he was discharged on postoperative day 4.

DISCUSSION

Schwannoma is a benign encapsulated nerve sheath tumor arising from Schwann cells. These tumors are more frequently located in the head, neck, extremities, and trunk.[1] Retroperitoneal pelvic localization of schwannoma accounts for 0.5–5% of all cases.[2] The incidence of retrorectal tumors is estimated at 1 in 40,000 to 63,000 cases in the general population.[3] A few large series provide an estimate of the overall incidence of retrorectal tumors in the general population and retrorectal schwannoma (Table 1). Schwannomas are slow-growing lesions that can reach a large volume without any symptoms for years if they are located in a place with large capacity like the presacral region.[11]

Presacral or retrorectal virtual space is limited from behind by the presacral fascia and in the front by the fascia propria of the rectum. Reflection of the pelvic peritoneum is its upper limit. Waldeyer fascia is the lower space which separates it from the supralevator space. Ureters, iliac vessels, and sacral nerve roots constitute its lateral limits.[6]

Retrorectal schwannoma may present with perirectal pain, change in defecation habits and sensation of incomplete evacuation, obstructed defecation, and tenesmus.

Preoperative diagnosis of retrorectal schwannoma is challenging. In a study published in January 2012 in ColoRectal Disease Journal by Macafee, 56 patients underwent excision of retrorectal tumors between 2002 and 2010 (11 cases were schwannomas), with MRI and CT done on all patients. Results showed that preoperative MRI is vital to make the correct diagnosis between benign disease and malignancy and the feasibility of tumor resection.[10]

Histological examination including immunohistochemistry can give the exact diagnosis of schwannoma. The two histological growth patterns are Antoni A and Antoni B. In Antoni A type, there is dense growth of fusiform cells, compactly arranged in palisades to form verocay bodies. In Antoni B, the fusiform cells are more loosely distributed with rounded or elongated nuclei, with a greater quantity of myxoid stroma and xanthomatous histiocytes.[12]

Table 1: Incidence of retrorectal masses and retrorectal schwannoma

Authors	*Institution*	*Length of study (years)*	*No. of cases*	*Schwannoma*
Jao et al[4]	Mayo Clinic	19	120	7
Sean et al[3]	Washington University Hospital	22	34	5
Buchs et al[5]	University Hospital of Geneva	9	16	1
Canelles et al[6]	University Hospital Spain	13	20	3
Chang et al[7]	Memorial Hospital Taiwan	13	14	3
Kye et al[8]	Catholic University of Korea School of Medicine	9	15	4
Strupas et al[9]	University Medical School Lithuania	13	14	1
Macafee et al[10]	General Hospital, Leeds, UK	9	56	

The use of immunohistochemical panels plays a fundamental role in the diagnosis of schwannomas and in ruling out other neoplasms of mesenchymal origin. Using anti-CD34 antibodies, desmin, cytokeratins (AE1/AE3), cKit, chromogranin, and S-100 protein.

Total resection is the main therapeutic treatment of retrorectal schwannoma, using transabdominal or retrorectal approach, open or laparoscopy.[13] All lesions below the middle of S3 without sacral, pelvic sidewall or visceral involvement were excised using the perineal approach. All lesions above S3 were excised by means of an abdominal approach.[14]

The rate of recurrence after complete resection is rare,[15] but it may reach 10 to 54% in incomplete resection.

CONCLUSION

In conclusion, schwannoma can occur anywhere on the peripheral nerve. Retrorectal schwannoma is quite rare, preoperative MRI is vital to make the correct diagnosis, and use of immunohistochemical panel is important to achieve a definitive histopathological diagnosis. Surgical resection with free margins is the best treatment.

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PHOTO ASSAY

Laparoscopic Entry: A Hybrid Technique of Open Hasson and Direct Trocar Access

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ABSTRACT

The first trocar entry for creating pneumoperitoneum is a very crucial step in minimizing complications and completing the procedure laparoscopically. Various methods have been described, among which Veress and open Hasson technique are widely used. Here we describe a novel and hybrid technique of combining open Hasson and direct trocar with several advantages.

Keywords: Entry, Laparoscopy, Technique.

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INTRODUCTION

Laparoscopy as a minimally invasive technique has many advantages for both the patient and the surgeon. As the armamentarium of laparoscopy is widening, the need to reduce complications and make it safe and easy to learn even for newcomers is a constant work in progress. The first trocar entry is a very important step in minimizing the complications and in completing the procedure laparoscopically.[1] There have been numerous techniques described for easy and safe access into the abdominal cavity for creating a pneumoperitoneum. Many surgeons use the Veress or the open Hasson technique, and with experience the ease of doing it is acquired, but the difficulty level in the initial few cases remains with both the techniques, and rarely even experienced surgeons face difficulty in few cases with these techniques. So, here we describe a hybrid technique of open and direct trocar access i.e., easy to get access into the abdomen, safe for the patient with minimal complications, and straightforward for any newcomer to learn and teach others.

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TECHNIQUE

- A midline vertical supraumbilical/infraumbilical incision is made for 1 to 1.5 cm long with a 15 no surgical knife (Fig. 1).
- The subcutaneous layers are opened upto the linea alba either using the knife or bluntly with artery forceps (Fig. 2).
- The linea alba is opened vertically (7–8 mm) till the peritoneal layer. It is necessary to open the linea alba in midline (Figs 3 and 4).

Fig. 1: Skin incision (supraumbilical)

Fig. 2: Linea alba visualized

Fig. 3: Linea alba incised

Fig. 4: Linea alba incised, peritoneum intact

Fig. 5: Trocar positioned at incised linea alba, ready to insert into peritoneal space

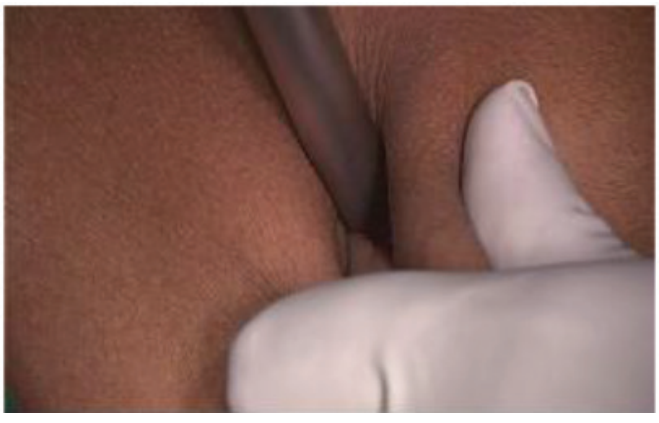

Fig. 6: Trocar insertion with elevation of abdominal wall

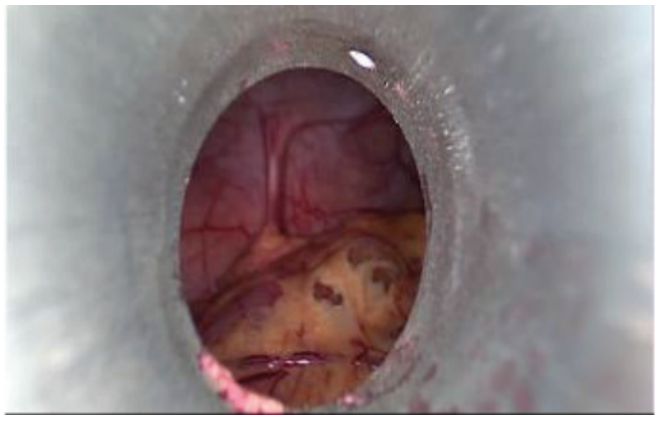

Fig. 7: Camera insertion visualizing the peritoneal space

- The 10 mm trocar is inserted at the site of linea alba opening and pushed downward through the peritoneum while the left hand elevates the abdominal wall (while carefully feeling the resistence) (Figs 5 and 6).
- The entry into peritoneal cavity is confirmed with air flow (at low rate of 3 l/min or by direct visualization by scope)and inserting the scope (Fig. 7).

ADVANTAGES

- The midline incision helps in easy dissection to the linea alba and also in extending the incision for easy specimen removal.
- The closure of the sheath is easy, assured, and free of future possible hernia. Considering the anatomy of the umbilicus, the ligamental support structures of the umbilicus are least damaged with direct vertical incision either above or below umbilicus.
- The force required to insert trocar is minimal as only the peritoneal layer needs to be breached, thereby avoiding injuries to bowel, vessels, or mesentery due to excess uncontrolled force used in direct trocar access. (One develops the feel as the experience increases).
- The chances of air leak surrounding the trocar is avoided as the incision in the linea alba is less than 1 cm, thereby snuggly fitting the trocar.
- If it needs to be converted to a laparotomy the incision can be easily extended unlike periumbilical transverse incision.
- The chance of extraperitoneal insufflation like in Veress needle insertion is avoided.
- Even in patients with previous lower abdomen scar extending into the umbilicus, this technique can be used with incision placed few centimeters above the umbilicus.
- The overall time taken in establishing pneumoperitoneum is comparitively less than Veress or open access techniques.

EXPERIENCE

The senior surgeon of our team first described this technique and has been using it for all his laparoscopic procedures since 2001 and now has experience of more than 4,000 procedures. He had no complications like bowel/mesentery or vascular injuries. The two other authors of this article are using this technique for over

a year now and have found it easy and reliable, without any injuries whatsoever.

DIFFICULT SITUATIONS

The difficult situations are the same as what one faces for other techniques like previous scar in the upper abdomen or hernia at umbilicus; in such cases palmer's point can be preferred for insertion of either Veress or direct 5 mm trocar depending on experience. If the cut in linea alba is slightly lateral, the entry with trocar might be through different layers of the abdominal wall like rectus muscle, posterior rectus sheath, and peritoneum leading to difficulty in either extending incision for specimen removal or for closure of the sheath.

REFERENCE

1. Gould JC, Philip A. Principles and techniques of abdominal access and physiology of pneumoperitoneum. Sci Am Surg 2011;8:P1-P9.