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LAPAROSCOPIC ADHESIOLYSIS FOR RECURRENT SMALL BOWEL OBSTRUCTION WITH THE ULTRASONICALLY ACTIVATED SHEARS

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Postoperative adhesions are the most common cause of recurrent small bowel obstruction (SBO). Laparotomy has classically been used in its treatment. The aim of this prospective study was to assess the feasibility, safety and clinical outcome of laparoscopic adhesiolysis in patients with recurrent SBO with the use of the ultrasonically activated shears. Between January 1998 and January 2001, elective laparoscopic adhesiolysis was attempted in 23 patients (13 men and 10 women, mean age 49.6 ± 6.3 years, range 16-63 years) with post operative recurrent SBO. All patients were subjected for complete clinical assessment, laboratory investigations, serial abdominal radiographs, abdominal ultrasound and CT. Patients in whom the bowel obstruction resolved within one day and who fulfilled the following criteria were treated laparoscopically: at least 2 prior episodes of small obstruction, confirmed improvement in physical signs of peritoneal inflammation, a decrease in white blood cell count to normal level and disappearance of air and fluid levels on plain abdominal radiographs . The technique of open laparoscopy was used for initial access to the peritoneum. The adhesions were lysed with the ultrasonically activated shears (Harmonic Scalpel). Follow up evaluation was performed by clinical examination every 6 months for 3 years (range 1-4). Laparoscopic adhesiolysis was successful in 18 patients (78.26%). Conversion to laparotomy was required in 5 cases (21.74), because of intestinal perforation in one patient (4.5%), and convoluted masses in 4 patients (17.9%). There was no mortality and low morbidity in the form of serosal injuries in 4 patients (17.9%) and intestinal perforation in one patient (4.5%). The mean time of operation, return of intestinal motility, and postoperative hospital stay were significantly shorter in the laparoscopically successful adhesiolysis group versus the group of patients who were converted to laparotomy. [(115 ± 9.1 vs 130± 6.7) P<0.001, (1.9 ± 0.3 vs 3.8± 1.2) P<0.01, (5.5± 2.2 vs 8.3± 3.4) P<0.001, respectively]. Recurrent SBO developed in 2 patients (12.5%) over a mean period of follow up (3 years).

Conclusion: ***Laparoscopic adhesiolysis is a feasible procedure for recurrent SBO with the use of the ultrasonically activated shears. It is safe (low morbidity and no mortality) and effective (low rate of recurrence of intestinal obstruction). Conversion to laparotomy should be considered only in patients with intestinal perforation or convoluted masses.***

Key words: Laparoscopy. Adhesiolysis. Small bowel obstruction

INTRODUCTION

Postoperative adhesions are an important and so far unsolved surgical problem. Recent observations indicate that 93-100 percent of patients who have undergone abdominal surgery develop adhesions [1,2,3,4], some of whom will later develop small bowel obstruction (SBO) and the risk ranges from 0.3 to 10.7 percent [3,5,6,7], rising to 22 percent if concomitant radiotherapy has been given[8]. Postsurgical adhesions are the predominant cause of SBO accounting for approximately 70-80 percent of cases [3,9,10], often associated with high morbidity and mortality rates [9]. Adhesions, once divided, tend to reform [11], and this seems to translate into an increased morbidity rate with a high frequency of relapse of bowel obstruction once adhesiolysis has been performed [3].

Laparotomy has classically been used in the treatment of obstruction caused by adhesions. However, there are reports about the feasibility and safety of laparoscopic adhesiolysis for SBO [12,13]. The ultrasonically activated devices also seem to be advantageous in laparoscopic

adhesiolysis [14]. The aim of the present study was to assess the feasibility, safety, and clinical outcome of laparoscopic adhesiolysis in patients with recurrent SBO with the ultrasonically activated shears (UAS).

PATIENTS AND METHODS

Between January 1998 and January 2001, 23 patients (13 men and 10 women; mean age 49.6 + 6.3; ranged from 16 to 63 years) with recurrent SBO caused by adhesions were managed by laparoscopy in General Surgery Department of El-Minia University Hospitals. Written consent was obtained from all patients after explanation of the risks of laparoscopic treatment and the possibility of conversion to laparotomy. All patients were subjected for complete history taking as regard to abdominal pain, vomiting, constipation, abdominal distension, and the history of previous abdominal or pelvic surgery. Careful examination was done to rule out an obvious incarcerated hernia and rectal examination also was performed to exclude intraluminal masses and to check for the presence of gross blood. The supine and erect plain abdominal films were taken where the findings of distended loops of small bowel with air/ fluid levels were characteristic. Abdominal ultrasound and CT were done.

All included patients had undergone one or two abdominal operation and had experienced at least 2 episodes of SBO. The patients were carefully observed during the period of conservative treatment that consisted of fasting, placement of nasogastric tube and the administration of broad spectrum antibiotics (third generation cephalosporin 1 gm intravenously every 12 hours with metronidazole 500 mg by intravenous infusion every 8 hours for 5 days) as well as intravenous fluids and elecetrolytes. Observation included serial abdominal radiographs, physical examination and laboratory investigations. Complete blood count with differential and serum electrolytes as sodium and potassium were done.

Patients in whom the bowel obstruction resolved within one day and who fulfilled the following criteria were treated laparoscopically: at least 2 prior episodes of small obstruction, confirmed improvement in physical signs of peritoneal inflammation, a decrease in white blood cell count to normal level and disappearance of air and fluid levels on plain abdominal radiographs. Elective laparoscopy was performed with the patient in the supine position under general anesthesia. The surgeon stood on the left side of the patient. Video monitors were placed at the head of the table if the previous operation was in the upper abdomen or at the foot if in the lower abdomen. The abdomen was entered away from all scars by open cannulation. The technique of open laparoscopy provided a safe method for insertion of the primary cannula in sites away from prior scar. For patients with prior lower or mid-abdominal scars, the initial trocar entry site was to the left and the below of the xiphoid process. For patients with upper midline or transverse scars, an initial subumbilical port was chosen. A pneumoperitoneum was established by insufflation of carbon dioxide. The intra-abdominal pressure was monitored. The remaining trocars (usually two) were inserted under direct vision in areas devoid of adhesions. The pathogenic adhesions were identified. The ultrasonically activated shears (UAS) were used for lysis of adhesions and adequate hemostasis. The model of UAS available in our hospital was the Harmonic Scalpel (Ethicon Endo surgery, Johnson & Johnson, Cincinnatic, USA), which is an instrument that cuts and coagulates tissues via vibration at 55.5 KHz (mechanical action) (Fig.1). The speed of cutting and amount of coagulation can be adjusted by the power setting of the generator and the pressure applied on the shears. There are three different positions of the blade of the shears, the sharp for cutting, the flat for coagulation, and the blunt for a combination of these effects. In patients with dense adhesions, especially when there was a convoluted mass of adherent bowel the operation was converted to laparotomy.

Follow up evaluation was performed by clinical examination every 6 months for 3 years (range 1-4 years) at the outpatient clinic

Statistical analysis

The data were analyzed using BMDP version PC 90 (SPSS, Chicago, USA). Proportions and percentage were used to summarize categorized variables while descriptive statistics such as mean ±S.D. was used for numerical variables. The X2 test was used to investigate the statistical significance of any difference between categorical variables. Student's t-test was used to compare the mean values of quantitative outcome measures between study subgroups. P value was considered significant when $P<0.05$.

RESULTS

The patient characteristics were summarized in table (1). The mean number of episodes of SBO was 2.8 ± 1.2 [2-4] before entry into the study (Table 1). The most frequent primary operations responsible for SBO were appendectomy, peritonitis and cystectomy for urinary bladder cancer (Table 2). Laparoscopic treatment was attempted in all 23 patients. Adhesions between the abdominal wall and small intestines were successfully lysed by using the laparoscopic approach in 18 of 23 cases (78.26%) (Fig. 2,3). Conversion to laparotomy was required in 5 cases (21.74%). In one, a minilaparotomy (3 cm length) was performed for an intestinal perforation caused during adhesiolysis (Fig. 4). Conventional laparotomy was required in four patients due to convoluted masses of adherent bowel. There were 5 complications: intestinal perforation in 1 patient in whom conversion to laparotomy

was done, and serosal injury in 4 patients and these injuries were successfully repaired laparoscopically.

The outcome was shown in (Table 3). In the laparoscopy group, the mean operative time was 115 ± 9.1 (range 60-150 minutes) and mean postoperative hospital stay was 5.5 ± 2.2 (2-7 days). For the group of patients in whom laparoscopy was converted to laparotomy, the mean operative time was 130 ± 6.7 (range 90-180 minutes) and mean postoperative hospital stay was 8.3 ± 3.4 (range 5-11days). Intestinal motility was re-established in 1.9 ± 0.3 (range 1-2 days) after laparoscopic adhesiolysis, compared with 3.8 ± 1.2 (range 3-5 days) for patients who were converted to laparotomy. Mean follow up was 36 ± 11.4 (12 to 48 months). At the end of the follow -up 16 of 18 (88.8%) patients, who were treated laparoscopically, were available and 14 patients (87.5%) were asymptomatic.

Recurrent SBO developed in 2 patients (12.5%) who had been treated by laparoscopic adhesiolysis. The first was hospitalized 12 months after the laparoscopy and improved with nasogastric suction and intravenous administration of fluids and left the hospital the next day. The cause of the obstruction was not established. This patient had no further episodes of SBO over the next 24 months. The other patient had a recurrence of SBO two times during the first 3 years after laproscopic adhesiolysis. He underwent laparoscopic adhesiolysis after the third such episode. The cause of the recurrent episodes of obstruction was due to incomplete adhesiolysis at the previous operation. The adhesions were completely lysed. Recurrent SBO developed in 2 patients (40%) who had been treated by conversion from laparoscopy to laparotomy and were successfully treated by laparoscopy. There were no deaths within 30 days of operation.

Table (1): ***Patients characteristics***

Age- years *	49.6 ± 6.3 (16-63)
Gender **	13 men (56.5%)
	10 women (43.5%)
No. of episodes of SBO *	2.8 ± 1.1 (2-4)

**** Data were represented as mean ± SD***
***** Data were represented as numbers and percent.***

Table (2): ***Previous operations***

Type of operation	*No. of patients*	*Percent*
Appendectomy	5	21.7
Cholecystectomy	1	4.3
Cholecystectomy with PUH*	1	4.3
Cholecystectomy with appendectomy	1	4.3
Cystectomy for urinary bladder cancer	5	21.7
Hysterectomy	3	12.9
Laparotomy for peritonitis	5	21.7
Partial gastrectomy	1	4.3
Unknown	1	4.3
Total	23	100

**** PUH, para-umbilical hernia***

Table (3): *Outcome*

	Laparoscopy group (n=18)	*Conversion to laparatomy (n=5)*	*P value*
Operative time*			
Range	60-150	90-180	<0.001
Mean ± SD	115 ± 9.1	130 ± 6.7	
Postoperative hospital stay (day)*			
Range	2-7	5-11	<0.01
Mean ± SD	5.5 ± 2.2	8.3 ± 3.4	
Intraoperative complication rate **	N=4 (21.7%)	N=0 (0%)	
Postoperative complication rate **	N= 3 (17.3%)	N=2 (40%)	
Deaths within 30 days of operation **	N=0 (0%)	N=0 (0%)	
Return of intestinal motility (days)			
Range	1-2	3-5	<0.01
Mean ± SD	1.9 ± 0.3	3.8 ± 1.2	

** Data were represented as mean ± SD and range. P value was calculated by Student t-test*
*** Data were represented as numbers and percent. P value was calculated by X^2 test.*

Fig. (1): The Model of the Harmonic Scalpel that was used in our study

Fig. (2): Laparoscopic view of adhesions before its lysis

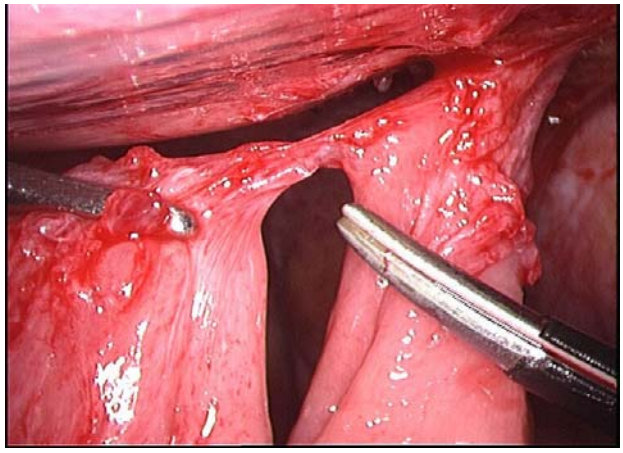

Fig. (3): Laparoscopic lysis of adhesions by ultrasonically activated shear

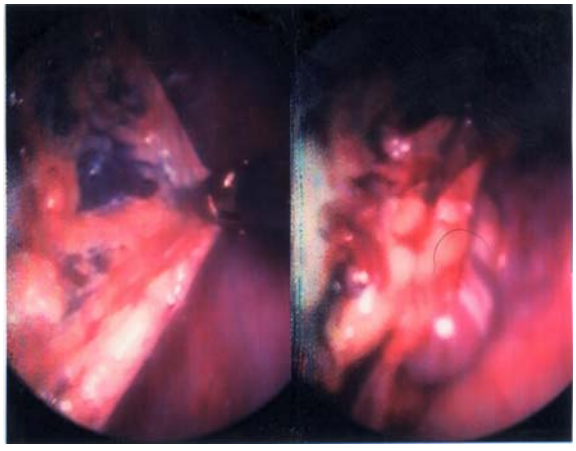

Fig. (4): Laparoscopic adhesiolysis complicated by intestinal perforation.

DISCUSSION

Surgery damages the peritoneum, either by direct trauma to the mesothelim at the surgical site, or indirect trauma during surgical manipulation. The disordered fibrin turnover plays a pathogenic role in the adhesion formation[15]. Postoperative adhesions are universal after abdominal and pelvic surgery and may cause SBO [3]. Traditionally, laparotomy has been performed for SBO caused by adhesions. Several investigators have reported that laparoscopic surgery leads to fewer adhesions compared with laparotomy [16,17]. This is due to less tissue handling desiccation, and the early postoperative mobilization, which is also an important factor for reducing postoperative adhesion formation [18,19]. The success rate for laparoscopic adhesiolysis for acute SBO has ranged from 46% to 87% [13, 20,21]. In the present study, lysis of adhesions was successful in 78.26% of cases that used laparoscopy, a satisfactory result by comparison with the previous studies. Conversion to laparotomy was performed for intestinal perforation or the presence of dense adhesions, the latter being the most common cause of conversion to laparotomy [20,21]. In the present study, the most common cause for conversion was the present of convoluted masses. Adhesions between the small intestines and the abdominal wall were lysed close to the abdominal wall. Electrosurgical current was used for hemostasis and bipolar instrumentation is preferred to minimize the potential for thermal injuries to intestinal loops or adjacent structures while the use of monopolar diathermy increases the risk of thermal injury and increases the remote tissue injury [22,23]. Other investigators used laser laparoscopic surgery to decrease the postoperative adhesions [24,25]. However, it does not appear that use of a laser per se reduces postoperative adhesions, when compared to other surgical modalities [26]. Recently, the use of a high frequency ultrasonic energy has been proposed as a cutting and coagulation tool for laparoscopic surgery [27]. Early impressions about the UAS in avoiding electrically induced complications were also positive [28]. This was due to the accurate direction of energy to the tissue in between the vibrating blade of UAS, in contrast to diathermy which directs the electrical current to wide area with the least electrical resistance [29]. In the present study, we used the UAS which provided a sound adhesiolysis with adequate hemostasis and no thermal perforations and added to feasibility and safety of laparoscopic adhesiolysis. Patients with adhesive SBO pose a specific problem of obtaining safe access to the abdominal cavity to initiate pneumoperitoneum. A blind access technique (Veress needle insertion followed by trocar insertion) has resulted in a high rate of complications (bowel and vascular injuries) [21,30,,31,32,33,34,35]. Some investigators have recommended preoperative sonographic mapping of adhesions to help to determine safe site for trocar insertions [36,37]. Safer alternative includes placement of the veress needle at a site far from previous scars, but the access may be in a remote area increasing the difficulty. Another alternative is the use of new optical trocars in which the laparoscope is inserted through transparent cannula [38,39].

In the present study, the optic trocars and the sonographic mapping were not available. We used the open cannulation, which allowed for the identification of adherent bowel with the abdominal wall and this technique was not associated with vascular or bowel injuries and this was similar to other studies [30,35,36,39,40]. The small bowel injury in the present study caused by lysis of adhesions rather than trocar insertion.

Several groups of investigators have assessed clinical outcome after laparoscopic adhesiolysis. Parent et al., (1995) [41] reported that the intestinal motility was re-established in 1.8 days after operation and the mean duration of hospitalization was 5 days for patients with laparoscopic procedure alone compared with 3.4 days for intestinal motility and 10.4 days hospitalization for patients who were converted to laparostomy. Our results were similar to the previous study which support that the patients can get the benefits of the laparoscopic approach as regard to shorter hospital stay with rapid return of intestinal motility. Sato et al, (2001) [42] reported a mean operating time 105 minutes, success rate of 82.4. Many series reported no deaths related to the procedure [42,43]. In the present study, the results were similar and no deaths were reported in relation to the operation.

Francois et al., [12] reported that 32 of 50 patients treated by laparoscopic adhesiolysis for SBO were asymptomatic at a mean follow up of 24 months. Strickland et al. [44] studied 34 patients who underwent laparoscopic or open laparotomy for acute SBO and found one recurrent SBO requiring surgery in each group during a mean follow up of 88 weeks. In the present study, the mean follow up was 36 months. Although 14 patients (88.8%) remained asymptomatic, 2 had recurrent SBO after laparoscopic adhesiolysis, one required surgery. Two of five patients (40%) who were converted from laparoscopy to laparotomy had recurrent SBO due to adhesion reformation. So laparoscopic adhesiolysis is associated with a low frequency of recurrence of obstruction and should be the first choice of operation for recurrent SBO. This may be due to the lack of use of retractors and packs at laparoscopy, maintenance of a closed abdomen with presumed reduction in peritoneal dryness, less likelihood of introduction of foreign bodies, a reduced likelihood of blind abdominal exploration, a less tissue damage as assessed by the length of laparotomy versus laparoscopy incisions [45,,46]. The conversion to laparotomy should be considered in cases of intestinal perforation or convoluted masses.

CONCLUSIONS

Laparoscopic adhesiolysis is a feasible operation for recurrent SBO with the use of UAS. It is safe (low morbidity and no mortality) and effective (low rate of recurrence of intestinal obstruction). Conversion to laparotomy should be considered in patients with intestinal perforation or convoluted masses.

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