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Alternative Sites for Laparoscopic Cholecystectomy, in Thin and Obese Patients from the Point of View of Changes in the Abdominal Dimensions

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Abstract
Background: Laparoscopic cholecystectomy is the standard operation for treatment of gallstone disease, which is difficult in obese patients, but narrow abdomen and thin patients are also a challenge, resulting in complications which mainly affect patients at the extreme ends of the weight spectrum. This represents a major source of morbidity and mortality from laparoscopic procedures; the majority (80%) of these complications is due to placement of the primary trocar,
Searching for techniques to prevent involuntary injuries must be put as the priority, to ensure the optimal retraction, allows enough space available for manipulation of the active jaws of the laparoscopic graspers or scissors.
Aim: To define alternative sites for laparoscopic cholecystectomy, in thin and obese patients from the point of view of alteration in the abdominal dimensions, which may reduces laparoscopic, related injury.
Methods:
In Al Sulaimaniyah Teaching Hospital and Hatwan Private Hospitral , from (July 15th 2004-July14th 2009) 1076 patients underwent laparoscopic cholecystectomy by same team and 35% of them by the same surgeon. Standard 4 ports were used, with first entry port in the periumblical region. Sixty patients were selected, because of their extreme weight and the patients were classified accordingly in to two groups:
Group A:had downward displacement of umbilicus (43-60 cm width & 30-45cm height of the abdomen).
Group B; had narrow abdominal dimensions (28-38 cm width & 14-27cm height of the abdomen).
Results: Different alternative sites for trocar insertion were selected in order to overcome abdominal thickness and discrepancy between length of the hand instruments and distance of the port to the gall bladder
Conclusions: We recommend using this principle in the patients with extreme weight and narrow abdomen when XU is less than 15 cm or (more than 25cm), to decrease challenges of sequel of laparoscopic cholecystectomy in these groups of patients.
Keywords: Abdominal dimensions, laparoscopy, cholecystectomy, port position

INTRODUCTION

Laparoscopic cholecystectomy is the standard operation for treatment of gallstone disease [(1)], and the advantages of minimally invasive surgery have been widely accepted [(2)]. Laparoscopy is difficult in obese patients because of the thickness of adipose panicle [(3)], and it presents unique technical challenges. The ease of the operation and the operative time seem to be more dependent on body habitués than body mass index (BMI).[(4)] Specially patients with significant central obesity (apple-shaped) were surgically more challenging and needed prolonged operative time compared to pear-shaped patients, independent of their BMI.[(4)] As the BMI increased, the location of the umbilicus shifts inferiorly and the distance between the umbilicus and xiphoid process (XU) will increase [(5)]. Although visceral surgeons are more often confronted with laparoscopic surgery in obese patients [(6)], but narrow abdomen and thin patients are also a challenge, resulting in complications which mainly affect patients at the extreme ends of the weight spectrum (thin and obese) and patients who have had previous abdominal operations, they represent a major source of morbidity and mortality from laparoscopic procedures and a major reason for conversion to the open approach. [(7)].
The majority (80%) of these complications are due to placement of the primary trocar, [(8)], which is put classically in the periumbilical region. [(9)] It is mentioned in the literature that, patients who are extremely thin or obese, or known to have abdominal adhesions are at increased risk for laparoscopic entry-related injury at the umbilical entry point. [(10)]
According to current evidence, based mainly on observational studies, there is wide variation among clinicians as to which entry method should be recommended [(11)] and no one laparoscopic entry method has demonstrated clear superiority over another. [(12)]

Searching for techniques to prevent involuntary injuries must be put as the priority, to ensure the optimal retraction which allows enough space available for manipulation of the active jaws of the laparoscopic graspers or scissors, [13] Also to overcome triangulation, and provides suitable vision in every step of the procedure of laparoscopy. [14] This concept made some authors to dictate the use of another site for primary entry, [9] in a study by **Nathaniel J. Soper** on laparoscopic cholecystectomy during pregnancy, he used alternative site for insertion of the initial port in all patients [15]. Selection of abdominal wall locations for the port arrangement is a critical step of every laparoscopic operation. The port arrangement must provide the surgeon with adequate access to the target quadrant(s) while avoiding critical structures and the ideal port arrangement for a given operation will vary from patient to patient. [16]

This paper is a trial to define alternative sites for laparoscopic cholecystectomy, in thin and obese patients from the point of view of changes in the abdominal dimensions, which may reduce laparoscopic related injuries

METHODS

In Al Sulaimaniyah Teaching Hospital and Hatwan Private Hospitral , from (July 15th 2004-July14th 2009) 1076 patients underwent laparoscopic cholecystectomy by same team and 35% of them by the same surgeon. Standard 4 ports were used, with first entry port in the periumblical region. Sixty patients were selected, because of their extreme weight and the patients were classified accordingly in to two groups:

Group A; 37 patients, had abdominal circumference obesity (BMI 28-32), had downward displacement of umbilicus (43-60 cm width & 30-45cm height of the abdomen).

Group B; 23 patients (BMI 15-20) had narrow abdominal dimensions (28-38 cm width & 14-27cm height of the abdomen).

After signing of the informed consent, collection of demographic data, height and weight of the patients were measured, and BMI calculated by equation,

$$BMI = \frac{\text{body weight (Kg)}}{\text{Height2 (m)}}$$

Circumference and width of the abdomen, height of the abdomen from xiphoid process to umbilicus (XU) and to pubic symphysis (torso) were measured using a standard tape measure with patient in supine and standing position .In the view of the discrepancy of the length of the telescope & hand instrument to the distance of the gallbladder from the site of the ports ,also angulated course of the tract , particularly subxiphoid port , we selected alternative sites for the trocar insertion .

Virtual port sites determined prior to placing ports and shifting port positions toward target quadrants accordingly. In group A, site for telescope port selected before CO_2 insufflation above umbilicus, sustaining (3/5) of the length of the telescope to the site of gallbladder (below costal margin, in the right midclavicular line).Other assistant's 5mm port sites were modified and displaced cephalic according to the same principle. While in obese patients with hepatomegally or fatty liver the subxiphoid port site displaced caudally to gain direct course and overcome angulations in the tract.

While in the group B, we selected port sites more caudal than usual; periumblical port incisions were done in the midline down in the hypogastrium .,Sustaining same distance(3/5 of the length of the hand instrument or telescope) from the port site to the target quadrant ,and gall bladder.Other ports also displaced caudually according to the same principles ,while subxiphoid port site was done in most cases in the usual standard site 6cm below xiphoid process in the midline, but in two patients with kyphosis we were obliged to displace this port site by 5 and 6.5 cm caudally to overcome angulated course to the Callot's triangle.

After entrance and putting other ports under direct vision, theses approaches gave adequate exposure of the operative field, and clear idefinitfication of the anatomy and pathology.

RESULTS

Most of the patients were female 78.3% (n = 47) ;(Table 1), median age was 37±5.4 years for females and was 41±5.7 years for male patients. BMI in the group A were different (from 28 to 32), (Table 1)

Circumference, girth and torso(height of the abdomen)of the patients in both groups are shown in table 2, in group A there is caudal dropping of the umbilicus up to 7-10 cm, while in the group B its just up to 1cm .We could also noticed larger circumference of the abdomen in standing position in group A, up to 3-4cm. while in group B there is 1cm increase in circumference in standing position. Height of the abdomen (torso), decreased in supine position in both groups ,in group A up to 3-5cm ,and up to 3cm in group B

Morbidity in patients included in this paper (group A &B (n=60), compared with patients had normal weight and abdominal dimensions (n=306) by the same surgeon and in the same period of time (Table 3).,we could noticed that differences are in number of complications and staying in hospital more in weight and abdominal dimensions

P value is non-significant (greater than0.05), means that there is no significant difference in morbidity between

the patients in whom classical 4 port position were used compared with those in which advanced port sites were used accordingly

Discussion

Classical sites for 4 port cholecystectomy in the patients with extremities of weight and abdominal dimensions will creates a technical challenge related principally to" retraction and triangulation ,necessary to expose the surgical field"[14] and target organ. Displacement of umbilicus and abdominal wall caudally or cephalic in obese and thin patients respectively do not allow adequate exposure of the gallbladder , this will restricts movements. In patients with narrow abdominal dimensions there will be collision of hand instruments. [13], which results in misidentification of anatomical structures, which is regarded as one of the major causes of biliary tract injury in laparoscopic cholecystectomy. [17]

In obese and thin patients with disproportional abdominal dimensions respectively, the hand instruments will not reach the target organ.In thin patients with narrow abdominal dimensions there is no enough "space available for manipulation of the active jaws of the laparoscopic graspers or scissors, [13] the surgeon cannot move the surgical instruments freely in the abdominal cavity (i.e., the chasing swords phenomenon) or cannot reach particular regions in the surgical field. [16, 18] All these short comings, when standard port sites used, "represent a major source of morbidity and mortality from laparoscopic procedures and a major reason for conversion to the open approach" [7]

In the literature there are widely different port sites used, for many reasons i.e. pregnancy, previous laparotomy, managing hernias and in obese, tall patients [6,7,15,19, 20, 21,22], which allow ethically searching for alternative port sites .In this paper we used advanced port sites caudally in thin patients when the XU distance was less than 15cm, and advanced cephalic when this distance was more than 25cm[4]. Keeping the distance from the port site to the target organ,(gallbladder) ; fixed at 3/5 of the length of the hand instruments (35cm) , with comparable ease and morbidity and no mortality(Table3), as there is no significant difference in morbidity between the patients in whom classical 4 port position were used compared with those in which advanced port sites were used accordingly

CONCLUSIONS

We recommend using this principle in the patients with extreme weight and narrow abdomen when XU is less than 15 cm or (more than 25cm), to decrease challenges of sequelle of laparoscopic cholecystectomy in these groups of patients.

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Table I; BMI in the patients of group

BMI Kg/m^2	Male patients no, & %	Female patients no, & %
28	**1**	**4**
	2.7%	**10.8%**
29	**0**	**7**
	0.0%	**18.9%**
30	**2**	**6**
	5.4%	**16.2%**
31	**2**	**7**
	5.4%	**18.9%**
32	**1**	**7**
	2.7%	**18.9%**

Table II; Abdominal dimensions in both groups

Group	A	B
Circumference at umbilical level in standing	**89-110 cm**	**60-71 cm**
Circumference at umbilical level in supine position	**82-106 cm**	**60-70 cm**
Girth Between Anterior axillary lines	**43-60 cm**	**28-38 cm**
Torso in standing position (Xiphioid process to pubic symphysis)	**28-42 cm**	**19 -28 cm**
Torso in supine position (Xiphioid process to pubic symphysis)	**37-54 cm**	**14-27 cm**
Upper half of the abdomen (Xiphioid process to pubic symphysis)	**26-35 cm**	**8--15 cm**
Lower half of the abdomen ; Umbilicus to pubic symphysis	**11-19 cm**	**10-13 cm**

Table III: Comparison of duration of operation, complications in study group and a group with normal BMI and abdominal dimensions.

	Patients included in this paper (group A & B (n=60)	Patients had normal weight and abdominal dimensions (n=306) by the same surgeon and in the same period of time	Chi-Square	Df	P-Value
Wound infection	**I (1.60 %)**	**6 (1.96%)**	**1.81**	**3**	**0.6183**
Duration of the operation From skin to skin	**30±10 minutes**	**30±9 minutes**			
Duration of hospitalization	**4-6 hours**	**4-6 hours**			
Number of patients need overnight hospitalization	**1 (1.60 %)**	**5 (1.63%)**			

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