Native Umbilical Defect for Laparoscopic Entry

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Abstract

Background: The presence of defects in native umbilical in adults and its use as laparoscopic first entry site is poorly documented. It would likely be a safer method than the Veress needle and direct trocar insertion. This work aimed to report the prevalence and size of native umbilical defects, and their relationship with gender, age and body mass index. **Methods**: In 160 consecutive laparoscopic operations, a trans-umbilical incision was made and a defect at its base was looked for. When found, the defect was measured and used as the first port entry site. Relationships of presence of native defects and their sizes in relation to gender, age and BMI were analyzed. **Results**: The prevalence of a native defect in this series was 90%. Its presence had no relation with gender, age or BMI. Its size, however, positively correlated with age and BMI. No complications were related to the defect's use for first laparoscopic entry site. **Conclusion**: A native umbilical defect is present in 90% of adults. Whenever present, it is recommended for use as the first port entry site by an open technique. This method is simple and safe and avoids unnecessarily inducing another defect.

Keywords: Laparoscopy, Open technique, Access, Native defect, Umbilical defect

Ann Afr Surg. 2020;17(3):116–119
DOI: http://dx.doi.org/10.4314/aas.v17i3.6
Conflicts of Interest: None
Funding: None

Submitted: 30 November 2019
Revised: 2 March 2020
Accepted: 29 March 2020
Online first: 29 May 2020

Introduction

At birth, the linea alba at the depth of the umbilicus has a defect. The linea alba is the passageway of umbilical vessels that connect the fetus with its placenta. The classic and long-held view is that this defect usually closes spontaneously within a week, but may take longer, up to two years; hence the dictum of not correcting an umbilical hernia before the age of two (1,2). This view was challenged by the finding of umbilical fascial defect in 25% of dissected adult cadavers (3).

It was further confronted by consistently finding even a small umbilical defect in all 94 pediatric patients ranging in age from 0.25 to 18 years, with a mean of 10 years, and by its practical use for laparoscopic entry (4). Furthermore, the same technique was later reported in 963 adult patients from Mexico, where it was found in 100% of cases who had no history of previous umbilical area surgery (5). While the use of Veress needle and direct trocar entry requires applying some force to penetrate the tough linea alba, open laparoscopy by Hasson's technique, at least theoretically, reduces entry injuries. Furthermore, using an existing defect avoids unnecessarily adding another defect. Though the latter promises more safety and speed, it is rarely and inadequately mentioned in the medical literature, to the extent that it did not get a mention in a 2019 Cochrane systematic review about laparoscopic entry techniques (6).

This work studied the prevalence and size of native umbilical defect in adults, and how its existence and size relate with age, gender and body mass index (BMI). Another aim was to document its use as a laparoscopic first entry site.

Methods

This cohort study was conducted on 160 consecutive adult patients who had laparoscopic operations at the general surgery department of Cairo University Hospitals during May–August 2017. The study protocol was

approved by KasrAlainy Research Ethics Committee and was archived using number 22110. Informed consent was obtained from all individual participants included in the study. Those who had clinically evident umbilical hernias and those with previous surgery in this region were excluded. Preoperative data were obtained on age, gender and BMI.

Operation

Under general anesthesia, a vertical trans-umbilical incision was made. The two lips of incision were dissected, revealing the linea alba where a defect, at the bottom of the umbilical scar, is looked for. In some cases, the defect was identified by the protrusion of a small piece of extraperitoneal fat that was easily distinguished visually from subcutaneous fat. As the flimsy peritoneum was reached, it was caught with fine clamps and snipped open with scissors. The defect's diameter was then calibrated with the tips of Kelly forceps (Fig. 1).

Figure 1. Tip of Kelly forceps used to calibrate maximum dimension of defect.

Whenever needed, the defect was then enlarged by dividing its upper and/or lower edges so as to accommodate the first trocar. At the end of the procedure, the defect edges were approximated with 0 polydioxanone suture.

Postoperative period

Patients were observed after the operation for possible complications, such as bleeding, intestinal injury and surgical site infection, as a result of the laparoscopic entry. They were followed up for at least six months for possible development of an incisional hernia.

Statistical analysis

Data were analyzed with SPSS version 24. Simple descriptive statistics (arithmetic mean and standard deviation) were used to summarize normal quantitative data, and frequencies for qualitative data. Chi square test was applied for relationships between gender and presence of a defect. After excluding patients with no detectable defect, independent *t*-test was applied for relationship between gender and size of defect, and between age and presence of defect. Pearson's correlation test was applied for relation between age and size of defect. Independent *t*-test was applied for relation between BMI and presence of a defect. The level of significance was set at $p < 0.05$.

Results

The patients—71 females (44.4%) and 89 males (55.6%)—ranged in age from 16 to 57 years (mean 35.06, SD±11.85). BMI ranged from 19 to 47 kg/m^2 (mean 30.95, SD ±6.3).

A defect was found during surgery in 144 patients (90%) and was used as point of first entry into the peritoneal cavity. The diameter of the defects, as measured during operation, ranged from 4 to 12 mm (mean 7.47, SD ±2.42). With 95% confidence, the population mean is between 7.09 and 7.84 (95% CI 7.09 to 7.84).

There was no statistical difference between gender and presence of a native umbilical defect, nor with its size (Table 1). Neither age nor BMI were significantly associated with the occurrence of a defect (Table 2).

Table 1. Relation between gender and presence and size of defect

	Yes		Total	
	Count (%)		Count (%)	p-value
Gender				
Male	80 (55.6)		89 (55.6)	0.958
Female	64 (44.4)		71 (44.4)	
	n	Mean	SD	p-value
Size of defect				
Male	80	7.25	2.357	0.204
Female	64	7.77	2.474	

Table 2. Correlation between age, BMI and presence of defect

Defect presence	*n*	Mean	SD	p-value
		Age (year)		
No	16	32.44	9.536	0.269
Yes	144	35.40	12.091	
		BMI (kg/m^2)		
No	16	30.06	9.263	0.609
Yes	144	31.01	6.711	

No complications were encountered as a result of using the native umbilical defect as the point of first laparoscopic port entry.

Discussion

The umbilical defect is described as the only hernia defect that is programmed to close spontaneously in childhood, usually within the first two years of life (7). Researchers unexpectedly found that an umbilical defect existed in 25% of cases (3). The widespread use of

laparoscopic surgery provided further evidence of higher incidence of a persistent native defect, particularly when making the first incision through the umbilicus. This persistent defect was found in laparoscopic procedures in 100% of pediatric patients up to 18 years (4).

Sharp laparoscopic entry is a major cause of intestinal and vascular injuries, and of litigation. Despite accumulation of experience and development of instrumentation, the number of malpractice claims remained relatively constant over this period. Entry-related complications accounted for 38% of the claims, intestinal injury being the major cause (9). Avoiding, or at best reducing, entry-related injuries drove many surgeons to use the open laparoscopy technique described by Hasson (10). In this method, the linea alba is incised under vision and the underlying peritoneum is picked up and is similarly incised under vision. The question is "If a natural fascial defect exists, why make another one?" In other words, why not use an already present easy access to the peritoneum. Evidence of the existence of a native umbilical defect in adults and of its prevalence is scarce. Furthermore, no mention is made of its size or its relation with gender, age and obesity. We conducted the current study for these reasons.

While the two clinical studies previously mentioned (4,5) claimed a 100% existence of a native umbilical defect, the current study found it in 90% of the Egyptian patients studied. The dissimilarity may be attributed to racial differences, the previous two studies having been carried out in USA and in Mexico. Another possibility arises from the finding that the smallest defects in the current study were 4 mm in diameter. As defects smaller than 4 mm were not found, it is possible that they may exist but were too small to be easily delineated. It is logical, therefore, to suspect that a persistent umbilical defect might actually be present in a larger percentage of adults. It is recommended that future studies search more diligently for smaller defects.

The found range of diameters with a mean of 7.47 mm and a median of 7 mm is convenient to pick up the peritoneum with fine forceps to make a tiny incision under vision. Once safely in the peritoneal cavity, the peritoneal incision and the fascial defect can be enlarged, if needed, in order to effortlessly accommodate the first port placement. A possible benefit of this entry site technique is that by the end of the procedure the defect is closed, and thus avoids the potential of an umbilical hernia developing in case intra-abdominal pressure rises in future, for example by ascites. The native defect would not have been closed with any of the other entry techniques.

While literature in English on the persistence of the defect is scarce, factors that may influence its presence and size were not mentioned in these papers. In the current study, factors were analyzed for these relations. Gender was chosen because of probable enlargement caused by pregnancy of an already present defect. Contrary to expectation, female gender was found to bear no relation with presence or size of defect. Similarly, neither age nor BMI were found to influence persistence of the defect. As 90% of the sample had persistent umbilical defect irrespective of gender, this approach seems suitable for use for most of the population. A further advantage is its suitability for access in cases of single incision laparoscopic surgery, which almost always makes use of an incision in the umbilicus.

In this study, access to the peritoneal cavity was universally speedy and easy. No intestinal or vascular injuries were related with entry of the first port, likely because entry was completed under vision and no force was used. However, we are unable to consider this as proof of safety as the sample size is small in relation to the low incidence of such complications. A larger sample size is needed to test this point. Incisional hernias were not observed at the umbilicus during the six-month follow-up. In addition, there were no complaints of the umbilical cosmetic appearance as the incision scar was always hidden in the depth of the umbilical scar.

Conclusions

A persistent umbilical defect was observed in 90% of the studied patients. Introduction of the first laparoscopic trocar through the native umbilical defect is a simple, safe and speedy method, and avoids inducing another defect.

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