

Ligation only versus disconnection ligation in laparoscopic inguinal hernia repair, does it make a difference?

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ABSTRACT

Background: Numerous techniques have been developed for laparoscopic inguinal hernia repair in infants and children. The internal ring ligation is the main stay of repair. Although isolated ligation is considered the simplest and fastest way of repair, yet it carries a higher incidence of recurrence and complications. The objective of this study is to compare ligation only versus disconnection ligation of the hernial sac. **Methods:** Sixty-five patients with inguinal hernia were laparoscopically treated in the period from March 2015 to May 2017 at Mansoura University Children's Hospital. Two techniques were used for repair, whether laparoscopic ligation of the internal ring (in 31 patients) or, disconnection of the sac with hook diathermy before ligation for the remaining 34 patients. Operative time, intra-operative complications, post-operative hydrocele formation, recurrence, testicular atrophy were compared. **Results:** In ligation only group, the operative time was significantly shorter (18 ± 3 minutes) and (25 ± 5 minutes) for unilateral and bilateral hernia respectively, than in disconnection ligation group (29 ± 6 minutes) and (38 ± 8 minutes). Only in the ligation only group, there were postoperative complications in the form of: hydrocele in two cases (4.6%) and recurrence in one case (2.3%). **Conclusion:** This study suggests that the ligation technique offers significant short operative time but carries a higher incidence of postoperative complications. Adding disconnection of the sac to the procedure increases the operative time but reduces the risk for complications.

INTRODUCTION

Laparoscopic treatment of congenital inguinal hernia in pediatric population is gaining increasing popularity¹. This is particularly true owing to the increasing experience, for both surgeons and anesthetists, in handling more complex procedures in such a vulnerable age group. Laparoscopic surgery provides magnification and enhanced visualization serving to achieve more precise tissue handling and minimizing tissue damage². Till now there is no standard laparoscopic procedure for hernial repair in infants and children³. Many techniques have been developed, all aiming at achieving the highest success rate with the simplest maneuver and with least tissue damage. Ligation of the internal ring alone, offers the advantage of a simpler procedure, with less instruments needed and rapid learning curve. Yet it carries the risk of higher recurrence and more operative complications⁴. In contrast, laparoscopic disconnection plus ligation of the hernial sac is more similar to the standard open repair⁵. However, it is reported to be more complex and

time consuming. Most studies address a single technique and no studies were found comparing those two techniques.⁶ The aim of this study is to compare the efficacy and technical feasibility of both techniques.

PATIENTS AND METHODS

This is a retrospective study comparing laparoscopic internal ring ligation versus the disconnection and ligation techniques for the treatment of inguinal hernia in children. It included 65 patients in the period between March 2015 till May 2017 in Mansoura university children's hospital. Patients included in the study are those who had the two target techniques. The choice of surgical technique in this study was according to the surgeon's preference and intra-operative judgment. Included patients were all above the age of one year. Patients with technical modifications or who had additional steps were excluded. Recurrent cases, conversions and those who needed muscle arch repair were also excluded from the study. All Patients were admitted to the one-day surgery unit and

discharged within 4-6 hours post-operatively. Demographic data, operative and post-operative complications were compared among groups. Operative time was calculated from the operative video recordings from the time of entrance with the scope till its exit at the end of the procedure. Patients groups were further subdivided into two subgroups of unilateral and bilateral cases for accurate comparison of operative time.

Data was expressed as number and percent, median and range for non-parametric data, or mean \pm standard deviation for parametric data. Test of normalization was done using Shapiro-Wilk test of normality. Changes in qualitative data were compared using Chi square test. Changes in continuous data were tested using independent sample t test for parametric data, while, for non-parametric data, Mann Whitney U test was used.

Operative Techniques:

Scope access and insufflation of the abdomen was made through a 5 mm umbilical port. Two lateral ports of 5 or 3mm were made through the right and left para-rectal region to achieve a triangular orientation. During the internal ring

ligation technique, intra-corporeal purse string non absorbable suture was used to close the internal ring. Suture material was whether synthetic mono-filament 4/0 or 3/0, or synthetic poly-filament 2/0. Needle size was selected according to the child's size and ring diameter. A purse-string suture was placed intracorporeally to close the ring. The needle was passed directly crossing over the spermatic vessels and vas deferens which were well visualized. The suture is then tied intracorporeally (figure 1). For the hernial sac disconnection technique, the internal ring at the proper neck was dissected with hook diathermy before ligation. Also the spermatic vessels and vas deferens were well visualized, separated and protected during dissection. The peritoneum was then closed with absorbable poly-filament purse string or figure of eight 3/0 or 4/0 suture. In girls, the round ligament was included in the sutures in both techniques. Patients were routinely discharged on the same postoperative day. All patients were evaluated routinely after 3 days, 2 weeks and 3 months.

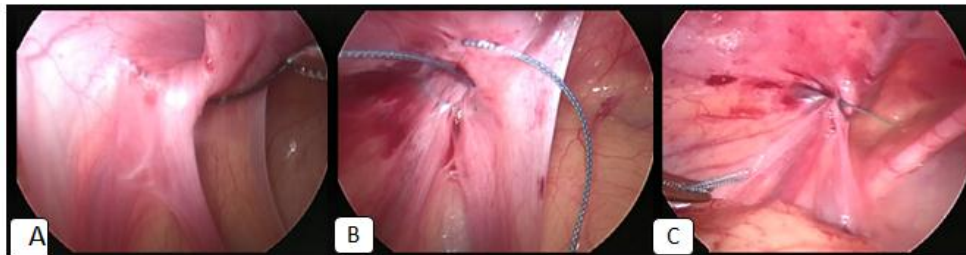


Figure 1: A: the needle sign is observed while the needle is passed over the vas and vessels, B: the suture encircling the ring C: ring is ligated.

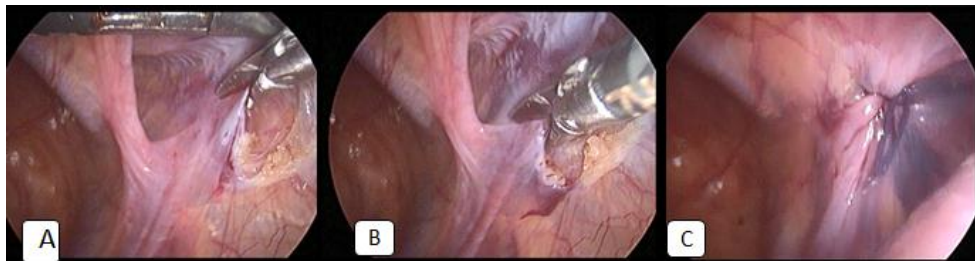


Figure 2: A and B: The Sac is incised over the vas and vessels C: the suture encircling the

RESULTS

During the period from March 2015 to May 2017, 65 patients with inguinal hernia were laparoscopically treated using either the two studied techniques. There were 49 (75.4%) males and 16 females (24.6%). There was a total of 80 indirect inguinal hernias were closed. Age of patients were ranging from 1 years to 10 years; median age of 3 years for the Ligation group (1-9 years) and 4 years in the disconnection group (1-10 years). There was no statistically significant difference as regards age in both groups. 31 patients (38 hernias) were managed by the internal ring ligation technique. 34 patients (43

hernias) were subjected to disconnection of the sac with hook diathermy before ligation. In ligation only group, the operative time was significantly shorter (18 ± 3 minutes) for unilateral and (25 ± 5 minutes) for bilateral cases, than in disconnection ligation group (29 ± 6 minutes) and (38 ± 8 minutes) respectively (Figure 2). No intraoperative complications occurred in any of the study groups. Postoperative hydrocele was reported in two cases (4.6%) and recurrence in one case (2.3%) in the ligation group. Scrotal swelling (edema) occurred in 2 cases in each group. No testicular atrophy or wound infection occurred. No conversion was required in any case (Table 1).

Table 1: Comparison between ligation only technique and disconnection ligation technique for inguinal hernia repair in children.

		<i>Ligation only technique</i> 31 (38 hernias)		<i>Disconnection and ligation</i> <i>technique</i> 34 (42 hernias)		<i>P-Value</i>
Age		3 years (1-9 years)		4 years (1-10 years)		0.461
Gender		23	8	26	8	0.873
Operative Time	Unilateral	18±3 minutes		29±6 minutes		0.005
	Bilateral	25±5 minutes		38±8 minutes		0.001
Scrotal Swelling		2 cases(4.6%)		2 cases (3.7%)		0.924
Hydrocele		2 cases(4.6%)		--		0.132
Recurrence		1 case (2.3%)		--		0.291

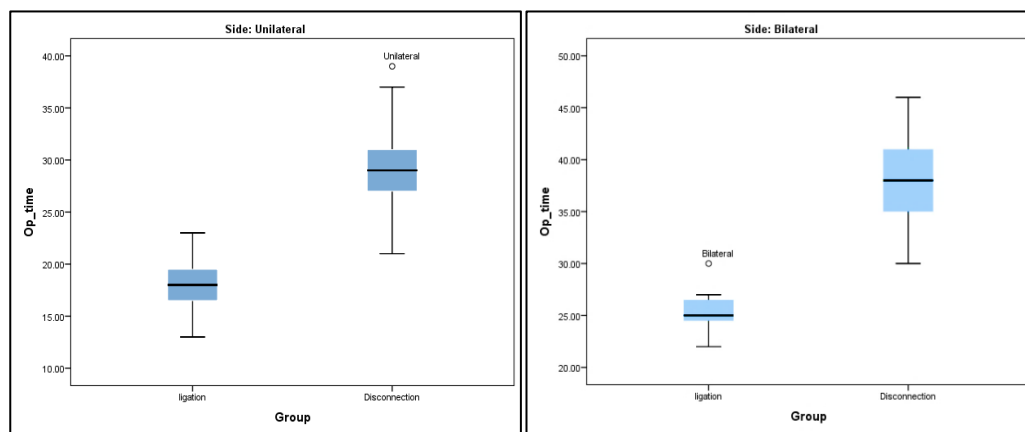


Figure 2: Operative time in Unilateral and bilateral cases

DISCUSSION

Sheir et al (2002) advocated the complete intra-corporeal internal ring ligation⁷. Recently, most of internal ring ligation techniques are done percutaneously⁸⁻¹⁴. Because of the relatively high recurrence rate, some modifications have been added to enhance scar formation and reduce recurrence, such as electrocautery of the peritoneal surface¹⁵. It has been demonstrated that ligation has to include peritoneum only and with no skip areas to avoid the vas and vessels¹⁶.

However, disconnection of the sac when added to closure to the peritoneal offers the closest resemblance to the open repair essential steps^{5,17-20}. The cause of the inguinal hernia is persistent patency of the processus vaginalis. Hence, division and disconnection of the hernia sac at the internal ring will reverse the disorder²¹. Few studies reported disconnection of the sac without ligation. These studies showed low recurrence rate with the advantage of shorter operative time²². Presumably, it is the dissection that is more effective than the ligation for repair.

For ring ligation, synthetic monofilament is commonly used for internal ring ligation. Its advantages are the ease of circumferential

placement due to its stiffness and ease of passage through tissues. However, they don't produce an inflammatory reaction to result in scar formation. Meanwhile, braided non-absorbable sutures induce an inflammatory response that results in a scar thus, improves closure and remains for enough time for the scar to be established. In contrast, ligation with the Vicryl® dissolved before a scar was able to fully develop.²³

In this study, ages ranged from 1 to 10 years. Many case series included patients in the first year of life and even neonates^{17-20,24-27}. There always has been a concern about the value of exposing such a vulnerable age group to carbon dioxide insufflation in comparison with the quicker and with a small unremarkable scar open repair.

In our study, there was a significantly shorter operative time in the ligation group, which is similar to other reports (table 1). There is extra time spent for the dissection of the sac. Different reports show a wide variation in operative time (Table 2). This can be related to the operator's experience and wide variability of the technique between centers. Non the less, it is reported to be even shorter time when the ligation of the ring is done extracorporeally¹⁰ (figure 3).

Table 2: different reports showing the operative time and rate of complications.

Author	Technique	Time (min)		Recurrence %	Hydrocele %	Atrophy %
		Unilateral	Bilateral			
El Gohary et al 1997 ²⁸	ligation	12-15	15-20	0.03	0	
Zallen & Glick 2007 ²⁹	ligation	-		0	-	
Shier, Montupet & Esposito 2002 ⁷	ligation	16/23	-	3.4	0.6	0.2
Schier 1998 ³⁰	ligation	10-55		3.7	0.7	0.2
Grosler 2003 ³¹		14/21		2.7	1.7	0.004
Oak et al 2004 ²⁹		25/35		5	1.54	
Chan 2004 ³²	ligation	--		1	-	
Chan 2005 ³³		23/34		-	0.2	
Chinnaswamy et al 2005 ³⁴		21-35	28-50	3.1	0.03	
Saranga 2007 ⁴		25-31	45-87	3	3	1.49
Becmeur et al 2004 ³⁵	Disc ligation	23-28	30-40	0	0	
Yip et al 2004 ¹⁹	Flip flap	26/38		0	3.125	
Hassan 2007 ³⁶	Flip flap	40-55		27	0	
Wheeler et al 2011 ⁵	Division ligation	34-74		0	0	

In the current study, there is 2.3% recurrence in the ligation group. That was not statistically significant when compared to the second groups with this sample size. Recurrence rate in literature ranges from 0 to 4.3%^{7,9,25,10-17}. But it's a major point of doubt in trusting the technique feasibility. Injury to the peritoneal surface at the level of the internal ring has been demonstrated on animal experiments to decrease the risk of recurrence¹⁵. This is reasonable as the intact healthy peritoneum will not adhere unless there was injury to the surface and inflammatory process to trigger healing and fibrosis. The most common site for recurrence is reported to be the medial part of the internal ring. This may be attributed to skipping part of peritoneum over the vas and vessels²⁵. There was an incidence of 4.6% hydrocele found after the ligation only technique. Other studies show a lower rate ranging from 0 to 3%^{7,10,14,18,26,38,39}. This complication is not encountered in the disconnection groups. This is similar to other studies using the same technique⁵.

Limitations:

This is a retrospective study with no randomization. Additionally, many confounding factors needs to eliminated to reveal more accurate results. For example, multiple surgeons performed surgeries which may result in variations in efficacy and speed according to their experience level. Suture material and needles were not standardized. Patients below one year of age were excluded. Preferably, a randomized controlled trail with a bigger sample can give better results.

CONCLUSION

Both techniques for laparoscopic inguinal hernia repair in children can be offered, as it is safe, and technically easy for experienced laparoscopic surgeons. This study suggests that the ligation technique offers significant short operative time but carries a higher incidence of postoperative complications. Adding dissection of the sac to the procedure increases the operative time but reduces the risk for complications.

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