KEYWORDS:
Laparoscopic hernia repair
Open herniotomy
Intracorporeal sutures
Disconnection of the hernia sac
Congenital inguinal hernia
Internal inguinal ring

Abstract: Background: Congenital inguinal hernia is one of the most common surgical diseases in children. It is estimated that over 20 million hernia repairs are performed each year worldwide. Herniotomy/open surgery has been the time honored treatment for congenital inguinal hernia. Laparoscopic surgery has recently emerged as an alternative in its management. However, controversy is present on its feasibility and wider adoption.

The aim of the study: Comparison between open and laparoscopic surgery (disconnection of the hernia sac with intracorporeal suture of proximal part) in management of congenital inguinal hernia.

Patients and methods: Prospective randomized comparative study was conducted on 60 children with congenital inguinal hernia, in General Surgery department in Qena University Hospital. They were randomized into 2 groups: Group A (30 child underwent conventional Open herniotomy), Group B (30 child underwent laparoscopic congenital inguinal hernia repair by dissection and division with intracorporeal suture repair).

Results: All cases were completed successfully. There were statistically significant differences between studied groups regarding operative time. There were significant statistical differences in the recurrence rate between the studied groups.

Conclusion: Laparoscopic inguinal hernia repair using disconnection of the hernia sac at IIR with closure of peritoneum mimic what happen with conventional open herniotomy is safe and feasible technique.

INTRODUCTION

A congenital inguinal hernia can be defined as a protrusion of intra-abdominal contents through the deep inguinal ring. The underlying abnormality leading to its development is a patent processus vaginalis. This was described by Galen in 176 AD as a ‘small off-shoot of the great peritoneal sac in the lower abdomen’ which may result in a congenital (indirect) inguinal hernia or hydrocele (1). Congenital inguinal hernia is one of the most common surgical diseases in children (2). It is estimated that over 20 million hernia repairs are performed each year worldwide. The estimated incidence of pediatric inguinal hernia ranges from 0.8 to 4 % in children and is highest in infants, especially in premature children, and decreases as children age. If left untreated, one of the major complications of inguinal hernia is incarcerated hernia. Incarcerated hernia is a pediatric emergency that can lead to intestinal gangrene and gonadal atrophy (3). The risk of incarceration in children with inguinal hernia ranges from 3 to 16 %, with highest incidence...
estimated to be 30% in premature children (3).

Herniotomy/open surgery has been the time honored treatment for congenital inguinal hernia. Laparoscopic surgery has recently emerged as an alternative in its management. However, controversy is present on its feasibility and wider adoption. The present need is to know whether a significant difference exists in the surgical outcomes following either technique (4). Initially, laparoscopy was used to examine the contralateral groin, either through the opened processus vaginalis during open unilateral herniotomy, or through placed of umbilical port (5). Recently, many centers routinely perform laparoscopic hernia repair in children and there have been numerous reports describing various laparoscopic techniques. Reported advantages of laparoscopic hernia repair include: excellent visual exposure, minimal dissection, less complications, comparable recurrence rates, and improved cosmetic results compared with the traditional open approach (6). The aim of the study comparison between open and laparoscopic management of congenital inguinal hernia as regard operative time, postoperative pain, return of bowel motility, Hospital stay, postoperative complications, cosmesis, and recurrence rate and testicular damage.

**Patients and methods:**

This prospective randomized comparative study was conducted on 60 child with congenital inguinal hernia were selected from outpatient clinic of general surgery department, in Qena University Hospital. No limitation towards sex.

**Inclusion criteria:** Child under age of 14, with congenital inguinal hernia. **Exclusion criteria:** Child with recurrent hernias. Child with previous abdominal surgery. Complicated congenital inguinal hernia.

**Methodology:** Sixty child were randomized into 2 groups: •Group A (30 child underwent conventional Open herniotomy). •Group B (30 child underwent laparoscopic congenital inguinal hernia repair by dissection and division with intracorporeal suture repair).

All patients were admitted a day before surgery. Routine investigations like pelvi_abdomenal ultrasonography, complete blood picture, Bleeding and Clotting time, Blood grouping and typing, Urine examination were performed at our center. Patients were kept on fasting for 5 hours before surgery and informed written consent from all parents was obtained.

All surgeries were performed under general endotracheal anaesthesia before induction a single shoot of prophylactic antibiotic cefotriaxone (50 mg/kg) was given.

Surgical technique:

1. Conventional Open herniotomy: the patient was placed supine, 1 inch inguinal skin crease incision. Then high ligation of the sac was performed using 4′0/3′0 absorbable (Monocryl) suture at prober neck of the sac. The distal sac was slit to prevent postoperative hydrocele formation. The wound was closed in layers, using absorbable suture.

2. Laparoscopic technique: the patient was placed supine in Trendelenburg's position. Insertion of the main umbilical port by open method was done, then pneumoperitoneum was created to a pressure of 8-12 mmHg. Two 3-mm ports, for working instruments, were inserted vision at the lateral border of both recti at the level of the umbilicus (fig 1). Laparoscopy [5-mm thirty-degree telescope] was used for initial visualization of the pelvis and internal inguinal ring on both sides, the peritoneum is incised lateral to internal inguinal ring and disconnected circumferentially by careful sharp dissection and to protect the vas and vessels, the peritoneum at IIR was sharply incised circumferentially (Fig 2, 3). This was achieved by lifting the peritoneum between the vas and vessels and making a small nick. This opening was gently widened, and the vas and vessels were
swept away under direct vision. To ensure that the vaginalis process was completely sectioned, we pulled on it. The distal part of the sac is partially resected or dropped in the inguinal canal and the peritoneum closed by a nonabsorbable suture (Fig.4). No electrocautery was used in the immediate vicinity of the vas and vessels. Then the proximal part of the disconnected peritoneum was sutured intracorporeally using non-absorbable prolene 3-0 suture. The suture needle was introduced into the peritoneal cavity by directly puncturing the lower abdominal wall. Then supraumbilical incision was closed with polyglycolic acid 3-0 suture after deflation of the abdomen and steri-strip was applied on 3-mm port sites.

Post-operative analgesia:
Diclofenac sodium 1mg/kg was given 8th hourly orally. Patients were maintained in inpatient ward for 1 day post-operative.

Evaluation:
Patients were evaluated clinically at outpatient clinic weekly for 1 month. They were evaluated after 6 months postoperative. Evaluation and follow up were for return of bowel motility, hospital stay, early complications post-operative as wound infection, early recurrence and late post-operative complications as cosmesis, scrotal oedema, hydrocele or recurrence.

Statistical Analysis:
- Analysis of data performed by Statistical Package for Social Sciences (SPSS) as follows:
  1- Description of quantitative data as mean and Range.
  2- Description of qualitative data as number.
  3- R-test (correlation co-efficient) is used to rank different parameters against each other either direct or indirect. P value > 0.05 is considered non-significant (NS and P value <0.05 is considered significant S).
**Results:**
This study was conducted on 60 patients at the general Surgery Department, Qena University Hospitals, Qena, Egypt. Sixty patients were divided into 2 groups; Group I included 30 patients (22 male +8 female) underwent open herniotomy, Group II included 30 patients (22 male +8 female) underwent laparoscopic repair. The demographic data of all patients is shown in table 1. There were no significant differences in the age and mode of presentation between the studied groups.

All cases were completed successfully without conversion. There were statistically significant differences between studied groups regarding operative time. In Group I, the mean duration for surgery was 20.42±1.78 min, ranged between (17-25) min for unilateral cases, and 24.68±2.58 min, ranged between (19-30) min for bilateral cases, while in Group II it was 27.68±2.58 min, ranged between (19-45) min for unilateral cases, and 47.00±0.00 min, (28-47) min for bilateral cases. There were no statistically significant differences between groups regarding intraoperative complications. No intraoperative complications were reported in both groups during this study except 3 cases of intraoperative bleeding (hematoma) in group I which controlled by hemostatic measures (diathermy).

There were significant statistical differences in the recurrence rate between the studied groups, two cases in Group II developed recurrence during the follow up period while no recurrence was reported in Group I. In the two studied groups, no testicular atrophy or iatrogenic ascent of the testis among male patients was reported during the period of follow up.

There were statistically significant differences between groups regarding scrotal edema formation. In Group I, 7 cases which was resolved spontaneously within 2 months, on the other hand in Group II only no cases developed scrotal edema. There were statistically significant differences between groups regarding wound infection. In Group I, 8 cases which was resolved spontaneously. On the other hand in Group II only no cases developed wound infection.

There were no significant differences in the return of bowel movement and hospital stay between the studied groups except one case in Group I late bowel return occurred which resolved spontaneously.

**Discussion:**
The standard surgical treatment for inguinal hernia, in children, is limited to ligation of the hernia sac at the IIR without narrowing the ring (7). The IIR normally is reached by dissecting the hernia sac from the cord structures. Open inguinal hernia repair is an excellent method of repair in the pediatric population. However, it has the potential risk of injury of the spermatic vessels and vas deferens, hematoma formation, wound infection, iatrogenic ascending testis in small number of cases, testicular atrophy, and recurrence of hernia (8). The advantage for laparoscopy in inguinal hernia repair is to approach inguinal hernias in children from the site of origin leaving the outer anterior abdominal wall intact. The laparoscopic approach is rapidly gaining popularity with more and more studies validating its feasibility, safety, and efficacy (9). A variety of laparoscopic techniques have been introduced in the past two decades such as the Z type suture, W-type suture, flip-flap techniques, subcutaneous endoscopically assisted ligation of IIR, etc (10).

The oldest, most widely practiced laparoscopic technique is intracorporeal suturing of the IIR using 3-ports (11). Further, technical refinements have led to the emergence of newer techniques, such as subcutaneous SEAL and percutaneously Endo-needle, Prasad technique, and others for closure of IIR. However, some of these new techniques are associated with a high recurrence rate and development of...
granuloma, infection, and skin puckering at the site of a subcutaneously placed knot (12).

However, these methods are technically similar in that herniotomy, which is a vital step of conventional herniorrhaphy, is not performed. Most previous laparoscopic techniques focused on the ligation of the internal ring leaving the sac intact without herniotomy; some of them focused on the ideal method of complete ligation of the internal ring. Takehara et al believe that the high recurrence rate and postoperative hydrocele formation of these laparoscopic techniques are mostly due to not performing herniotomy and ligation of the IIR leaving the sac intact without herniotomy (13).

Laparoscopic hernia repair in children is known to take longer operative time than open herniotomy. Many reports showed that it ranged from 25 to 74 minutes (14). However, the operative time is reduced gradually with advancing the learning curve (11).

In the current study, the operating time, in group I was 20.42±1.78 minutes for unilateral case and 43.67±1.15 minutes for bilateral case, in group II it was 24.68±2.58 minutes for unilateral case and 47.00±0.00 minutes for bilateral case. There was significant difference regarding the operating time between the 2 groups. In the study of Tam et al. who did laparoscopic hernia repair using the hook method in 433 children the mean operating time was 23.8 minutes (7).

Post-operative complications: Early follow up was done within 2 weeks after the procedure. In group I, postoperative scrotal edema developed in 7 cases but resolved conservatively without surgical intervention within 3 weeks. In group II postoperative scrotal edema didn’t appear in any case. Post-operative scrotal edema and hematoma are acceptable complications after hernia repair as they resolve spontaneously. Shalaby et al reported that 4% of their cases developed scrotal edema and were treated conservatively without surgery (15). In the study of Tam et al. postoperative scrotal edema also was reported (1%) and was treated non-surgically (16).

Recurrence rate after LHR in many series is from 0.7% to 4.5%. In the current study recurrence of hernia on the same side was reported in two cases in Group II after 24 months follow up, no recurrence was reported in Group I. Regarding postoperative recurrence, purse string suturing after hernia sac disconnection showed that it is less effective than open herniotomy may be due to less experience. Becmeur et al performed the disconnection of hernia sac in 82 patients. After 6 months follow up no recurrences were reported in his study. They stated that laparoscopic disconnection of the hernia sac reproduces every step of the conventional operation: dissection, division, and suture of the processus vaginalis at IIR (17).

In laparoscopic disconnection of the hernia sac, the vas and spermatic vessels are dissected safely at the level of the IIR where these elements are easier to spare from the peritoneum. Finally, the current study showed that disconnection of the hernia sac at the IIR is an important step in preventing both post-operative wound infection and hydrocele formation. These results are comparable to different series that performed disconnection of the hernial sac, also it helped in diagnosis of many cases with bilateral hernia and was diagnosed as unilateral hernia radiological and clinical pre-operative (18).

Conclusion: Laparoscopic inguinal hernia repair using disconnection of the hernia sac at IIR with closure of peritoneum mimic what happen with conventional open herniotomy is safe and feasible technique. It resulted in both low recurrence rate and low hydrocele formation with no risk of injury to the vas and vessels. Whenever we are going to perform laparoscopic hernia repair in pediatric age group, it is recommended to do it by disconnection of the hernia sac.
rather than open herniotomy as it is effective and safe with added advantages of laparoscopy in diagnosis of contralaterality of the congenital inguinal hernia.

References: