

# Comparing Post-operative Scrotal Oedema and Surgical Site Infection Between Open and Laparoscopic Hernia Repair in Children: Update from Literature Reports

## Abstract:

**Background:** One of the most frequent surgical disorders in newborns and kids is inguinal hernia. However, there is a debate regarding the advantages of laparoscopic herniorrhaphy (LH) versus traditional open herniotomy (OH).

**Aim of the Study:** The aim of this review is to analyze the current literature to assess the outcome of LH compared with OH regarding postoperative scrotal edema and surgical site infection.

**Results:** We reviewed the publications that were published between January 2011 and December 2020. The retrieved publications were analysed included more than 100 studies then concentrate on 30 review. Our study showed that the laparoscopic hernia repair group had significantly lower incidence of postoperative scrotal oedema as compared with the open repair group. At the same time, laparoscopy has a superiority over conventional hernia repair according to surgical site infection.

**Conclusions:** Our findings indicated that laparoscopic hernia repair is preferable to open herniotomy as the LH has significantly lower scrotal oedema incidence and lower SSI.

**Key words:** Laparoscopic, repair, pediatric, herniotomy, Inguinal hernia

## Introduction

Surgical wound classification is an important measurement of quality of care and is the foundation for infection risk assessment often influencing perioperative protocols and surgical decisions (1). Surgical site infection are associated with significant morbidity, additional use of antibiotics, antibiotic resistant pathogen growth, potential for additional surgery, and lead to longer hospitalisation, all of which increase the burden on healthcare resources as all these results in higher cost. (2, 3).

The most common method of treating inguinal hernias in children is open surgery, but laparoscopic surgery is now more frequently employed in clinical settings. (4)

The incidence of pediatric inguinal hernia ranges from 0.8 to 5% and increases to more than 30% in preterm born infants. (4, 5)

Treatment is necessary because of the risk of incarceration of bowel, testis, or ovary, which occurs in approximately 3–16% of children with inguinal hernia.<sup>(4, 6)</sup>

Although paediatric surgeons conduct inguinal hernia repairs the most frequently, there is still debate over which approach open or laparoscopic is best for children who need inguinal hernia repairs.

The International Pediatric Endosurgery Group (IPEG) conducted a review of all available data on minimal access techniques for treating paediatric inguinal hernias in 2016 and came to the conclusion that laparoscopic hernia repair was less invasive, required less time to perform, and had fewer postoperative complications than open surgery<sup>(7)</sup>

Nevertheless, there are very few studies that provide level Ia proof. In addition, several outcome criteria remain unaddressed.<sup>(8)</sup>

As a result, there is still ongoing discussion regarding the best approach. There is insufficient proof that one treatment strategy is better than the other. In this study, we reviewed the literature to provide an evidence for the postoperative SSI and postoperative scrotal oedema to be assessed between both approaches as primary outcome.

## **Materials and Methods:**

We reviewed the English literature for consideration of our inclusion criteria based on title and abstract screening for patients less than eighteen years old underwent laparoscopic or open inguinal hernia repair. The articles are restricted in English language, Published from January 2011 till December 2020 and full article is available.

### **Data retrieval:**

Studies came from trusted sources were considered and evaluated, such as:

- ❖ **Medline:** a) PubMed clinical queries, b) PubMed quick search box.
- ❖ **Cochrane library**

We found more than 100 articles published between 2011 and 2020 and only 30 studies are included.

### **We reported data and analyzed the following outcomes regarding:**

1. Wound or surgical site infection (SSI)
2. Postoperative scrotal edema or swelling

## Ethical approval

None of the authors of this article did any experiments on human subjects. Secondary data from studies that have already been published was utilised. The institutional review board of Tanta University Hospital approved this study.

## Results

### Findings from a literature review:

For this review, there were 2777 total results from the searches then 100 studies were assessed and then 30 studies remained.

### Outcomes data reported in individual studies and analyzed in our study

1. Wound or surgical site infection (SSI).
2. Scrotal edema or swelling.

**Table (1): Data outcomes reported studies included in this review:**

Studies included in our review	Wound/SSI				Scrotal edema /swelling			
	LHR		OHR		LHR		OHR	
	N	T	N	T	N	T	N	T
30	116	25064	401	61316	10	1788	92	2852

Where: N: Number of cases; T: Total number of patients; LHR: Laparoscopic Hernia Repair; OHR: Open Hernia Repair.

### Literature review of the evaluated 30 studies showed:

Results of analysis of post-operative wound infection among inguinal hernia cases underwent laparoscopic versus open repair :

Showed 116 cases developed SSI out of 25064 patients underwent laparoscopic hernia repair which represent a percentage 0.46% , on the other hand there was 401 cases developed SSI out of 61316 patients underwent open hernia repair which represent a percentage 0.65%. As a result, studies showed significant reduction in the risk of postoperative wound infection among patients who underwent laparoscopic hernia repair as compared to the open hernia repair group.



Results of analysis of post-operative scrotal oedema among inguinal hernia cases underwent laparoscopic versus open repair:

Showed 10 cases developed post-operative scrotal oedema out of 1788 patients underwent laparoscopic hernia repair which represent a percentage 0.56% , on the other hand there was 92 cases developed post-operative scrotal oedema out of 2852 patients underwent open hernia repair which represent a percentage 3.22%. As a result, studies showed significant reduction in the risk of post-operative scrotal oedema among patients who underwent laparoscopic hernia repair as compared to the open hernia repair group.

## DISCUSSION

The most frequent procedure that paediatric surgeons still do is the treatment of inguinal hernias. It affects 0.8% to 4.4% of all children, with premature babies having a greater incidence (up to 30%).<sup>(9)</sup> Conventional open treatment of an inguinal hernia has become the preferred procedure Due to its decreased morbidity, good cosmetic results, and lower recurrence rates. However, laparoscopic inguinal hernia repair (LIHR) has been used as an alternative method in paediatric surgery. There have been a number of approaches published where total endoscopic or endoscopic assisted operations were used in conjunction with extra or intracorporeal knotting, high ligation, with or without internal ring dissection.<sup>(10)</sup> Some authors described a procedure that successfully disconnects the hernia sac with peritoneum closure, comparable to an open repair.

In terms of the risk of postoperative surgical site infection, patients who underwent laparoscopic hernia repair as compared to the open hernia repair group showed a negligible reduction in risk. Many literature studies on postoperative surgical site infection evaluated the surgical site infection whether open or laparoscopic.<sup>(5, 11-15)</sup>

These findings are correlated to the results of Yang et al., who found no appreciable differences between patients who underwent laparoscopic hernia repair and those who underwent open hernia repair in terms of the incidence of hydrocele, wound infection, scrotal edoema, erythema.<sup>(16)</sup>

In our opinion, the fact that laparoscopic scars are positioned higher on the abdomen wall than inguinal scars, which are located inside the body, may be the cause of the increased wound infection rate following OH. This hypothetical point means that ports insertion in LH away from napkin and inguinal area minimize the SSI incidence.

Regarding post-operativel scrotal oedema:

In our study, we discovered that patients who underwent laparoscopic hernia surgery as opposed to the open hernia repair group had a much lower probability of developing postoperative

scrotal edoema.<sup>(5, 12)</sup> This is probably attributed to less tissue trauma and minimal dissection resulting in less tissue reacting and lower local oedema represented by scrotal oedema.

Seranga et al. noted modest scrotal oedema in 2 instances after OS, but it went away on its own within a few days.<sup>(17)</sup>

Overall, post-operative scrotal oedema is common after inguinal surgeries, but it normally goes away on its own over time and disappears spontaneously by conservative treatment.

## CONCLUSION:

In pediatrics, inguinal hernias are treated via open herniotomies as well as laparoscopic hernia surgery.

Our study after assessing all the data and looking at earlier literature reports that examined various types of procedures for the therapy of inguinal hernia in pediatrics:

The literature data supported the advantages of laparoscopic hernia repair over conventional surgery in terms of lower incidence of post-operative scrotal oedema and SSI development.

## REFERENCES

1. Devaney L, Rowell KS. Improving surgical wound classification--why it matters. *Aorn j*. 2004;80(2):208-9, 12-23.
2. Monahan M, Jowett S, Pinkney T, Brocklehurst P, Morton DG, Abdali Z, et al. Surgical site infection and costs in low-and middle-income countries: A systematic review of the economic burden. *PLoS one*. 2020;15(6):e0232960.
3. Badia J, Casey A, Petrosillo N, Hudson P, Mitchell S, Crosby C. Impact of surgical site infection on healthcare costs and patient outcomes: a systematic review in six European countries. *Journal of Hospital Infection*. 2017;96(1):1-15.
4. Zhu LL, Xu WJ, Liu JB, Huang X, Lv ZB. Comparison of laparoscopic hernia repair and open herniotomy in children: a retrospective cohort study. *Hernia*. 2017;21(3):417-23.
5. Liu J, Wu X, Xiu W, Hao X, Zhao J, Wei B, et al. A comparative study examining laparoscopic and open inguinal hernia repair in children: a retrospective study from a single center in China. *BMC Surg*. 2020;20(1):244.
6. Shibuya S, Miyazaki E, Miyano G, Imaizumi T, Mikami T, Ochi T, et al. Comparison of laparoscopic percutaneous extraperitoneal closure versus conventional herniotomy in extremely low birth weight infants. *Pediatr Surg Int*. 2019;35(1):145-50.
7. Duh YC, Chang PC, Huang H, Fu YW, Hsu YJ, Wei CH, et al. Single-site laparoscopic burnia for inguinal hernias in girls: comparison with open repair. *Surg Endosc*. 2021;35(1):471-5.
8. Celebi S, Uysal AI, Inal FY, Yildiz A. A single-blinded, randomized comparison of laparoscopic versus open bilateral hernia repair in boys. *J Laparoendosc Adv Surg Tech A*. 2014;24(2):117-21.
9. Kumar A, Ramakrishnan T. Single port laparoscopic repair of paediatric inguinal hernias: Our experience at a secondary care centre. *Journal of minimal access surgery*. 2013;9(1):7.
10. Bharathi RS, Arora M, Baskaran V. How we "SEAL" internal ring in pediatric inguinal hernias. *Surg Laparosc Endosc Percutan Tech*. 2008;18(2):192-4.
11. Ho IG, Ihn K, Koo EJ, Chang EY, Oh JT. Laparoscopic repair of inguinal hernia in infants: Comparison with open hernia repair. *J Pediatr Surg*. 2018;53(10):2008-12.

12. Amano H, Tanaka Y, Kawashima H, Deie K, Fujiogi M, Suzuki K, et al. Comparison of single-incision laparoscopic percutaneous extraperitoneal closure (SILPEC) and open repair for pediatric inguinal hernia: a single-center retrospective cohort study of 2028 cases. *Surg Endosc*. 2017;31(12):4988-95.
13. Miyake H, Fukumoto K, Yamoto M, Nouso H, Kaneshiro M, Nakajima H, et al. Comparison of percutaneous extraperitoneal closure (LPEC) and open repair for pediatric inguinal hernia: experience of a single institution with over 1000 cases. *Surg Endosc*. 2016;30(4):1466-72.
14. Chu CB, Chen J, Shen YM, Liu SJ, Sun L, Nie YS, et al. Individualized treatment of pediatric inguinal hernia reduces adolescent recurrence rate: an analysis of 3006 cases. *Surg Today*. 2020;50(5):499-508.
15. Steven M, Carson P, Bell S, Ward R, McHoney M. Simple Purse String Laparoscopic Versus Open Hernia Repair. *J Laparoendosc Adv Surg Tech A*. 2016;26(2):144-7.
16. Yang C, Zhang H, Pu J, Mei H, Zheng L, Tong Q. Laparoscopic vs open herniorrhaphy in the management of pediatric inguinal hernia: a systemic review and meta-analysis. *J Pediatr Surg*. 2011;46(9):1824-34.
17. Saranga Bharathi R, Arora M, Baskaran V. Pediatric inguinal hernia: laparoscopic versus open surgery. *Jsls*. 2008;12(3):277-81.