

The Incidence of Inguinal Hernia among Children

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ABSTRACT

Objectives: The aim of this study was to document clinical features of inguinal hernia (IH) in the pediatric populace. It delivers data to assess related risk factors of incarcerated hernia, its reappearance in addition to the occurrence of contra lateral metachronous hernia.

Materials and Methods: We report a retrospective analytic study comprising 230 children presenting with IH and operated from April 2015 to June 2017 in the pediatric surgery department, King Abdulaziz Hospital.

Results: We managed 36 girls (15.6%) and 194 boys (84.4%). The mean age was 3 years; The median age in the studied group was 3 years (range 22 days to 12 years). Males were predominantly affected (84.4%, n = 194). The rate of IH was more important in the youngest group (age < 2 years); thus, we accounted 43.5% (n = 100) infants. The cumulative incidence of hernia in the 2–6-year age group was 34.7% (n = 80). Thirteen percent (n = 31) of these patients presented with an incarceration mostly on the right side (62.6%, n = 154). We recognized that the total rate of incarcerated hernia incidence in premature group was evaluated at 27%. This rate was high, particularly in neonates and infants. Prematurity and hypotrophy were documented in 9% and 7% respectively. The mean follow-up period was 3.8 years. We think that incarceration can be related to several risk factors such as feminine gender, prematurity, and the initial left side surgical repair of the hernia.

Conclusion: IH occurs mainly in male infants. Prematurity and male gender was identified as risk factors of incarceration. Contralateral metachronous hernia was reported, especially in female infants and after a left side surgical repair of the hernia.

Keywords: Children, inguinal hernia, recurrence, surgery.

INTRODUCTION

Inguinal hernia (IH) is the most common surgical condition of childhood, affecting 1%–2% of mature infants and up to 30% of premature infants^[1].

One of the major complications of IH is incarcerated hernia. The risk of incarceration in children with IH ranges from 3% to 16%, with the highest incidence estimated to be 30% in premature children^[2].

In the present study, we reviewed 230 children to evaluate clinical features of IH in the pediatric population and to evaluate associated risk factors of incarcerated hernia, its recurrence as well as the occurrence of contralateral metachronous hernia.

MATERIALS AND METHODS

We reported a retrospective analytic study comprising 230 children presenting with IH and operated from April 2015 to June 2017 in the

pediatric surgery department, King Abdulaziz Hospital.

Data were collected through a standardized form including age at surgery, circumstances of surgery (incarcerated or not incarcerated), hernia side, the occurrence of metachronous hernia, and postoperative complications. Patients presenting with crural hernia or undescended testis with a surgical repair of a persistent peritoneal-vaginal duct were excluded from the study. Children were managed by herniotomy with direct inguinal method consistent with Forgue technique.

The so-called Barker artifice was performed in all female infants to repair the round ligament. Statistical analysis was performed using Excel Microsoft office 2013 (codenamed office 15), and variables were compared with Chi-squared test.

The study was done according to the ethical board of King Abdulaziz university.

RESULTS

Demographic data of the studied population are detailed in Table 1.

Table 1: Demographic data of all patients

Number of patients	230
Age Range	1-12 years
Mean Age	3
Gender (%)	
Male	194 (84.4%)
Female	36 (15.6%)
Different age groups	
Neonates	3,7
Infants	43,5
2-6 years	34,8
6-12 years	17,8
Comorbidities	
Prematurity	9,0
Hypotrophy (birth weight < 2KG)	7,0
Hernia Presentation (%)	
Asymptomatic reducible hernia	85,0
symptomatic and irreducible hernia	15,0
Hernia side (%)	
Right sided hernia	154 (62.6%)
Left sided hernia	76 (30.8%)
Bilateral hernia	16 (6.5%)

The median age in the studied group was 3 years (range 22 days to 12 years). Males are predominantly affected (84.4%, n = 194). The rate of IH was more important in the youngest group (age < 2 years); thus, we accounted 43.5% (n = 100) infants. The cumulative incidence of hernia in the 2–6-year age group was 34.7% (n = 80).

Thirteen percent (n = 31) of these patients presented with an incarceration mostly on the right side (62.6%, n = 154). We recognized that the total rate of incarcerated hernia incidence in premature group was evaluated at 27%. This rate was high, particularly in neonates and infants. Prematurity and hypotrophy were documented, respectively, in 9% and 7%. Uncomplicated IH was treated with an elective surgical repair. Once diagnosed, timing of herniotomy for asymptomatic hernia ranged from 1 to 5 weeks in our group study.

Regarding infants presenting with incarcerated hernia, a manual attempt of hernia reduction, rendering to Taxis technique, was successfully done in most cases. Otherwise, after an intrarectal administration of a muscle relaxant medication such as midazolam at the dose of 0.3 mg/kg, a

gentle precision led consequently in most cases to hernia reduction.

Nonetheless, we documented two infants who were presenting initially as an emergency (irreducible hernia), those cases had undertaken an emergency operation. Thus, there was an intestinal ischemia, but intestinal resection was not necessary. Patients achieved postoperatively full recovery.

Herniotomy, for incarcerated hernia that could be reduced according to “Taxis,” was performed within 72 h. All hernia repairs were carried out under general anesthesia. The surgeon was a specialist senior in 136 cases (59.1%) versus a resident in 93 cases (40.4%). The mean operation timing was 22 min (range: 12–138 min). On surgical exploration, there were particularities in young females; commonly, the hernia sac is freed, and once the surgeon is assured that the sac does not comprise any ovarian or intestinal content, it is closed. In the present study group, we found an ovarian content in 7%, intestinal content in 2%, bladder corn in 1%, and fallopian tube in 1%. All patients received postoperative pain relief in addition to postoperative surgical wound care. The mean follow-up period was 3.8 years.

Postoperative complications were recognized. Consequently, we reported a postoperative peritonitis, as a result of bowel perforation, in one child who subsequently needed an intestinal resection-anastomosis. The patient recovered well. An abdominal distension with a good spontaneous recovery was likewise documented in one case. We reported one case of recurrence, for unilateral herniotomy within 11 months postoperatively. Recurrence on the opposite side occurred in 8 patients (3.5%). Most of them were female infants who were primarily operated on the left side with 7.8% versus 2.9% (in males).

The statistical study is detailed in Table 2. In fact, risk factors of incarceration identified in this study were essentially: Prematurity, male gender in addition to age <2 years. Hernia recurrence was not related to patient age, recurrence on the operated side was much more observed in males, and we noted a significant statistical relation between recurrence and trainee surgeons (P = 0.017). Consequently, cases of recurrence were noted essentially when the surgeon is a resident. Nevertheless, risk of hernia recurrence on the opposite side was significantly high in females and was not age specific. We found that the statistical relation between prematurity and postoperative complications was not significant with P = 0.068.

Table 2: Statistical relations between the studied variables

Significant variables	P	Nonsignificant variables	P
Prematurity and incarceration	0.0007	prematurity and postoperative complications	0.068
Male and incarceration	0.017	Age <2 years and recurrence	0.75
Age <2 years and incarceration	0.028	Age <2 years and contralateral recurrence	0.29
Male and recurrence	0.008		
Female and contralateral recurrence	0.019		
Recurrence when the surgeon is a resident	0.011		

DISCUSSION

From the present study, the cumulative incidence of IH was 12%, and this rate was higher than that quoted in the literature with an occurrence of approximately 0.8%–4.4%^[3,4]. The male-to-female ratio of 5/1 noted in this article agrees with that reported in the literature (3/1–10/1) as does the higher occurrence of right-sided occurrence^[4]. Else, in pediatrics survey and in regards to **Nataraja and Mahomed^[5] and Ron *et al.*^[6]** the hernia incidence in children is closely allied to age and the risk is mainly increased in children under 2 years of age.

Published data acknowledged that levels of prematurity and dysmaturity were encompassed between potential risk factors of IH^[7,8]. In reality, prematurity in the present study was assessed at 8%. The indication for the optimal administration of IH in premature infants was not well recognized in our department. In these fragile newborns, we believed that surgical repair might expose them to high risk of perioperative and postoperative complications. Consequently, we were reluctant toward preventable emergency operations to diminish potential surgical and anesthetic complications. That made us adopt elective surgical repair. Reported survey data designated the eventual minor risk of IH development in females as compared to males with an occurrence of 1.9%^[7]. In the present study, we reported an occurrence of 15% versus 85% in males.

Once IH diagnosis in a female is made, repair ought to be carried out on time as

incarceration arises in the 1st year of life. Reduction of an incarcerated ovary is not as crucial as a reduction of incarcerated intestinal loop, nonetheless, it ought to be done at the earliest^[7]. Bilateral exploration in all female patients has been suggested by some authors. Nonetheless, routine contralateral exploration was felt unjustified since only 10% of children with unilateral repair consequently developed a contralateral hernia^[9]. In this series, any contralateral herniotomy was systematically done.

Incarceration ensued in 12% at a mean age of 1.5 years, commonly in boys and mostly on the right side^[4]. The incidence of complicated IH has been documented in about 30% of cases in the age group under 2 months^[10]. Stylianos *et al.*^[11] designed to evaluate the occurrence of incarcerated IH in their series and they concluded that 85% of incarceration occurred before the 1st birthday. However, our analysis verified that complication occurred in 31 patients (13.5%), about one-third of strangulation were noted in children under 1 year old, 28% were premature. We likewise reported that the risk of incarceration decreased with age. For this group of patients, we endeavored a manual reduction; it led commonly to the hernia reduction. Herniotomy was then carried out within 72 h. As stated in the literature, for children who presented with incarcerated hernia, early surgical intervention is indicated as a result of high re-incarceration rates^[2]. Reports exist with regard to the relationship between prematurity and incarcerated IH. Our results found a significantly higher rate of incarcerated hernia in premature children (with significant P value). These findings were compatible with early reports which revealed that incarceration was mostly encountered in preterm infants with a relatively high rate of 30%^[4].

Erdogan *et al.*^[12] stated that the occurrence rate of hernia strangulation in premature children was 9.6% versus 5.9% in full-term children. As stated by the Canadian Paediatric Surgeons Guideline^[13], there were recommendations for optimal timing of surgical hernia repair. It was stated that surgical administration ought to be performed 1 week after the diagnosis. Else, numerous studies described that the risk of incarceration doubles after a prolonged delay^[14].

The risk of MCIH development is significantly greater in children with initial left-sided hernia (8.5% vs. 3.3%). Additional risk factors might well comprise female gender (8.2 vs. 4.1%) and young age (<1 year) (6.9% vs. 4.5%)^[15]. Even though our series showed that a girl

with an hernia on the left side had 7% chance of developing an opposite-side hernia on her right side (which was not age related), the fact that 7.7% of girls ever developed an opposite side hernia lead us to conclude that routine contralateral exploration was not indicated. Much controversy about contralateral exploration continues to exist from many authors^[4].

The recurrence rate in the present series was 0.4%, and it occurred within 12 months postoperatively. It was recognized, particularly in cases that were treated by a resident and not a senior surgeon. Our recurrence rate falls between other reports in the literature of 0% and 3.8%^[4]. We believe that recurrences arose because of the dissolvable suture utilized for the high ligation of the sac which dissolved early or as a result of the sac being completely missed, incompletely repaired, or not being ligated high enough.

Lately, some authors adopted a laparoscopic technique as a substitute to the open procedure. Laparoscopic repair provides an excellent visual exposure. It is able to allow better evaluation of the contralateral side as well as minimal dissection to prevent vas deferens and spermatic vessels, bladder injuries, and iatrogenic ascent of the testis. Furthermore, the well-known excellent cosmetic results of this approach encourage authors to apply this technique extensively in pediatrics^[16]. Moreover, transinguinal laparoscopic exploration can be utilized for identification of contralateral IHs in pediatric patients; this technique proved to be safe and efficient that some surgeons recommend to use it routinely^[17].

CONCLUSION

IH arises mostly in males < 2 years old. Prematurity and hypotrophy are described as risk factors of IH. Premature males ought to be promptly treated due to the high risk of incarceration. Metachronous IH happens basically in females; consequently, laparoscopic technique can be useful to detect contralateral hernia with better cosmetic results. We recommend likewise that the resident ought to be assisted by a senior to prevent postoperative complications such as hernia recurrence.

REFERENCES

1. **Timberlake MD, Herbst KW, Rasmussen S, Corbett ST(2015):** Laparoscopic percutaneous inguinal hernia repair in children: Review of technique and comparison with open surgery. *J Pediatr Urol.*,11:262.e1-6

2. **Chang SJ, Chen JY, Hsu CK, Chuang FC, Yang SS (2015):** The incidence of inguinal hernia and associated risk factors of incarceration in pediatric inguinal hernia: A nation-wide longitudinal population-based study. *Hernia*,30:1-5.
3. **Pan ML, Chang WP, Lee HC, Tsai HL, Liu CS, Liou DM et al.(2013):** A longitudinal cohort study of incidence rates of inguinal hernia repair in 0 to 6 year-old children. *J Pediatr Surg.*,48:2327-31.
4. **Ein SH, Njere I, Ein A(2006):** Six thousand three hundred sixty-one pediatric inguinal hernias: A 35-year review. *J Pediatr Surg.*,41:980-6.
5. **Nataraja RM, Mahomed AA(2011):** Systematic review for paediatric metachronous contralateral inguinal hernia: A decreasing concern. *Pediatr Surg Int.*,27:953-61.
6. **Ron O, Eaton S, Pierro A(2007):** Systematic review of the risk of developing a metachronous contralateral inguinal hernia in children. *Br J Surg.*,94:804-11.
7. **Lee SL, Gleason JM, Sydorak RM (2011):** A critical review of premature infants with inguinal hernias: Optimal timing of repair, incarceration risk, and postoperative apnea. *J Pediatr Surg.*,46:217-20.
8. **de Goede B, Verhelst J, van Kempen BJ, Baartmans MG, Langeveld HR, Halm JA et al.(2015):** Very low birth weight is an independent risk factor for emergency surgery in premature infants with inguinal hernia. *J Am Coll Surg.*,220:347-52.
9. **Chawla S(2001):** Inguinal hernia in females. *Med J Armed Forces India.*,57:306-8.
10. **Aboagye J, Goldstein SD, Salazar JH, Papandria D, Okoye MT, Al-Omar K et al.(2014):** Age at presentation of common pediatric surgical conditions: Reexamining dogma. *J Pediatr Surg.*,49:995-9.
11. **Stylianou S, Jacir NN, Harris BH(1993):** Incarceration of inguinal hernia in infants prior to elective repair. *J Pediatr Surg.*,28:582-3.
12. **Erdogan D, Karaman I, Aslan MK, Karaman A, Cavusoglu YH(2013):** Analysis of 3,776 pediatric inguinal hernia and hydrocele cases in a tertiary center. *J Pediatr Surg.*, 48:1767-72.
13. **Gawad N, Davies DA, Langer JC(2014):** Determinants of wait time for infant inguinal hernia repair in a Canadian children's hospital. *J Pediatr Surg.*,49:766-9.
14. **Sulkowski JP, Cooper JN, Duggan EM, Balci O, Anandalwar SP, Blakely ML et al.(2015):** Does timing of neonatal inguinal hernia repair affect outcomes? *J Pediatr Surg.*,50:171-6.
15. **Wenk K, Sick B, Sasse T, Moehrlen U, Meuli M, Vuille-dit-Bille RN(2015):** Incidence of metachronous contralateral inguinal hernias in children following unilateral repair – A meta-analysis of prospective studies. *J Pediatr Surg.*,50:2147-54.
16. **Shalaby R, Ismail M, Samaha A, Yehya A, Ibrahim R, Gouda S et al.(2014):** Laparoscopic inguinal hernia repair; experience with 874 children. *J Pediatr Surg.*, 49:460-4.
17. **Lazar DA, Lee TC, Almulhim SI, Pinsky JR, Fitch M, Brandt ML(2011):** Transinguinal laparoscopic exploration for identification of contralateral inguinal hernias in pediatric patients. *J Pediatr Surg.*,46:2349-52.