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Original Article (Pages: 14362-14368)

A Survey of Pediatric Inguinal Hernia: A Single Center Experience with 40,000 Cases in a Ten-Year Period (2009-2019)

Marjan Joodi[1, 2], Mehdi Fathi[2, 3], Mohammad Mehdi Zarif Soltani[1], Hormoz Hosseinpoor[1], Mohammad Aref Emami[1], *Ali Azadmand[1]

[1] Department of Pediatric Surgery, Mashhad University of Medical Sciences, Mashhad, Iran.

[2] Surgical Oncology Research Center, Mashhad University of Medical Sciences, Mashhad, Iran.

[3] Department of anesthesia, Mashhad University of Medical Sciences, Mashhad, Iran.

Abstract

Background: Inguinal hernia repair is one of the most common operations in surgical practice. Herniotomy is the most common choice and standard treatment for inguinal hernia. The purpose of this study was to describe and analyze the data of pediatric patients who had undergone open surgery for inguinal hernia repair.

Methods: A retrospective review of 40,000 pediatric patients with inguinal hernia was conducted between 2009 and 2019. The collected data included age, sex, type of hernia, side of hernia, predisposing factors and type of hospitalization. The patients' postoperative follow-up was performed until recovery.

Results: Inguinal hernia was observed in 22125 males (55.31%) and 17847 females (44.61%). We also had 28 cases (0.07%) with testicular feminization. The age of all cases ranged from premature newborn to 16 years old. There were 52.2% right sided hernia, 34.99% left sided hernia and 12.8% bilateral. 59.74% (23898) of the patients had predisposing factors. Most patients were managed as outpatients and about a third of them (9037 cases) needed hospitalization.

Conclusion: In conclusion, although inguinal hernias are usually believed to be much more common in boys, girls also showed a high incidence in this study. Their occurrences among boys are in younger ages as compared to girls. In inguinal hernia repair, we should be careful about family history and predisposing factors, especially chronic constipation.

Key Words: Achievement goals, cheating behavior.

* Please cite this article as: Joodi M, Fathi M, Zarif Soltani M, Hosseinpoor H, Aref Emami M, Azadmand A. A Survey of Pediatric Inguinal Hernia: A Single Center Experience with 40,000 Cases in a Ten-Year Period (2009-2019). Int J Pediatr 2021; 9(9): 14362-14368. DOI: **10.22038/ijp.2020.52439.4165**

Corresponding Author:

Ali Azadmand, Department of Pediatric Surgery, Akbar hospital, Fakori Street, Mashhad, Iran.

Email: azadmanda@mums.ac.ir

Received date: Sep. 29, 2020; Accepted date: Nov. 18 ,2020

1- INTRODUCTION

Hernia is one of the oldest problems of human that is more common in groin (1). Hernia is defined as an organ protrusion through the body wall that generally contains it. In an inguinal hernia the protrusion occurs through the inguinal canal. Groin hernias are among the most common conditions in which the patients are referred for surgery. Approximately 96% of groin hernias are inguinal and 4% are femoral (2). Unlike adult inguinal hernias, the cause of pediatric inguinal hernias usually is the processus vaginalis's failure to be closed during fetal growth, for which groin weak muscles are not the main reason (3).

The incidence of inguinal hernia in preterm infants is about 30% and decreases to less than 5% in pediatric age groups. The risk of incarceration of bowel, testis, or ovary in children with inguinal hernia is about 3–16%. So, inguinal hernia repair is necessary. The most common treatment management in children is open inguinal hernia repair (4). And Herniotomy is the most common choice and standard treatment for inguinal hernia. It is estimated that around more than 20 million cases are operated per year worldwide (5).

Reports about the number of inguinal hernia repairs are different in various countries. They fluctuate between 100 000 in the United Kingdom to 500 000 in the United States annually. It is also said that 27% of men and 3% of women undergo inguinal hernia repairs at least once in their life (6). However, epidemiological data regarding the pediatric patients with inguinal hernia is very limited and requires further research. The purpose of this study was to describe and analyze the data of pediatric patients who had undergone open surgery for inguinal hernia repair.

2- Materials and Methods

This study is a retrospective review. It was performed in two pediatric centers in Mashhad University of medical sciences, Iran. Data were obtained using the HIS system and the hospital archive. A total of 40,000 pediatric patients who had undergone open surgery between 2009 and 2019 for inguinal hernia were included in the study. Patients who had undergone laparoscopic surgery and children whose records were incomplete or whose parents did not consent were excluded from the study. For example, Emergency cases were excluded because their records were incomplete. Recurrences were also removed because they might have been operated at another center and referred to our center during the recurrence, or those who operated at our center may have been referred to another center. So we did not have complete information about the recurrences.

All operations were done under general anesthesia with open surgical technique by surgery subspecialties and subspecialty residents. Patients' postoperative follow-up was performed by the above-mentioned surgeons until recovery (for 1 month to 1 year). A retrospective review of their records was done. The collected data included age, sex, type of hernia, side of hernia, predisposing factors and type of hospitalization. Ethical committee of Mashhad University of medical sciences has approved the study (ID-code: IR.MUMS.MEDICAL.REC.1399.451).

3- RESULTS

The data of these 40,000 patients referred to the pediatric hospital for surgery during the past ten years is shown in the **Table 1**.

Table-1: data for pediatric patients undergoing open surgical hernia repair from 2009 to 2019.

Type of data		Number	Percent%
sex	boys	22125	55.31
	girls	17847	44.61
	Testicular Feminization	28	0.07
age	Average boys age	9 months	-
	Average girls age	50 months	-
Side of hernia	right side hernia	20881	52.2
	left side hernia	13996	34.99
	Bilateral hernia	5123	12.8
Type of hernia	Indirect hernia	35931	89.82
	Direct and indirect hernias	4044	10.11
	Femoral hernia	25	0.06
predisposing factors	Family history of hernia	18175	45.43
	jaundice	7203	18
	History of immaturity	6632	16.58
	Ventriculoperitoneal shunt	54	0.135
	Peritoneal Dialysis	62	0.15
	Chronic constipation	9816	24.54
	Cystic fibrosis	41	0.10
	Ascites	21	0.05
	congenital abdominal wall defect (Omphalocele gastroscopy extrusion)	69	0.17
Type of Hospitalization	Outpatient (Hospitalization and discharge within 6 hours)	30963	77.4
	Hospitalization in the ICU after surgery	1123	2.8
	Hospitalization in the surgery ward	7914	19.78

There were 22125 males (55.31%) and 17875 females (44.61%). Their age ranged from premature newborn to 16 years old. As can be seen from the Table, right side hernia accounted for the highest number of cases over these periods. In our study, the most frequent hernia was indirect hernia (89.82%), whereas femoral hernia experienced the lowest number of cases (0.06%). 18175 of cases (45.43%) had a positive family history of hernia and 23898 cases, corresponding to 59.74%, had predisposing factors. These predisposing factors were jaundice, immaturity, ventriculoperitoneal shunt, peritoneal dialysis, chronic constipation, cystic fibrosis, ascites and/or congenital abdominal wall defect. The most common predisposing factor observed in these patients was chronic constipation. Each patient had only one predisposing factor and we did not have a patient with two predisposing factors simultaneously. Most patients were managed as outpatients and about a third (9037 cases) needed hospitalization.

4- Discussion

In this study, a retrospective review of 40,000 pediatric patients with inguinal hernia was done between 2009 and 2019. An interesting result obtained in this study was the high incidence of girls with inguinal hernia. Gender-ratio was 1.2 boys to 1 girl. Another point to consider is family history and predisposing factors, especially chronic constipation in inguinal hernia repair.

Inguinal hernia surgery is one of the most common surgeries in children. Inguinal hernias don't resolve spontaneously, and therefore require surgery in most cases. The incidence rate is estimated as 1 to 5%, and it is six times more common in males (7). Our study confirmed the higher prevalence in boys. However, prevalence differences in gender were too small and gender-ratio was 1.2 boys to 1 girl in our study.

Unlike our findings, previous literature has mostly reported high prevalence differences between boys and girls. For example, in an analysis of 3776 cases, there were 78.4% males and 21.6% females (8). In another survey of 6361 patients there were 84% males and 16% females (9). In a study in Taiwan, it was stated that the prevalence of inguinal hernia throughout the general papulation was 7 times higher in males than in females, but this was 3.5 to 1 in children. Also gender difference was observed among the age subgroups. It was higher in boys (49% vs 39%) in ages 1-4, while girls were higher in ages 5- 9 (37% vs 23%). The sex ratio between preterm infants who received herniotomy was 3 males to 1 female (10). In study of Yegane et al., among elementary boys in West of Iran, prevalence of inguinal hernia was 2.4% (11). In another study which was done in China, the prevalence of inguinal hernia was 9.02% in preterm infants and 4.07 % in term infants. This rate was higher among males than among females (12). In our study, which investigated more cases, the results were not consistent with those mentioned. We had 55.31% males, 44.61% females and 0.07% testicular feminization. These results revealed that Iranian girls are more likely to develop inguinal hernias than other communities. The reason may be related to the type of games played by girls in our country or the raising of another child by a girl, which increases the pressure in the abdomen and causes a hernia.

In the same line with our findings, Erdogan et al., found that the mean age of presentation was meaningfully lower in boys than girls (8). It can indicate that signs and symptoms of hernia appear later in girls than in boys.

The incidence of right-sided hernias is more than that of left-sided hernias. Bilateral hernias mostly occur in premature infants (5). In our experience we observed 52.2% right side hernias, 34.99% left side hernias and 12.8% bilaterals. In an analysis of 3776 inguinal hernias and hydrocele in children 61.1% of cases had right-sided hernia, 29.4% had left-sided hernia and 9.5% were bilateral (8). In another study which was done in Iran, penoscrotal abnormalities and inguinal hernias were surveyed among 920 boys. Inguinal hernia was the most common abnormality in their survey. 71.5% were right-sided, 19.1% were left-sided, and 8.4% were bilateral (13). These percentages indicate that the occurrences in the right side are higher than that of the left and bilateral.

Femoral and direct inguinal hernias are very unusual in pediatrics population; and their management differs from that of the more common indirect inguinal hernias (14). In our study, the most frequent hernia was indirect hernia (89.82%), whereas femoral hernia experienced the lowest number of cases (0.06%). 10.11% of patients had both direct and indirect hernias.

As manifested in the current study, among 40000 children and infants, 18175 of cases (45.43%) had a positive family history of hernia and 23898 of cases had predisposing factors (59.74%), such as jaundice, immaturity, ventriculoperitoneal shunt, peritoneal dialysis, chronic constipation, cystic fibrosis, ascites and congenital abdominal

wall defect. These high percentages indicate that we must be careful about the family history of hernia and other predisposing factors.

The most common predisposing factor observed among the patients, in the current study, was chronic constipation (24.54%). Chronic constipation can be a cause of hernias that have not received much attention. Likewise, in a previous study, chronic constipation was determined as the most important risk factor of the late hernia recurrence because of the high pressure and force required to defecate (15). Family history is another risk factor which can express the early hernia recurrence (16). We should consider these factors not only for the recurrence of the hernia but also during its primary onset.

A study that investigated 62 cases found comorbidities in 60% of them including ventriculoperitoneal shunts, prematurity, malnutrition, chronic pulmonary disease, bladder exstrophy, connective tissue and crytorchism, seizure disorders. Accordingly, it was concluded that the direct hernias occurr as a consequence of comorbidities, such as cystic fibrosis (17).

Almost all surgeries were performed as outpatients, 19.78% needed hospitalization, and 2.8% needed postoperative intensive care. In a 35 years review of 6361 pediatric patients, all hernia repairs were done as outpatients except premature babies and patients with health issues (9).

Inguinal hernia can be treated with laparoscopic and open surgical technique. Open surgery is a standard treatment preferred over the other treatments, because of high success rate and low complications rate. It is also convenient to do. Nowadays, the laparoscopic method is replacing the conventional open surgical procedure. But there are some concerns in this method, including the possibility of recurrence and the expensiveness of laparoscopic procedure. However, there are some opinions about its benefits. Finally, a well-done conventional herniotomy gives similar results to those of laparoscopic repair (18, 19).

Hernia, on the contrary, is appeared in some children and infants after surgical repair, which is called metachronous contralateral inguinal hernia. However, the incidence is very rare and it is not recommended to explore contralateral hernia (20, 21).

Many studies have been performed about inguinal hernia but many aspects of it are still controversial. Furthermore, we didn't find comprehensive data about this subject in Iran. The superiority of the present study is the large number of cases, which leads to more reliable results.

5- STUDY LIMITATIONS

One of the study limitations is the incompleteness of patients' records, for which we had to remove some cases.

6- CONCLUSION

In conclusion, the following results were obtained over a period of 10 years with 40,000 patients. Although inguinal hernias are more common in boys, girls showed a high incidence in this study. Gender-ratio was 1.2 boys to 1 girl. It is more frequents on the right side. They occur at younger ages in boys as compared to girls. The most inguinal hernias are indirect in pediatrics. In inguinal hernia repair, we should be aware of family history and predisposing factors, especially chronic constipation.

7- CONFLICT OF INTEREST: None.

8- ACKNOWLEDGMENTS

The current study is an approved proposal in Mashhad University of Medical Sciences (MUMS) with the code 980190. The authors would like to thank from MUMS for the financial support.

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