

A clinical Study of inguinoscrotal swelling in children

¹Dr. Rashmi Vidya Dsouza, ²Dr. Uchil Sonali Raghav, ³Dr. Avinash Jagannath

^{1,3}Assistant Professor, Department of General Surgery, Kanachur Institute of Medical Sciences, Mangalore, Karnataka, India

²Consultant Plastic Surgeon, Gauhati Medical College and hospital, Mangalore, Karnataka, India

Corresponding Author:

Dr. Avinash Jagannath

Abstract

The characteristic bulge in the groin which disappears at times and then recurs may not be present at the time of examination, however, and the surgeon may be compelled to rely on the description given by a competent observer. The most important aspect of the management of neonatal inguinoscrotal swellings relate to its risk of incarceration, strangulation which include gangrene of bowel, testis and ovaries. A prompt early and appropriate treatment is necessary to avoid various complications.

Keywords: Inguinoscrotal, swellings, children, signs, symptoms

Introduction

In textbooks and systems of surgery the problem of hernia in children is often dismissed with a few sentences, or the principles governing treatment in adults are unconcernedly applied to children ^[1]. Inguinoscrotal swellings are one of the commonest conditions in pediatric age group. Inguinal hernias in children are found in 10-20 per 1000 live births ^[2]. Hernias and hydrocoeles are common conditions, and inguinal herniotomy is one of the most frequently performed surgeries. Hernia is derived from the Greek word 'Heros' means 'offshoot' or 'bulge' or 'budding'. In Latin, it means rupture of a portion of a structure. It can be defined as a "protrusion of a viscus or part of a viscus through a normal or an abnormal opening in the wall of its containing cavity". With the increase in the number of premature deliveries, the incidence of neonatal inguinal hernia and hydrocele is increasing ^[3]. Inguinal hernia occurs in 1 to 5 percent of all newborns and 9 to 11 percent of those born prematurely ^[4]. Most of these swellings are diagnosed by either a parent who notices a bulge when a child is straining or crying, or by a physician during a routine physical examination. The characteristic bulge in the groin which disappears at times and then recurs may not be present at the time of examination, however, and the surgeon may be compelled to rely on the description given by a competent observer. The most important aspect of the management of neonatal inguinoscrotal swellings relate to its risk of incarceration, strangulation which include gangrene of bowel, testis and ovaries. A prompt early and appropriate treatment is necessary to avoid various complications ^[5].

Aims and Objectives

- 1) To study the age, sex and sidewise distribution of the inguinoscrotal swelling in children.
- 2) To know the clinical presentation in children age ranged from 1 day to 12 years.

Materials and Methods

The present study is a Prospective hospital based study conducted in Department of General Surgery, Kanachur Institute of Medical Sciences. In this study, 50 patients were selected by a simple random sample. The study was done from Nov 2016 to May 2018.

Inclusion criteria

All the selected patients 12 years and below including both male and female patients who presented with swelling in inguinoscrotal region admitted to Department of General Surgery.

Exclusion criteria

All Patients above twelve years of age are excluded from the study.

1. Patients who refuse surgery.
2. Patient with systemic disorder not able to undergo surgery.
3. Patient with acute scrotal swelling like torsion of testis, epididymo-orchitis, funiculitis, lymphadenitis and also other swellings like varicocele, lymph varix, cuticular and subcutaneous swellings and malignant extensions from testis.

After taking detailed history, all the registered patients were examined systematically which included examination of inguinal and groin region, scrotum and its contents. Respiratory system, cardiovascular system and per abdomen were also examined to know other associated congenital conditions like undescended testis and other connective tissue disorder.

Simple investigations like hemoglobin %, bleeding time, clotting time, routine urine examination were carried out for fitness for operation. Children with unilateral inguinal hernia underwent US examination for CPPV.

Observation and Results

Age distribution

The age of the patients ranged from 8 months to 12 years. They were divided into 6 groups, each with a gap of 2 years. The maximum number of cases was in the age group of 2-4 year (28%) and the minimum number was in the age group 4-6 years (8%).

Our study findings are in accordance with those of Suvera MS *et al.* where maximum number of cases was in age group of 2 to 6 years (47%) [6].

Table 1: Age Distribution

Sl No	Age in Years	No of Cases	Percentage
1	0-2 yrs	10	20%
2	2-4 yrs	14	28%
3	4-6 yrs	4	8%
4	6-8 yrs	7	14%
5	8-10 yrs	5	10%
6	10-12 yrs	10	20%

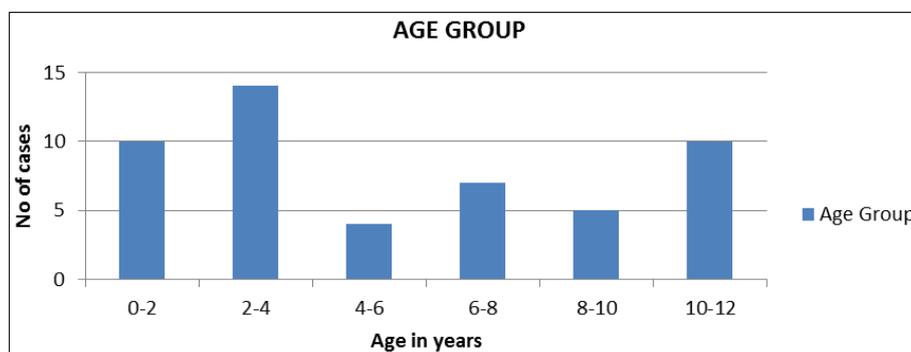


Fig 1: Age Distribution Graph

Prematurity

Out of these 50 cases, 2 cases (4%) had premature delivery (both were male). Our study does not correlate with studies conducted by Robert Baird *et al.* where association of prematurity was 36.6%.

Table 2: Prematurity

Prematurity	No of patients	Percentage
Born before 28 weeks of gestation	2	4%

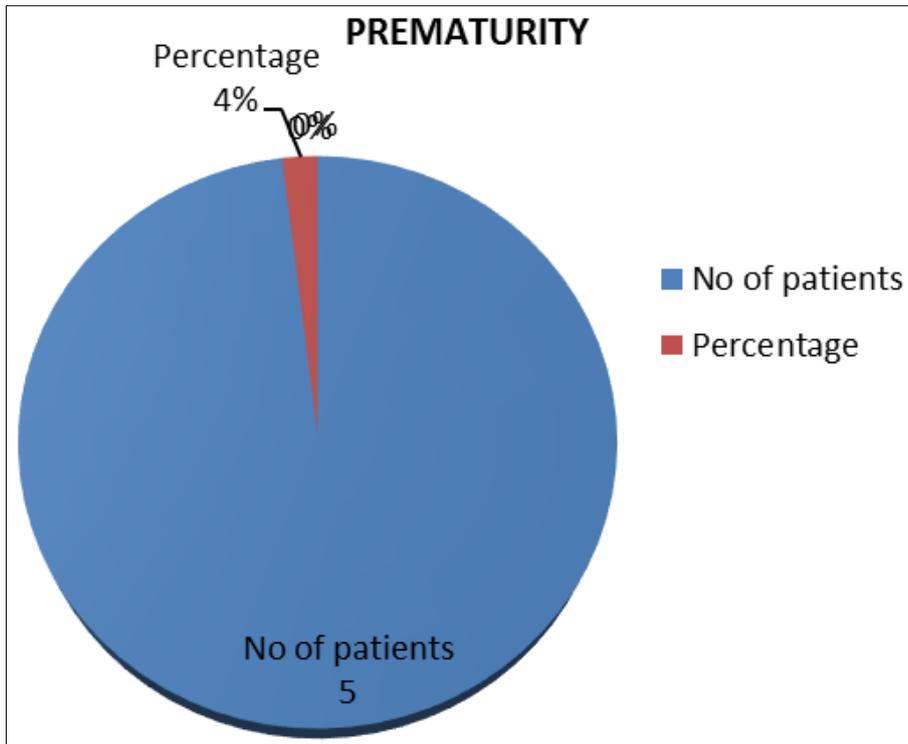


Fig 2: Prematurity Graph

Sex distribution

In this study of 50 children, 48 were males and 2 were females, the ratio was 24:1. Our study was in accordance with all the other studies of inguinal hernia in children, wherein male preponderance was noted.

Table 3: Sex Distribution

Sl no	Sex	No of cases	Percentage
1	Female	2	4%
2	Male	48	96%

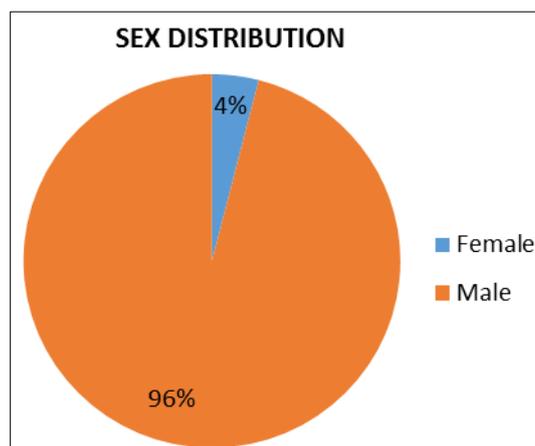


Fig 3: Sex Distribution

Side distribution

In my study the predominance of involvement of Right side in inguinal hernia in pediatric age group was established with 30(60%) occurring on Right Side, Left Side 16(32%) and Bilateral 4(8%). Similar findings were observed by Carneiro PMR^[7].

Table 1: Side Distribution

Sl No	Side	No of cases	Percentage
1	Right	30	60%
2	Left	16	32%
3	Bilateral	4	8%

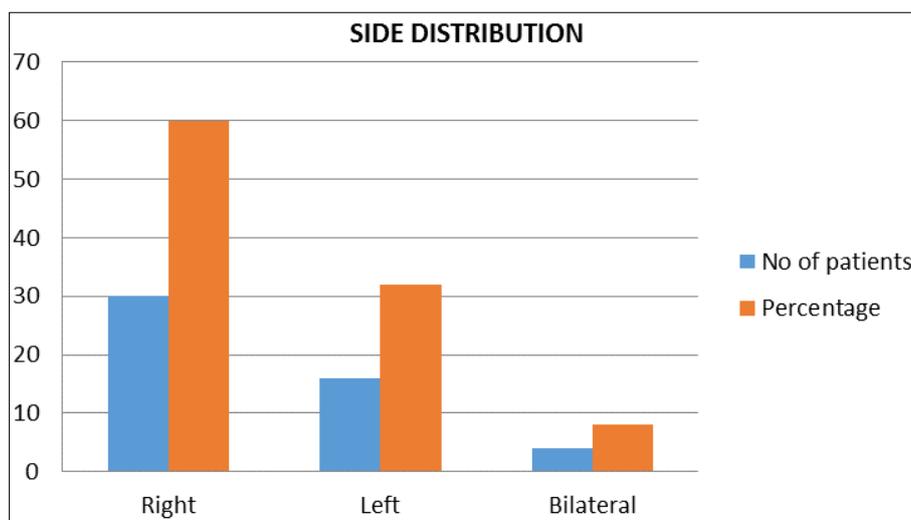


Fig 4: Side Distribution Graph

First person to notice the swelling

In the present series of 50 cases, 34(68%) swellings were first noticed by their mothers, 7(14%) by grandmother, 7(14%) by father and 2(4%) by doctor.

Table 5: First Person to Notice the Swelling

Sl No	Person to notice	No of cases	Percentage
1	Mother	34	68
2	Father	7	14
3	Grandmother	7	14
4	Doctor	2	4

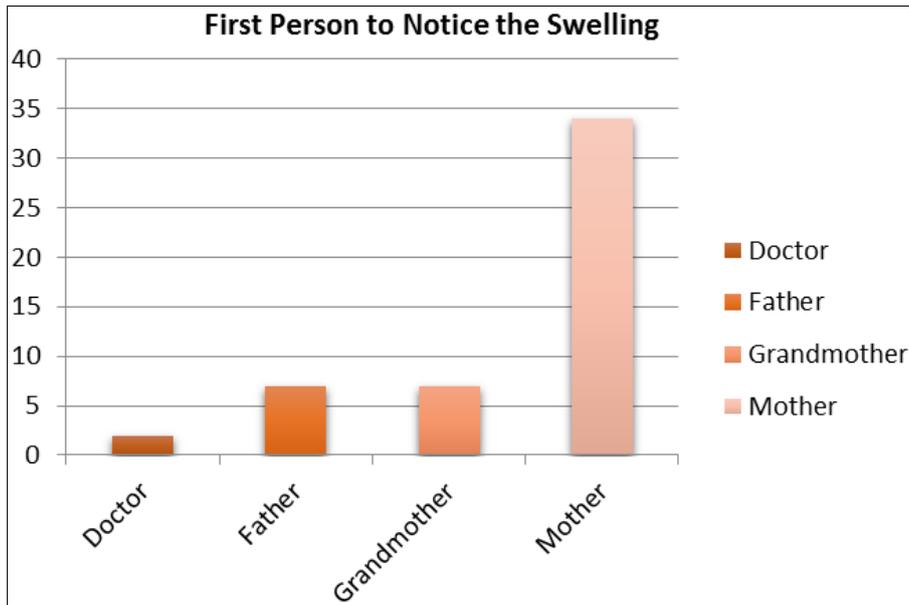


Fig 5: First Person to Notice the Swelling Graph

Symptoms

Most common presentation of hernia is swelling. In the present study, without exception all patients presented with swelling in the groin/scrotum region. Swelling only was present in 92% of patients as compared to swelling associated with pain in 6%, and swelling and pain with vomiting in 2%.

Table 6: Symptoms

SI No	Symptoms	Number of Patients	Percentage
1	Swelling	46	92
2	Swelling + Pain	3	6
3	Swelling + Pain + Vomiting	1	2

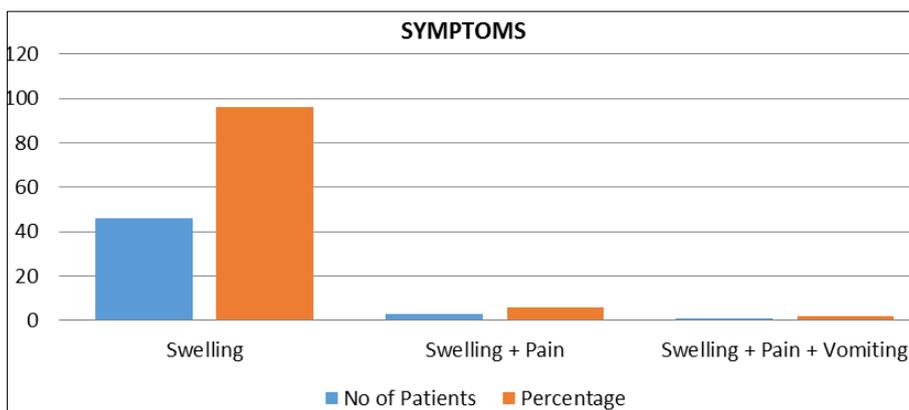


Fig 6: Symptoms Graph

Signs

In the present study, swelling only was present in 92% of patients. Swelling with tenderness with irreducibility was noted in 8% and these patients were diagnosed to have Incarcerated Hernia. Though 1 patient had symptoms of obstruction, but on clinical examination and investigation, there were no signs of obstruction and hence was electively managed.

Table 7: Signs

Sl No	Signs	Number of Patients	Percentage
1	Swelling	46	92
2	Swelling + Tenderness	0	0
3	Swelling + Tenderness + Irreducibility	4	8

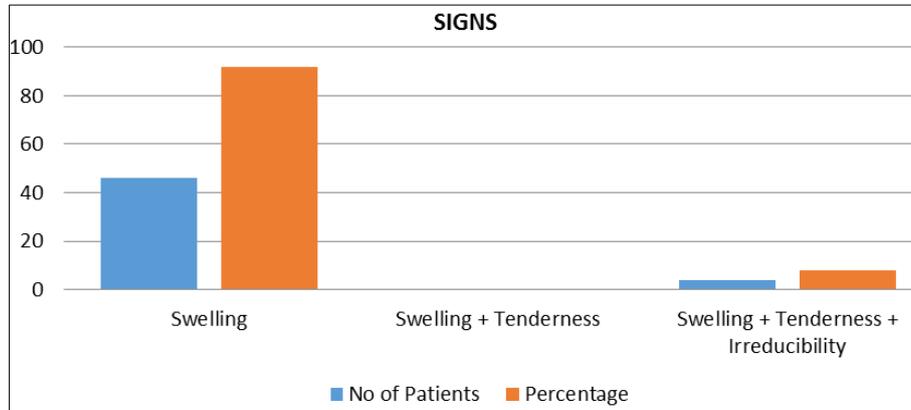


Fig 7: Signs Graph

Direct/Indirect component

In the present study, no patient had direct inguinal hernia and 50 patients had indirect inguinal hernia.

Table 8: Direct/Indirect Component

Sl No	Particular	No of patients	Percentage
1	Direct hernia	0	0
2	Indirect hernia	50	100%

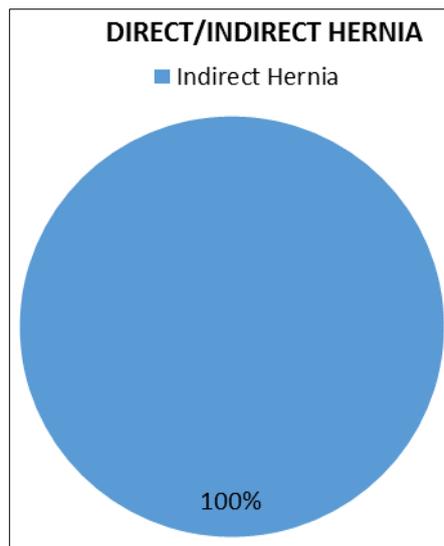


Fig 8: Direct/Indirect Hernia Graph

Discussion

Inguinoscrotal swellings in pediatric age group form a majority of surgical conditions observed by pediatricians and surgeon’s requiring surgical intervention [8]. The incidence of pediatric inguinal hernias reported throughout the literature has ranged between 0.8% and

4.4% with 30% in premature infants. In controlled population based studies, there are between 10 and 20 inguinal hernias per 1000 live births ^[3]. All inguinal hernias in children should be repaired without delay because of risk of complications like incarceration and strangulation.

Age distribution

In the present study of 50 cases, the youngest patient was 8 months of age and oldest was 12 years old. The maximum number of patients was in the age between 2 to 4 years, comprising 14 cases. The least number of patients were observed in the age group of 4 to 6 years. 50% of the cases were in between the age of 2 to 8 years.

The findings are in accordance with those of Suvera MS *et al.* who studied 58 children below the age of 12 years and found that less than 2 years comprise 21% of the cases, 2 to 6 years which comprise 47% and 7 to 12 years which comprise 32% ^[6].

In a study conducted by V RaviKumar *et al.*, the commonest age of presentation was between 1-5 years (42%), 24% occurred in 5-10 years and the youngest baby was 1.5 months old ^[9].

In a study conducted by AA Kareem *et al.* on 252 children, the commonest presentation of 51.6% was noted in the age group 1-6 years, 31.2% in less than 1 years of age, 16% was noted in more than age of 6 years ^[10].

Wright JE studied 117 cases of inguinal hernia and observed that 87% of the cases were less than 7 years of age, 65% were in the age group of less than 5 years and 25% were encountered in less than 1 year of age ^[3].

Table 12: Age Group Distribution Discussion

Studies	Age group	Percentage (%)
Suvera MS <i>et al.</i> ⁶	< 2 years, 2 to 6 years, 7 to 12 years	21, 47 and 32 respectively
V RaviKumar <i>et al.</i> ⁹	1 to 5 years, 5 to 10 years	42 and 24
AA Kareem <i>et al.</i> ¹⁰	< 1 years, 1 to 6 years, > 6 years	31.2, 51.6 and 16 respectively

Wright JE ³	< 7yrs, <5yrs, and <1yrs	87,65,and 25 respectively
Present study	2 to 4 years, 4 to 6 years, 6 to 8 years	28, 8 and 14 respectively

This study shows that the majority of inguinal hernias appears early in life, the fact that should raise the attention of people, parents, pediatrician and surgeon about this common and easily managed condition if treated at earlier time can prevent complications.

Prematurity

Table 13: Prematurity Discussion

Study	Incidence
Grosfeld ^[4]	13%
Marinković S, <i>et al.</i> ^[11]	31%
Robert Baird <i>et al.</i> ^[12]	36.6%
Rescorla and & Frederick J. <i>et al.</i> ^[13]	30
Gray. S.W. skandalakis ^[14]	44-55%
Present study	4%

In a study conducted by Grosfeld, he noted that the incidence of inguinal hernias is approximately 3% to 5% in term infants and 13% in infants born at less than 33 weeks of gestational age ^[4].

In a study conducted by Marinković S *et al.*, it was observed that out of the 144 infants who

underwent inguinal herniotomy and found that there were a large number of premature infants (31%) in his series ^[11]. Of the Two hundred sixty-eight children studied by Robert Baird *et al.*, 176 were term and 98 (36.6%) were premature.

Prematurity was associated with 44-55% incidence of Inguinal hernia ^[14].

30% incidence was noted by Rescorla & Frederick J, *et al.* ^[15].

The figures in the present study do not correlate with the above mentioned studies. This may be due to informant not being aware of the birth history.

Sex distribution

In all the studies of inguinal hernia in children, there is male preponderance. In our study of 50 children with inguinoscrotal swellings, there were 96% male and 4% female. The finding in the present study is in accordance with those of most of the previous studies.

Adesunkanmi A.R. *et al.* in a study of 208 children for inguinal hernia and hydrocele found that 197 (94.7%) of the cases to be male and only 11 (5.3%) to be female ^[15].

Ralph M Larsen and Nashville Tenn treated 111 patients from birth to 6 years of age for inguinal hernia of whom 102(92%) were males and 9(8%) were females ^[16].

A six year retrospective review of 397 herniotomies in 380 children up to the age of 10 years by Carneiro PM, it was observed that 373 (98.2%) were boys and only 7 (1.8%) were girls ^[7].

In a study conducted by Shalaby R and Desoky A, it was observed that out of the 150 children operated for inguinal hernia, 130 (86.6%) were males and 20 (13.4%) were females ^[17].

Marc I Rowe reviewed 2764 children treated for inguinal hernia and found 87% of the children to be boys, giving male to female ratio of 7:1 ^[18].

Similar findings were noted by William Kiesewetter & Kook Sang who studied 400 paediatric patients with inguinal hernia and hydrocele over a period of 2 years and noted that 85% were males and 15% were females ^[19].

Frederick J. *et al.* reviewed 100 children and observed the same findings ^[20].

A retrospective analysis was performed on 827 children who underwent inguinal herniotomy at Al-Fatah Children Hospital, Libya, between 1998 and 2002 and it was found that 681(82.4%) were boys and 146 (17.6%) were girls ^[21].

Similar results were observed in a prospective study conducted over 5 years, 285 patients were analyzed who ranged from 1 month to 15 years old which included 233 males (81.7%), and 52(18.2%) females ^[17].

Table 14: Sex Distribution Discussion

Author	Boys (%)	Girls (%)	M:F Ratio
Ralph M Larsen and Nashville Tenn ¹⁶	92	8	11.5:1
Adesunkanmi A.R. <i>et al.</i> ¹⁵	94.7	5.3	17.8:1
Shalaby R and Desoky A ¹⁷	86.6	13.4	6.5:1
Marc I Rowe ¹⁸	87	13	6.7:1
Kiesewetter & Kook Sang ¹⁹	85	15	5.6:1
Present study	96	4	24:1

Side distribution

Childhood inguinal hernias are generally more predominant on the right side and this has been attributed to the delay in descent of the right testis.

In this study of 50 cases of inguinal hernia in children up to 12 years of age, 60% were on the right side, 32% on the left and 8% were bilateral.

These results were similar to those conducted by Karabulut who reported an incidence of 64.9% right sided, 27.1% left sided, and 7.9% bilateral hernias in his study ^[22].

In a 6 years retrospective review of herniotomies in 380 children by Carneiro PMR, it was

found that 227 (59.7%) were on the right side, 136 (35.7%) on the left and 17(4.5%) as bilateral ^[7].

In a study of over 2000 children with inguinal hernias, Rowe M.I. observed 60% of the cases on the right, 30% on the left and 10% bilateral ^[23].

Similar findings were noted in a study conducted on 240 inguinal hernias in infants and children by Muhammad T. Salaymeh which revealed 60% of the cases to be on the right side, 30% on the left and 10% bilateral ^[24].

In a study of 400 paediatric patients for inguinal hernia over a period of 2 years by William B. Kiesewetter and Kook Sang, 64% were on the right side, 26% on the left and 10 bilateral ^[25].

A retrospective study of 6361 infants and children with inguinal hernia who were operated on and followed by Sigmund H. Ein, it was observed that 59% were right, 29% were left, and 12% were bilateral hernias ^[26].

A study conducted on 3776 children, it was found that 2306 (61.1%) patients were operated on the right and 1111 (29.4%) on the left side, while bilateral surgery was performed on 359 (9.5%) patients ^[12].

Michel Gilbert and William Clatworthy after analyzing the results of 1164 operative procedures for inguinal hernia in children found 63.5% to be on the right side, 27% on the left and 9.5% bilateral ^[27].

Luo and Chao determined the incidence of bilateral inguinal hernia in children to be around 11.5% ^[28]. Similarly, Jallouli *et al.* demonstrated the incidence of bilateral inguinal hernia to be 11% ^[29].

In a prospective study conducted by Pradhan GB *et al.* done on inguinal herniotomy in 61 children, bilateral hernia was noted to be 3.27% ^[30].

Table 15: Side Distribution

Author	Rt (%)	Lt (%)	B/L (%)
Michel Gilbert and William Clatworthy ²⁷	63.5	27	9.5
Sigmund H. Ein ²⁶	59	29	12
William B. Kiesewetter and Kook Sang ²⁵	64	26	10
Muhammad T. Salaymeh ²⁴	60	30	10
Rowe M.I. ²³	60	30	10
Karabulut ²²	64.9	27.1	7.9
Carneiro PMR ⁷	59.7	35.7	4.5
Present study	60	32	8

First person to notice the swelling

In the present series of 50 cases, 41 swellings were first noticed by their parents, 7 cases by grandmother and in 2 cases it was noticed by doctors during routine checkup for immunization.

Parents are usually the first person to notice the swelling and this has been documented in earlier studies.

Scherer L.R and Grosfeld J.L and Javad Ghoroubi *et al.* they noticed, in 99% of the cases, hernia was diagnosed by the parents for the first time ^[31, 32].

Usually parents and grandmother notice the swelling while bathing the child or changing clothes. This could be because of the closeness of parents and grandmother to the child. Doctors notice during vaccination or routine physical examination.

Symptoms

In our study most of the patients presented with asymptomatic swelling (92%).Swelling with pain was present in 6% and swelling with pain and vomiting was present in 2%.

In a study conducted by Rowe *et al.* [33], the incarceration of inguinal hernia is 17% on right side and 7% on left side with over all rates being 12%. In our study cases of incarceration was 8% with equal incidence on the right (4%) and left side (4%). Incidence of incarceration is low in our study this may be due to early diagnosis and the availability of the surgeons to operate on infants as early as possible to avoid complications.

Signs

In the present study, swelling only was present in 92% of patients. Swelling with tenderness with irreducibility was noted in 8% and these patients were diagnosed to have Incarcerated Hernia. Though 1 patient had symptoms of obstruction, but on clinical examination and investigation, there were no signs of obstruction and hence was electively managed. There were no case of strangulation and gonadal infarction. The less number of complications in this series could be attributed to larger number of elective cases that were operated.

Preoperative sonographic evaluation for CPPV

In our study 47 patients with unilateral inguinal hernia underwent US examination. In 47 cases 3 cases (6%) were diagnosed as CPPV. Out 3 cases 2 were on right side, 1 one left and all of them were below 2 years of age. Since our study is observational and there is chance of spontaneous closure within 2 year, we have not explored contralateral side and no comparison was done with operative findings. None of the cases developed contralateral hernia during follow up.

348 patients with unilateral inguinal hernia were studied by Hata S and Takahashi Y *et al.* [34]. All these patients underwent USG examination. 78 cases (22.4%) were diagnosed by USG as patients with a CPPV; these patients underwent bilateral surgery. Of these, 74 cases (94.9%) were confirmed surgically as patients with CPPV, and concluded a CPPV was detected correctly by USG in 74 of 348 patients (21.3%) with clinically diagnosed unilateral inguinal hernias. As there was no comparison, we cannot conclude from this study.

Direct and Indirect component

Direct inguinal hernias in children are rare and represent 0.25% to 1% of all groin hernias. In our study, no case was found to have direct hernia.

Table 2: Direct and Indirect Component Discussion

Si No	Author	Direct Hernia (%)
1	Karabulut ²²	0.25%
2	Schier ³⁵	0.9%
4	Present Study	0

Sliding inguinal hernias are uncommon in children. It is more common in girls than in boys. In the series of Grosfeld *et al.* ovary and fallopian tube were found in the sac in as many as 15% of hernias in girls. The structures encountered in sliding hernias are caecum, appendix, bladder, sigmoid colon and rarely uterus. In the present study, we have not found any case of Sliding inguinal hernias.

Conclusion

Inguinal hernia and hydrocele in children remain one of the most common congenital condition observed by surgeons. Prompt diagnosis and early treatment of the inguinal hernia continues to be the mainstay if the complications are to be avoided.

References

1. Potts WJ, Riker WL, Lewis JE. The treatment of inguinal hernia in infants and children. *Ann Surg.* 1950; 132(3):566.
2. Ferguson AH. Oblique inguinal hernia: A typical operation for its radical cure. *JAMA.* 1899;33:6.
3. Kapur P, Caty MG, Glick PL. Paediatric Hernia and Hydrocele. *Paed Clin Nor Am.* 1998;45(4):773-789.
4. Grosfeld JL. Current concepts in inguinal hernia in infants and children. *World J Surg.* 1989;13(5):506-515.
5. Uemura S, Woodward AA, Amerena R, Drew J. Early repair of inguinal hernia in premature babies. *Pediatr Surg Int.* 1999;15(1):36-9.
6. Suvera MS, Damor PB, Patel SV. Surgery for inguinal hernia in pediatric age. *Int J Res Med Sci.* 2013;1(2):112-115.
7. Carneiro, P. M. Inguinal herniotomy in children. *East Afr Med J* 1990; 67(5): 359-364.
8. Glick PL, Boulanger SC. Inguinal hernias and hydroceles. *Pediatric Surgery*, 6th ed., 2. Philadelphia: Mosby/Elsevier, 2006, 1172-92pp.
9. Ravikumar V, Rajshankar S, Kumar HR. A clinical study on the management of inguinal hernias in children on the general surgical practice. *J Clin Diagn Res.* 2013;7(1):144-147.
10. Kareem AA, Juma'a KM. Herniotomy in Infants, Children and Adolescents without Disruption of External Ring. *World Journal of Laparoscopic Surgery.* 2009;2(1):13-16.
11. Marinković S, Bukarica S, Cvejanov M *et al.* Inguinal herniotomy in prematurely born infants. *Med Pregl.* 1997;51(5-6):228-230.
12. Baird R, Gholoum S, Laberge JM, Puligandla P. Prematurity, not age at operation or incarceration, impacts complication rates of inguinal hernia repair. *J Pediatr Surg.* 2011;46(5):908-911.
13. Rescorla FJ, Grosfeld JL. Inguinal hernia repair in the perinatal period and early infancy: clinical considerations. *J Paed Surg.* 1984;19(6):832-837.
14. Skandalakis JE, Gray SW. Ovary and testis. *Embryology for surgeons*, Baltimore: Williams & Wilkins, 1994, 414-450.
15. Adesunkanmi AR, Adejuyigbe O, Agbakwuru EA. Prognostic factors in childhood inguinal hernia at Wesley Guild Hospital, Ilesa, Nigeria. *East Afr Med J.* 1999;76(3):144-147.
16. F Ralph, M. Larsen, Nashville Tenn. Inguinal Hernia in Infancy and Early childhood. *Ann Surg.* 1949;25:307-328.
17. Shalaby R, Desoky A. Needlescopic inguinal hernia repair in children. *Pediatr Surg Int.* 2002;18(2-3):153-156.
18. Rowe MI, Clatworthy HW. Incarcerated and strangulated hernias in children: a statistical study of high-risk factors. *Arch Surg.* 1970;101(2):136-139.
19. Kiesewetter WB, Oh KS. Unilateral inguinal hernias in children: What about the opposite side? *Arch Surg.* 1980;115(12):1443-1445.
20. Lambertz A, Schälte G, *et al.* Spinal anesthesia for inguinal hernia repair in infants: a feasible and safe method even in emergency cases. *Pediatr Surg Int.* 2014;30(10):1069-1073.
21. Omar AR, Omar AM, Shaheen AN, Geryani MH. Treatment strategy of inguinal hernia in infants and children in Eastern Libya. *Saudi Med J.* 2004;25(6):753-755.
22. Karabulut B. One surgeon experiences in childhood inguinal hernias. *J Korean Surg Soc.* 2011;81(1):50-53.
23. Rowe MI, Clatworthy HW. The other side of the pediatric inguinal hernia. *Surg Clin North Am.* 1971;51:1371.
24. Muhammed TS. Complications of Inguinal Hernia in Infants and Children. *Int. Surg.* 1969;51:95-98.
25. William BK, Kook S. Unilateral Inguinal Hernia in children. *Arch Surg.* 1980;115:1443-

1445.

26. Ein SH, Njere I, Ein A. Six thousand three hundred sixty-one pediatric inguinal hernias: a 35-year review. *J Pediatr Surg.* 2006;41(5):980-986.
27. Gilbert M, Clatworthy HW. Bilateral operations for inguinal hernia and hydrocele in infancy and childhood. *Am J Surg.* 1959;97:255.
28. Lou CC, Chao HC. Prevention of unnecessary contralateral exploration using the silk glove sign (SGS) in pediatric patients with unilateral inguinal hernia. *Eur J Pediatr.* 2007;166(7):667-9.
29. Jallouli M, Yaich S, Dhaou MB, Yengui H, Trigui D, Damak J, Mhiri R. Are there any predictive factors of metachronous inguinal hernias in children with unilateral inguinal hernia? *Hernia.* 2009;13(6):613-615.
30. Pradhan GB, Shrestha D, Shrestha S, Bhattachan CL. Inguinal herniotomy in children: A one year survey at Nepal Medical College Teaching Hospital. *Nepal Med Coll J.* 2011;13(4):301-302.
31. Scherer LR, Grosfeld JL. Inguinal hernia and umbilical anomalies. *Paed Clin Nor Am.* 1993;40(6):1121-1131.
32. Notes PS. Inguinal hernias and hydroceles in infancy and childhood: A consensus statement of the Canadian Association of Paediatric Surgeons. *Paediatr Child Health.* 2000;5(8):461-462.

33. Rowe MI, Lloyd DA. "Inguinal Hernia" in 'Paed Surgery' edited by Welch Judson, Mark, James and Rowe. 1986;4(2):779-793.
34. Hata S, Takahashi Y. Preoperative sonographic evaluation is a useful method of detecting CPPV in pediatric patients with unilateral inguinal hernia. J Paeditr Surg. 2004;39(9):1396-9.
35. Schier F. Direct inguinal hernias in children: laparoscopic aspects. Pediatr Surg Int. 2000;16(8):562-4.
36. Lou CC, Chao HC. Prevention of unnecessary contralateral exploration using the silk glove sign (SGS) in pediatric patients with unilateral inguinal hernia. Eur J Pediatr. 2007;166(7):667-9.