

Original Research Article

Persistent processus vaginalis presenting as hydrocele and hernia

S. Prabakaran^{1*}, K. Kasthuri Thilagam²

¹Department of Paediatric Surgery, ²Department of Pathology, Government Mohan Kumara Mangalam Medical College and Hospital, Salem, Tamil Nadu, India

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***Correspondence:**

Dr. S. Prabakaran,

E-mail: paedprabakaran@gmail.com

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ABSTRACT

Background: Inguino-scrotal swelling is a common finding in the paediatric population, attributed to the persistent processus vaginalis. But the reason why some children present with hernia and some with hydrocele is not yet clear. Histological examination of the sac may be useful in understanding the reason for this differential presentation. Hence the current study was undertaken to assess the association between type of clinical presentation and histological findings in pediatric population.

Methods: A prospective observational study was done on 51 children aged below 12 years presenting with inguinoscrotal swelling and subsequently diagnosed with either hernia or hydrocele and treated with surgical intervention. The samples were sent for histological examination and analysed for association with diagnosis.

Results: There were 31 Inguinal hernia and 20 Hydrocele subjects. The predominant age group was 6 to 10 years. The number of children with hydrocele right and left, inguinal hernia right and left was 21 (41.2%), 10 (19.6%), 17 (33.3%) and 3(5.9%) respectively. All hydrocele subjects had mesothelial lining, smooth muscle but scanty lymph vessels and absent inflammatory cells. 95% of the Inguinal hernia subjects had low cuboidal lining, inflammatory cells, and lymph vessels.

Conclusions: Paediatric inguinal hernias and hydroceles are due to incomplete or abnormal obliteration of the processus vaginalis. Mesothelial lining, Presence of smooth muscle, Scanty lymph vessels, absence of inflammatory cells are characteristic of Hydrocele Inguinal hernia is characterized by low cuboidal lining, absence of smooth muscles, presence of lymph vessels and inflammatory cells.

Keywords: Children, Hydrocele, Histological findings, Inguinal Hernia, Mesothelium, Processus vaginalis, Smooth muscle

INTRODUCTION

Inguino-scrotal swelling is a common finding in the paediatric population.¹ Of the possible causes, the most common diagnoses are hernias and hydroceles.² Hernias occur in 1% to 4% of all infants, depending on the child's gestational age at birth.³ One third of all children with hernias present before six months of age. Hydroceles and hernias of the inguinal and scrotal areas represent an embryologic and clinical continuum of conditions that

usually present with a painless bulge in the groin, scrotum, or both.¹ Inguinoscrotal abnormalities in children are best understood by understanding the embryology of testicular descent and the failure of the processus vaginalis to properly obliterate.^{4,5} The inguinal hernia, communicating hydrocele, hydrocele of the spermatic cord, and scrotal hydrocele should be differentiated based on a history and physical examination in most cases, with selective use of ultrasonography.^{2,6,7} Surgical correction of these

conditions is the most common surgical procedure performed on young children.^{8,9} The urgency to surgically correct these entities depends on the nature of a hernia or hydrocele and the likelihood of incarceration or spontaneous resolution. Hence the contents of a hernia are also equally important in deciding the timing of surgery and management.¹⁰ Histological structures of the peritoneum, processus vaginalis, and sacs obtained from girls and boys with inguinal hernia, hydrocele, and undescended testis can give a clue with regards to etiology of an inguinal hernia.^{11,12} An Inguinal hernia during childhood seems to be related to the presence of smooth muscle within the wall of the sac. The smooth muscle bundles can play a role both in the prevention of obliteration and clinical outcome.¹¹ Hence histological examination besides ultrasonography can give a clear picture with regards to diagnosis and etiology.¹³ The literature regarding the association between type of clinical presentation (hernia versus hydrocele) with the histological findings is very limited and hence we carried out our study to analyze the clinical presentation of persistent processus vaginalis in infants and young children and its association with histological findings.

Objectives of this study were to analyze the clinical presentation of persistent processus vaginalis in infants and young children and to assess the association between type of clinical presentation (hernia versus hydrocele) with the histological findings.

METHODS

The current prospective observational study was conducted in the department of paediatric surgery, Government Mohana Kumara Mangalam Medical College and Hospitals in Salem, Tamil Nadu, India. The study population included all the children below 12 years of age presenting with inguinoscrotal swelling and subsequently diagnosed with either a hernia or hydrocele and treated with surgical intervention.

The data collection for the study was done between January 2016 to December 2017, for a two-year period. After obtaining the informed written consent from the parents/guardian, all the children were assessed by thorough clinical history and evaluation. The diagnosis of a congenital hernia or hydrocele was predominantly made by clinical examination and was further confirmed by ultrasound examination. After opening of the inguinal canal, the sac was identified. The sac was transfixed, ligated and division of the excessive sac was performed. In children with hydrocele, the distal sac was incised, and fluid was let out. The dissected specimens were sent for histopathological examination in 10% Formalin.

Diagnosis (hydrocele versus inguinal hernia) was considered as primary outcome variable. Age, type of procedure performed, lining, smooth muscle, lymph vessels and inflammatory cells were considered as a primary explanatory variable

Descriptive analysis was carried out by frequency and proportion for categorical variables. The association between age, type of procedure performed, lining, smooth muscle, lymph vessels, and inflammatory cells) and [diagnosis findings (hydrocele versus an inguinal hernia)] was assessed by cross-tabulation and comparison of percentages. Chi-square test was used to test statistical significance. P value <0.05 was considered statistically significant. IBM SPSS version 22 was used for statistical analysis.¹⁴

RESULTS

A total 51 people were included in the analysis. Among the study population, 1 (2%) participant was aged up to 1 year, 8 (15.7%) were aged between 2 to 5 years, 28 (54.9%) were aged between 6 to 10 years and 14 (27.5%) were aged 11 years and above. Among the study population, 21 (41.2%) participants had diagnosed hydrocele right. The number of hydrocele left, right inguinal hernia and left an inguinal hernia was 10 (19.6%), 17 (33.3%) and 3 (5.9%) respectively. Among the study population, processus vaginalis SAC resection was performed in all 31 (60.78%) hydrocele cases and hernial sac resection was performed in all 20 (39.21%) hernia patients respectively (Table 1).

Table 1: Descriptive analysis of parameter in the study population (n = 51).

Parameter	Frequency	Percentage
Age group		
Up to 1 year	1	2
2 to 5	8	15.7
6 to 10	28	54.9
11 and above	14	27.5
Diagnosis		
Hydrocele right	21	41.2
Hydrocele left	10	19.6
Right inguinal hernia	17	33.3
Left an inguinal hernia	3	5.9
Type of procedure performed		
Processes vaginalis SAC resection	31	60.78
Hernial SAC resection	20	39.21

Among the study population, 32 (62.7%) participants had mesothelial lining and 19 (37.3%) participants had a low cuboidal lining. Out of 51 people, 32 (62.7%) participants had the presence of smooth muscle.

Among the study population, 19 (37.3%) people had the presence of lymph vessels and 32 (62.7%) participants had present scanty. Out of 51 people, 19 (37.3%) participants had the presence of inflammatory cells (Table 2).

In hydrocele group 6 (19.4%) people were aged between 2 to 5 years, 16 (19.4%) were aged between 6 to 10 years

and 9 (29%) were aged 11 years and above. In inguinal hernia group, 1 (5%) participant was aged up to 1 year, 2 (10%) were aged between 2 to 5 years, 12 (60%) were aged between 6 to 10 years and 5 (25%) were aged 11 years and above (Table 3).

Table 2: Descriptive analysis of lining in the study population (N = 51).

Lining	Frequency	Percentage
Mesothelial	32	62.7
low cuboidal	19	37.3
Smooth muscle		
Present	32	62.7
Absent	19	37.3
Lymph vessels		
Present	19	37.3
Present scanty	32	62.7
Inflammatory cells		
Present	19	37.3
Absent	32	62.7

Table 3: Comparison of diagnosis findings with age group of the study population (N = 51).

Age group	Diagnosis findings	
	Hydrocele (N = 31)	Inguinal hernia (N = 20)
Up to 1	0 (0%)	1 (5%)
2 to 5	6 (19.4%)	2 (10%)
6 to 10	16 (51.6%)	12 (60%)
11 and above	9 (29%)	5 (25%)

No statistical test was applied due to 0 subjects in one of the cells

Table 4: Comparison of diagnosis findings with the type of procedure performed of the study population (N = 51).

Parameter	Diagnosis findings	
	Hydrocele (N = 31)	Inguinal hernia (N = 20)
Type of procedure performed		
Processes vaginalis SAC resection	0 (0%)	20 (100%)
Hernial SAC resection	31 (100%)	0 (0%)
Lining		
low cuboidal	0 (0%)	19 (95%)
Mesothelial	31 (100%)	1 (5%)
Smooth muscle		
Present	31 (100%)	0 (0%)
Absent	0 (0%)	20 (100%)
Lymph Vessels		
present	0 (0%)	19 (95%)
Present scanty	31 (100%)	1 (5%)
Inflammatory cells		
Present	0 (0%)	19 (95%)
Absent	31 (100%)	1 (5%)

Among the study population, all 31 (100%) hydrocele cases were performed process vaginalis SAC resection and all 20 (100%) hernia patients were performed HERNIAL SAC resection. In hydrocele group 31 (100%) participants had in the mesothelial lining. In inguinal hernia group, 19 (95%) participants had in the low cuboidal lining and remaining 1 (5%) participant had in mesothelial lining.

In hydrocele group 31 (100%) people had in presence of smooth muscle. In hydrocele group 31 (100%) people had in presence of scanty. In inguinal hernia group, 19 (95%) people had in presence of lymph vessels and remaining 1 (5%) participant had in presence of scanty. In inguinal hernia group, 19 (95%) participants had in presence of inflammatory cells (Table 4).

DISCUSSION

Pediatric inguinal hernias and hydroceles are due to incomplete or abnormal obliteration of the processus vaginalis. Surgical correction of these conditions is the most common surgical procedure performed on young children.⁸ The extratesticular scrotal contents consist of the epididymis, spermatic cord, and fascia derived from the embryologic descent of the testis through the abdominal wall. Abnormal closure of the processus vaginalis leads to congenital anomalies of the tunica vaginalis, such as complete or partial patency of the processus vaginalis, spermatic cord hydrocele, and inguinoscrotal hernia. The processus vaginalis represents an outpouching of the parietal peritoneum, which passes through the abdominal wall and extends caudally toward the scrotum in boys and the labium majora in girls. The processus vaginalis appears during the second and third months of gestation. Open standard herniorrhaphy remains the most common surgical approach, and concurrent transinguinal laparoscopy allows quick and accurate inspection of the contralateral internal inguinal ring and the need for bilateral repair of an inguinal hernia.² Given the differences in the management of these abnormalities and the risk of complications, timely diagnosis and treatment are essential.

We did a prospective observational study on children aged below 12 years presenting with inguinoscrotal swelling in the department of paediatric surgery, Government Mohana Kumara Mangalam Medical College and Hospitals Salem from 2017 to 2018 and subsequently diagnosed with either a hernia or hydrocele and treated with surgical intervention. Finally, 51 children were included for analysis. After performing the surgery, the samples were sent for histological examination and then analysed for association between clinical diagnosis and factors like age, procedure, lining, smooth muscle, lymph vessels, lymph vessels and inflammatory cells.

In the present study population, more than half of the study subjects (54.9%) were aged between 6 to 10 years.

Only 1 subject (2%) was below 1 year of age. Most inguinal hernia repairs in full-term, healthy infants, and older children may be performed selectively in an outpatient setting soon after the diagnosis is made. Infants younger than one year of age, particularly former preterm infants, are at greater risk for an incarcerated hernia. Repairs in preterm infants should be carried out as soon as it is convenient, preferably within one week of diagnosis.^{3,15}

In the present study, 27.5% were aged above 10 years while 15.7% were aged between 2 to 5 years. Normally, in the male fetus, the testes descend to the vicinity of the internal ring of the inguinal canal by approximately 28 weeks gestational age. Then, by about 29 weeks gestation, the testes descend into the scrotum. With testicular descent, the lining of the peritoneal cavity extends into the inguinal canal and scrotum. This peritoneal canal is referred to as the processus vaginalis. Each testis descends through the inguinal canal external to the processus vaginalis. In the present study, we included subjects with persistent processus vaginalis and diagnosed them as Hernia or Hydrocele. We identified 30 subjects with Inguinal hernia and 21 subjects with Hydrocele. A paediatric inguinal hernia will not close spontaneously, and it must be repaired. While repair is not a surgical emergency, prompt referral to a paediatric surgeon is recommended. The recommended management of a hydrocele is observed during the first one to two years of a child's life, unless the diagnosis of a hernia cannot be excluded.¹⁶

Hydroceles that persist or appear beyond that age are unlikely to resolve spontaneously and should, therefore, undergo elective surgical repair.¹⁷ Hence, the majority (51.6%) of the hydrocele subjects were aged between 6 to 10 years and similarly, majority of the subjects (60%) with inguinal hernia were aged between 6 to 10 years. A similar study describing the pediatric inguinal hernia and hydrocele experience of a tertiary care training hospital was done by Erdogan D et al on 3776 subjects with hydrocele and hernia.¹⁸ Their study population included subjects from 6 days to 17 years and almost similarly our study subjects were aged between 0 to 12 years. In our study, 33.3% had inguinal hernia on the right side compared to 61.1% as reported by Erdogan D et al.¹⁸ They also reported a higher proportion of inguinal hernias on the right side compared to the left side (61.1% versus 29.4%) similar to the present study (33.3% versus 5.9%). In the present study, 41.2% had hydrocele on the right side compared to 19.6% on the left side. We performed processus vaginalis SAC resection in all hydrocele cases and hernial SAC resection in all hernia subjects.

In the present study, the lining of the sac was mesothelial in 32 subjects totally. All subjects diagnosed with Hydrocele (31/31) had mesothelial lining while only one inguinal hernia subject had mesothelial lining. 95% of the Inguinal hernia subjects had a low cuboidal lining of their sac. Smooth muscle was present in all hydrocele cases

while it was absent in all inguinal hernia subjects. Similar to our study, Tanyel FC et al in their study examined histological structures of peritoneum, processus vaginalis, and sacs and encountered smooth muscle layers within the walls of hernia sacs.¹¹ They identified hydrocele sacs have smooth muscle bundles distributed as patchy areas while Peritoneum and processus vaginalis samples have been free of smooth muscle. The smooth muscle bundles may have played a role both in the prevention of obliteration and clinical outcome. Extratesticular lesions are common incidental findings at ultrasonography (US) among men and boys. Most lesions originate from or depend on the tunica vaginalis, a mesothelium-lined sac with a visceral layer and a parietal layer. The tunica vaginalis is formed when the superior portion of the processus vaginalis closes during embryologic development. Abnormal closure of the processus vaginalis leads to congenital anomalies of the tunica vaginalis, such as complete or partial patency of the processus vaginalis, spermatic cord hydrocele, and inguinoscrotal hernia.¹⁹ In the present study, all Hydrocele cases had only scanty lymph vessels but in 95% of inguinal hernia subjects, there were predominant lymph vessels. All hydrocele cases in the present study were characterized by the absence of inflammatory cells but in 95% of inguinal hernia subjects, inflammatory cells were present.⁷

The tunica vaginalis invests all but the posterior aspect of the testis and is composed of a visceral portion around the testis and a parietal layer against the scrotal wall. Hydroceles occur when serous fluid accumulates between the parietal and visceral layers of the tunica vaginalis. Congenital hydroceles occur when there is the incomplete closure of the processus vaginalis. Children with a patent processus vaginalis are at increased risk for developing an inguinal hernia. Approximately 99% of all inguinal hernias in children are indirect inguinal hernias. Direct hernias are rare. Most inguinal hernias are unilateral. An indirect hernia exits the abdominal cavity through the internal inguinal ring, traversing the inguinal canal into the scrotum and are associated with a patent processus vaginalis. It is contained inside the coverings of the spermatic cord. If large enough it emerges through the external ring and descends into the scrotum.

Pediatric inguinal hernias and hydroceles are due to incomplete or abnormal obliteration of the processus vaginalis. In differentiating a hydrocele from a hernia, history and physical examination can be diagnostic. Right-sided hernia and hydrocele predominated in the present study as reported by other authors. The predominant age group was 6 to 10 years.

In the present study, we also identified the association between histologic features and diagnosis as a hernia or hydrocele. Mesothelial lining, presence of smooth muscle, scanty lymph vessels, the absence of inflammatory cells were characteristic of hydrocele while in inguinal hernia there was low cuboidal lining, absent

smooth muscles, the presence of lymph vessels and inflammatory cells.

Present study was limited by a very small sample size. We did only a descriptive study which was an initial step in a rather unexploited area in paediatric surgery. We have come up with a hypothesis which has the need to be further strengthened by analytical studies of larger sample size

CONCLUSION

Paediatric inguinal hernias and hydroceles are due to incomplete or abnormal obliteration of the processus vaginalis. Mesothelial lining, Presence of smooth muscle, Scanty lymph vessels, absence of inflammatory cells are characteristic of Hydrocele while in Inguinal hernia is characterized by low cuboidal lining, absence of smooth muscles, presence of lymph vessels and inflammatory cells.

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