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Ascending testis after repair of pediatric inguinal hernia and hydrocele: A misunderstood operative complication

Furan Wang, Hongji Zhong, Junfeng Zhao

Department of Pediatric Urology, Ningbo Women & Children's Hospital, Cicheng New Town, Jiangbei District, Ningbo, Zhejiang, China

Correspondence to: F. Wang, Department of Pediatric Urology, Ningbo Women & Children's Hospital, No. 266, Cishuixi Street, Cicheng New Town, Jiangbei District, Ningbo, Zhejiang, 315031, China, Tel.: +86 0574 87651692

pheonix925@live.cn
(F. Wang)

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Summary

Introduction
Ascending testis (AT) is a rare complication after repair of an inguinal hernia/hydrocele. However, there has been some controversy concerning the AT following laparoscopic and open procedures.

Objective
To review the experience of, and discuss the associated mechanisms with, testicular ascent after pediatric inguinal hernia/hydrocele surgery.

Study design
A retrospective review of the medical records of male children who underwent inguinal hernia/hydrocele repair at the present hospital between January 2000 and December 2014. Those who underwent subsequent orchiopexies due to ipsilateral cryptorchidism were identified. The ATs that were misdiagnosed, caused by improper operation, and retractile testes were excluded. The Poisson distribution evaluated the incidences of subgroups.

Results
A total of 17,295 inguinal hernias and hydroceles were repaired on 12,849 males; of whom, 10 testes (0.058%) developed ATs on nine individuals postoperatively (Summary Table). The difference of AT incidences between subgroups was insignificant ($P > 0.05$), except for that grouped by the age at initial operation (cutoff = 1 year, $P = 0.008$; cutoff = 2 years, $P = 0.012$). During orchiopexy, extensive adhesions were found in the inguinal canal only in the two cases following open repair. The hernia sac/processus vaginalis remained intact in the canal of AT after laparoscopic repair, and partial after open herniotomy.

Discussion
It was generally assumed that testicular ascent after repair of an inguinal hernia/hydrocele was caused by adhesion of the spermatic cord. However, the cord was not dissected during laparoscopic procedure, so adhesion was not the major reason for AT following laparoscopic surgery. The sac/processus were partially excised during open repair, but kept intact in laparoscopic procedure. Therefore, remnants of the sac/processus might play a greater role in postoperative testicular ascent than adhesions. Furthermore, it was found that AT incidence after the repair was not higher than that in 'normal' males. Ascending testis was probably not an operative complication, but a natural descent process of testis independent of the operation. Moreover, the testis descended further due to dissection of the cord and excision of the sac/processus, so the AT incidence was extremely low following open operation. From this point of view, open repair of an inguinal hernia/hydrocele was probably a protective factor for preventing testicular ascent.

Conclusion
Ascending testis is rare in male pediatric patients who have had repair of an inguinal hernia/hydrocele. Currently, the mechanism of testicular ascent is still unclear, and should be further investigated in the future.

Summary Table General characteristics of patients with inguinal hernia/hydrocele repairs and ascending testis after the repairs.

	Patients underwent repair of an inguinal hernia/hydrocele	Patients with ascending testis after the repairs
Age, median (range)	3.19 years (10 days–12 years)	4.33 years (1–8 years)
Birth weight, median (range)	3.4 kg (1.5–5.0)	3.02 kg (1.6–3.7)
Number of patients	12,849	9
Open/laparoscopic	6500/6379	2/7
Inguinal hernia/hydrocele	9388/3461	8/1
Right/left/bilateral	7793/3118/1968	3/5/1
Preterm/full-term	462/12,387	2/7
Age ≤1 year/>1 years	7180/5669	1/8
Age ≤2 years/>2 years	9336/3513	2/7
Birth weight <2.5 kg/≥2.5 kg	319/12,530	1/8

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Introduction

Ascending testis (AT) is defined as a testis that has descended into the scrotum in the early infant period, but later ascends into a cryptorchid position, such as the high scrotum and low inguinal region [1,2]. It differentiates from a congenitial undescended testis, which fails to migrate into the scrotum before birth, and an iatrogenic cryptorchidism, which is caused by an incorrect inguinal operation. It has been estimated that AT is present in approximately 1—2% of all 'normal' males [3].

Postoperative AT is a rare complication in children. A large study [4], including 3776 pediatric inguinal hernia and hydrocele cases, showed the AT incidence to be <1% after an open operation. It was generally assumed that testicular ascent after the repair was caused by adhesion of the spermatic cord in the inguinal canal [5—7]. Therefore, AT after laparoscopic herniotomy is considered to be less than that after open repair because the laparoscopic approach does not destroy the structure of the inguinal canal [8]. However, there has been some controversy in other studies [9—11], which have reported a higher AT incidence following laparoscopic repairs.

The present study reviewed 15 years of experience at the present institution, and discussed the mechanism associated with testicular ascent after repair of pediatric inguinal hernia and hydrocele.

Materials and methods

A retrospective review was conducted of the medical records of male children who underwent inguinal hernia or hydrocele repair at the present hospital between January 2000 and December 2014. Patients were identified if they met one of the following inclusion criteria: diagnosed as undescended testis, cryptorchidism, or AT after repair of an ipsilateral inguinal hernia/hydrocele; and undergoing an orchidopexy after an ipsilateral inguinal hernia/hydrocele operation.

The exclusion criteria were as follows: misdiagnosed AT; the AT was caused by improper operation; and retractile testes. A misdiagnosed AT means that an undescended testis, which was never clearly diagnosed before the initial operation but misdiagnosed as an inguinal hernia and received a herniotomy, was found postoperatively in the early follow-up and then proceeded to an orchiopexy. An AT caused by an improper operation means that a testis was pulled up into a cryptorchid position, but was not restored to the scrotum immediately during the inguinal hernia/hydrocele repair. Retractile testis was defined as a testis that could be manipulated into a stable scrotal position, where it remained until the cremasteric reflex was elicited. It is painful to pull the spermatic cord of an AT, but not that of a retractile testis [12].

The age at initial repair, gestation age (premature, mature or postmature), birth weight, disease (inguinal hernia or hydrocele), surgical approach, laterality of repair, laterality and position of ATs, and time from initial repair to orchiopexy were collected. During the period, all repairs were performed by an open or laparoscopic approach. The open procedure was performed using a 1-cm inguinal skin incision, which was deepened afterwards to expose the external ring. The external oblique fascia was defined by pushing down with retractors, and incised with scissors. The cremasteric fibers were spread bluntly and the spermatic cord was exposed properly up to the level of the internal ring. The hernia sac/processus vaginalis was identified and isolated after careful blunt and sharp dissection of the cord. Then the sac/processus was highly ligated twice and the distal part was excised. The external oblique fascia and Scarpa's fascia were closed interrupted, while the skin was attached with glue or tape.

The laparoscopic approach was performed using two 5-mm incisions at the umbilicus and 5 cm near the umbilicus, respectively. A telescope and a grasper were subsequently introduced. Under direct visualization, a modified epidural needle pierced the skin at the internal ring. The needle traveled at the extraperitoneal level of the medial half of the ring. Then the peritoneum was pierced and a modified lumbar puncture needle left a double silk thread. A lateral circle was made in the same way, and another double silk thread was introduced into the loop of the first thread. The first thread was intended to pull the second thread out of abdomen to form a complete circle around the internal ring. Finally, double ligations were made extracorporeally to close the ring, and the knot was embedded subcutaneously. The contralateral patent processus vaginalis was repaired simultaneously, if present at exploration.

All patients were advised to have regular outpatient examinations at: the first week, first month, third month, sixth month and first year after the inguinal hernia/hydrocele operation. After the first year postoperatively, the patients were not followed up regularly, but they could see their doctor for any associated discomfort or abnormity. Once an AT was found after operation, an elective orchiopexy was performed as soon as possible.

All statistical analyses were performed using Stata 12.0 (Stata Corporation, USA). Given the very low incidence of AT after the operation, the Poisson distribution was used to evaluate the significance of differences among subgroups. A *P*-value of <0.05 was considered to be significant.

Results

A total of 17,295 inguinal hernias/hydroceles were repaired on 12,849 males over the past 15 years at the present institution. There were 9388 patients with an inguinal hernia and 3461 with a hydrocele; of these, 462 patients were premature. The median age at the time of initial repair was 3.19 years old, with a range of 10 days—12 years. The clinical presentation was left-sided in 3118 patients, right-sided in 7793, and bilateral in 1968. Open surgery was performed in 6500 patients (6801 repairs), and laparoscopic surgery in 6379 patients (10,494 repairs). The median follow-up was 10.6 years (range: 5—15) with 87% attendance for open repair, and 4.7 years (range: 0.75—8.5) with 92% attendance for laparoscopic repair. Overall, 20 children were diagnosed as undescended testis, cryptorchidism or AT, or received an orchidopexy after the ipsilateral operation. Of them, 11 patients were subsequently excluded: undescended testis was misdiagnosed as an inguinal hernia/hydrocele in four patients; caused by improper operation in