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Laparoscopic versus open orchiopexy in the management of peeping testis: A multi-institutional prospective randomized study

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Abstract *Objective:* Peeping testis is an inconsistently palpable/seen undescended testis that migrates back and forth at the internal inguinal ring. Both open and laparoscopic orchiopexy are effective forms of management. The present study aimed to evaluate the efficacy and safety of both approaches.
Patients and methods: Between September 2007 and January 2012, 46 peeping inguinal testes were randomly treated with either open (25 cases) or laparoscopic (21 cases) orchiopexy procedures. Spermatic vessels were preserved for all cases. Operative details, postoperative morbidity and final testicular site and size were recorded.
Results: The median age of the children was 2.5 years (range 0.5—12.0). The follow-up period ranged from 1.0 to 5.5 years. Of these testes, 20 in the open surgery group and 19 in the laparoscopic group maintained correct intrascrotal position ($P = 0.428$). Re-do orchiopexy was indicated for two cases in the surgical group ($P = 0.493$). No cases of testicular atrophy or hernia were encountered.
Conclusion: Open and laparoscopic orchiopexy procedures for peeping testes are fairly comparable. However, laparoscopy is relatively more effective, as two re-do orchiopexies were required in the open surgical group.

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Introduction

Cryptorchidism is one of the most common congenital anomalies found in full-term male neonates; at the age of three months there is a prevalence of 1–2%. Undescended testis (UDT) is the absence of one or both testes from normal scrotal position; during initial clinical evaluation it may be palpable or nonpalpable. On physical examination, approximately 20–27% of extrascrotal testes are found to be non-palpable testes (NPT) [1,2].

A peeping testis is a special cryptorchoid testis that emerges from the internal ring and is fairly mobile between the inguinal region and abdominal cavity; hence, it is not consistently palpable/seen in the inguinal region. Peeping testis represents a diagnostic challenge and a therapeutic dilemma. Open surgical treatment of such testes is the most popular approach among pediatric urologists and surgeons. Due to the difficult surgical mobilization of some peeping testes, as well as significant complications, including testicular retraction/atrophy (3–18%), it was hypothesized in the present study that laparoscopic orchiopexy for such high inguinal testes is an attractive alternative approach [3–7].

The work presented herein is a prospective randomized study to compare open and laparoscopic orchiopexy procedures for the management of peeping testis. The aim was to evaluate the success and morbidity of both approaches.

Materials and methods

The study was reviewed and approved by the institutional ethical review boards of the authors' affiliations. Parental informed consent was signed preoperatively. Between September 2007 and January 2012, all children with newly diagnosed unilateral peeping testes were included in a prospective study. Peeping testes with a minimum diameter of 7 mm or more were included. Sample size calculation was carried out using Epi-info™, version 3.3 (Centers for Disease Control and Prevention [CDC], 2005; Atlanta, GA, USA). A calculated sample of 46 was needed to detect an effect size of 0.3 between the two groups (25 from the open orchiopexy group and 21 from the laparoscopic orchiopexy group), with a P-value < 0.05 and 90% power.

A total of 143 children presented with unilateral NPT. Initial clinical evaluation in a frog-legged position (after application of lidocaine 5% topical anesthetic gel to the inguinal region) revealed palpable high inguinal testis in 38 children. Scrotal-inguinal ultrasonography (performed by seven radiologists using a 38 mm linear array transducer at 10 MHz) revealed inguinal testis of $\geq$7 mm in maximum diameter in eight more children, in addition to the clinically palpable 38 testes. Testicular volume was calculated in cm^3 using the following formula: length $\times$ width $\times$ height $\times$ 0.523. Testicular volume discrepancy was estimated by the formula: (the non-peeping testicular volume $-$ the peeping testicular volume) $\times$ 100 $\div$ the non-peeping testicular volume. Preoperative testicular volumes for the non-peeping UDTs were within normal for the children's ages. Testicular volume discrepancy of $>$20% was considered for evaluation. Testicular atrophy was considered if the size of the testis was less than the contralateral normal sized one, by one-third or more.

The selected 46 children completed the present study. The children were quasi-randomized into two treatment groups according to the month of presentation; those who presented in odd months were treated with open orchiopexy and those in even months were treated with laparoscopic orchiopexy. Four surgeons (AE, AA, HA and KFN) performed the surgical procedures at the three institutions.

Although all, included peeping testes, were not palpable under general anesthesia, 31 of them were palpable using the bimanual digital rectal examination. Spermatic vessels of peeping testes were preserved for all cases. The contralateral testes were: normally descended in 33 cases, high scrotal in six cases and at superficial inguinal pouch region in the remaining seven patients. Contralateral surgical orchiopexy of UDT was performed at the same session. All children received a single dose of i.v. 1st generation cephalosporin (50 mg/kg) 1 h before induction of anesthesia.

The technique of open orchiopexy ($n = 25$) was as follows: through a transverse inguinal incision, the subcutaneous tissues then the inguinal canal were opened sharply. The testis was delivered, the gubernaculum was divided, and the patent processus vaginalis was dissected and ligated at the level of the internal inguinal ring. Dissection continued proximally into the retroperitoneum to mobilize the testicular vessels off the peritoneum. A dartos pouch was then created in the bottom of the ipsilateral hemiscrotum, to which the testis was delivered and fixed. The incisions were closed anatomically and local infiltration of 2% lidocaine at a dose of 4 mg/kg was applied.

The technique of laparoscopic orchiopexy ($n = 21$) was as follows: after insertion of a urethral catheter, a 5 mm umbilical trocar was inserted using the open Hasson technique. A pneumoperitoneum was created to 10–12 mm Hg. Two additional 5 mm trocars were inserted in the midclavicular line just below the level of the first trocar. The peeping testis could then be seen to be emerging from the internal ring. The dissection was started with an incision of the peritoneum, lateral to the testicular vessels down to the internal ring, followed by division of the gubernaculum, then incision of the peritoneum medial to the vas deferens. When such testis reached to the contralateral internal ring, the peritoneum was incised over the testicular vessels and wide mobilization of the testicular vessels up to the upper retroperitoneum was done. A subdartos pouch was created, a grasping forceps was placed into the peritoneum medial to the inferior epigastric vessels and the testis was fixed to the bottom of the scrotum, as in the surgical group. Local instillation of 2% lidocaine at a dose of 4 mg/kg to the peritoneal cavity through a trocar port was applied at the end of the procedure.

A visual pain analogue scale (VPAS) was calculated for all children 6 h after the procedure by three Post-Anesthesia Care Unit (PACU) nurses; one in each institution. A pain score of 4–6/10 was the indication for rectal paracetamol 15 mg/kg, whilst a pain score of $>$6/10 was the indication for additional analgesia by i.v. Pethidine (1 mg/kg). All children were discharged on postoperative Day 1; they were followed up clinically 1 month, 3 months and 1 year

Table 1 Basic characteristic of children with peeping testes at presentation.

Variable	Surgical orchiopexy ($n = 25$)	Laproscopic orchiopexy ($n = 21$)	*P*-value
Age at presentation (in months)	30 (18, 48)	24 (18, 48)	0.715
Children that had a left peeping testis	44.0%	57.1%	0.375
Testicular size discrepancy > 20%	32.0%	28.6%	0.801

post-operatively, then biannually. Success was considered if the testis was located at the bottom of the scrotum with lack of atrophy at the last follow-up (≥1 year(s) after orchiopexy). Scrotal-inguinal ultrasound was done one year post-operatively. Complications were recorded for both groups according to the modified Clavien system [8]. Follow-up included evaluation of testicular site, vasculature and presence of atrophy.

Statistical analysis was performed using STATA®, version 9.2 (Inter-cooled STATA, Texas, USA). A univariate analysis was done to compare the two treatment groups. Analysis included: the Chi-square test or Fisher's exact test for comparison of the categorical data, and the Mann—Whitney *U* test (values expressed as median, inter-quartile range) to compare the non-categorical data.

Results

The median age of the children at presentation was 2.5 years (range 0.5—12). Left sided peeping testis was noted in 50% of cases. Contralateral patent processus vaginalis was seen in 4/16 patients with contralateral normally descended testes in the laparoscopy group; for which no intervention was actioned. The preoperative, intraoperative and postoperative data are summarized in Tables 1 and 2. Postoperative testicular volumes for the non-peeping UDTs were within normal for the children's ages. Laparoscopic orchiopexy provided a median of 25% additional costs over open orchiopexy.

Early post-operative complications were: umbilical port site infection for one child in the laparoscopic group, significant scrotal edema for one child in the open surgical group and scrotal wound infection for another child in the open surgical group; all were Clavien Grade II and were treated conservatively.

Follow-up period ranged from 1 to 5.5 years. Of the treated peeping testes, 20 in the open surgical group and 19 in the laparoscopic group maintained correct position at the base of the scrotum ($P = 0.428$). The ultrasound detected 8/46 UDTs were successfully treated with no re-do surgery indicated for any. Re-do orchiopexy was indicated for two inguinally re-ascended testes in the open-surgical arm; re-do open inguinal orchiopexy was performed for one case, whilst an open inguinal orchiopexy was combined with laparoscopic mobilization of spermatic vessels for the other. All testes maintained their vasculature until the last follow-up, with no encountered cases of testicular atrophy or hernia. Follow-up data are presented in Table 3.

Discussion

To date, the management of NPT is controversial; the standard tool among pediatric urologists is laparoscopy, with an accuracy of >98% for diagnosis and the ability to proceed for orchiopexy if applicable. Overall, 35—70% of NPT are atrophic, 15—40% are viable peeping/canalicular and 33—50% are viable abdominal testes [3—7,9].

To avoid the high costs of laparoscopy, its potential 1.18% risk of complications and to maximize its benefit for detection of viable testes, other approaches are available. Of these approaches there are: scrotal exploration of unilateral NPT with contralateral testicular hypertrophy (testicular length > 1.8 cm); a preoperative course of human chorionic gonadotropin; scrotal-inguinal ultrasound; magnetic resonance imaging; and evaluation under general anesthesia with or without bimanual digital rectal examination. All of these maneuvers can avoid laparoscopy in up to 18—64% of NPT cases [9—13]. During evaluation of NPT at the present institutions, peeping testes were detected by clinical/ultrasonic preoperative diagnosis.

Surprisingly, intraoperatively, a bimanual digital rectal examination was found to be more helpful than a careful abdominal exam alone; this is perhaps due to intra-abdominal receding of the peeping testis under general anaesthia (through the relaxed internal ring and the patent processus vaginalis) and bimanual digital rectal examination relocates it to the inguinal canal.

Similar to NPT, a variety of clinical/non-operative imaging techniques have been used to palpate/visualize peeping testis; then open orchiopexy (although somewhat difficult) is usually utilized. Although laparoscopy has a great role in the diagnosis and treatment of NPT, its role in the management of peeping testis is not well established. For either approaches, testicular vessel preservation is

Table 2 Summary of intraoperative and postoperative data of open versus laparoscopic orchiopexy.

Variable	Surgical orchiopexy ($n = 25$)	Laproscopic orchiopexy ($n = 21$)	*P*-value
Operative time (in minutes [median (inter-quartile range)])	40 (35, 45)	40 (40, 45)	0.213
Postoperative VPAS [median (inter-quartile range)]	3 (2, 3)	3 (3, 3)	0.062
Early postoperative complications	8.0%	4.8%	0.567

Table 3 Summary of follow-up results of peeping testes orchiopexy.

Variable	Surgical orchiopexy ($n = 25$)	Laproscopic orchiopexy ($n = 21$)	*P*-value
Follow-up in years [median (inter-quartile range)]	2 (1.5, 2)	2 (2, 3)	0.170
Final scrotal position: mid-scrotum or higher	20.0%	9.5%	0.428
Redo-orchiopexy	8.0%	0.0%	0.493
Testicular size discrepancy > 20%	36.0%	33.3%	0.850

always advisable, which is the predictor of successful orchiopexy on multivariate analysis [14]. The present prospective randomized study was conducted to compare both approaches; testicular vessel preservation was performed for all cases.

Regarding open orchiopexy for such high inguinal testes, the reported success rate (i.e. testis at the bottom of scrotum with lack of atrophy) showed that it was not usually satisfactory. Docimo reported successful orchiopexy for such testes to be only 82.3%, which is much lower than the rate of successful open surgical orchiopexy (92.6%) for testes beyond the external ring [6]. The success rate for such high palpable testes is much better (upto 97%), with extensive anatomical retroperitoeal dissection of spermatic vessels and an adapted Prentiss maneuver [15]. For 45 testes (including 11 peeping) with short spermatic vessels, staged orchiopexy with spermatic vessels being preserved showed a 100% success rate [16].

The results of primary laparoscopic orchiopexy for the management of palpable inguinal testes (including peeping testes) were reported to be effective, with a 100% success rate [7,17,18]. The potential advantages of laparoscopy in such situations are: magnification, and a wide range of testicular dissection with facilitation of the Prentiss maneuver to allow satisfactory orchiopexy without vascular injury/tension [7,17,18]. Long looping vas was not detected in any of the present study's cases; open orchiopexy may be advised for such a rare finding [19].

In the literature, only one study compared the results of traditional open versus laparoscopic orchiopexy for 75 palpable inguinal testes and showed that the results were almost equal [20]. In contrast to the previous study, the present study included only the more difficult high inguinal peeping testes. Both surgical groups in the present study showed similar results regarding postoperative VPAS, as well as insignificant testicular volume change; these findings may limit the routine use of the more-costly laparoscopic orchiopexy for peeping testes. However, re-do orchiopexy was required in only two patients of the surgical group, which is a clinically significant advantage of laparoscopic orchiopexy for such patients. This supports the efficacy of a minimally invasive technique, i.e. laparoscopy.

Limitations of the present study included: the inherent bias of the used quasi-randomization, multiplicity of radiologists and operators, lack of a well-standardized definition of peeping testis and relatively small number of cases. Moreover, longer-term follow-up is still needed to confirm these initial findings.

Conclusions

Laparoscopic orchiopexy is a successful, eventless approach for peeping testis, with no re-do orchiopexy being required. However, traditional open orchiopexy is also a feasible alternative.

Conflict of interest/funding

None declared.

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