

Single penile incision for combined hypospadias and inguinal surgery: A comparative study

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Abstract

Introduction: We sought to compare the surgical outcomes of hypospadias repair with correction of inguinal pathology using a single penile incision vs. conventional approach using two incisions.

Methods: This is a retrospective study that reviewed all patients who underwent concurrent surgical repair for both hypospadias and inguinal pathologies between January 2003 and November 2015. Patients were classified into Group A, conventional (inguinal or scrotal and penile incision) approach; or Group B, single penile incision approach. Baseline characteristics, including age, degree of hypospadias, type and laterality of inguinal pathology, operative time, and surgical outcomes, were collected. Between groups, variable comparisons were analyzed using Mann-Whitney U-Test and Fisher-exact test. Statistical significant set at <0.05.

Results: Seventy-six patients (Group A: 40; Group B: 36) were eligible for study. Baseline characteristics of both groups were comparable, with no significant statistical difference. Overall mean operative time for Group A was 139.3 ± 56.2 minutes, while Group B was 107.8 ± 46.7 minutes (Z=2.6; U=470.5; p=0.009). Two patients in Group A and two patients in Group B had testicular ascension, all of which also had hypospadias-related complications (p=1.0). Hypospadias-related complications in Group A included seven urethrocutaneous fistulae and two repair dehiscence. Eight urethrocutaneous fistulae, one urethral stricture, and two repair dehiscence occurred in Group B (p=0.448). Surgical outcome appearance in both groups were comparable, with no statistically significant difference (p=0.466).

Conclusions: Single penile incision for both hypospadias repair and correction of inguinal pathology is a feasible technique and comparable to the conventional approach, with similar surgical outcomes and shorter overall operative time.

Introduction

Hypospadias is one of the most common congenital anomalies noted among boys at birth.¹ This condition may be

associated with other genital and extraurogenital anomalies.^{2,3} Cryptorchidism and inguinal hernia are the most common hypospadias-associated congenital anomalies.^{3,4} Traditionally, concomitant hypospadias and inguinal pathology (cryptorchidism or hernia) are approached using two separate skin incisions in a single surgical setting. However, since 2009 in our institution, we adapted a single penile incision (SPI) to address both pathologies. We hypothesize that SPI is a feasible technique and its surgical outcomes are comparable to conventional approach in addressing the repair for both hypospadias and inguinal pathologies. Herein, we present our surgical outcome of hypospadias repair with correction of inguinal pathology using SPI in comparison to conventional approach.

Methods

This study was approved by our institutional research ethics board (study #1000047953). Our non-concurrent cohort study was performed using our institution's surgical database, registered between January 2003 and November 2015. Included for study followup assessment were all pediatric patients who underwent concurrent surgical repair for both hypospadias and inguinal pathologies (includes inguinal hernias and palpable undescended testicles) in a single operative setting. Concurrent repair for both pathologies was not done for cases that involved non-palpable undescended testicles, patients with incarcerated, strangulated hernias, or testicular torsions where surgery was done as an emergency rather than elective procedure. Patients with other congenital anomalies who may require additional surgical intervention in the urogenital area (i.e., anorectal malformation) were likewise not included.

Perioperative care and surgical techniques

Standard perioperative care was performed on all patients in both groups. Pre-surgical evaluation in the clinic, with documentation of the hypospadias degree and inguinal pathol-

ogy classification, was performed in all patients. Patients were evaluated by the pre-anesthesia team prior to surgery. Informed consent was secured prior to the procedure, with clear explanation on the surgical procedure to be done. Patients underwent the contemplated surgery within three months of initial evaluation. All patients received caudal block and one dose of preoperative intravenous antibiotic. Intraoperative findings and complications were indicated in the surgical technique and operative notes, while operative time for each cases are specified in the operating room logs. Notably, the tabularized incised plate (TIP) procedure is the repair approach for all distal hypospadias in this cohort.

For the conventional approach, all patients underwent subsequent surgical repair in a single operating room setting, with either the hypospadias repair or inguinal pathology repair as the first procedure, followed by the other. A separate inguinal incision for hernias or both inguinal and scrotal incisions was made for orchidopexy. For single penile incision, the procedure was started with a skin incision made for hypospadias repair. The penile shaft was degloved and followed by placing the retractors towards the inguinal area. The retractors were rested on the pelvic bone and directed toward the ipsilateral shoulder, with dissection into the inguinal area for identification of the gubernaculum. Once the gubernaculum was grasped with forceps, we proceeded with mobilization of undescended testis and spermatic cord lengthening (Fig. 1). The hernial sac was isolated and ligated high at the inguinal area. For undescended testis, after dissection of hernia and cremasteric muscle and preservation of spermatic vessels and vas deferens, a subdartos pouch was developed via hypospadias incision. The testicle was placed into the subdartos pouch, followed by closure of the dartos layer and completion of the hypospadias procedure. Tunica vaginalis may be used for additional flap layer for hypospadias repair.

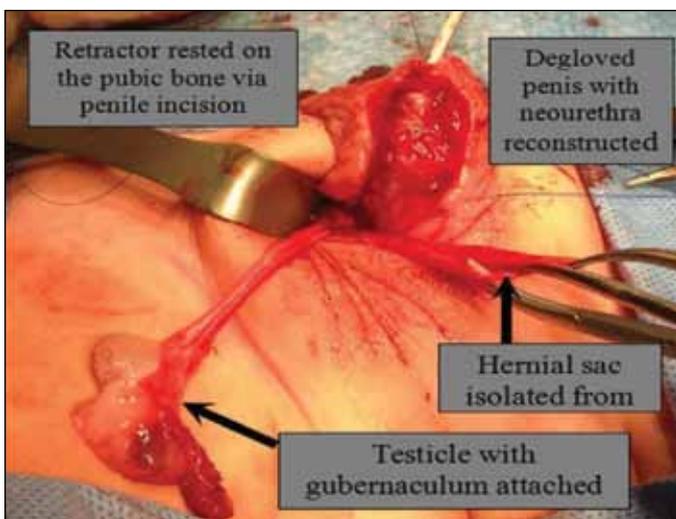


Fig. 1. Single penile incision dissection for repair of both hypospadias and inguinal pathologies.

All patients in both groups underwent the procedure as day surgery; however, depending to the comorbidities of the patient, some were admitted to the hospital for overnight monitoring. All hypospadias repair used a silastic stent or catheter left in place and removed seven days postoperatively. At the surgeon's discretion, patients in either group could have been given prophylactic antibiotics until stent/catheter removal. All patients were followed up after three months. The patient database and records were followed for evaluation of any postoperative complication. Clinic notes should have indicated postoperative testicular location and characteristics and the hypospadias repair cosmetic condition. Third-party physicians evaluated overall appearance and surgical outcome satisfaction at the three-month postoperative followup physical examination. Satisfactory outcome is defined as testicular location in the scrotum with good testicular consistency and hypospadias repair site with absence of skin discoloration, skin redundancy, ventral curvature, meatal stenosis, severe scarring, fistula, and dehiscence, as well as good graft/flap uptake.

Data collection and analysis

Patients were classified into Group A, conventional (inguinal, scrotal and penile incision) approach; or Group B, single penile incision approach. Surgical databases with patient records were gathered for collection of patient demographics and baseline characteristics, including age, degree of hypospadias, type and laterality of inguinal pathology, operative time, and surgical outcomes (third-party surgeon outcome assessment, pathology recurrence, and complication rates).

Continuous data, such as age, was analyzed using T-test, while operative time comparison was analyzed using Mann-Whitney U-test. Categorical data, such as hypospadias and inguinal pathology classification, laterality, and surgical outcomes (complications and physician outcome assessment) were analyzed using Fisher-exact test. Statistical significance was set at <0.05 . All statistical analysis was done on SPSS Statistics 20.

Results

Seventy-six patients were identified for inclusion from the institutional surgical databases. Forty patients underwent conventional approach (Group A) and thirty-six had single penile incision approach (Group B). The mean age of patients at the time of procedure for Group A and Group B was 24.8 ± 23.6 months and 24.7 ± 23.9 months, respectively (no significant difference between groups [$t(2)=0.02$; $p=0.98$]). Baseline characteristics of both groups for hypospadias type, inguinal pathology, and laterality were all comparable, with no significant statistical difference (Table 1).

Table 2 summarizes the perioperative surgical outcome. Overall mean operative time for Group A was 139.3 \pm 56.2 minutes, while Group B was 107.8 \pm 46.7 minutes. This showed a significant statistical difference in favour of the single penile incision ($Z=2.6$; $U=470$; $p=0.009$). On further subgroup analysis according to hypospadias type, mean operative time was significantly shorter among distal hypospadias repair for single penile incision (80.6 \pm 26.7 minutes) than for the conventional approach (123.7 \pm 38.6 minutes) ($Z=3.57$; $U=93$; $p<0.001$). Subgroup Mann-Whitney test analysis according to inguinal pathology also noted statistically significant shorter mean operative time for hernia repair in single penile incision (101.6 \pm 41.4 minutes) compared to the conventional approach (143.7 \pm 47.8 minutes) ($Z=2.11$; $U=33.5$; $p=0.035$). Likewise, significantly shorter mean operative time was noted for unilateral inguinal pathology in single penile incision than for the conventional approach (102.3 \pm 50.8 minutes vs. 131 \pm 50.2 minutes) ($Z=2.296$; $U=190$; $p=0.02$). For other subgroup analysis, such as midshaft and proximal hypospadias repair, orchidopexy and bilateral inguinal pathology, although statistically non-significant, shorter mean operative time was noted among the single penile incision group (Table 2).

At the three month postoperative followup, both inguinal surgery and hypospadias repair complication rates were similar between groups, with no statistical significant difference ($p=1.0$ and $p=0.448$, respectively). Specifically, two patients in Group A and two patients in Group B had testicular ascension, all of whom also had initial condition of penoscrotal hypospadias and resultant postoperative penile complications. Among the single penile incision group, both complication cases had redo orchidopexy and urethrocutaneous fistula repair done again using single penile incision, with no further complications noted. For the conventional

approach group, both cases had urethrocutaneous fistula and dehiscence repaired and redo orchidopexy done with scrotal approach in a separate incision. Likewise, Group A had seven urethrocutaneous fistulae and two repair dehiscence, while eight urethrocutaneous fistulae, one urethral stricture, and two repair dehiscence occurred in Group B. The initial hypospadias classification in both groups that had penile complications does not have significant difference ($p=1.0$, Fisher exact test). In terms of physician surgical outcome assessment, no difference in satisfactory outcome was noted between groups ($p=0.466$) (Table 2).

Discussion

The concept of minimally invasive surgery can be applied to open surgery in pediatric urology. This involved an effort to lessen incision, potentially resulting in reduced morbidity and hasten convalescence, without compromising gold standard outcomes.⁵ Concomitant conditions of hypospadias and inguinal pathologies of cryptorchidism and hernia are common;^{3,4} the pathologies are in close proximity and anatomically, the penile dartos layer is continuous with the inguinal scarpa and scrotal space. Hence, the dissection of penile degloving for hypospadias repair can access both spaces and the testicle can be located and fixed to its intended location in the scrotum.⁶ The feasibility of this minimally open incision was demonstrated by prior studies.⁵⁻⁸ However, our study was able to provide a better analysis that showed distinct advan-

Table 2. Comparative summary of perioperative outcome

Perioperative surgical outcome	Group A – Conventional approach	Group B – Single penile incision	p
Procedural time in minutes			
Overall	139.3 (56.2)	107.8 (46.7)	0.009
Hypospadias type			
Distal	123.7 (38.6)	80.6 (26.7)	<0.001
Midshaft-proximal	175.8 (74.0)	135 (47.0)	0.134
Inguinal pathology			
Orchidopexy	135.7 (63.2)	109.6 (48.7)	0.168
Hernia	143.7 (47.8)	101.6 (41.4)	0.035
Laterality			
Unilateral	131 (50.2)	102.3 (50.8)	0.02
Bilateral	158.8 (66.5)	116.5 (39.8)	0.19
Complications			
Inguinal complication	2	2	1.0
Penile complication	9	11	0.448
Distal	3	4	1.0
Midshaft-proximal	6	7	
Outcome			
Satisfactory	29	23	0.466
Non-satisfactory	11	13	

Table 1. Baseline characteristics of both groups for hypospadias type, inguinal pathology, and laterality

Baseline characteristics	Group A – Conventional approach	Group B – Single penile incision	p
Number of patients	40	36	
Mean age in months (SD)	24.8 (23.6)	24.7 (23.9)	0.98
Age range in months	6–118	6–120	
Hypospadias type			
Distal	28	18	0.1
Midshaft-proximal	12	18	
Inguinal pathology			
Cryptorchidism	22	28	0.053
Hernia	18	8	
Laterality			
Unilateral	28	22	0.47
Bilateral	12	14	

SD: standard deviation.

tage of doing the single penile incision approach. This modified technique resulted in shorter operative time since less incisions were made and less structure violated. The results of our patient cohort demonstrated that overall operative time is significantly shorter with single penile incision than with the conventional approach (107.8 ± 46.7 minutes vs. 139.3 ± 56.2 minutes; $p=0.009$). Similar results were obtained by Sabetkish et al, whose data showed a significantly shorter operative time among patients who underwent single subcoronal incision than among those with multiple incisions (93 ± 11 minutes vs. 138 ± 17 minutes; $p=0.03$).⁸

In subgroup analysis of our cohort, a significant between-group differences were also noted on distal hypospadias (123.7 ± 38.6 vs. 80.6 ± 26.7 minutes; $p<0.001$), inguinal hernia (143.7 ± 47.8 vs. 101.6 ± 41.4 minutes; $p=0.035$), and unilateral inguinal pathology (131 ± 50.2 vs. 102.3 ± 50.8 minutes; $p=0.02$). Our result showed no statistically significant difference between groups for subgroup of proximal hypospadias and bilateral inguinal pathology, which may be due to the small subgroup size. However, the operative time was generally shown to be shorter those who underwent the single penile incision approach. Our result is in contrast to the results reported by Kajbafzadeh et al, which showed shorter mean operative time among proximal hypospadias with bilateral hernia compared to distal hypospadias with unilateral hernia (mean operative time difference 15.5 vs. 5.3 minutes); however, no statistical analyses were used in their study, which was a major limitation of their report.⁷

Surgical outcome analyzed from the result of our study cohort showed no differences in both inguinal and penile complications between groups. These outcomes are similar to those reported by smaller studies in 2014 and 2015, where they described no significant differences between groups for complication occurrence.^{7,8} We postulate another distinct advantage for single penile incision approach is that when a difficult case is encountered, there is always an option to convert to multiple incisions without compromising surgical outcome. Likewise, in cases of inguinal pathology recurrence, a separate non-scarred area of inguinal or scrotal incision can always be made, and this would make the redo procedure easier.

The evaluation of the three-month followup physical examination of our study cohort also showed no differences between groups for satisfactory outcome. This is contrary to Sabetkish et al, where significantly better cosmetic outcomes were noted at six-month and two-year postoperative followups among single subcoronal incision groups ($p=0.02-0.03$).⁸ However, the definition of satisfactory cosmetic outcome in the Sabetkish et al study is only based on presence and absence of scar; in contrast, our study defines outcome satisfaction as post-surgical conditions of both inguinal pathology and hypospadias repair condition.

We presented a slightly higher testicular re-ascent rate of 5% as compared to our institution's overall redo-orchidopexy rate of 1.6%.⁹ As described, all the re-ascent cases reported in this cohort were of severe proximal hypospadias and associated with postoperative hypospadias complication. The reason could be phenotypic-genotypic characteristics with defect in the wound healing and tissue regeneration among this subset of patients. There is literature stating that genotypes that have sonic hedgehog signalling (SHH) problems are likely to present with severe hypospadias and this genotype is also associated with defect on tissue repair and regeneration.¹⁰⁻¹¹

Our study has the limitation of being a non-concurrent cohort, although no randomization was applied; however, we are able to include all well-defined patients in the set timeframe. Furthermore, the baseline characteristics between groups in this study did not show any statistical significant difference, which supports no involvement of selection bias. Although the postoperative assessment was short (three months), both treatment groups received a consistent and well-documented followup evaluation — something that was not reported by any previous studies. This being said, we still recommend future studies to assess long-term outcome using hypospadias objective penile evaluation (HOPE) and to evaluate between-group differences on pain control using the pediatric visual analogue scale.¹²⁻¹³

Conclusion

Single penile incision approach for concurrent repair of hypospadias and correction of inguinal pathology is a feasible and safe technique. Our study cohort illustrates that both single penile incision and conventional approach have comparable surgical outcome, with a significant shorter overall operative time in the single penile incision approach. Prospective studies collecting information on morbidity (pain control) and longer-term outcomes with objective measurement are necessary to support this preliminary data.

Competing interests: Dr. Dos Santos has received honoraria from Duchesnay. Dr. Koyle has been an advisor for Duchesnay. The remaining authors report no competing personal or financial interests.

This paper has been peer-reviewed.

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