The use of tourniquet versus bipolar cautery as hemostatic aid in distal hypospadias repair in children: a multicentric study

Rasha Kassem[a,c], Khalid Shreef[a,b,c,d], Hazem Eltayeb[b], Tarek Gobran[a], Nishith K. Jetley[d], Mervat Saleem[e]

[a]Pediatric Surgery Unit, [b]Pediatric Surgery Department, Faculty of Medicine, Zagazig University, Zagazig, Egypt, [c]Pediatric Surgery Department, King Saud Hospital, Unaizah, [d]Aseer Central Hospital, Abha, Kingdom of Saudi Arabia, [e]Pediatric Surgery Unit, Soba University, Sudan

Correspondence to Rasha Kassem, MD (Doctorate), Pediatric Surgery Unit, Faculty of Medicine, Zagazig University, Zagazig, Egypt; Tel: 00201000089369; E-mail: rasha_yousof@yahoo.com

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Background/purpose
Hypospadias is a congenital penile defect in which the urethra opens into the ventral part of the penis, scrotum, or perineum. Hypospadias surgery is performed in children where losses of even minimal amounts of blood are of concern. The two commonly used methods to achieve hemostasis are vasoconstrictive agents and the bipolar and application of a penile tourniquet. *The aim of this study* is to compare the outcome of using vasoconstrictors and bipolar diathermy without tourniquet versus the use of tourniquet and bipolar diathermy to obtain hemostasis during hypospadias repair in children.

Patients and methods
This prospective study was carried out at 4 different pediatric surgery units, during the period from April 2012 to September 2014. The study included 60 uncircumcised boys with mid penile, distal penile or coronal hypospadias with ages ranging between 6 months and three years. Recurrent hypospadias, proximal penile hypospadias and patient had sickle cell disease or sickle cell trait was excluded from this study. Standardized proformas were used to allot patients to two treatment groups. ***Group A***, included 30 patients in whom the tourniquet, *rolled rubber glove*, was applied around the base of the penis during operations to control bleeding. **Group B**, included 30 cases, in whom the operation was performed without tourniquet and hemostasis was obtained by preoperative infiltration of the incision site with adrenaline and bipolar cautery throughout the procedure.

Results
The operative time ranged from 66–85 minutes (mean 76.66 ± 21.50) in **group A**, while in **group B** it was 79–95 minutes (mean 88.50 ± 29.40). The difference between the two groups was statistically significant. Early Postoperative hematomas occurred in 13.3% of group A and 6.6% of group B patients respectively. The rate of fistula formation was higher in group B patients than group A (10% and 6.6% respectively). One patient developed urethral stricture in group A and two cases in group B. Metal stenosis was higher in group A than group B, (6.6% and 3.3% respectively). However, there was no significant statistical difference between both groups as regard the post-operative complications.

Conclusion
Use of tourniquets as hemostatic technique is a good option in hypospadias surgery. It facilitates the surgical technique and gives clear field to the surgeon so reduces the operating time.

Keywords:
bipolar, hemostasis, hypospadias, tourniquets, vasoconstrictors

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Introduction

Hypospadias is a congenital penile defect in which the urethra opens into the ventral part of the penis, scrotum, or perineum. It is the result of incomplete development of the urethra, which occurs in 0.3–0.8% of male newborns. About 70% of hypospadias are distal, 10% midshaft, and 20% proximal (penoscrotal, scrotal, perineal) [1].

Hypospadias surgery is performed in children where loss of even minimal amounts of blood is of concern [2,3]. Maintaining a bloodless field during the repair facilitates safe dissection and accurate placement of sutures [1]. The two commonly used methods to achieve hemostasis are the use of vasoconstrictive agents and a bipolar tourniquet, or application of a penile tourniquet [4].

Tourniquets can be maintained by applying various devices – for example, a rubber band, an elastic vascular loop, a Penrose drain, or a cylinder cut from the finger of a glove and rolled to the base of the penis (technique of Barnett) [1,3].

The systemic effects of penile tourniquet use are unlikely to be of any major significance because of the relatively minor changes in blood volume that would occur following penile tourniquet application. It is the local effects of tourniquet application that are of concern when following a hemostatic approach in penile surgery [3]. The usual methods of hemostasis – for example, cauterization and ligation – can cause tissue damage in children [2].

The aim of this study was to compare the outcome of using vasoconstrictors and bipolar diathermy without tourniquet versus the use of tourniquet and bipolar diathermy to obtain hemostasis during hypospadias repair in children.

Materials and methods

This prospective study was carried out at the Pediatric Surgery Unit, Surgical Department, Zagazig University Hospital, Egypt, Assir Central Hospital and King Saud Hospital, Qassem, KSA, and Soba University, Sudan, from April 2012 to September 2014. Standardized proformas were used to allot patients to two treatment groups. The study included 60 uncircumcised boys with midpenile, distal penile, or coronal hypospadias with ages ranging between 6 months and 3 years. Patients with recurrent hypospadias, proximal penile hypospadias, or sickle cell disease or sickle cell trait were excluded from this study. The study was granted approval by our institutional Ethical Committee.

The enrolled patients were divided into two groups:

Group A included 30 patients in whom the tourniquet, rolled rubber glove, was applied around the base of the penis during operations to control bleeding. The maximum application time was 40 min; if the operation lasted longer than 40 min the tourniquet was released for 10 min.

Group B included 30 patients in whom the operation was performed without using a tourniquet and hemostasis was obtained by preoperative infiltration of the incision site with adrenaline (1/20 000) and bipolar cautery throughout the procedure.

The patients received an injection of cefuroxime perioperatively and for 7 days postoperatively. All patients were operated upon by senior surgeons of comparable experience. Snodgrass technique was used for hypospadias repair. Urethral catheters were left for 1 week. Dressing was done with petroleum jelly-impregnated gauze (bactigras wrapped with gauze and plaster). The dressing was changed on the third day after the operation.

The following observations were made:

(1) Time taken for the operation.
(2) The need for changing the dressing because of bleeding in the early postoperative period.
(3) Presence or absence of hematomas.
(4) Infection.
(5) Appearance or absence of diffuse penile edema.
(6) Postoperative appearance of fistula, meatal stenosis, or stricture in the late postoperative period and during clinic visits.

The data were collected, organized, and tabulated with particular reference to age, site of hypospadias opening, operative time, and postoperative complications. The collected data were statistically analyzed using Statistical package for social science (SPSS) software, version 13; IBM, Armonk, New York, USA. Data comparison between the two groups was made using the χ^2-test. Correlation between variables (age, site of opening, operative time, and complications) was evaluated. Significance was adopted at P value less than 0.05 for interpretation of results of tests of significance.

Results

The age of our patients ranged from 6 to 38 months (average=1.8 years). The hypospadias opening was coronal in 18 patients (30%), distal penile in 27 patients (45%), and midpenile in 15 patients (25%) (Table 1).

The operative time ranged from 66 to 85 min (mean=76.66±21.50) in group A, whereas in group B it was 79–95 min (mean=88.50±29.40). The difference between the two groups was statistically significant (Table 2).

Early postoperative hematomas occurred in 13.3% of group A and 6.6% of group B patients. Diffuse penile edema appeared in 23.3% of group A and 10% of group B patients. Postoperative bleeding occurred in 6.6% of group A and 3.3% of group B patients. One patient in group A developed wound infection. However, there was no significant statistical difference between the two groups with regard to early postoperative complications (Table 3).

The rate of fistula formation was higher in group B patients than in group A patients (10 and 6.6%), respectively. One patient developed urethral stricture in group A, compared with two patients in group B. However, meatal stenosis was higher in group A than in group B (6.6 and 3.3%), respectively. This difference was not statistically significant (Table 4).

Table 1 Clinical data

Variables	Group A	Group B	Total numbers of patients [*n* (%)]
Age (months)	6–38	8–35	
Site of opening			
Coronal	9	9	18 (30)
Distal penile	14	13	27 (45)
Midpenile	7	8	15 (25)

Table 2 Operative time

	Group A	Group B	*P* value
Operative time (min)	66–85	79–95	
Mean±SD	76.66±21.50	88.50±29.40	<0.05

Table 3 Early postoperative complications

Complications	Group A [*n* (%)]	Group B [*n* (%)]	Total numbers of patients [*n* (%)]	*P* value
Wound hematoma	4 (13.3)	2 (6.6)	6 (10)	>0.05
Diffuse penile edema	7 (23.3)	3 (10)	10 (16.6)	>0.05
Postoperative bleeding	2 (6.6)	1 (3.3)	3 (5)	>0.05
Wound infection	1 (3.3)	0 (0)	1 (1.6)	>0.05

Table 4 Late postoperative complications

Complications	Group A [*n* (%)]	Group B [*n* (%)]	Total numbers of patients [*n* (%)]	*P* value
Meatal stenosis	2 (6.6)	1 (3.3)	3 (5)	>0.05
Urethrocutaneous fistula	2 (6.6)	3 (10)	5 (8.3)	>0.05
Urethral stricture	1 (3.3)	2 (6.6)	3 (5)	>0.05

Discussion

Meticulous hemostasis is an important requisite for any form of surgery. It reduces blood loss and ensures good operating conditions. During hypospadias repair, the best option for maintenance of effective hemostasis without permanent tissue injury has not been determined. However, it is generally accepted that the use of hemostasis methods should be kept to a minimum to avoid ischemic injuries [3,5].

We set out to compare two different methods for obtaining hemostasis during hypospadias surgery – vasoconstrictors and bipolar diathermy versus tourniquet only.

The average duration of surgery in group A was 76.66 versus 88.50 min in group B.

The duration of surgery was significantly different in the two groups ($P<0.05$). The shorter times in group A may be attributed to the clearer operative field consequent to tourniquet application.

In our results, the incidence of postoperative diffuse penile edema, hematoma, bleeding, and stenosis was higher in group A when compared with group B. These results are in accordance with other studies [6,7].

The percentage of urethrocutaneous fistulae and urethral stricture in group A was lower than that in group B. Nevertheless, in our study these differences were statistically nonsignificant. These results are in agreement with the results of Orhan and colleagues, in whose study the rate of meatal stenosis was higher with the application of tourniquets. In their study fistulae occurred more frequently with the use of bipolar cautery (11.1 vs. 9.3%) [6]. We observed urethral fistulae and strictures to be more common in group B. This has been attributed to impaired healing caused by diathermy use [8]. Pfistermuller *et al.* [9], however, observed more fistulae (5.7%) and urethral strictures (1.3%). Snodgrass believes that meatal stenosis is due to insufficiently deep incision of the urethral plate or continuing the urethral plate tubularization too far distally into the glans. Correcting these errors has been reported to significantly reduce complications [10].

Conclusion

Our study concluded that the use of tourniquets as a hemostatic technique is a good option in hypospadias surgery. It facilitates the surgical technique and gives a clear field, thus reducing the operating time significantly. However, as regards the early and late postoperative complications our results were statistically nonsignificant and need to be interpreted with caution as the surgeons' experience and preferences can be considered as confounding variables. In addition we think that a larger population and longer follow-up are needed.

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Conflicts of interest

There are no conflicts of interest.

References

1 Hensle TW, Tennenbaum SY, Reiley EA, Pollard J. Hypospadias repair in adults: adventures and misadventures. J Urol 2001; 165:77–79.

2 Ashok KL, Mazharkhan M, Shashi SS, Brijesh KL, Rajkumar M. A prospective comparison of topical feracrylum citrate versus adrenaline as haemostatic agent in hypospadias surgery in children. Afr J Paediatr Surg 2014; 11:215.

3 Parsons BA, Kalejaiye O, Mohamed M, Persad RA. The penile tourniquet. Asian J Androl 2013; 15:364–367.

4 Kajbafzadeh A, Seyedmehdi P, Seyed T. Comparison of different techniques for hemostasis in a rabbit model of hypospadias repair. J Urol 2007; 178:2555–2560.

5 Retik AB, Borer JG. Hypospadias [chapter 65]. In: 8th ed. Edited by Walsh PC, Retik AB, Vaughan ED Jr, Wein AJ. Campbell's urology. Philadelphia: WB Saunders; 2002. 3. 2284–2333.

6 Orhan K, Muzafer K, Mustafa G, Mehmet A, Cevdet K, Muhammet K. The effect of using a tourniquet during operation in patients with distal hypospadias on operation success. Turk J Urol 2011 37:331–334.

7 Rabinovitch HH. Experience with a modification of the Cloutier technique for hypospadias repair. J Urol 1988; 139:1014–1017.

8 Snodgrass W. Snodgrass technique for hypospadias repair. Br J Urol Int 2005; 95:683–693.

9 Pfistermuller KLM, McArdle AJ, Cuckow PM, *et al.* Meta-analysis of complication rates of the tabularized incised plate (TIP repair). J Pediatr Urol 2015; 11:54–59.

10 Snodgrass WT, Bush N, Cost N. Tubularized incised plate hypospadias repair for distal hypospadias. J Pediatr Urol 2010; 6:408–413.