



# Comparative Study between Adrenaline Injection and Bipolar Electrocautery in Proximal Hypospadias Repair

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## Abstract

**Background & Aim:** There are several techniques to repair hypospadias. Hemostasis is very important for meticulous surgical repair to achieve the best cosmetic and functional outcome and also to prevent complications as bleeding, hematoma, wound dehiscence and fistula formation because this area is very vascular. Hemostasis in hypospadias can be achieved by different methods as tourniquet, electrocautery, and vasoconstrictive agents as adrenaline. The aim of this study is to compare between the effect of Adrenaline-Xylocaine injection (Adrenaline 1/200000-Xylocaine 1%) and bipolar electrocautery for hemostasis in proximal hypospadias (proximal shaft, penoscrotal and perineal hypospadias).

**Patients and Methods:** This study included 40 uncircumcised boys with proximal hypospadias without any attempt of surgical repair. Patients randomized into 2 groups, Group A: Included 20 boys in whom the bipolar diathermy was used to achieve hemostasis during repair, and Group B: Included 20 boys in whom Adrenaline-Xylocaine injection (Adrenaline 1/200000-Xylocaine 1%) was injected in the surgical incision site in the ventral aspect of the penis and anterior aspect of scrotum to achieve hemostasis during repair. The data were collected, organized, and tabulated according to age, operative time, early postoperative bleeding, wound dehiscence and flap necrosis, fistula and cosmetic appearance.

**Results:** The Adrenaline-Xylocaine injection in the surgical site is more effective than bipolar diathermy in achieving hemostasis ( $p=0.039$ ), reducing the postoperative incidence of hematoma ( $p=0.04$ ), and fistula formation ( $p=0.0088$ ), and helping in meticulous repair, but with more operative time than bipolar one because waiting for adrenaline action to fulfill its vasoconstrictive action.

**Conclusion:** Although epinephrine injection has previously been shown to have deleterious effects on tissue repair, in the present clinical practice, epinephrine injection was found to minimize operative bleeding without significant harmful effects on the postoperative outcomes. Therefore, it could be considered as a safe and effective method with which to prepare a bloodless field during hypospadias surgery.

**Keywords:** Adrenaline injection; Bipolar electrocautery; Proximal hypospadias repair

## Introduction

Hypospadias is one of the most common congenital anomalies that is defined as abnormal inferior displacement of the external urethral meatus and may be associated with penile chordee, prepucial skin defect and disrupted development of corpus cavernosum and spongiosum [1]. The etiology of this anomaly is still unknown. In some cases, the defect may be syndromic and may be associated with other defects as undescended testes and intersex conditions [2]. Duckett classified hypospadias into glanular, coronal, subcoronal, distal shaft, mid shaft, proximal shaft, penoscrotal and perineal hypospadias [3]. There are several techniques to repair hypospadias. Hemostasis is very important for meticulous surgical repair to achieve the best cosmetic and functional outcome and also to prevent complications as bleeding, hematoma, wound dehiscence and fistula formation because this area is very vascular [4]. Hemostasis in hypospadias can be achieved by different methods as tourniquet, electrocautery, and vasoconstrictive agents as adrenaline [5].

## Patients and Methods

### Patients

This prospective comparative study was done in plastic surgery unit in Banha Insurance

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Hospital, Egypt, from 2011 to 2018.

A total of 40 uncircumcised boys with proximal hypospadias without any attempt of surgical repair, were included in the study.

#### Inclusion criteria were:

1. Any age
2. 1ry repair
3. Proximal hypospadias in which application of tourniquet was difficult

#### Exclusion criteria were:

1. Glanular, coronal, subcoronal, distal shaft, mid shaft.
2. Recurrent hypospadias
3. Circumcised boys

The enrolled boys were divided randomly into two groups A and B:

- Group A: (N=20): included 20 boys in whom the bipolar diathermy was used to achieve hemostasis during repair.
- Group B: (N=20): included 20 boys in whom Adrenaline-Xylocaine injection (Adrenaline 1/200000-Xylocaine 1%) was injected in the surgical incision site in the ventral aspect of the penis and anterior aspect of scrotum to achieve hemostasis during repair.

## Methods

#### Procedure:

- All boys were received cefotaxime antibiotic injection during anesthesia induction based on the body weight dose and after testing the sensitivity to the drug.
- The anesthesia was caudal block with light general anesthesia to reduce the general anesthesia time and minimize the post-operative pain side by side with local one.
- Snodgrass technique was used in repair with coverage by preputial flap and local z-plasty flaps to cover the proximal defect. Urethra Nelton catheter stent was placed in the penile urethra and left for 7-10 days postoperatively after fixation in the coronal sulcus by 2/0 silk suture with rounded needle.
- The stent was removed after 7-10 days followed by repetitive dilatation of the external meatus for up to 4 months to prevent urethral stenosis with subsequent fistula formation.
- Dressing was applied and changed after about 3-4 postoperatively.

**After operation, each patient was evaluated for post-operative outcomes:**

#### A. Early complications

1. Operation time
2. The early need to change the dressing to assess bleeding
3. Presence or absence of hematoma
4. Infection
5. Wound dehiscence
6. Flaps complications

**Table 1:** Comparison between A and B groups as regards basic clinical and intra-operative data.

Variable	A group (20)	B group (20)	Mann-Whitney's U
	Median (IQR)	Median (IQR)	P value
Age (months)	11 (7.5 - 15)	12.5 (9 - 17)	0.4396
Weight (kg)	9 (8 - 10)	9 (8 - 10)	1
Operative time (min)	87.5 (85 - 90)	110 (107 - 120)	= 0.000008**

IQR: Inter-Quartile Range

**Table 2:** Comparison between A and B groups as regards early post-operative complications.

Variable		A group (20)	B group (20)	Chi square P value
Bleeding	+ve	6 (30%)	1 (5%)	=0.039*
Hematoma	+ve	9 (45%)	3 (15%)	=0.04*
Infection	+ve	2 (10%)	1 (5%)	=0.553
Wound dehiscence	+ve	3 (15%)	2 (10%)	=0.636
Flap necrosis	+ve	2 (10%)	0 (0%)	=0.151

% per column total

#### B. Late complications

1. Fistula formation in late post-operative period during clinic visits up to 4-6 months
2. Cosmetic appearance

**Statistical analysis:** Data entry, processing and statistical analysis was carried out using MedCalc ver. 15.8. (MedCalc, Ostend, Belgium). Tests of significance (Mann-Whitney's U and Chi square tests) were used. Data was presented and suitable analysis was done according to the type of data (parametric and non-parametric) obtained for each variable. P-values less than 0.05 (5%) was considered to be statistically significant.

## Results

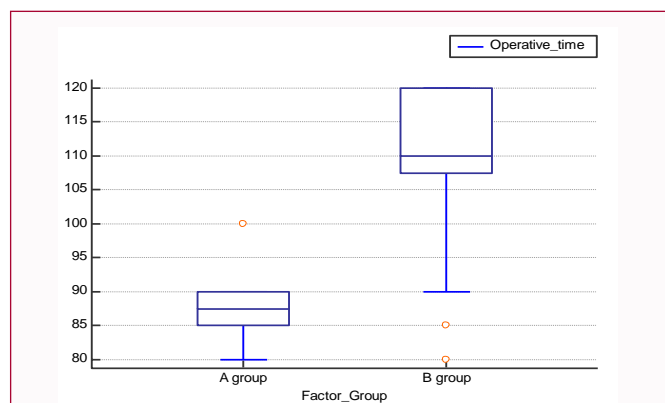
In this study, a total of 40 hypospadias patients between (6-24) months were included in the study. Regarding basic clinical and intra-operative data, was found that; the mean age of all hypospadias patients was ( $12.6 \pm 5$ ) months; and the mean weight was ( $8.9 \pm 1.4$ ) kg, and the mean operative time was ( $98.1 \pm 14.1$ ) minutes.

As regards basic clinical and intra-operative, follow up period revealed the following:

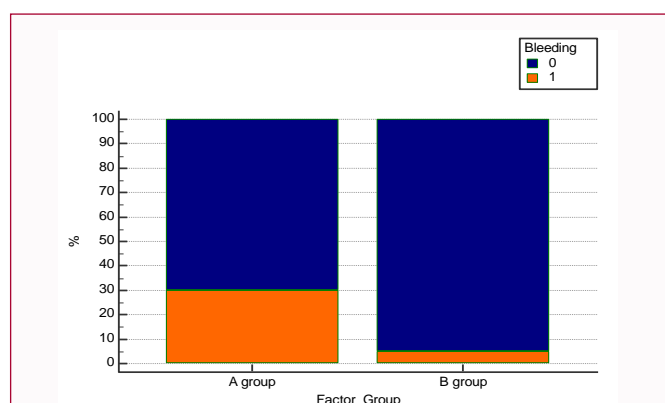
- Highly significant increase in operative time in B group; compared to A group of patients; with highly significant statistical difference ( $p < 0.01$ ). The median value of operative time in B group was (110) min; while in A group was (87.5) min, as shown in Table 1, Figure 1.
- Non-significant difference as regards age and weight of patients ( $p > 0.05$ ), as shown in Table 1.

As regards early post-operative complications, follow up period revealed the following:

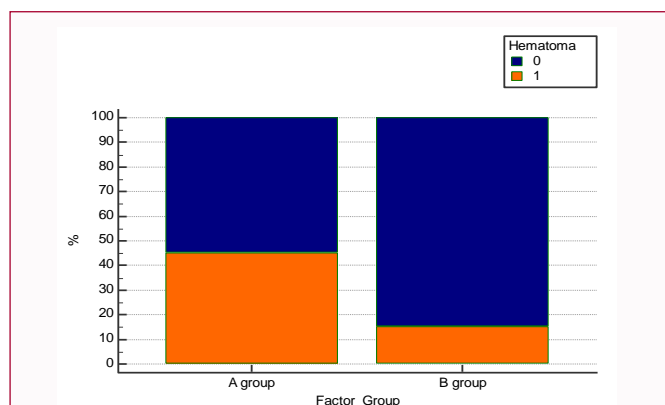
- Significant decrease in bleeding in B group; compared to A group of patients; with significant statistical difference ( $p = 0.039$ ). The prevalence of bleeding in B group was (5%); while in A group was (30%), as shown in Table 2, Figure 2.
- Significant decrease in hematoma in B group; compared to A group of patients; with significant statistical difference ( $p = 0.04$ ). The prevalence of hematoma in B group was (15%); while in A group



**Figure 1:** Comparison between the 2 groups of patients regarding operative time.



**Figure 2:** Comparison between the 2 groups of patients regarding bleeding.



**Figure 3:** Comparison between the 2 groups of patients regarding hematoma.

was (45%), as shown in Table 2, Figure 3.

- Non-significant difference as regards prevalence of infection, wound dehiscence and flap necrosis ( $p > 0.05$ ), as shown in Table 2.

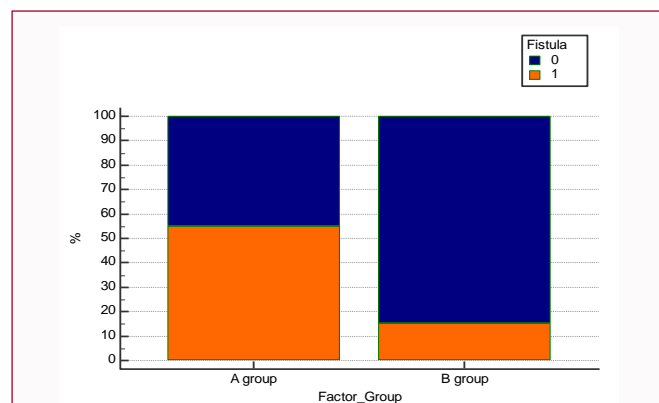
As regards late post-operative complications, follow up period revealed the following:

- Highly significant decrease in fistula formation in B group; compared to A group of patients; with significant statistical difference ( $p = 0.0088$ ). The prevalence of fistula formation in B group was (15%); while in A group was (55%), as shown in Table 3, Figure 4.

- Non-significant difference as regards prevalence of

**Table 3:** Comparison between A and B groups as regards late post-operative complications.

Variable		A group (20)	B group (20)	Chi square P value
Fistula	+ve	11 (55%)	3 (15%)	$= 0.0088^{**}$
	-ve	9 (45%)	17 (85%)	
Cosmetic disfigurement	+ve	5 (25%)	3 (15%)	$= 0.435$
	-ve	15 (75%)	17 (85%)	



**Figure 4:** Comparison between the 2 groups of patients regarding fistula formation.

cosmetic disfigurement ( $p > 0.05$ ), as shown in Table 3.

## Discussion

This prospective comparative study was conducted on 40 uncircumcised boys with proximal hypospadias without any attempt of surgical repair, in plastic surgery unit in Banha Insurance Hospital, Egypt, from 2011 to 2018.

Those patients were chosen upon inclusion and exclusion criteria; inclusion criteria were (Any age, 1 yr repair and Proximal hypospadias in which application of tourniquet was difficult) while exclusion criteria were (Glanular, coronal, subcoronal, distal shaft, mid shaft, Recurrent hypospadias and Circumcised boys).

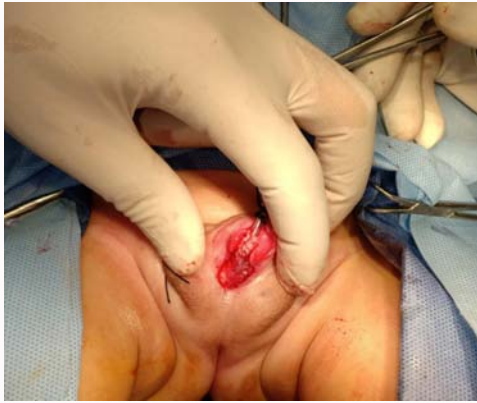
The enrolled boys were divided randomly into two groups: Group A: (N=20): in whom the bipolar diathermy was used to achieve hemostasis during repair and Group B: (N=20): in whom Adrenaline-Xylocaine injection (Adrenaline 1/200000-Xylocaine 1%) was injected in the surgical incision site in the ventral aspect of the penis and anterior aspect of scrotum to achieve hemostasis during repair (Figure 5).

All boys were received cefotaxime antibiotic injection during anesthesia induction based on the body weight dose and after testing the sensitivity to the drug.

The anesthesia was caudal block with light general anesthesia to reduce the general anesthesia time and minimize the post-operative pain side by side with local one.

Snodgrass technique was used in repair with coverage by preputial flap and local Z-plasty flaps to cover the proximal defect. Urethra Nelton catheter stent was placed in the penile urethra and left for 7-10 days postoperatively after fixation in the coronal sulcus by 2/0 silk suture with rounded needle.

The stent was removed after 7-10 days followed by repetitive dilatation of the external meatus for up to 4 months to prevent urethral stenosis with subsequent fistula formation.



**Figure 5:** Patient's intra-operative hemostasis after intra-operative adrenaline injection.

Dressing was applied and changed after about 3-4 postoperatively.

After operation, each patient was evaluated for early and late complications; early complications were: (Operation time, the early need to change the dressing to assess bleeding, Presence or absence of hematoma, Infection, Wound dehiscence and Flaps complications) while Late complications were: (Fistula formation in late post-operative period during clinic visits up to 4-6 months and Cosmetic appearance).

In this study, a total of 40 hypospadias patients between (6-24) months were included in the study. Regarding basic clinical and intra-operative data, was found that; the mean age of all hypospadias patients was ( $12.6 \pm 5$ ) months; and the mean weight was ( $8.9 \pm 1.4$ ) kg, and the mean operative time was ( $98.1 \pm 14.1$ ) minutes which came in agreement with Alizadeh et al. [6].

Alizadeh et al. [6] reported that Inclusion criteria were: all prepubertal boys, aged >6 months, and with any type of hypospadias that could be repaired in a single session.

As regards basic clinical and intra-operative, follow up period revealed the following:

Highly significant increase in operative time in B group; compared to A group of patients; with highly significant statistical difference ( $p < 0.01$ ). The median value of operative time in B group was (110) min; while in A group was (87.5) min which came in agreement with Dhua et al. [7].

Dhua et al. [7] reported that although this endeavor took some extra time, this gradually decreased as we climbed the learning curve. The mean duration of operation was 87 min (range: 75 to 115 min).

Non-significant difference as regards age and weight of patients ( $p > 0.05$ ).

As regards early post-operative complications, follow up period revealed the following:

Significant decrease in bleeding in B group; compared to A group of patients; with significant statistical difference ( $p = 0.039$ ). The prevalence of bleeding in B group was (5%); while in A group was (30%).

Significant decrease in hematoma in B group; compared to A group of patients; with significant statistical difference ( $p = 0.04$ ). The prevalence of hematoma in B group was (15%); while in A group was

(45%).

As regard bleeding and hematoma complications; results came in agreement with Alizadeh et al. [6].

Alizadeh et al. [6] reported that, in present clinical practice, it was revealed that epinephrine injections minimize operative bleeding without significant harmful effects on postoperative outcomes; therefore, it could be considered to be a safe and effective method for preparation of a bloodless field during hypospadias surgery.

Non-significant difference as regards prevalence of infection, wound dehiscence and flap necrosis ( $p > 0.05$ ) which came in disagreement with Allawi [8].

As regards late post-operative complications, follow up period revealed the following:

Highly significant decrease in fistula formation in B group; compared to A group of patients; with significant statistical difference ( $p = 0.0088$ ). The prevalence of fistula formation in B group was (15%); while in A group was (55%) which came in disagreement with Kim et al. [9].

Kim et al. [9] reported that, they reported that hypospadias type, surgical duration and subcutaneous adrenaline (epinephrine) injection were associated, but caudal was not associated, with the occurrence of fistula after hypospadias surgery.

Non-significant difference as regards prevalence of cosmetic disfigurement ( $p > 0.05$ ) which came in agreement with Ates et al. [10].

Ates et al. [10] reported that, for better cosmetic impact and decreased breakdown of repair, it is crucial to obtain bloodless surgical field. There are various methods for achieving a bloodless field in hypospadias surgery such as tourniquet application, cauterization and vasoconstrictive agent injection [10].

## Conclusion

To conclude, although epinephrine injection has previously been shown to have deleterious effects on tissue repair, in the present clinical practice, epinephrine injection was found to minimize operative bleeding without significant harmful effects on the postoperative outcomes. Therefore, it could be considered as a safe and effective method with which to prepare a bloodless field during hypospadias surgery.

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