

# Comparison of penile measurements between Nepalese boys with and without hypospadias

Manish Pokhrel

Department of Surgery, Kathmandu Medical College Teaching Hospital, Sinamangal, Kathmandu, Nepal.

**Correspondence:** Dr. Manish Pokhrel, Lecturer, Department of Surgery, Kathmandu Medical College Teaching Hospital, Sinamangal, Kathmandu, Nepal.

**Email:** guru0941@gmail.com

## Abstract

**Introduction:** Comparison of penile measurements between boys with and without hypospadias is important to determine whether there is any truth in the notion that the hypospadiac penis is shorter than its age-matched normal counterpart. This study was designed to check whether there was any difference in penile sizes between Nepalese boys with and without hypospadias.

**Methods:** A cross-sectional study was conducted among 72 Nepalese boys (36 with hypospadias and 36 without hypospadias) attending the paediatric surgical unit of Kathmandu Medical College Teaching Hospital between July 2019 and June 2020. The penile length was measured in both the flaccid state and the stretched state yielding the flaccid penile length (FPL) and the stretched penile length (SPL) for each subject utilizing standardized measuring conditions. The SPL/FPL ratio was calculated for each patient.

**Results:** The mean FPL in the hypospadias group (A) was  $3.42 \pm 0.80$  cms while that in the normal group (B) was  $3.62 \pm 0.61$  cms. The mean SPL in group A was  $4.58 \pm 0.94$  cms compared to  $5.52 \pm 0.68$  cms in group B. The SPL/FPL ratio was  $1.34 \pm 0.14$  in group A compared to  $1.54 \pm 0.17$  in group B. The difference in FPL was not significant between groups but the difference in SPL and the SPL/FPL ratio was statistically significant between groups.

**Conclusion:** The flaccid penile length (FPL) does not vary between the two groups. However, the stretched penile length (SPL) and the Stretched penile to Flaccid penile length ratio (SPL/FPL ratio) are significantly different between the two groups of boys.

**Keywords:** Chordee; Hypospadias; Nepalese; Penile length.



DOI: <https://doi.org/10.3126/jssn.v23i1.33520>

## Introduction

Penile length is an important criterion for patient satisfaction after hypospadias surgery.<sup>1-3</sup> However, because of apparent ventral hypoplasia of the hypospadiac penis, it has long been thought that these penises were shorter when compared to their normal counterparts. This seems more of a logical speculation rather than an experimental finding as evidenced by the fact that there have been only a few studies actually comparing the penile lengths between these two populations.<sup>4,5</sup> Therefore it is imperative to experimentally verify whether there is any truth in that notion.

The handful of publications comparing the preoperative differences in penile lengths between these two populations have measured either the flaccid penile length<sup>4</sup> or the stretched penile length<sup>5</sup>, and have concluded that there was no difference in penile length between these two groups of boys. Both of these two studies were done in different populations with different racial, environmental and socio-cultural profiles. We know that the average penile length varies widely between populations as can be evidenced by the different nomograms of penile lengths of normal boys in different countries.<sup>6-11</sup> Such nomograms are however not available for Nepalese boys.

Therefore, this study was designed to compare the penile length among boys with and without hypospadias as applicable to the Nepalese population.

## Methods

A prospective cross-sectional study was designed. After approval from the Institutional Review Committee of Kathmandu Medical College Teaching Hospital, and with informed consent from the patient's attendants, boys visiting the paediatric surgical unit of Kathmandu Medical College Teaching Hospital between July 2019 and June 2020 were recruited via a purposive, non-randomised sampling method. A sample size of 36 participants in each group was calculated to have 80% power at a significance level of 0.05 to detect a minimum difference of 0.6 cms between the groups. Thus a total of 72 boys were recruited; 36 in each group.

Group A: 36 boys with Hypospadias

Group B: 36 boys without hypospadias

This study included boys from birth to 16 years of age who did not have any endocrine disorders or had received any form of hormonal stimulation for penile growth (topical or intravenous/intramuscular testosterone). We did not include any boys who had undergone any previous surgery on their penis or had any abnormality that compromised the proper visualization of the peno-pubic junction or the tip of the glans. The boys in Group B were selected among patients who had come for routine herniotomy as this is one of the commonest operations for boys. We did not include any boys with undescended testis.

All the measurements were done by the author in a warm environment with ample lighting while maintaining a standardized technique. The child was made comfortable and supine with the attendant by the side. A 15 cms long pliable plastic ruler with millimeter markings was used for every measurement. In every instance, three measurements were taken and the mean value was entered in the datasheet.

### Measurement of Stretched Penile Length (SPL)

The foreskin was retracted and the penis was fully stretched vertically holding the glans between the thumb and the index finger of the right hand. For boys without hypospadias and having prepuceal adhesion or physiological phimosis, the foreskin was retracted just enough for the external urethral meatus to be visible. Using the left hand, the ruler was apposed to the dorsal aspect of the penis while compressing

the pre-pubic fat to the lower edge of the pubic bone with the lower edge of the ruler. The measurement was taken along the dorsal aspect of the penis from the peno-pubic junction to the tip of the glans, excluding the foreskin.

### Measurement of Flaccid Penile Length (FPL)

The penis was measured along the dorsal aspect with the same ruler applying the same maneuvers to expose the glans or the external urethral meatus as done in the measurement of the stretched penile length (SPL). The penis was held vertically with the thumb and the index finger of the right hand without stretching it. Using the left hand, the ruler was apposed to the dorsal aspect of the penis while compressing the pre-pubic fat to the lower edge of the pubic bone with the lower edge of the ruler. The measurement was taken along the dorsal aspect of the penis from the peno-pubic junction to the tip of the glans, excluding the foreskin.

Chordee was reported to be present when there was a visible angle between the glans and the shaft of the penis when viewed from the side while keeping the penis upright holding the prepuceal skin on each side between the thumb and the index finger of both hands.

The SPL/FPL ratio was calculated for each participant by dividing the SPL with the FPL.

The data were recorded and analysed in IBM Statistical Package for Social Sciences version 21. A two-tailed p-value of <0.05 was considered significant.

## Results

A total of 72 boys were enrolled in the study, 36 in each group. None of the patients were excluded from the study. The two groups are comparatively similar in their age distribution (range= 0.5-12 years) which can be seen in **Table 1**.

**Table 1. Comparison of the mean age in both groups**

Groups	Number of participants	Age in years (mean ± SD)	p-value
Group A (Boys with Hypospadias)	36	3.61 ± 2.86	0.97
Group B (Normal boys)	36	3.34 ± 2.47	

Among the boys with hypospadias (Group A), the different varieties of hypospadias can be seen in **Table 2**.

**Table 2. Table depicting the different varieties of hypospadias (n=36)**

Varieties of hypospadias	Number of patients	Percentage (%)
Glandular	5	14
Coronal	14	39
Distal penile	6	17
Proximal penile	4	11
Penoscrotal	7	19

Twenty-nine (80.6%) boys among the 36 with hypospadias (Group A) had an associated chordee. Similarly among the 36 boys with hypospadias, one (2.8%) had bifid scrotum, five (13.9%) had bifid scrotum with penoscrotal transposition while the remaining 30 boys had normal scrotum.

None of the 36 boys in the normal group (Group B) had any chordee or scrotal abnormalities.

Table 3 depicts the comparison of FPL, SPL, and the SPL/FPL ratio between the two groups of patients. The independent sample t-test was used to compare the differences. Equality of variances was not assumed when the significance for Levene's test was <0.05. The table shows that FPL does not vary between the two groups but SPL and SPL/FPL ratio is statistically different between the two groups of boys.

hypoplasia with the absence of the distal urethra and deficient corpus spongiosum distally, as a result of which the penis looks ventrally bent (chordee). It is not unreal that a bent penis appears shorter than its straight counterpart, which might have given base to the notion that the hypospadiac penis is shorter than its normal counterpart. However previous studies comparing these two groups of boys have found that there was no difference in penile length between the groups<sup>4,5</sup>.

Studies relating to the measurement of penile length measure the penis either with a caliper<sup>8</sup> or a ruler placed along the dorsal surface of the penis<sup>9-11</sup>. This should not cause any problem when a normal penis is measured. However, the hypospadiac penis is shorter ventrally, giving rise to chordee. This poses a question as to whether measuring along the dorsal or the ventral side of the hypospadiac penis matters when comparing to the normal penis. The postoperative length of the hypospadiac penis, however, is determined mainly by the dorsal aspect of the penis as this is the true achievable length for such penis when chordee is corrected. Even in scenarios where a dorsal plication is required for correction of penile curvature, there are mixed reports about penile shortening<sup>12,13</sup>. Therefore we deemed that measuring the ventral penile length for comparison was unnecessary and therefore only measured the dorsal penile length in both the groups of boys.

Age-matching between groups is important when a comparison is made about a feature such as penile length that changes with increasing age. This is also important to diagnose such conditions as micropenis. Since the

**Table 3. Comparison of FPL, SPL and SPL/FPL ratio between the two groups**

	Group A	Group B	95% Confidence Interval of the Difference	P-value
	Mean ± SD	Mean ± SD		
<b>FPL (cms)</b>	3.42 ± 0.80	3.62 ± 0.61	-0.53 to 0.15	0.26*
<b>SPL (cms)</b>	4.58 ± 0.94	5.52 ± 0.68	-1.33 to -0.56	<b>0.001*</b>
<b>SPL/FPL ratio</b>	1.34 ± 0.14	1.54 ± 0.17	-0.27 to -0.13	<b>0.001**</b>

\* Equal variances not assumed in Levene's Test for equality of variances

\*\* Equal variances assumed in Levene's Test for equality of variances

P-value calculated for Independent sample t-test (significant when <0.05)

## Discussion

Hypospadias is an anomaly of the penis in which the external urethral meatus opens at the ventral surface of the penis anywhere from the glans to the perineum. It is thought to arise due to the failure of the urethral plate to tubularise, leading to various degrees of ventral penile

study population was small, exact age-matching in small increments was not possible in this study. However, the mean age and standard deviation between these two groups were comparable, which reflects that the two groups were not statistically different in their overall age distribution. This lays the foundation for further comparisons between these two groups.

In the current study, among the 36 boys with hypospadias, 80.6% of the boys had chordee. This is in sharp contrast to the findings of Teckchandani and Bajpai<sup>5</sup> who found that none of their patients with distal and mid-penile hypospadias had chordee while all with proximal hypospadias had chordee (34%). Among the few similar studies, Fievet et al<sup>4</sup> have failed to mention the proportion of the patients with chordee in their study. However other studies looking into the incidence of chordee with various degrees of hypospadias have found a significant percentage (22%-88%) of their distal and mid-penile hypospadias to be associated with some degree of chordee.<sup>14-16</sup> The higher proportion of boys with chordee in our study may explain some of the differences in our findings, particularly the findings of SPL and the SPL/FPL ratio. We, however, did not compare between boys with and without chordee (among the boys with hypospadias) due to the very small proportion of boys without chordee, which would make comparison unfavorable and skewed.

In the current study, it was found that the FPL was comparable between boys with and without hypospadias. This finding is in agreement with the finding by Fievet et al<sup>4</sup> who have also compared between these two groups using FPL.

Regarding the SPL, this study has found that normal boys had significantly longer SPL when compared to boys with hypospadias. This finding does not agree with the findings of Teckchandani and Bajpai<sup>5</sup> who have also used SPL to compare between these two groups of boys. We cannot be sure if this is a standalone finding because there are no other studies to compare to. One reason for the disagreement might be the higher proportion of boys with chordee in our study. The current author maintains the belief that the presence of chordee makes the measurement of SPL difficult because these penises cannot be stretched properly. A similar impression was also noted by Fievet et al<sup>4</sup> regarding the measurement of SPL in the hypospadiac penis which was cited as the reason they had chosen to measure the FPL instead.

This study has introduced a unique penile anthropometric parameter which is described as the SPL/FPL ratio. It was hypothesized that the reduced stretchability of the penis in hypospadiac boys with chordee would cause the ratio to be altered when compared to normal boys. In fact, this study found that the SPL/FPL ratio was significantly higher in normal boys when compared to boys with hypospadias, giving truth to our hypothesis that the ratio would be altered. We could not compare this finding to other studies because the SPL/FPL ratio has never been described in any

previous publications dealing with paediatric hypospadias. However, the cause of the alteration being reduced penile stretchability remains untested. If true, this would mean that these boys have the potential to achieve comparable penile length if their chordee is meticulously corrected. In fact, the study by Teckchandani and Bajpai<sup>5</sup> has found that after two years of chordee correction, proximal hypospadias patients had a significantly longer SPL than their age-matched pre-chordee correction counterparts. Given the paucity of such studies, it is also advisable that other authors report the changes in preoperative and postoperative penile lengths in patients with hypospadias so that it can be verified if the difference in the SPL and the SPL/FPL ratio still continues to remain even after correction of chordee.

This study faces the same limitations that studies related to the measurement of penile length face. The current techniques of measurement of penile length, whether SPL or FPL, are very much operator-dependent and are not accurately reproducible. Since all the measurements in this study were made by a single person and a mean value of three measurements were taken, the measurement bias is notably reduced, however it cannot be completely ruled out. Another limitation is the reporting of chordee which was a clinical and visual diagnosis in this study, which is prone to vary between observers. It is a known fact that chordee is best measured at the operation theatre, after degloving of the penis and with artificial erection. However that was not possible in this study because the boys were examined in the outpatient setting, and besides we did not aim to measure and classify the degree of chordee, but only determine whether chordee was present or not.

Thirty-six children cannot truly reflect the range of normal variations in a population. For this purpose, it would have been ideal if the comparison was made between boys with hypospadias and their age-matched counterparts taken from the population-based nomogram. However, as stated earlier such nomograms of penile lengths are not available for the Nepalese population. The sample size of this study is also small, yet enough to allow detection of a 6 mm difference. That was a balance between a respectable power of the study and a feasible number of patients in a single center. More patients would mean that the study would be able to detect an even smaller difference between the two groups with greater power. However, experience has taught us that it is nearly impossible to achieve reproducible precision in measuring the penis of young boys. So we settled for a precision of 6 mm. However, the power of the study would be improved by increasing the sample size. A multi-centric study will enable a larger population of patients to be enrolled.

## Conclusion

This study comparing the penile measurements between Nepalese boys with and without hypospadias has concluded that the flaccid penile length (FPL) does not vary between the two groups. However, the stretched penile length (SPL) and the Stretched penile to Flaccid penile length ratio (SPL/FPL ratio) are significantly different between the two groups of boys.

**Conflict of interest:** none

**Acknowledgment:** To all the residents in the Department of Surgery of Kathmandu Medical College Teaching Hospital for their help in recruiting patients for this study.

## References

1. Moriya K, Kakizaki H, Tanaka H, Furuno T, Higashiyama H, Sano H, et al. Long-term cosmetic and sexual outcome of hypospadias surgery: norm related study in adolescence. *J Urol.* 2006 Oct;176:1889-92.
2. Singh JC, Jayanthi VR, Gopalakrishnan G. Effect of hypospadias on sexual function and reproduction. *Indian J Urol.* 2008 Apr;24(2):249-252.
3. Mureau MA, Slijper FM, Nijman RJ, van der Meulen JC, Verhulst FC, Slob AK. Psychosexual adjustment of children and adolescents after different types of hypospadias surgery: a norm-related study. *J Urol.* 1995 Nov;154(5):1902-7.
4. Fievet L, Harper L, Chirpaz E, Michel JL, Sauvat F. Penile length is comparable in boys with and without hypospadias. *J Pediatr Urol.* 2012 Oct;8:493-6.
5. Teckchandani N, Bajpai M. Penile length in hypospadias. *Journal of Progress in Paediatric Urology.* 2014 May-Aug;17(2):80-83.
6. Camurdan AD, Oz MO, Ilhan MN, Camurdan OM, Sahin F, Beyazova U. Current stretched penile length: cross-sectional study of 1040 healthy Turkish children aged 0 to 5 years. *Urology.* 2007 Sep;70(3):572-5.
7. Teckchandani N, Bajpai M. Penile length nomogram for Asian Indian prepubertal boys. *J Pediatr Urol.* 2014 Apr;10(2):352-4.
8. Bhat A, Upadhyay R, Bhat M, Sabharwal K, Singla M, Kumar V. Penile anthropometry in North Indian children. *Indian J Urol.* 2015 Apr-Jun;31(2):106-10.
9. El-Ammawi TS, Abdel-Aziz RT, Medhat W, Nasif GA, Abdel-Rahman SG. Measurement of stretched penile length in prepubertal boys in Egypt. *J Pediatr Urol.* 2018 Dec;14(6):553.e1-553.e5.
10. Asafo-Agyei SB, Ameyaw E, Chanoine JP, Nguah SB. Normative penile anthropometry in term newborns in Kumasi, Ghana: a cross-sectional prospective study. *Int J Pediatr Endocrinol.* 2017;2017:2.
11. Park S, Chung JM, Kang DI, Ryu DS, Cho WY, Lee SD. The change of stretched penile length and anthropometric data in Korean children aged 0-14 years: comparative study of last 25 years. *J Korean Med Sci.* 2016 Oct;31(10):1631-4.
12. Chertin B, Koulikov D, Fridmans A, Farkas A. Dorsal tunica albuginea plication to correct congenital and acquired penile curvature: a long-term follow-up. *BJU Int.* 2004 Feb;93(3):379-381
13. Chung PH, Tausch TJ, Simhan J, Scott JF, Morey AF. Dorsal plication without degloving is safe and effective for correcting ventral penile deformities. *Urology.* 2014 Nov;84(5):1228-1233.
14. Tugtepe H, Thomas DT, Kandirici A, Yener S, Dagli T. Should we routinely test for chordee in patients with distal hypospadias? *Eur J Pediatr Surg.* 2015 Apr;25(2):195-8.
15. Abdelrahman MYH, Abdeljaleel IA, Mohamed E, Bagadi AO, Khair OEM. Hypospadias in Sudan, clinical and surgical review. *Afr J Paediatr Surg.* Sep-Dec 2011;8(3):269-71.
16. Schneuer FJ, Holland AJA, Pereira G, Bower C, Nassar N. Prevalence, repairs and complications of hypospadias: an Australian population-based study. *Arch Dis Child.* 2015 Nov;100(11):1038-43.