

Shaeer's Corporal Rotation for Length-Preserving Correction of Penile Curvature: Modifications and 3-Year Experience

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ABSTRACT

Introduction. Correction of penile curvature by corporal rotation enabled the correction of 90 degrees ventral curvature with neither shortening nor erectile dysfunction. However, some limitations were described, and only one case was reported upon.

Aim. This work described a 3-year experience with corporeal rotation, the modifications addressing and eliminating its drawbacks and limitations, as well as the long-term follow-up of 22 patients.

Methods. Modified corporeal rotation was performed in 22 patients with various degrees of curvature. Degree of deviation, erect penile length, symmetry, and erectile function were evaluated and compared pre- and postoperatively.

Main Outcome Measures. Correction of curvature, resultant sexual function, penile length, and girth.

Results. Full correction of curvature was achieved in 20 out of 22 patients, with no shortening, asymmetry, or erectile dysfunction. Residual curvature in two patients was no more than 10 degrees.

Conclusions. Corporal rotation can restore straightness to the penis with no loss in phallic length, asymmetry, or erectile dysfunction. While a variety of surgical techniques are feasible for the correction of milder degrees of curvature, we believe that severe degrees should be spared the shortening and corrected by corporeal rotation.

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Key Words. Curvature; Rotation; Penis; Penile

Introduction

Penile curvature has a cosmetically negative effect, leading to a distorted body image. Greater degrees of curvature can make intercourse difficult, painful to both partners, or—on occasions—impossible. Congenital penile curvature is relatively common, occurring in 4–10% of males unaccompanied by hypospadias [1,2], and in 0.8% accompanied by hypospadias [3].

Surgical correction is the only solution for curvature of a considerable degree. For decades, classic surgical techniques for correction of curvature have served the purpose in milder cases with satisfactory results and acceptable complications. Those included Nesbit procedure [4], modified Nesbit technique [5], tunica albuginea plication [6], and interposition grafting [7], among others.

However, severe degrees of curvature aggravate the complications, pushing those techniques to the edge of infeasibility.

Shortening the convex aspect of the tunica albuginea in Nesbit, modified Nesbit, and plication techniques results in a shorter penis. The resultant loss of shaft length can be unacceptable in case of severe curvature. On the other hand, grafting the concave side has the consequences of graft contraction [8] and erectile dysfunction as a result of venous leak [9].

Shortening-free correction of penile curvature in adults by corporal rotation was first published in 2006 [10]. The basic principle was shifting the concavity of both corpora cavernosa from the ventral aspect of the penis to the lateral aspects in opposition, such that they flex against each other rather than synergistically, thereby neutralizing

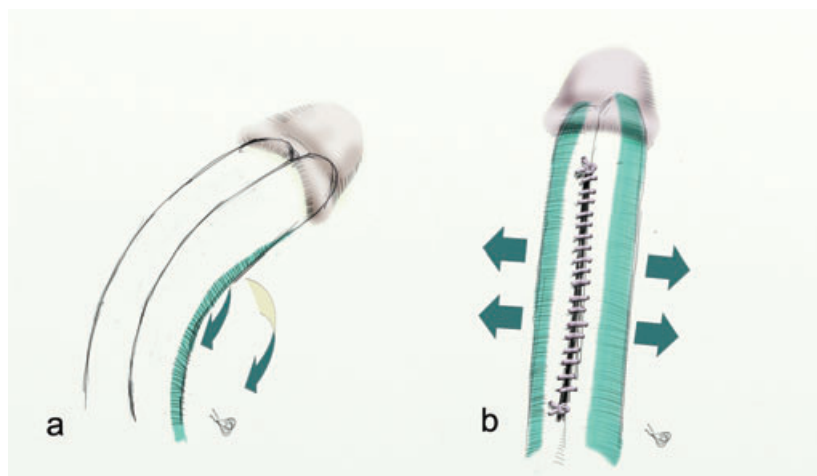


Figure 1 Before rotation, the flexion forces of both corpora (darker areas) act synergistically (arrows) to bend the penis ventrally (A). Rotation shifts the flexion force of each corpus to its lateral aspect (darker areas), acting against and neutralizing each other (arrows) (B).

their curvature-inducing effect (Figure 1). A case of 90 degrees curvature was fully corrected with no impact on length or rigidity [10]. Nevertheless, the technique had its limitations and its results could not be verified by just one case.

This work describes a 3-year experience with corporeal rotation, the modifications addressing and eliminating its drawbacks and limitations, as well as the long-term follow-up of 22 patients.

Methods

Modified corporeal rotation was performed in 22 patients with congenital curvature. Degree of deviation, erect penile length, girth symmetry, and erectile function were evaluated prior to surgery and 8 months postoperatively.

Patient Characterization and Measurements

Twenty-two adult patients with penile curvature were selected for the procedure. All patients had congenital ventral curvature without hypospadias ranging from 25 to 90 degrees in the erect state, with an average of 66 degrees (Table 1). Age range was 18–24.

Preoperative evaluation of degree of deviation, erect penile length, girth symmetry, and erectile function was performed by intracorporeal injection of prostaglandin E1 (ICI). This revealed the fore-mentioned degree of deviation, an average erect penile length of 15.4 cm, equivalent proximal and distal erect girth, and excellent erectile function (E5 after an average of 6 minutes from injection, lasting for an average of 40 minutes) in all patients (Table 1).

The degree of deviation was measured by applying a white board to the lateral aspect of the

erect penis, marking the contour of the erect penis on the board, dividing that contour to a proximal part and a distal part relative to the point of maximum curvature, projecting a longitudinal axis for each part, and measuring the angle between the two axes by compass. Erect penile length was measured on the lateral aspect, from the pubic bone to the point of maximum curvature (Figure 2), and from that point to the tip of the glans (Figure 3). Erect penile girth was measured by tape, proximal and distal to the point of maximum curvature to check for symmetry and equality.

To evaluate sexual function further, the International Index of Erectile Function (IIEF-15) ques-

Table 1 Preoperative measurements

Patient number	Angle	Erect length	Rigidity upon ICI
1	40	14.8	E5
2	25	14.0	E5
3	35	17.0	E5
4	40	16.0	E5
5	45	18.0	E5
6	55	14.9	E5
7	50	16.0	E5
8	40	15.1	E5
9	50	15.0	E5
10	45	15.0	E5
11	90	22.0	E5
12	85	18.0	E5
13	85	14.0	E5
14	80	18.0	E5
15	85	12.0	E5
16	90	14.0	E5
17	80	11.5	E5
18	75	16.0	E5
19	90	17.8	E5
20	90	12.0	E5
21	88	15.6	E5
22	90	13.0	E5
Average	66.0	15.4	

ICI = intracorporeal injection of prostaglandin E1.



Figure 2 Preoperative ventral curvature of 80 degrees and proximal length of 3 cm.

tionnaire was used to evaluate sexual function in 12 patients with a regular partner. This revealed mild erectile dysfunction in 3 out of 12 patients (average erectile function score 26.3 out of 30), poor satisfaction with intercourse (an average of 7.3 out of 15), poor overall satisfaction (an average of 3.3 out

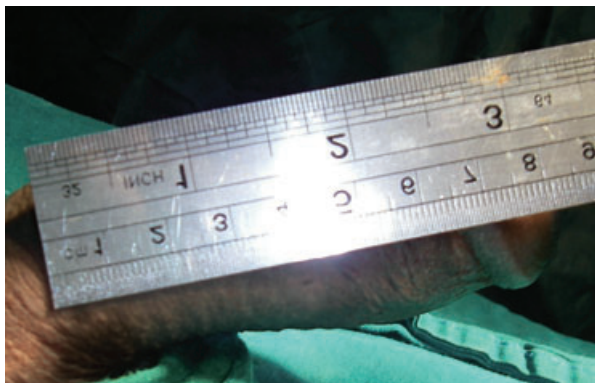


Figure 3 Preoperative distal length of 8.5 cm.

of 10), and a total average score of 56 out of 75 (Table 2). IIEF-15 was inapplicable in 10 patients with no sexual encounters (single patients repudiating premarital sex). ICI results were considered sufficient for evaluating erectile function in those patients. A written informed consent was obtained from all patients before surgery.

Surgical Technique

Access

Under general or spinal anesthesia, the urethra was catheterized, and the penis was degloved through a subcoronal incision. Circumcision was performed if necessary. Ventral chordee was excised, if any. Degree of deviation was reevaluated, and the point of maximum curvature was determined (it is our experience that excision of ventral chordee does not correct the curvature apart from mild rectification no more than 10%). Buck's fascia was incised. The deep dorsal arteries are identified by inspection or—if difficult—by intraoperative micro-Doppler probe. The dorsal nerves and their branches were identified or assumed to be lateral to the arteries. A clear area on either sides of the deep dorsal vein was needed for the intended rotation. This requires minimal lateral mobilization of the dorsal arteries on the proximal aspect of the shaft in a paucity of cases (6 out of 22 cases in this series). In the majority, no mobilization was required as in the erect state, the arteries usually diverge from the midline and the deep dorsal vein as they proceed distally (Figure 4). No or minimal mobilization is supposed to preserve the integrity of the artery and nerves. The deep dorsal vein may be mobilized off of the dorsum of the corpora cavernosa (10 out of 22 cases) or incorporated in the repair.

Table 2 International Index of Erectile Function before surgery

Patient number	Degree of curvature	Erectile function	Erectile dysfunction	Satisfaction with intercourse	Orgasmic function	Desire	Overall satisfaction	Total score	Rigidity upon ICI
1	20	29	None	11	10	10	4	64	E5
2	20	29	None	11	10	10	5	65	E5
3	15	30	None	11	10	10	4	65	E5
4	40	28	None	8	10	10	3	59	E5
5	45	28	None	8	10	10	4	60	E5
6	55	24	None	6	10	10	3	53	E5
7	50	25	None	7	10	10	4	56	E5
8	40	26	None	7	8	9	2	52	E5
9	50	24	Mild	6	10	10	4	54	E5
10	45	26	None	7	10	10	2	55	E5
11	90	23	Mild	3	10	3	2	41	E5
12	85	23	Mild	3	10	10	2	48	E5
Mean		26.3		7.3	9.8	9.3	3.3	56	

ICI = intracorporeal injection of prostaglandin E1.

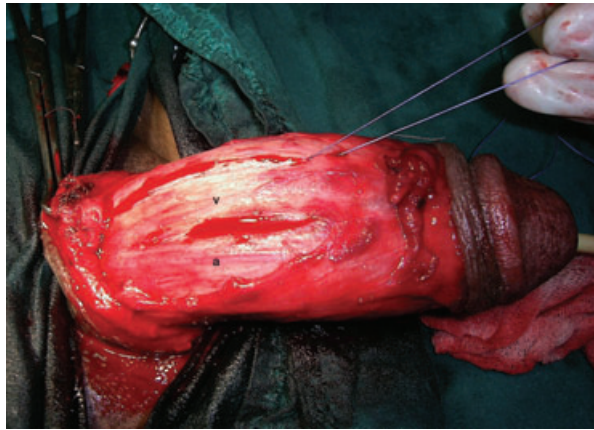


Figure 4 Two parallel incisions medial to the dorsal arteries (a) and lateral to the vein (v), with minimal bleeding indicating integrity of the inner circular layer of the tunica albuginea.

Trial Corporeal Rotation

The dorsal aspects of both corpora cavernosa were brought together by interrupted 2/0 silk sutures. The approximated points were 5 mm on either sides of the midline. The sutures were tied, rotating the corpora cavernosa and correcting the curvature to an extent. This was started proximal to the point of maximum curvature and repeated distally until curvature was fully corrected. The distance between the most proximal and most distal sutures determined the length of incision required for corporal rotation. The trial sutures were then removed, and the actual repair was commenced.

Actual Corporeal Rotation

Incision. Two parallel incisions were cut, one on the dorsum of each corpus cavernosum, a few millimeters on either sides of the midline, extending along the length predetermined by the trial sutures (Figure 4). The two incisions converged toward their distal and proximal ends (Figure 5). The incisions were superficial, involving only the outer longitudinal layer of the tunica albuginea, preserving the inner circular layer, and keeping the integrity of the corpus cavernosum (this precise control over the depth of incision is not difficult considering that the direction of the fibers of the tunica albuginea is usually clear in the erect state, discriminating the outer longitudinal layer from the inner circular layer, and considering that too deep an incision will result in a characteristic corporeal blood jet in contrast to the mild bleeding [Figure 4] from a superficial incision).

Repair. The medial edges of the incisions were sutured to each other, and so were the lateral edges.

A continuous Vicryl-0 suture line started distally, approximating the medial edges (Figures 6 and 7), and proceeding proximally (whether underneath the mobilized deep dorsal vein or crossing over it). When the medial edges were fully approximated (Figure 8), at the proximal-most end, the direction of suturing was reflected distally, approximating the lateral edges together (Figures 6 and 9), up to the starting (distal-most) point. Interrupted polydioxanone (PDS) sutures were placed over every centimeter of the continuous suture line to ease the tension and increase security.

Upon approaching the distal-most point, straightness was evaluated, and if residual curvature was present, the incision lines were extended distally and sutured, thereby correcting the residual curvature. When the two incisions were fully approximated and sealed (Figure 10), curvature was fully corrected (Figure 11).

When pulling on the continuous suture line to approximate the parallel incisions, I manually corrected the curvature to allow the continuous suture line to be pulled fully without force, otherwise it may snap. Once the thread was pulled fully and the edges were approximated, I left the penis to assume its new (straightened) position and went for the next suture.



Figure 5 The incisions converge both proximally and distally, involving the outer longitudinal layer of the tunica albuginea, short of the inner circular (shown).

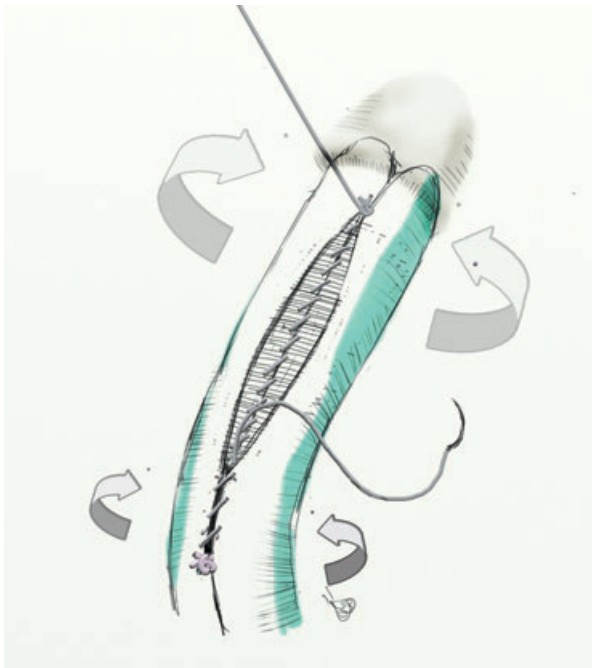


Figure 6 The medial edges of the incisions are fully approximated. The lateral edges are halfway approximated with the resultant rotation and correction of curvature. A narrow arc of rotation proximally results in rotation along a wider arc distally (arrows).

The length and girth of the penis were reassessed (Figure 12). Pharmacologic erection was undone by aspirating blood from the corpora cavernosa and irrigating with saline. Hemostasis was secured. The degloving incision was sealed. The penis was dressed with mild compression applied. Average operative time was 60 minutes. The catheter was removed in the evening, and the patient was discharged.



Figure 7 Medial edges approximated halfway.



Figure 8 Medial edges fully approximated.

Follow-Up and Evaluation

The patients were followed up for a range of 16 months to 3 years. At the eighth month, the patients were reevaluated as to straightness, length, and girth symmetry of the erect penis, as well as erectile function by ICI (Table 3). IIEF-15 was readministered to the patients who had regular sex partners (Table 4). Preoperative and postoperative results were compared and statistically analyzed. The patients were followed up thereafter for recurrence of curvature or further complications.

Results

Full correction was achieved in 20 patients. Residual curvature was seen in two patients, of 5 and 10 degrees, respectively (Table 3). No loss of erect penile length was seen. On the contrary, an average increase in length from 15.4 to 15.7 cm was observed (Tables 1 and 3). Though statistically significant, I cannot claim that this technique increases length. Proximal and distal erect penile

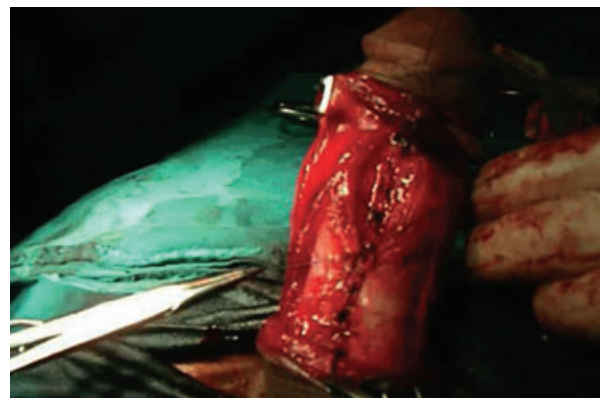


Figure 9 Lateral edges approximated halfway.

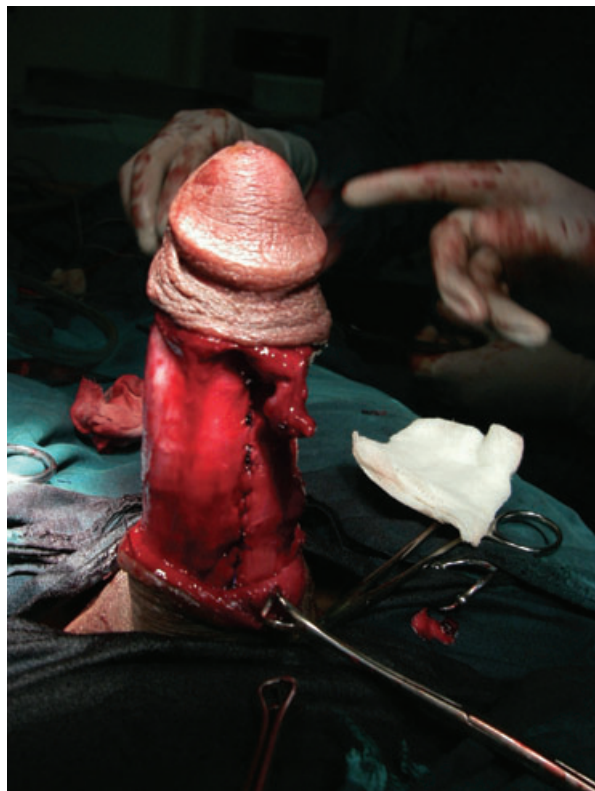


Figure 10 Full approximation, corporeal rotation, and correction of curvature. Dorsolateral view showing the rotating suture line. Symmetry is apparent.

girths were almost identical, both preoperatively and postoperatively, with no dimpling or asymmetry. Rigidity, onset, and duration of erection in response to ICI were comparable pre- and postoperatively (Tables 1 and 3).

Postoperative IIEF-15 administered to 12 patients revealed highly significant improvement in erectile function (from 26.3 to 30), satisfaction with intercourse (from 7.3 to 14), overall satisfaction (from 3.3 to 9.3), and the overall score (from 56 to 73.3) (Tables 2 and 4).

Immediately postoperative, there was mild edema that resolved spontaneously. Postoperative pain upon nocturnal erection persisted for an average of 1 month. Most patients complained of a firm palpable area and sometimes pricking sensation over the dorsum of the penis. This faded by the fourth month following surgery. All patients were warned as to those symptoms before surgery. No postoperative hyposthesias or paresthesias were observed. Three patients had slight wound gaping and one had mild wound infection. They were managed conservatively. Throughout the follow-up period, no recurrences or further com-

lications occurred. Mobilization of the deep dorsal vein or incorporating it in the repair had no influence on the outcome.

Discussion

Shortening the convex side of curvature is very effective in rectification, unfortunately, on the expense of phallic length. Grave shortening can afflict cases with extreme degrees of curvature corrected by this method [11]. Grafting the concave side is known to cause erectile dysfunction as a result of venous leakage [9]. This was the motivation behind the development of the corporeal rotation for the correction of penile curvature in adults as an alternative to the classic techniques [10].

The technique was applied to a case of congenital ventral penile curvature of 90 degrees. Artificial erection was induced by applying a tourniquet and injection of saline. The neurovascular bundle was fully mobilized. Multiple separate incisions were cut on the dorsal aspect of the corpora cavernosa, two on each side, parallel to each other. The edges

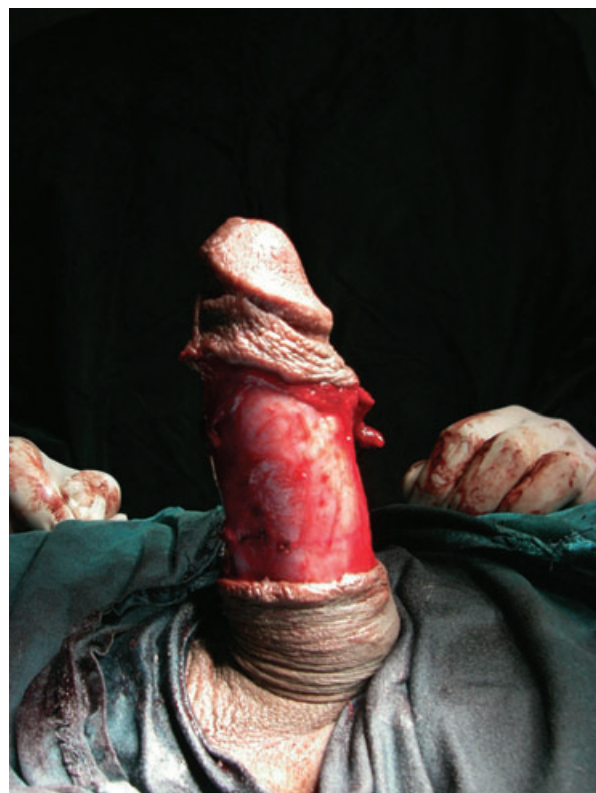


Figure 11 Full corporeal rotation and correction of curvature. Lateral view showing perfect symmetry.

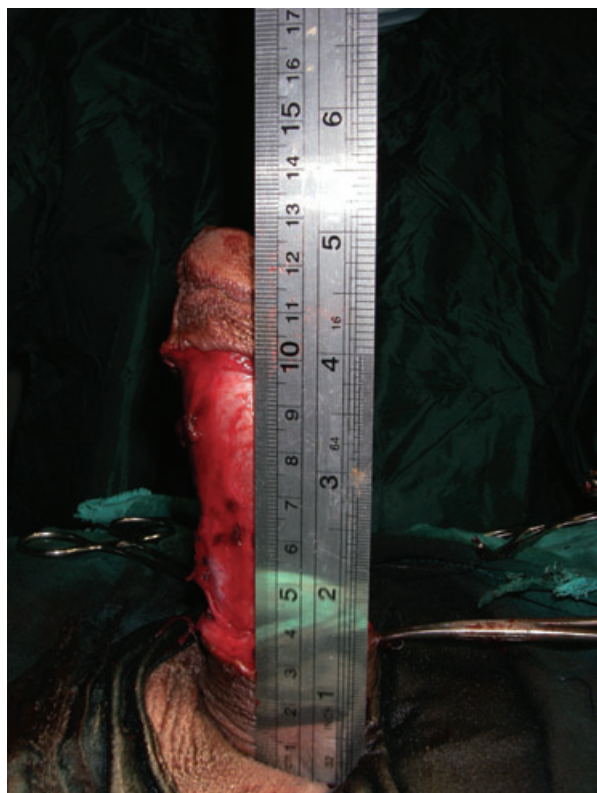


Figure 12 Full corporeal rotation and correction of curvature. Erect penile length of 12.8 cm, indicating a 13-mm increase over the prerotation state.

were approximated, thereby achieving corporeal rotation and full correction. This resulted in the narrowing of the urethra, which was relieved by freeing the spongiosum from the corpora cavernosa at the narrow points. There was dimpling at the sites of corporal rotation, and there was slight asymmetry in the form of mild increase of penile girth distally [10]. I came to modify this technique based on 3 years of experience.

I prefer to operate on an erect penis by ICI, rather than with a tourniquet and saline injection. This was proven to spare the patient the postoperative edema to a large extent. Pharmacologic erection helped in determining the depth of the corporeal incisions precisely, stopping short of the cavernous tissue.

The author prefers not to mobilize the neurovascular bundle fully from lateral to medial, but rather identify the dorsal arteries, and accordingly, the nerves lateral to the arteries, and operate medial to them. Not only does this shorten and simplify the procedure, but it also spares the nerves the extensive dissection and accordingly preserves sensibility. Incorporation of the deep

dorsal vein in the repair may be a point of debate, though experience has found it harmless. It is up to every surgeon to decide whether or not to mobilize the vein, a point not critical to the technique at hand.

As to the rotating incisions, the author gave up the few, interrupted, widely separated pairs of incisions for a single pair of longer proximate incisions, converging toward their proximal and distal ends and sutured together in one continuous suture line. This prevented the dimpling, asymmetry, and the slight loss in girth reported upon in the first case [10] and is the main essence of the modified technique.

To break this down, it seems that the structural adhesions between the corpora will only allow slight freedom of mobility without the need for disassembly. In order to rotate the corpora with a few interrupted stitches, the stitches have to be wide apart on either sides of the dorsal vein to achieve the desired degree of rotation. Approximating points that are wide apart requires the corpora to rotate beyond the extent allowed by the structural adhesions, thereby causing some degree of narrowing [10], unless disassembly is performed.

On the contrary, if approximation is achieved by suturing continuous longer incisions, the incisions need not be wide apart. Every suture brings

Table 3 Postoperative measurements

Patient number	Angle	Erect length	Rigidity upon ICI
1	0.0	15.1	E5
2	0.0	14.0	E5
3	0.0	18.0	E5
4	0.0	16.2	E5
5	10.0	18.0	E5
6	0.0	15.0	E5
7	0.0	16.0	E5
8	0.0	15.3	E5
9	0.0	15.0	E5
10	0.0	15.2	E5
11	0.0	22.0	E5
12	0.0	19.5	E5
13	5.0	14.0	E5
14	0.0	18.0	E5
15	0.0	12.0	E5
16	0.0	14.0	E5
17	0.0	12.8	E5
18	0.0	16.0	E5
19	0.0	18.0	E5
20	0.0	12.8	E5
21	0.0	16.0	E5
22	0.0	13.0	E5
Average	0.7	15.7	
	t-test	0.007868786	

ICI = intracorporeal injection of prostaglandin E1.

Table 4 International Index of Erectile Function after surgery

Patient number	Degree of curvature	Erectile function	Erectile dysfunction	Satisfaction with intercourse	Orgasmic function	Desire	Overall satisfaction	Total score	Rigidity upon ICI
1	0.0	30	None	15	10	10	10	75	E5
2	0.0	30	None	15	10	10	10	75	E5
3	0.0	30	None	15	10	10	8	73	E5
4	0.0	30	None	15	10	10	10	75	E5
5	10.0	30	None	15	10	10	10	75	E5
6	0.0	30	None	14	10	10	10	74	E5
7	0.0	30	None	13	10	10	8	71	E5
8	0.0	30	None	14	10	10	9	73	E5
9	0.0	30	None	14	10	10	10	74	E5
10	0.0	30	None	12	10	10	9	71	E5
11	0.0	30	None	12	10	10	8	70	E5
12	0.0	30	None	14	10	10	10	74	E5
Mean		30.0		14.0	10.0	10.0	9.3	73.3	E5
P value		0.00028765		0.00000043	0.33880070	0.276	0.00000000	0.000001	

ICI = intracorporeal injection of prostaglandin E1.

together proximate points, offering a slight contribution to rotation within the extent allowed by the structural adhesions. These contributions add up and cumulate as the sutures proceed distally, until full rotation is achieved without narrowing. Convergence of the incision lines toward their proximal and distal ends also favors this gradual rotation without loss in girth. Proximal rotation along a narrow arc results in distal rotation along a wider arc (Figure 6), thus limiting the length of incision required to achieve full rotation and correction of curvature.

The abandoned interrupted sutures may possibly result in indentation because of the abrupt transition in girth between the rotated (sutured) and nonrotated (nonsutured) parts of the penis. On the contrary, with the pair of long incisions that converge toward their ends, one continuous suture line is possible without abrupt transitions between the rotated and nonrotated states, and therefore, no indentation or asymmetry.

The author observed that performing more than one long suture line resulted in S-shaped deformity. In one of the first cases, the single suture line was not sufficient for full correction. This author performed another incision distal to the first one and sealed it. S-deformity resulted. The condition was resolved by untying the sutures, connecting the incisions and sealing them as one. This resulted in an undeformed straight penis. It is therefore recommended to conduct the repair through a single incision, that is extended as needed.

Not only that the full-length incisions prevented loss in girth and asymmetry, but they also eased the tension on the repair. Less tension should decrease the possibility of recurrence of curvature. This modification also spared the

urethra from stenosis and eliminated the need for mobilizing the spongiosum off of the corpora cavernosa contrary to the first case [10].

This author prefers using thick absorbable/slowly absorbable suture materials than thin, permanent suture material to avoid stitch sinuses and infection, especially that the tension on the suture line is not high (gradual nonabrupt rotation). After full healing, the strength of the repair lies in the healed scar of the approximated incisions, which proved very reliable.

According to these modifications, the technique became easier, shorter, with less edema, less hyposthesia, with no dimpling, asymmetry or girth loss, still preserving phallic length and erectile function throughout a follow-up period of up to 3 years. Longer follow-up periods may confirm or modify these impressions.

In comparison to alternative techniques, not only that length and erectile function are preserved, but there is also less tension on the suture line as the curvature-inducing forces of the concave aspects of the corpora are neutralized by rotating the concavities to the lateral sides, flexing against each other (Figure 1), rather than against the suture line as happens with the convexity-shortening techniques. This may—theoretically—decrease recurrence and postoperative pain on erection.

The remaining limitations of this technique are its infeasibility for correction of lateral curvature and lack of information about its feasibility in cases of Peyronie's-induced curvature. If ventral or dorsal deviation is accompanied by lateral deviation, corporeal rotation can be applied to correct the ventral or dorsal curvature, and another technique such as modified Nesbit technique is applied to correct the lateral curvature.

Conclusion

Corporal rotation can restore straightness to the curved penis with no loss in phallic length, asymmetry, or erectile dysfunction. While a variety of surgical techniques are feasible for correction of milder degrees of curvature, I believe that severe degrees should be spared the shortening and corrected by corporeal rotation.

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Conflict of Interest: None declared.

Statement of Authorship

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Category 3

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References

- 1 Culp OS, McRoberts JW. Hypospadias. In: Alken CE, Dix VW, Goodwin WE, eds. Encyclopedia of urology. New York: Springer-Verlag; 1968:11307–44.
- 2 Kramer S, Aydin G, Kelalis P. Chordee without hypospadias in children. *J Urol* 1982;128:559–61.
- 3 Baskin L, Duckett J, Lue T. Penile curvature. *Urology* 1996;48:347–56.
- 4 Nesbit RM. Congenital curvature of the phallus: Report of three cases with description of corrective operation. *J Urol* 1965;93:230.
- 5 Nesbit RM. Operation for correction of distal penile ventral curvature with and without hypospadias. *Trans Am Assoc Genitourin Surg* 1966;58:12–4.
- 6 Baskin LS, Duckett JW. Dorsal tunica albuginea plication for hypospadias curvature. *J Urol* 1994; 151:1668–71.
- 7 Devine C Jr, Horton C. Use of dermal graft to correct chordee. *J Urol* 1975;113:56–8.
- 8 Hafez AT, Smith CR, McLorie GA, El-Ghoneimi A, Herz DB, Bägli DJ, Khoury AE. Tunica vaginalis for correcting penile chordee in a rabbit model: Is there a difference in flap versus graft? *J Urol* 2001; 166:1429–32.
- 9 Dalkin BL, Carter MF. Venogenic impotence following dermal graft repair for Peyronie's disease. *J Urol* 1991;146:849–51.
- 10 Shaeer O. Correction of penile curvature by rotation of the corpora cavernosa: A case report. *J Sex Med* 2006;3:932–7.
- 11 Daitch JA, Angermeier KW, Montague DK. Modified corporoplasty for penile curvature: Long-term results and patient satisfaction. *J Urol* 1999;162: 2006–9.