

KL Ho 何崑崙
 AWC Yip 葉維晉
 LS Leung 梁樂生
 IC Law 羅賢澤

Surgical treatment of penile curvature

手術治療陰莖彎曲

Objective. To review long-term efficacy and complications of surgical treatment of penile curvature in a Chinese population.

Design. Retrospective review.

Setting. Regional hospital, Hong Kong.

Patients. Patients who underwent surgical treatment of penile curvature between January 1997 and March 2005 inclusive.

Intervention. Penile curvature corrective surgery.

Main outcome measures. Penile curvature recurrence, early and late complications.

Results. Of 22 patients who underwent surgical treatment of penile curvatures, 19 had congenital and three had acquired diseases. The mean angle of deformity was 52.5 (range, 20-90) degrees. Ten patients had Nesbit procedures, ten had modified Nesbit procedures, and two underwent vein grafting. Twenty patients had residual or recurrent penile curvatures at a mean follow-up of 50.9 months. Fifteen patients had less than 30 degrees curvature and five had 30 to 60 degrees curvature. Early complications included wound infection (n=3), penile skin necrosis (n=1) treated by skin graft, and urethral injury (n=1). Three patients had erectile dysfunction; four complained of glans paraesthesia. Penile shortening (mean, 1.4 cm) and palpable knots were common late complications. A total of 19 patients were satisfied with the final outcomes.

Conclusions. Surgical treatment of penile curvature produces long-term patient satisfaction. Preoperative counselling on potential recurrence and common minor complications is crucial to produce favourable outcomes.

目的：檢討華籍人士以手術治療陰莖彎曲的長期效果和併發症。

設計：回顧式檢討。

安排：地區醫院，香港。

患者：由1997年1月至2005年3月期間，接受過治療陰莖彎曲手術的病人。

治療：陰莖彎曲改正手術。

主要結果測量：陰莖彎曲再次發生、早期和後期併發症。

結果：22名接受陰莖彎曲治療手術的病人中，19人有先天性疾病，3人有後天性疾病。平均變形角度為52.5度（介乎20-90度）。10名病人接受涅斯比特治療法（Nesbit procedures），另外10人接受改良涅斯比特治療法，最後2人則接受靜脈移植手術。在平均為50.9個月的跟進期內，20名病人出現殘餘或復發性陰莖彎曲，其中15人的彎曲少於30度，其餘5人的陰莖彎曲介乎30至60度。早期的併發症包括傷口感染（3人）、陰莖皮膚壞死（1人）而用皮膚移植治療和尿道受傷（1人）。3名病人出現勃起機能失調，4名病人表示龜頭感覺異常。較常出現的後期併發症則有陰莖縮短（平均數1.4 cm）和出現可感覺到的結節。19名病人對最終效果表示滿意。

結論：陰莖彎曲治療手術長遠來說能令病人滿意。為獲得滿意結果，手術前對病人解釋復發的潛在可能和輕微併發症十分重要。

Key words:

Penile diseases;
 Penile induration;
 Surgery

關鍵詞：

陰莖疾病；
 陰莖硬粒；
 手術

Hong Kong Med J 2006;12:410-4

Department of Surgery, Kwong Wah Hospital, Yaumatei, Hong Kong

KL Ho, FRCS (Urology) (Edin), FHKAM (Surgery)
 AWC Yip, FRCS (Edin), FHKAM (Surgery)
 LS Leung, FRCS (Edin)
 IC Law, FRCS (Edin), FHKAM (Surgery)

Correspondence to: Dr KL Ho
 (e-mail: kwanlun2001@yahoo.com)

Introduction

Francois de la Peyronie¹ first described the acquired disease of penile deformity in 1743. Peyronie's disease is characterised by fibrous plaques over the corpus cavernosum, penile curvature on erection, painful erection, and erectile dysfunction. Schwarzer et al² had reported its prevalence to be 3.2% in a cross-sectional community-based study. Congenital penile curvature is also not uncommon; Ebbehøj and Metz³ as well as Yachia et al⁴ had reported its prevalence to be 0.4 to 6 per thousand. The actual prevalence may be far higher

than this because many curvatures are mild and of no clinical significance.

Severe penile curvature is associated with difficulty in vaginal intromission, discomfort to the patient or his partner during sexual intercourse, and psychological trauma.⁵ Patients with symptoms due to penile plaques may also overlap with those of tumours. Indications for treatment include: severe penile deformity, difficulty or discomfort in vaginal intromission, and erectile dysfunction.

Medical treatment⁶ mainly aims at the early inflammatory phase of Peyronie's disease. Prescriptions include vitamin E, potassium para-aminobenzoate, tamoxifen, colchicines, verapamil and intralesional interferon. Extracorporeal shock wave therapy and low-dose radiotherapy are also part of the armamentarium. Most of these interventions are based on small, poorly controlled studies, few of which entailed objective measurements.

Surgery remains the mainstay of treatment for patients with congenital penile curvature and Peyronie's disease (evident ≥ 1 year and with a stable deformity for ≥ 3 months).^{7,8} In 1965 Nesbit⁹ first described correction of the penile curvature by elliptical resections of the tunica albuginea on the convex aspect of the penis. Subsequently, various tunica shortening or lengthening procedures were developed. In the contemporary western literature, the description of surgical treatment of penile curvature in Chinese patients has been meagre.^{5,10}

Therefore, the objective of our study was to review the long-term efficacy and complications of penile curvature corrective surgery in a local Chinese population. To the best of our knowledge, this is the first case series of its kind reported in Hong Kong.

Methods

From January 1997 to March 2005 inclusive, 22 consecutive patients underwent surgical correction of penile curvature at the Kwong Wah Hospital. Hospital records and operation notes were retrospectively reviewed. Most of the patients were referred from general out-patient clinics or the Family Planning Association of Hong Kong. Nineteen patients had congenital penile curvature and three had Peyronie's disease. The criteria for surgery included penile curvature of more than 30° , difficulty or severe discomfort on vaginal intromission, or partners' discomfort on vaginal intromission. For patients with Peyronie's disease, surgical correction was only offered to those with disease duration of more than 1 year and stable deformity of at least 3 months. All except two patients had normal erectile function. The two exceptions with erectile dysfunction had a good response to oral type-5 phosphodiesterase inhibitors.

A detailed medical and sexual history was obtained in the out-patient clinics. The degrees of penile curvature were

documented by patient-taken photos or drawings. For patients who could not give an accurate description of the deformity, intracavernosal prostaglandin E1 injection was given. Patients who fulfilled the above-mentioned criteria were offered surgical correction. All of them were counselled preoperatively about potential complications (penile shortening, palpable knots, erectile dysfunction, and penile paraesthesia). Nesbit⁹ or modified Nesbit¹¹ procedures were performed in most patients. Plaque excision and vein grafting were performed in two patients with severe penile deformity, who were worried about penile shortening.

Operative techniques

All patients had surgery under general anaesthesia. After a constricting 10-Fr Nelaton catheter was applied to the penile root, an artificial erection was induced with intracorporeal injection of normal saline through a 21-gauge butterfly needle. The direction, degree of penile curvature, and site of maximum convexity were determined. A circumferential subcoronal incision was made and the penile skin degloved. Potential sites of excision or incision were marked on the region of maximal convexity. Buck's fascia was incised and bilateral neurovascular bundles dissected carefully from potential sites of excision or incision. Elliptical excisions (Nesbit⁹) or incisions (modified Nesbit¹¹) of the tunica albuginea were made at sites of maximum convexity. The choice between excision and incision of tunica albuginea was based on the surgeon's preference. The number and width of excisions/incisions depended on the degree of curvature. The tunica defects were then closed with 4/0 polydioxanone in interrupted manner; the resulting knots were cautiously buried. A second artificial erection was induced to check the correction, which was examined by all members of the operation team for evaluation of its straightness. Any residual penile curvature was corrected with further excision or incision of the tunica albuginea.

Two patients with Peyronie's disease had severe penile curvature and were worried about penile shortening. For them, plaque excision and vein grafting were performed. The vein grafts were both harvested from the great saphenous vein and patched to the defect of tunica albuginea with 5/0 polydioxanone.

After correction of the penile curvature was deemed to be satisfactory, the penile skin was closed with 3/0 chromic catgut. The penile shaft was wrapped in a light compressive dressing. A urethral catheter was left indwelling overnight. The patients were discharged when wound pain and oedema decreased. All patients were followed up in 6 weeks for evaluation of early complications and recurrence of penile curvature. All patients were interviewed by telephone with a standardised questionnaire to evaluate late complications and recurrence of penile curvature. During early follow-up the degrees of penile curvature recurrence was estimated from patient-taken photos or drawings, and in the telephone interviews estimated by patients themselves.

Table 1. Patient characteristics and outcomes

	No. of patients, n=22
Direction of penile curvature	
Ventral (concavity facing downwards)	15
Dorsal (concavity facing upwards)	2
Left	3
Right	0
Left and dorsal	1
Left and ventral	1
Penile curvature (range, 20°-90°; mean, 52.5°)	
<30°	1
30°-60°	16
>60°	5
Early complications	
Wound infection	3
Haematoma	0
Penile skin necrosis	1
Urethral injury	1
Recurrent penile curvature	
0°	2
<30° (mean, 13.3°; SD, 4.9°)	15
30°-60° (mean, 39.0°; SD, 8.2°)	5
>60°	0
Late complications	
Penile shortening (mean decrease, 1.4 cm)	9
Palpable knots	14
Penile paraesthesia	4
Pain on erection	3
Erectile dysfunction	3

Results

Twenty-two consecutive patients had surgical correction of penile curvature during the study period. The mean length of follow-up was 50.9 (range, 9-96) months. The mean age was 31.2 (range, 19-67) years. Nineteen patients had congenital penile curvature and three patients had Peyronie's disease. The commonest deformity was ventral penile curvature. Two patients had bi-directional penile curvature. The mean angle of deformity was 52.5 degrees (Table 1). Seventeen patients were sexually active. Twelve patients complained of difficulty in vaginal intromission or partner discomfort. Two patients had preoperative erectile dysfunction and both responded well to oral treatment. The requests for surgery were because of difficulty in vaginal intromission, partner's discomfort, and severe penile deformity.

Procedures performed include Nesbit (n=10), modified Nesbit (n=10), and vein grafting operations (n=2). The mean duration of the operation was 82 (range, 55-135) minutes. Postoperative hospital stays ranged from 1 to 5 (mean, 2.6) days. Three patients had mild wound infection and responded to conservative treatment. One patient had penile skin necrosis and subsequently required full-thickness skin graft. This patient had good functional recovery. One patient had urethral injury during mobilisation of the corpus spongiosum for correction of dorsal penile curvature. The urethral injury was immediately recognised and repaired. This patient had no urethral stricture on follow-up for 1 year. No patient developed a haematoma (Table 1). Six patients

Table 2. Outcomes following Nesbit vs modified Nesbit procedures

	Nesbit, n=10	Modified Nesbit, n=10	P value
Recurrent penile curvature (mean±SD)	16.7°±8.7°	25.0°±15.6°	0.19
Infection	2	1	0.60
Penile skin necrosis	0	1	0.44
Urethral injury	0	0	-
Paraesthesia	2	2	0.66
Penile shortening	4	3	0.13
Erectile dysfunction	0	1	0.44
Palpable knots	7	6	0.82
Pain on erection	2	1	0.60

reported residual penile curvature at 6 weeks after operation, ranging from 10 to 20 degrees.

At telephone interview 9 months to 8 years postoperatively, 20 patients complained of residual or recurrence of penile curvatures (Table 1). Fifteen patients noted curvatures of less than 30 degrees (mean, 13.3; standard deviation [SD], 4.9 degrees). None of these patients found this degree of curvature bothersome. On the other hand, five patients reported curvatures of 30 to 60 degrees (mean, 39.0; SD, 8.2 degrees). Two of the latter had recurrent difficulty in vaginal intromission and three complained of erectile dysfunction. One of those with erectile dysfunction had had this problem preoperatively. The other two patients who had developed the symptom de-novo, underwent plaque excision and vein grafting procedures. All three patients responded well to oral treatment. The commonest late complications were palpable knots and penile shortening (Table 1). The loss of penile length ranged from 1 to 2 cm (mean, 1.4 cm), but this did not seem to have affected sexual activity in any of the patients. Other late complications included decreased penile sensation and pain on erection. Altogether 19 patients were very satisfied or satisfied with the final outcomes of their surgery.

Subset analysis was performed in patients who had Nesbit versus modified Nesbit procedures; their mean±SD degrees of preoperative penile curvature having been fairly similar (43.0±9.5 degrees and 54.5±26.8 degrees, respectively; P=0.23). As summarised in Table 2, there was no difference in postoperative outcomes and complications in patients undergoing Nesbit as opposed to modified Nesbit operations.

Discussion

The incidence of penile curvature in the Chinese population is unknown. Most such abnormalities are probably mild and have not been brought to medical attention. By contrast, severe penile deformity is associated with difficulty in vaginal intromission, patient/partner discomfort, and psychological trauma. In the present series,

most of the patients had congenital penile curvatures and the curvature exceeded 30 degrees in all but one of them. The latter patient nevertheless reported significant discomfort on vaginal intromission, for which he was offered surgical treatment following extensive preoperative counselling.

Since Nesbit's original description of surgical correction of penile curvature,⁹ various tunica shortening and lengthening procedures have been described. In recent years, Baskin and Lue¹² popularised plication procedures in an attempt to reduce the surgical trauma associated with the Nesbit procedure. Hsieh et al⁵ and Lee et al¹⁰ contributed their experience on penile curvature surgery in the Chinese population. Hsieh et al⁵ had compared the results of a modified plication technique and the Nesbit procedure. Lee et al¹⁰ had described the largest series of Chinese patients having plication procedures for congenital penile curvature. In the present article, we report our experience in the local population, which mainly entailed use of the Nesbit or modified Nesbit procedures.

The reported success rates of Nesbit or modified Nesbit procedures for the correction of congenital penile curvature and Peyronie's disease range from 89 to 100% and 65 to 95% respectively.^{11,13,14} In the present series, only two patients reported a completely straight penis at a mean follow-up of 50.9 months. Six patients complained of a residual curvature of 10 to 20 degrees immediately after the operation. Most of these "residual" curvatures fell within the physiological range, which would generally be considered to be insignificant, and serves to reinforce the importance of patient expectations and appropriate preoperative counselling. Andrews et al¹⁵ had critically analysed the reasons of poor outcomes after the Nesbit procedure. Immediate or early recurrences of penile curvatures were due to surgical errors or suture failures. Late recurrences were attributed to recurrence of Peyronie's disease. Under-correction of penile curvature based on artificial erections might have contributed to early recurrences. Suture of insufficient tensile strength (4/0 polydioxanone synthetic suture) might be another reason. Non-absorbable sutures were not used because of the well-known complications of painful knots and granulomas.⁵ Andrews et al¹⁵ had suggested the use of '0' polydioxanone synthetic suture. Altogether 17/22 (77%) patients had either no or very mild recurrent penile curvatures on the long-term follow-up. This result was comparable with contemporary results reported in the western literature.

One of the patients seen early in our series had penile skin necrosis, which was attributed to overzealous dissection of the dartos fascia from the penile skin during degloving. Penile skin blood supply was jeopardised when the dissection plane was superficial to the dartos fascia. This patient was subsequently treated by full-thickness skin graft and had an uneventful recovery. Another patient had dorsal penile curvature and suffered from a urethral injury during

mobilisation of the corpus spongiosum. The injury was immediately recognised and repaired. This patient had no evidence of urethral stricture on follow-up after 1 year. To guard against these problems, routinely we now introduce a urethral catheter to guide us during mobilisation of the corpus spongiosum.

The commonest late complications included penile shortening and palpable knots. Nine patients reported penile shortening, ranging from 1 to 2 cm (mean, 1.4 cm). This was an inevitable consequence of any kind of tunica shortening procedure. All patients were adequately informed of this before the procedure. Stretched penile length⁷ before the procedure might give an idea of the postoperative erect penile length. Fourteen patients reported palpable knots after the procedures and though such symptoms were mild, they persisted even after prolonged follow-up. Despite the use of fine absorbable sutures and attempts at burying the knots within the tunica albuginea, palpable lesions were still very common. We speculated that many of these were partly due to scar formation over the penile shaft after surgery. None of the patients with penile shortening or palpable knots reported significant influence on sexual intercourse.

Three patients reported postoperative erectile dysfunction, one of whom had preoperative erectile dysfunction and in the other two it developed de-novo after their procedures. The latter two patients had Peyronie's disease treated by plaque excision and vein grafting procedures. Possible causes included damage of the healthy tunica albuginea and underlying erectile tissue. Progression of Peyronie's disease was another possible cause of their de-novo erectile dysfunction. The symptoms of all three patients responded well to oral treatment. In a series of 418 men treated by plaque excision and dermal grafting, Austoni et al¹⁶ had demonstrated that 20% of patients still had significant erectile dysfunction. Many therefore considered plaque excision and grafting to be an obsolete operation. As an alternative, El-Sakka et al¹⁷ devised the operation of plaque incision and vein grafting, but erectile dysfunction was nevertheless encountered in 5 to 12% of the patients.⁶

Four patients complained of mild paraesthesia over the glans penis and penile shaft. Most of these patients had transient paraesthesia and no significant influence on sexual activity. Baskin et al¹⁸ had nicely demonstrated the anatomy of circumferential distribution of the penile nerves. Despite our attempts at dissection and preservation of the neurovascular bundles over the dorsal aspect of penile shaft, some penile nerves would have been severed during the excision/incision of the tunica albuginea. Plication procedures at 12'o clock between the dorsal vein and artery^{7,12} might be the only way to avoid this potential complication.

Altogether 19 of 22 patients were satisfied with the final surgical outcomes, but three were dissatisfied. One of them

had a significant recurrence of penile curvature (45 degrees at 6 months after the procedure), probably due to a suture failure. In two patients, curvatures of 30 and 45 degrees had recurred with a follow-up of 5 years later. Both reported recurrent difficulty in vaginal intromission. All three patients were counselled on re-operation for the recurrent penile curvatures.

In this retrospective study, the numbers of patients with congenital penile curvature and Peyronie's disease were unpaired. While we consider this as a limitation of the study, it also reflects the spectrum of patients that we manage in the local population.

Conclusion

Penile curvature is not uncommon. Most such deformities are mild and of no clinical significance. Severe penile curvature is associated with difficult vaginal intromission, patient/partner discomfort, and psychological trauma. Surgical correction remains the mainstay of treatment for congenital penile curvature, and Peyronie's disease of more than 1 year's duration and stable deformity for at least 3 months.

In our series, three different kinds of surgical techniques (Nesbit, modified Nesbit, and vein grafting) were employed to the curvatures. The long-term efficacy (no or mild recurrent curvature) was ensued in 77% of patients. The results were comparable with contemporary western series in which similar techniques were used. Penile shortening and palpable knots were common late complications, which apparently had no major impact on coital function. However, preoperative counselling and realistic patient expectations were of crucial importance.

In recent years, plication procedures have been advocated for both congenital and acquired penile curvatures.^{5,12} The frequently quoted advantages over traditional Nesbit procedures include easier operations, better long-term efficacy, and fewer complications. Such procedures will very probably be the impetus for new lines

of research in the local Chinese population with penile curvatures.

References

1. de la Peyronie F. Sur quelques obstacles qui s'opposent a l'ejaculation naturelle de la semence [in French]. *Mem Acad R Chir* 1743;1:425.
2. Schwarzer U, Sommer F, Klotz T, Braun M, Reifenrath B, Engelmann U. The prevalence of Peyronie's disease: results of a large survey. *BJU Int* 2001;88:727-30.
3. Ebbelohj J, Metz P. Congenital penile angulation. *Br J Urol* 1987;60:264-6.
4. Yachia D, Beyar M, Aridogan IA, Dascalu S. The incidence of congenital penile curvature. *J Urol* 1993;150:1478-9.
5. Hsieh JT, Huang HE, Chen J, Chang HC, Liu SP. Modified plication of the tunica albuginea in treating congenital penile curvature. *BJU Int* 2001;88:236-40.
6. Ralph DJ, Minhas S. The management of Peyronie's disease. *BJU Int* 2004;93:208-15.
7. Gholami SS, Lue TF. Correction of penile curvature using the 16-dot plication technique: a review of 132 patients. *J Urol* 2002;167:2066-9.
8. Dean RC, Lue TF. Peyronie's disease: advancements in recent surgical techniques. *Curr Opin Urol* 2004;14:339-43.
9. Nesbit RM. Congenital curvature of the phallus: report of three cases with description of corrective operation. *J Urol* 1965;93:230-2.
10. Lee SS, Meng E, Chuang FP, et al. Congenital penile curvature: long-term results of operative treatment using the plication procedure. *Asian J Androl* 2004;6:273-6.
11. Yachia D. Modified corporoplasty for the treatment of penile curvature. *J Urol* 1990;143:80-2.
12. Baskin LS, Lue TF. The correction of congenital penile curvature in young men. *Br J Urol* 1998;81:895-9.
13. Poulsen J, Kirkeby HJ. Treatment of penile curvature—a retrospective study of 175 patients operated with plication of the tunica albuginea or with the Nesbit procedure. *Br J Urol* 1995;75:370-4.
14. Ralph DJ, al-Akraa M, Pryor JP. The Nesbit operation for Peyronie's disease: 16-year experience. *J Urol* 1995;154:1362-3.
15. Andrews HO, Al-Akraa M, Pryor JP, Ralph DJ. The Nesbit operation for Peyronie's disease: an analysis of the failures. *BJU Int* 2001;87:658-60.
16. Austoni E, Colombo F, Mantovani F, Patelli E, Fenice O. Radical surgery and conservation of erection in Peyronie's disease [in Italian]. *Arch Ital Urol Androl* 1995;67:359-64.
17. El-Sakka AI, Rashwan HM, Lue TF. Venous patch graft for Peyronie's disease. Part II: outcome analysis. *J Urol* 1998;160:2050-3.
18. Baskin LS, Lee YT, Cunha GR. Neuroanatomical ontogeny of the human fetal penis. *Br J Urol* 1997;79:628-40.