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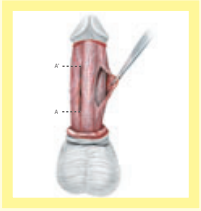

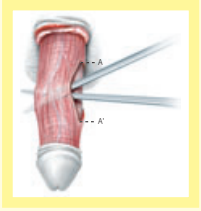

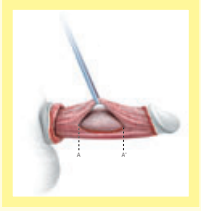

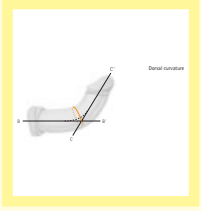

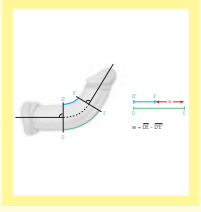

A single relaxing incision to correct different types of penile curvature: surgical technique based on geometrical principles

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INTRODUCTION

Penile curvature, whether caused by Peyronie's disease or congenitally, leads to reduced functional penile length and may be associated with penile shaft constriction and/or erectile dysfunction. The current available surgical treatment consists of shortening the healthy tunica albuginea on the long side, invariably associated with loss of penile length [1–5], or lengthening the short side by incision and/or excision of the tunica with graft placement [6–10].

As the plaque is not palpable in 30% of cases [11], may be multifocal [12], and changes in the tunica are diffuse and not restricted to the plaque itself [13,14], excising the plaque gives uncertain results. Also, the patients' main complaint is penile deformity and not the plaque itself. However, relaxing incisions can correct all types of curvature and may be applied whether or not associated with a plaque [7,8]. Different kinds of relaxing incisions have been suggested for each type of penile curvature, whether associated or not with constriction [7,8], but there is no standard procedure [15–17].

The technique described here aims to assess the use of a single almost complete circumferential relaxing incision, forked at the ends. It is best done by precisely applying geometrical principles to determine the exact site for the incision in the tunica or plaque so that the shorter side is as long as the longer side, thus creating a simpler defect in the tunica to make the grafting procedure easier. Bovine pericardium graft has been used although different types of graft may be used with the same technique.

In patients with erectile dysfunction that require a penile prosthesis [18,19], the latter can be implanted during the same procedure and through the same incision in the tunica. The size of the prosthesis is compatible with the longer side as it is the shorter side that is lengthened.

PATIENT SELECTION AND SURGICAL TECHNIQUE

Only patients with moderate to severe and stable penile curvature that makes sexual intercourse difficult or impossible require surgery. Penile curvature and rigidity are evaluated before surgery using a 10 μg alprostadil-induced erection and Doppler ultrasonogaphy.

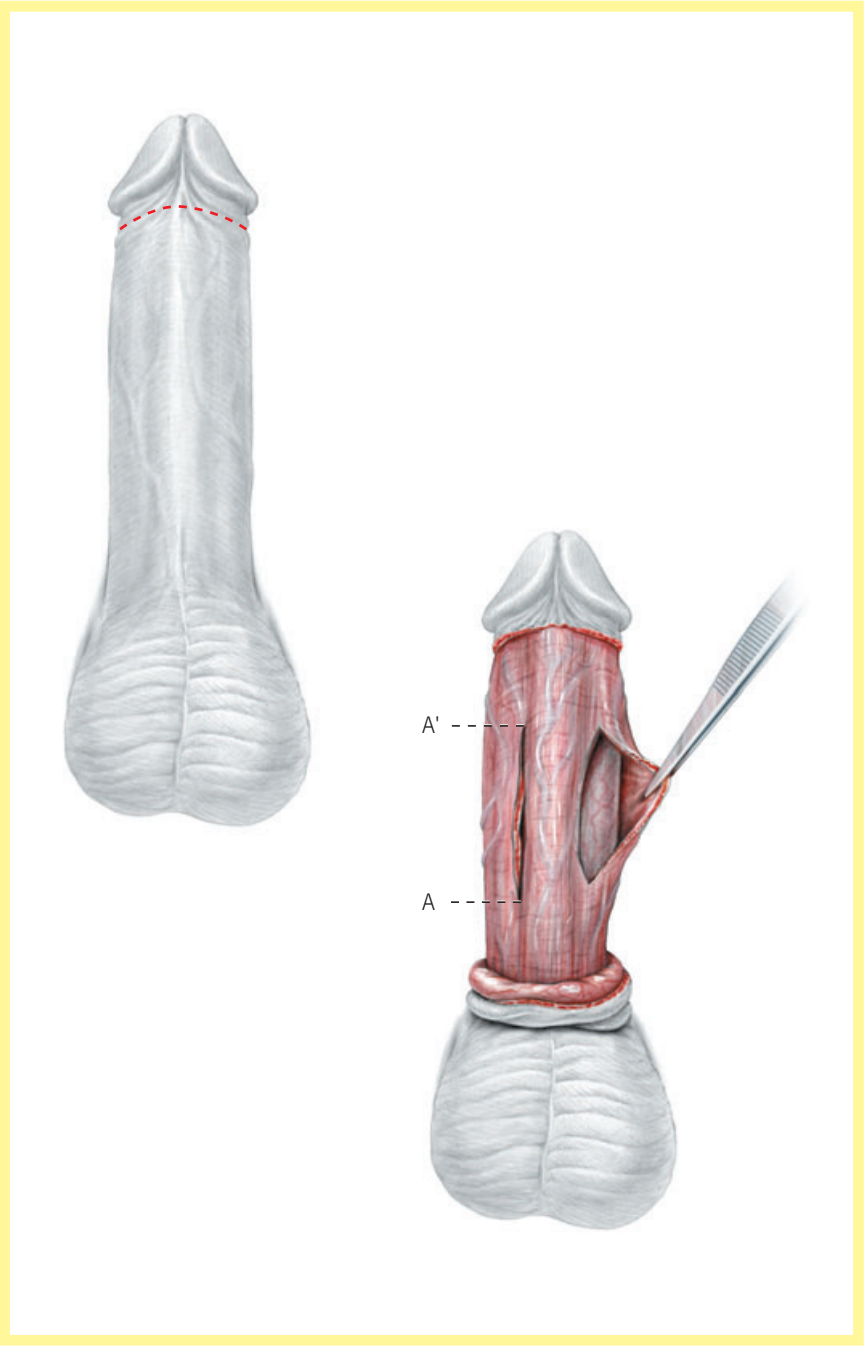
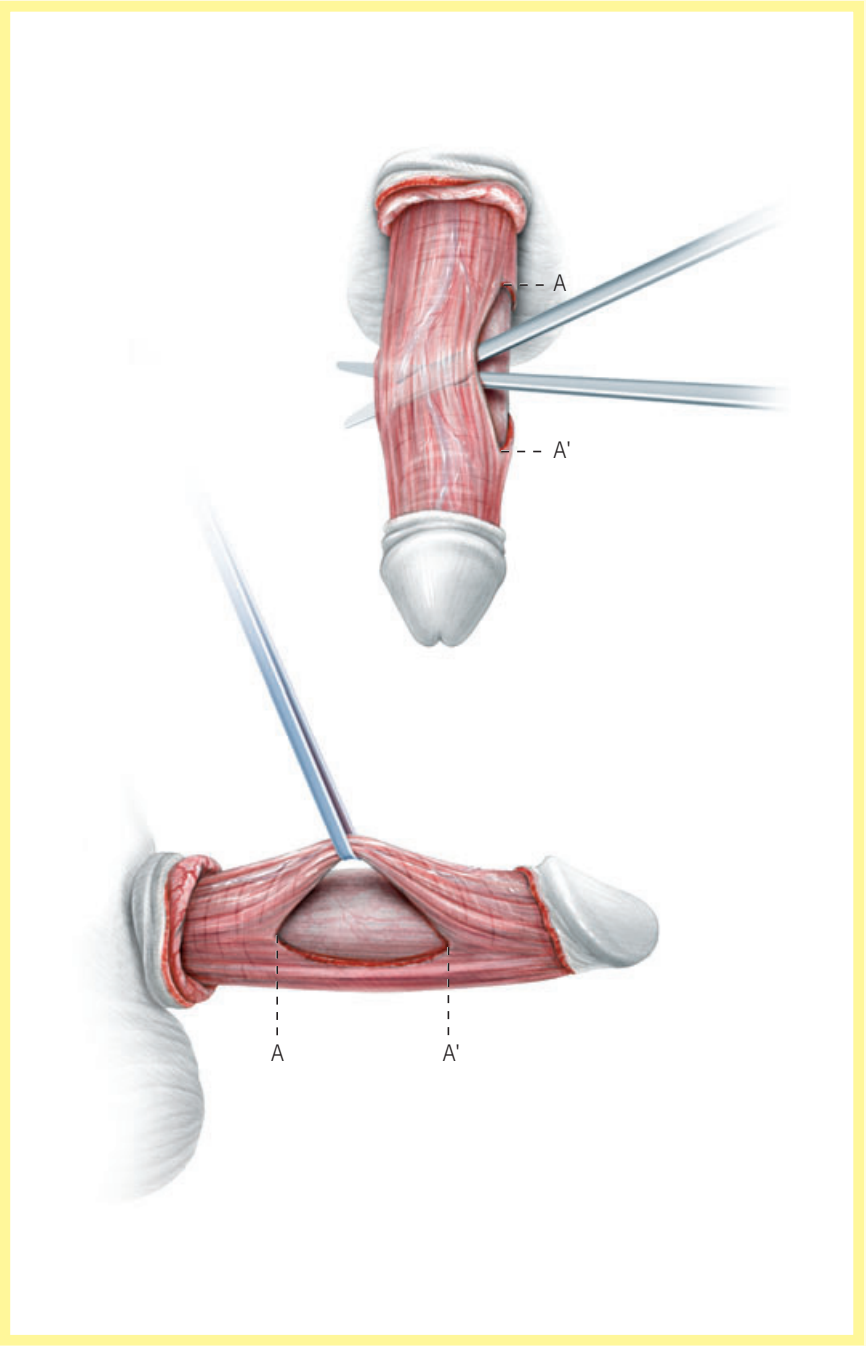


Figure 1

The penis is degloved after a circumcision incision. Lenses of ×2.5 may be used according to the surgeon's preference. A full erection is induced by saline injection through a 21 G scalpel puncture of one or both cavernosal bodies, to determine the point of maximum curvature. In all types of curvature two para-urethral incisions (A–A′) are made through this point to dissect the neurovascular bundle from the tunica.

Figure 2

Buck's fascia and its neurovascular bundle are dissected from the tunica albuginea around the circumference of the penis.



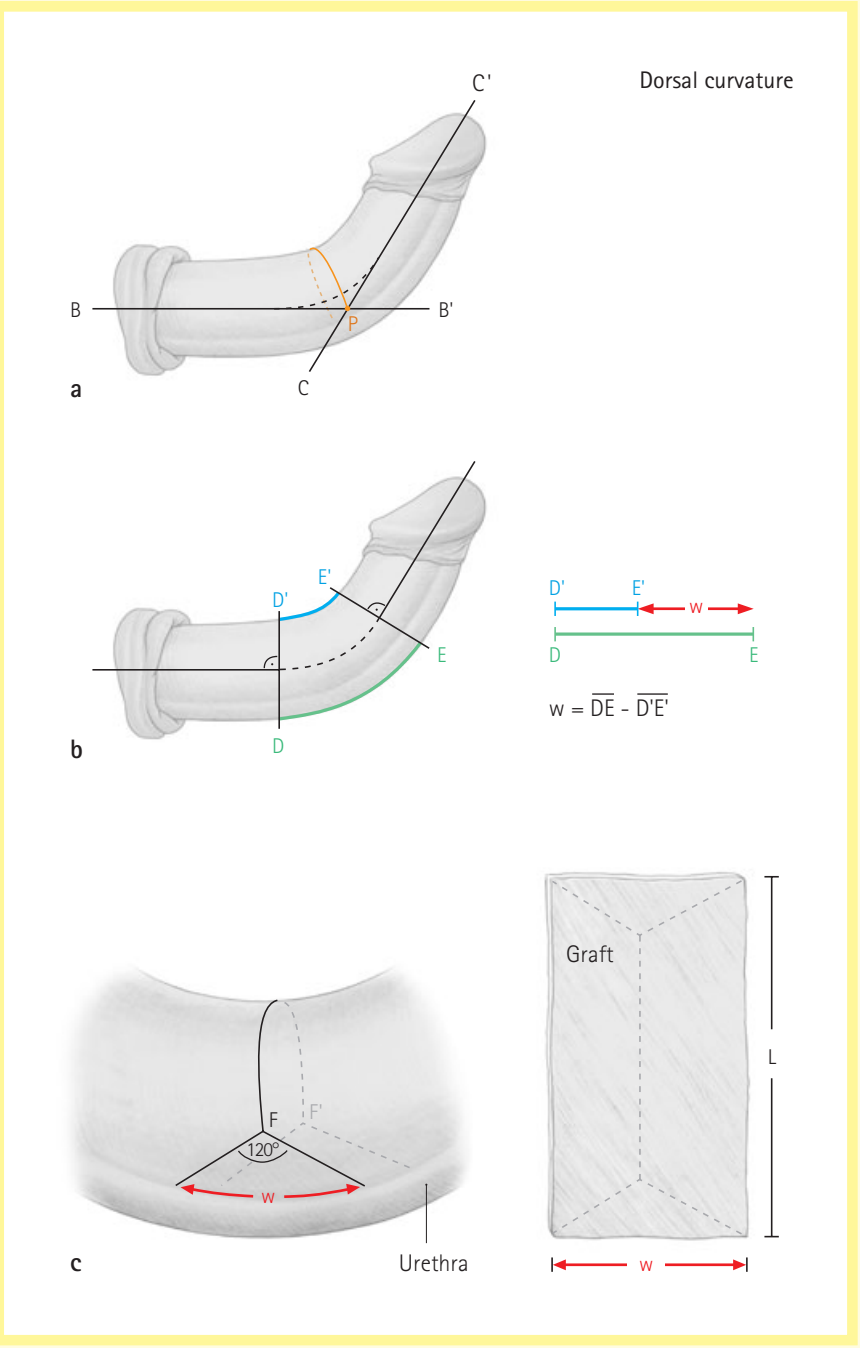


Figure 3

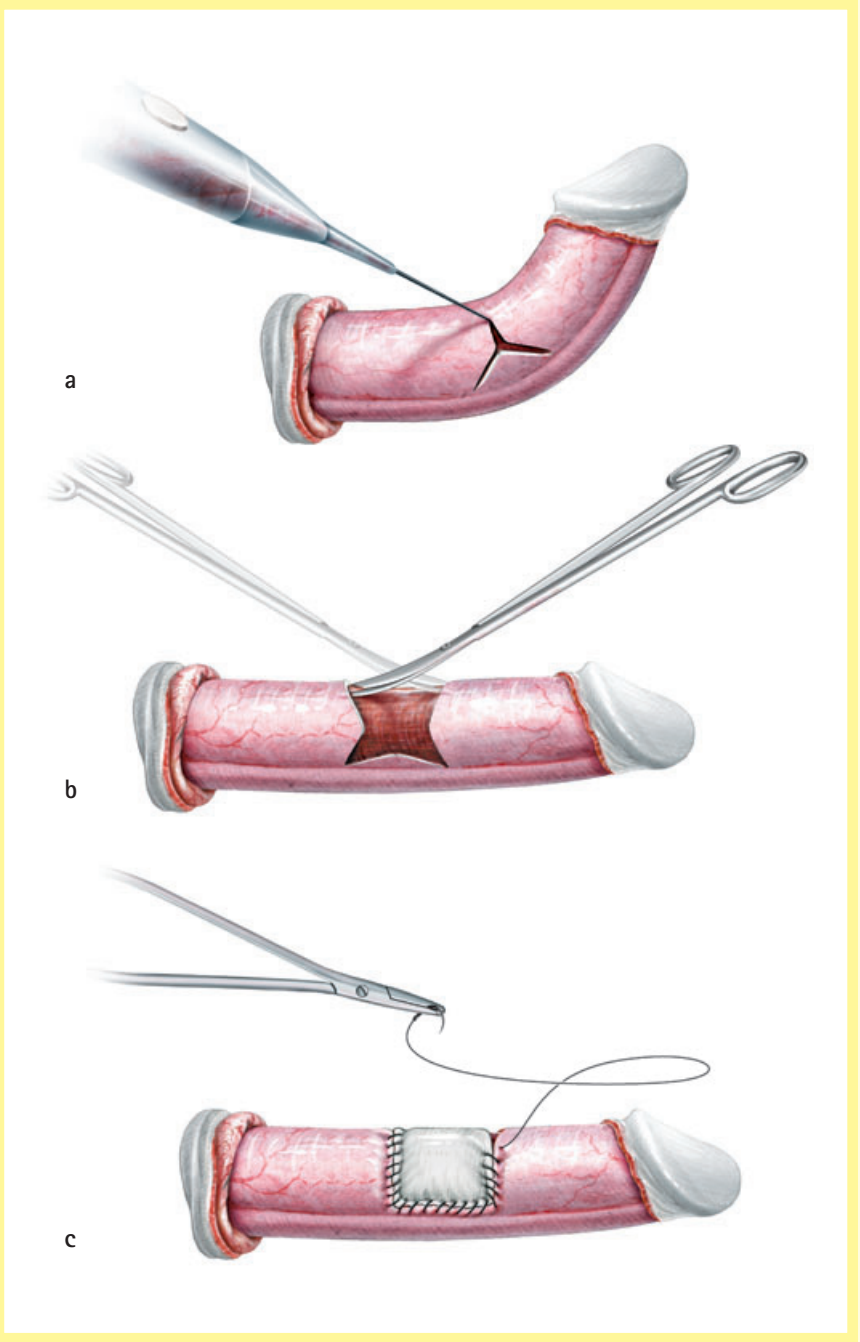
A new erection is induced and maintained; two lines tangential to the penile axis (Fig. 3a) are drawn on the proximal and distal straight segments B–B′ and C–C′. From the point of maximum curvature (P) situated at the intersection of the lines B–B′ and C–C′, a circumferential line is drawn at the bisectrix of the angle formed by these lines.

In Fig. 3b, the width (W) of the defect to be created should be the same as the difference between the long and short sides of the penis, corresponding to the difference in the distance between any two complete circumferential lines perpendicular to the penile axis drawn on the straight penile segments, i.e. outside the area of curvature. The difference (W) between D–E and D′–E′ will be the size of the defect on each side of the urethra in cases of dorsal curvature. The length of the defect (L) is equivalent to the distance between the two para-urethral incision (Fig. 1).

In Fig 3c, the circumferential line forked at the ends is drawn on the tunica. Thus the defect created will be rectangular. The points on the circumferential line where the forking should begin are identified as F and F′. Their position will be at a distance equivalent to one quarter of W (width of the defect) from the para-urethral incisions (Fig. 1). The resulting angle of the fork will be 120°, producing defects which are simpler and as stable as a tripod.

Figure 4

(a) Once the position of the circumferential line forked at the ends is determined, the incision is made in the tunica albuginea, producing a rectangular defect of predetermined size. In Fig. 4b, the penis is completely straightened by adding a 5-mm incision in the intercavernosal septum on each side of its intersection with the transverse incision. A 5-mm dissection is made underneath the four edges of the defect and the adjacent cavernosal bodies to facilitate the graft suturing. In Fig. 4c, the graft is sutured and a newly induced erection will then show complete penile straightening.



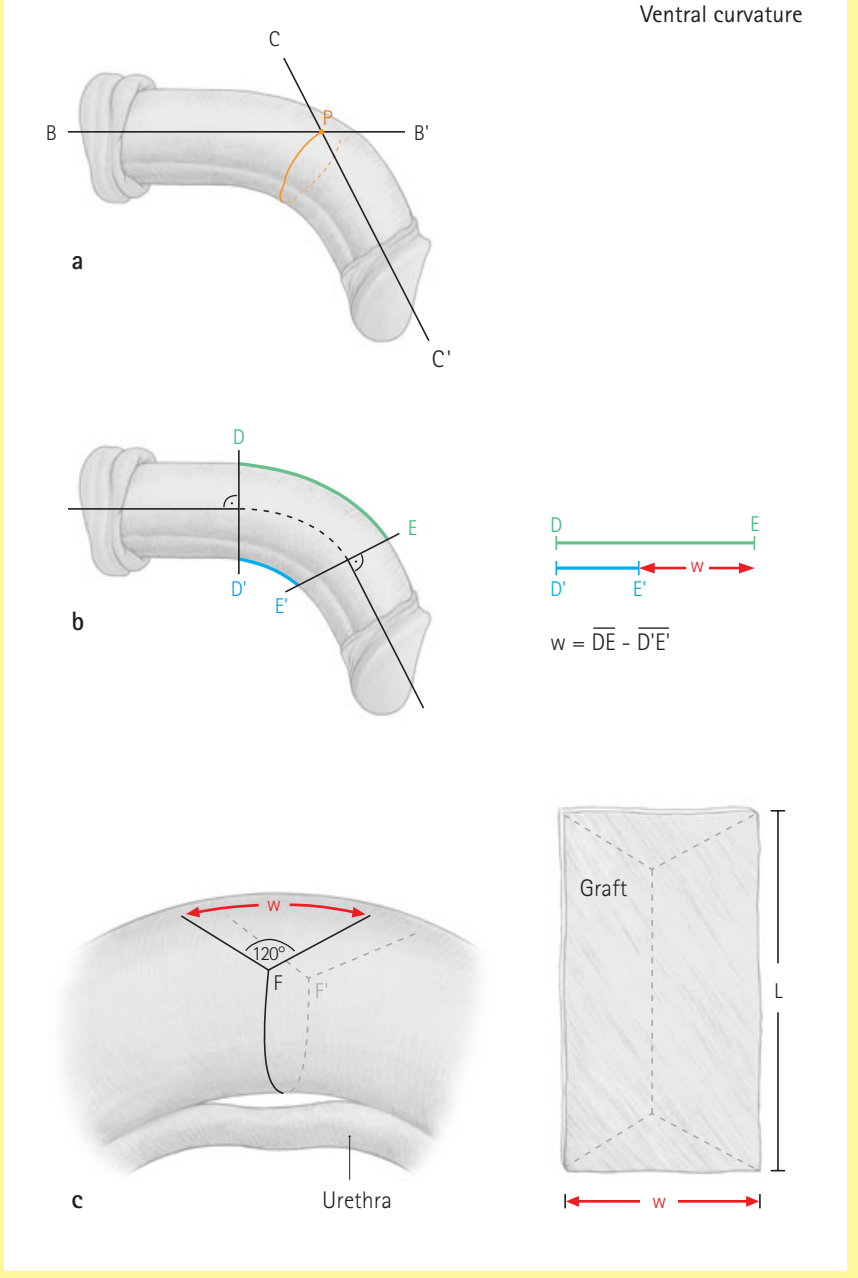


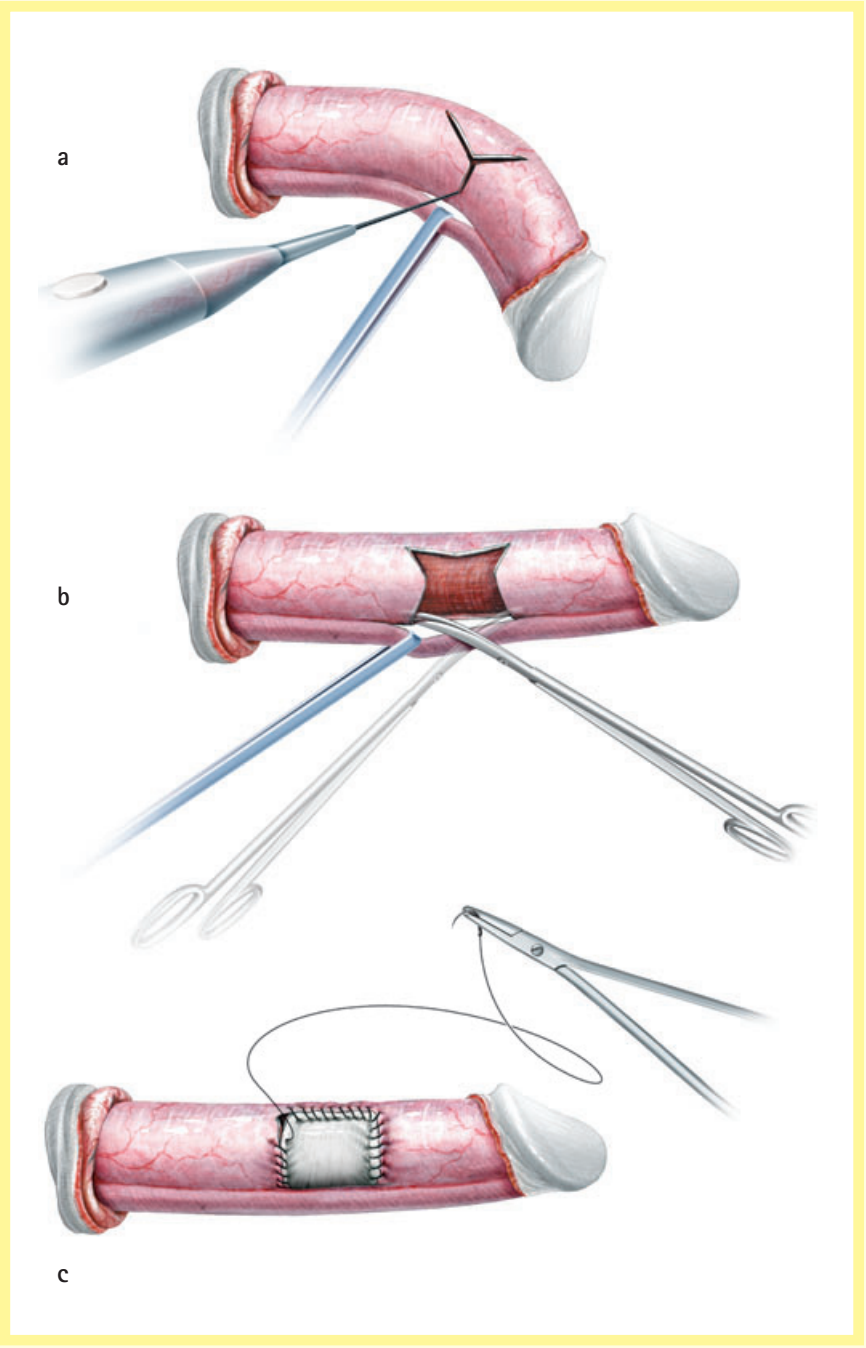
Figure 5

In cases of ventral curvature the technique is similar (a and b) with the following differences: in (c) the urethra is dissected from its bed and the fork of the transverse incision is made in the dorsal region near the intercavernosal septum.

Figure 6

In (a) the urethra is dissected from its bed; in (b) the dorsal septal insertion is maintained and the ventral septum insertion is cut on both sides. A 5-mm dissection is made underneath the four edges to create the defect and facilitate the suture. (c) The graft is placed between the urethra and the cavernosal body; another erection then shows complete penile straightening.

Dorsolateral curvatures with a larger dorsal component and ventrolateral curvatures with a greater ventral component are corrected using the same technique, respectively, as for dorsal and ventral curvatures.



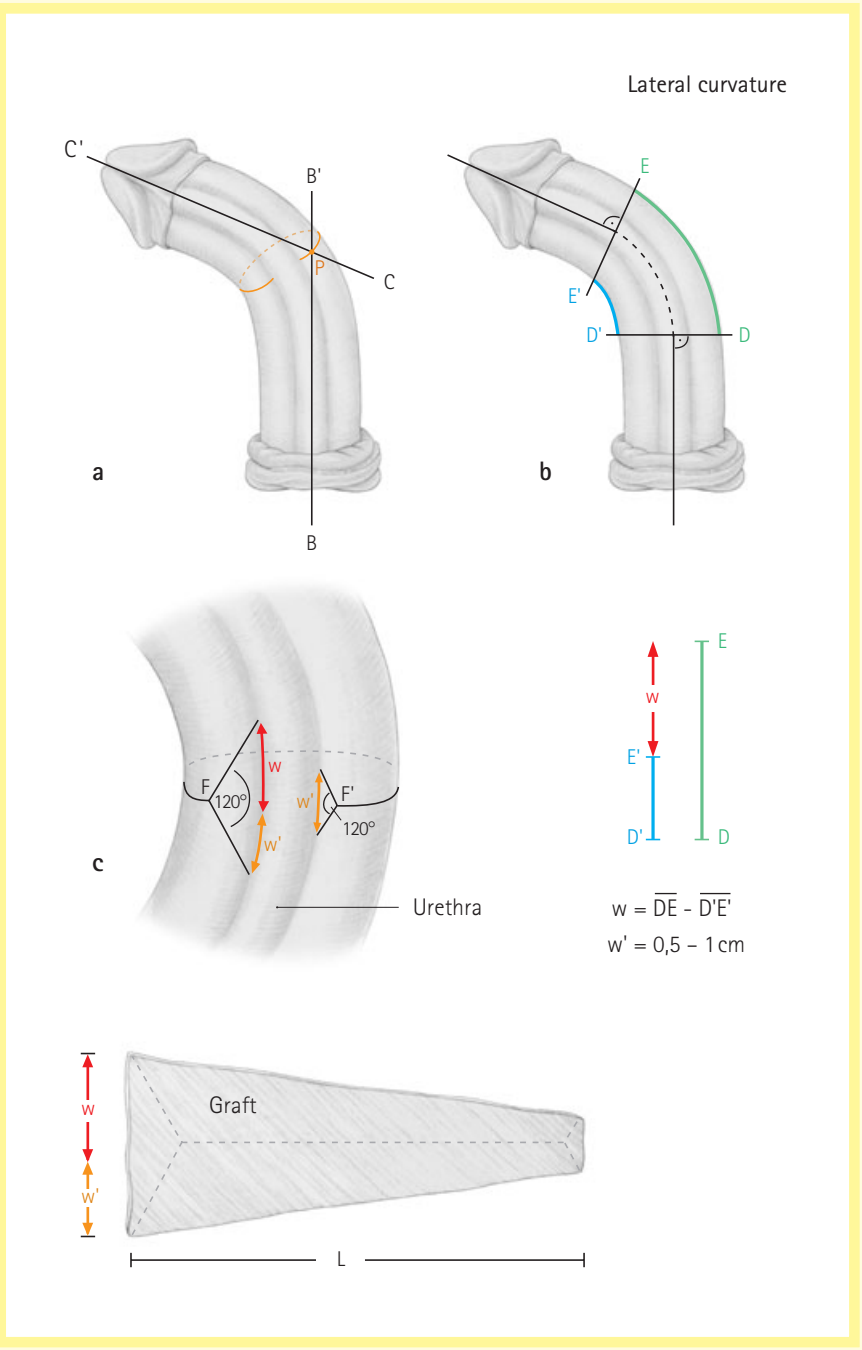
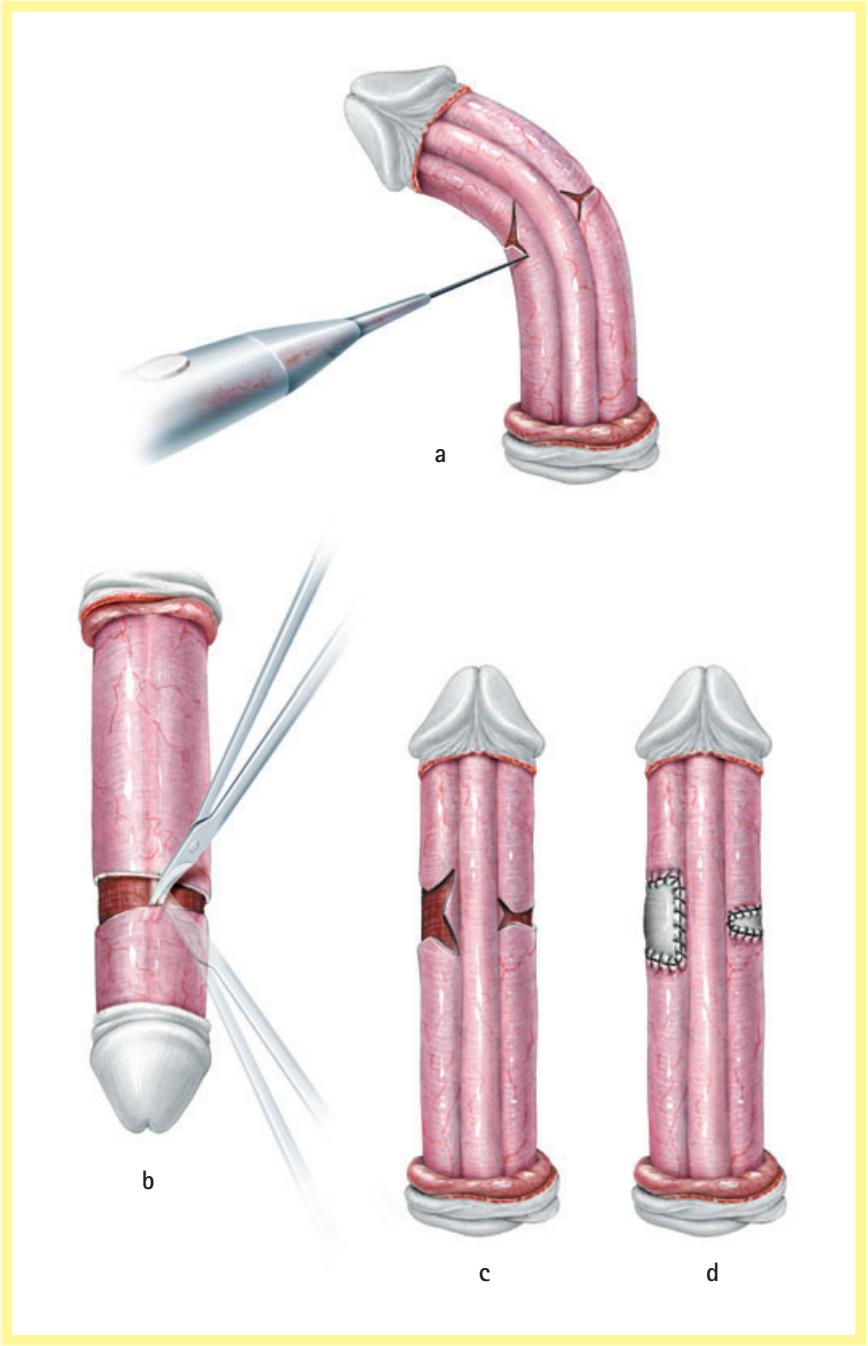


Figure 7

In cases of lateral curvature (a and b) the technique is similar with the following differences: (c) to avoid a triangular defect which would make the grafting procedure more difficult, a trapezoidal defect is created by adding an additional 0.5–1 cm (W′) to the width (W), and to the opposite side.

Figure 8

(a) An incision is made in the tunica; (b) an intercavernosal septum incision is made just on the dorsum, as the urethra is maintained in its bed. (c) A trapezoidal defect is created; (d) a trapezoidal graft is sutured and a newly induced erection then shows complete penile straightening.



GENERAL OBSERVATIONS

Buck's fascia is not sutured again. An aspirative drain is placed and left there for ≈12 h. The penis is re-gloved and the incision closed. The foreskin may be removed if necessary. A 6-week period of sexual abstinence is recommended.

Bovine pericardium grafts were trimmed to 1–2 mm wider and longer than the respective defects because the extra margin is taken up by the poliglecaprone 4/0 continuous suture. During this suturing it is important to maintain the tunica stretched. In 122 cases the mean (SD, range) size of grafts used for Peyronie's disease with no prosthesis were 2.5 (0.6,1.7–4.1) by 7.7 (0.9, 5–10) cm; for the 13 cases of congenital penile curvature, 2.2 (0.4, 1.7–3) by 8.8 (1.6, 7–12.5) cm; and for the six cases of Peyronie's disease with a prosthesis, 3.0 (0.6, 2.5–4.0) by 7.7 (0.3, 7.5–8.0) cm. The mean increase in functional penile length for Peyronie's disease with no prosthesis was 2.9 (1.5, 1.0–7.0) cm, for cases of congenital penile curvature 2.85 (1.24, 1.5–5.0) cm, and for Peyronie's disease with a prosthesis 2.8 (1.6, 1.5–5.5) cm.

SUMMARY OF THE BENEFITS

The present technique is based on a long circumferential incision forked at the ends in the tunica albuginea and/or plaque, irrespective of the characteristics and location of the plaque [20,21]; it may be used to correct all types of curvature, whether associated with constriction or not.

The dissection of Buck's fascia and the neurovascular bundle was standardized for all cases using the two para-urethral incisions. At this level the circumflex veins were of narrower calibre, thus facilitating their cauterization, which results in fewer ligatures; the bundle is manipulated far from the dorsal nerves of the penis, preventing their injury. The dissection may be limited to the area of the curvature, or extended if necessary. The risk of lesions to the collaterals of the dorsal arteries is minimized with a smaller dissection.

Inducing a full erection is very important for accurately applying these geometrical principles and consequent identification of the appropriate site for the tunical incision. The difference between the long and short sides that will define the width of the defect can be measured between any two points on the straight portions of the penis, because it will always be the same. The almost complete circumferential incision makes it possible to break all the lines of force, allowing the curvature to be corrected in more than one plane (dorsolateral or ventrolateral). For lateral curvatures, the correction based on a rectangular tunical defect would result in cutting the intercavernosal septum in both dorsal and ventral regions. As the risk of erectile dysfunction produced by the incisions is unknown [22], a trapezoidal defect was preferred, so as to preserve one of the intercavernosal septum insertion points.

The sectioning the septum on both edges of the tunical incision on the short side of the penis is fundamental for adequate lengthening of the short side and complete penile straightening, there being no association with a higher incidence of erectile dysfunction. The traction of the penis after the final tunical and septal incision, and tunical dissection from the spongy tissue of the cavernosal body, allows complete penile straightening to be assessed. If the neurovascular bundle is restricting penile straightening, its dissection may be extended.

Tripod-shaped forks of 120° produce a simpler configuration of the tunical defect, resulting in geometrically shaped grafts that can be easily sutured. These forks also permit relaxation of constricted areas on the tunica and correcting of associated constrictive lesions. The bifurcations in the dorsal region for ventral curvatures should not cross the intercavernosal septum.

When geometrical principles and induced erection are used, the size of the defect in the tunica albuginea can be calculated before the incision is made, and makes previous preparation of the graft possible. The graft should have the same size as the defect where there is no likelihood of it shrinking, as is the case of the pericardium [9,10], but otherwise a percentage allowance for shrinkage should be added to the dimensions of the graft for other materials such as dermis [6]. The length of the defect should be measured with the penis erect and at a point with no constriction. Under these circumstances, only one incision and graft are necessary, providing that the penis presents only one point of maximum curvature. If there are two significant curvatures at different points of the penis, two grafts should be used as described. Complementary plication, which not only damages the healthy side but also leads to penile shortening, should be avoided whenever possible.

The present technique allows for the standardization of a single tunical incision procedure that may be reproducible in multicentre studies, leading to a better understanding of the advantages and disadvantages of the different types of graft material [23–25].

CONCLUSIONS

This single incision technique applying geometrical principles is a standard procedure which may be used for correcting any penile curvature, whether associated or not with tunical constriction, and regardless of plaque characteristics, resulting in maximum penile gain.

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