

An original mininvasive corporoplasty technique for penile curvature without circumcision

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Summary Objective: We describe an original minimally invasive penile plication technique with scrotal or infrapubic access, not requiring circumcision, for penile curvature of different severity and types. This technique can be used to correct both congenital and acquired curvatures, mono or bidirectional deformities.

Materials and methods: Between 2012 and 2018 we treated 134 patients suffering from congenital curvature (33) and acquired curvature from Peyronie's disease (101). The average curvature was 62.2° (± 30.4°). Preoperative evaluation included prostaglandin E1 injection with photographic documentation and measurement of penile angulation, administration of IIEF-15, vasoactive penile Doppler ultrasound, analysis of thermal and vibratory sensitivity with Genito-Sensory-Analyzer (GSA) and assessment of nocturnal penile stiffness with Rigiscan, performed twice, for a detailed evaluation of patient's erectile function.

Scrotal access was performed in patients with dorsal and/or lateral penile curvature; the infrapubic access was performed in patients with ventral curvature. After preparation and incision of Colles' fascia, penis was partially degloved and an original plication technique called "binary corporoplasty" was performed at the site or sites established at preoperative assessment, with non-resorbable synthetic multifilament (Premicron®) suture.

Results: Complete correction of penile curvature was achieved in 96.8 % of patients. No major complications were reported, and no patients suffered worsening in erectile function or in penile sensitivity. The average shortening of convex side was 1.65 cm (± 0.7 cm) and all patients report easy intercourse after correction. The average time of surgery was 46 minutes (± 11 min) and all procedures were performed as a day-hospital or ambulatory settings, with local anesthesia and light sedation. Overall satisfaction rate is 96%.

Conclusions: This is a simple and rapid technique that perfectly corrects even the most severe and complex penile curvatures. In comparison to traditional techniques, such as Nesbit procedure, this technique is associated with low morbidity, a very low recurrence rate and a great aesthetic results. Aesthetic and functional patients' satisfaction was excellent.

KEY WORDS: Corporoplasty; Induratio penis plastica; Recurvatum; Peyronie's disease; Penile disease.

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INTRODUCTION

Penile curvature (PC) is an increasingly common disorder consisting of an alteration in the shape of the erect penis which instead of being straight appears curved on one or more planes. It can be congenital or acquired. The curvature can be ventral, dorsal, lateral or mixed and it can be associated with urethral malformations.

Congenital curvature can be caused by disproportionate development of the tunica albuginea of the corporal bodies (1). Penises with congenital curvature are usually good-sized and the young patient notices the anomaly after the onset of puberty. The curvature is often ventral, that is the one causing the greatest problems in coital dynamics.

Acquired penile curvature can be caused by penile fractures or traumas or mostly by Peyronie's disease also called *induratio penis plastica* (IPP).

In both congenital and acquired curvatures the surgical indication arises when the curvature of the penis does not allow normal sexual intercourse. Symptoms are an initial difficulty in penetration with pain for the patient and/or for the partner that can evolve towards the impossibility of penetration when the curvature is severe.

Several alternatives and improvements have been proposed since the first corporoplasty technique was described by Nesbit in 1965 (2), although most techniques require circumcision and total penile degloving. This aggressive approach leads to various problems such as altered sensitivity, unsightly scars and high recurrence rates. In order to balance results in term of erectile and aesthetic function, especially in the patient with Peyronie's disease, it is crucial to seek minimally invasive surgical techniques.

We describe a new original plication technique where surgical access is at the base of the penis and the albuginea incision is not performed making the surgery safe, easier and minimally invasive.

MATERIALS AND METHODS

Between 2012 and 2018 we treated 134 patients suffering from congenital curvature (33) or curvature acquired from Peyronie's disease (101) (Figure 1).

No conflict of interest declared.



Figure 1.
Some of the clinical cases treated. Congenital and acquired curvature.



Figure 2.
Preoperative identification of the correction point/s.

Before the procedure patients were carefully evaluated to assess type and severity of curvature and any associated malformations. In particular, initial length of the penis and erectile function were assessed. Careful evaluation of all these variables together with the patient is mandatory because this is a functional-aesthetic surgical procedure. Accurate measurements were made to plan the site and the number of corporoplasties by simulating the straightening of the penis. Photographs and measures were taken to document the potential result. In fact, the patient must be aware of the change in length of his penis which consists of an adaptation of the length of the convex side to that of the other side (Figure 2).

Accurate preoperative measurements of the site and length of corporoplasties is crucial because the procedure is performed during flaccidity and hydraulic erection is only used intraoperatively to confirm the correction. In fact, different from the Nesbit's procedure, sites of surgical corrections cannot be evaluated intraoperatively because circumcision is not performed.

After PGE1 injection, the penis is straightened using a finger as a lever and placing the other hand in opposition at the point of greater curvature until the ideal point of correction of the curvature is identified. According to the radius of the curvature the site and number of corrections is planned.

The distance between this identified point of correction and the external urethral meatus is then measured. Photographs are taken to guide the surgeon during the operation and to show the patient the postoperative result in terms of shape and size of the penis. The photographs are shown to the patient, so that he could appreciate the change that will occur in his penis. Postoperative photographs are compared to the preoperative photographs. This has great significance from the medico-legal point of view.

Technique

Our technique does not involve circumcision or subcoro-

nal incision. The technique consists of a dorsal access at the base of the penis in case of ventral bending (Figure 3) or a scrotal access for dorsal and/or lateral bending (Figure 4), with no consequences on penile sheaths or alterations in sensitivity.

The procedure can be performed under either local anesthesia with a light sedation. To correct a dorsal and/or lateral curvature we perform a small median longitudinal incision on the scrotal raphe whereas for the ventral curvatures we perform a small infrapubic incision. Both incisions are about 3 cm in length.

We access the Colles space with bevel scissors creating a space to make degloving easier. The pre-established sites are identified by means of a sterile ruler starting from the meatus while the assistant completely stretches the penis from the glans.

With an Allis clamp, the selected site in the Colles space is pressed and a selective degloving is performed at this level to expose the albuginea in order to make the "track" corporoplasty (Figure 5).



Figure 3.
Dorsal incision at the base of the penis.

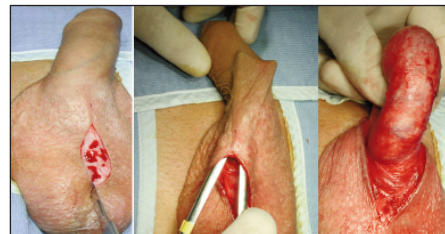
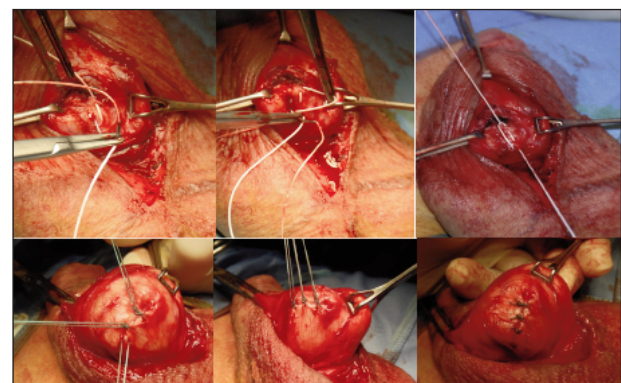


Figure 4.
Median scrotal incision, preparation of the Colles space and penile degloving.



Figure 5.
Selective degloving through scrotal access and identification with Allis clamp of the selected site.

Figure 6.
Schematic drawing of the "binary corporoplasty". Protecting the urethra with Babcock's forceps, the first corporoplasty is performed medially and the other two laterally to distribute the forces.



When correcting dorsal curvatures, the site of corporoplasty should be placed as close as possible to the groove of corpus spongiosum, whereas for ventral curvature it must be close to the dorsal neurovascular bundle.

This maneuver is performed in order to obtain the maximum correction of the penile curvature with the minimal shortening of the penis.

A single 0 non-absorbable synthetic multifilament suture is placed in order to perform a special plication on two parallel lines that is therefore called "track" (Figure 6).

Laterally to the corporoplasty described, two corporoplasties should be performed along the line that goes from the dorsal neurovascular bundle, or the spongiosocavernosus groove, to the lateral end of the corpus cavernosus at 30° and 60° on the penile sagittal plane. The two corporoplasties should measure 50% at 30° and 25% at 60°. The suture at 30° is usually performed on a single line going in and out from the tunica albuginea and tying the knot. The corporoplasty at 60° is performed with a single suture. This asymmetry allows a uniform distribution of forces from a mechanical point of view reducing the risk of recurrence with a better aesthetic and palpatory result. When the curvature is only dorsal or ventral same operative steps are performed on the contralateral corpus cavernosus. When the curvature is lateral, the described corporoplasty is performed on a single cavernous body. When the curvature is mixed, however, the corporoplasties on the two cavernous bodies will be asymmetrical. After having carried out the corporoplasties at the planned sites, hydraulic erection is obtained to check the achieved correction of the curvature (Figure 7). A photographic documentation of the straightening on different floors is obtained. An important advantage of this technique without incision of the albuginea, is that if during the hydraulic erection we have not obtained the

perfect correction, or we have corrected excessively, we can remove the stitches or modify the existing ones.

Colles's fascia is rebuilt to ensure that the knots are less palpable and to ensure the correct smoothness of the subcutaneous planes of the penis. The small cutaneous breach is sutured.

We used Donati's silk 0 stitches especially on the scrotum, to be removed on the 6th post-operative day (Figures 8, 9). The final dressing is carried out with an elastic bandage of the penis which is maintained for 30 days. The function of this bandage is initially to avoid swelling and oedema in the immediate post-operative and to limit spontaneous and nocturnal erections. This expedient reduces the tensions on the corporoplasties and guarantees an important reduction of the relapse rate. It is not necessary to use urethral catheters or drains. The patient is asked to avoid sexual activity for 30 days.

RESULTS

The average age of the patients was 49.3 years, the average length of the penis in erection before surgery was 13.5 cm (\pm 3.3 cm).

The average curvature was 62.2° (\pm 30.4°). The most common curvature was dorsal (50), then dorsolateral (40), ventral (30) and ventro-lateral (14).

The average duration of surgery was 46 minutes (\pm 11 min). There were no major complications during the interventions. Among the minor complications we report ecchymosis (9%) palpable nodules (18%) and mild hyposensitivity (3%).

After an average 48 months follow-up complete correction of penile curvature was achieved in 96.8% of patients (Figures 10, 11).

The subjective patient report of satisfaction of the results of surgery was 92%. The relapse rate, defined as postoperative curvature of at least 15°, was 3.2%. Only two patients (1.5%) were dissatisfied with the final length of the penis, although it was consistent with the measurements taken and photographed before the operation, confirming the importance to establish which are the patient's expecta-



Figure 7.
Intraoperative hydraulic erection to evaluate the correction made.



Figure 8.
Aesthetic outcome of scrotal access after 10 days.



Figure 9.
Aesthetic outcome of dorsal access after 10 days.



Figure 10.
Lateral bending, pre and postoperative after 30 days.



Figure 11.
Dorsal bending, pre and postoperative after 30 days.

tions before the surgery. All patients were satisfied with the aesthetic outcome related to surgical access. The mean score of IIEF-15 before surgery was 17.2 and after surgery 18.6.

DISCUSSION

Curvature of the penis is an abnormal bend in the penis that occurs during erection. It can be congenital or acquired. Congenital penile curvature can be caused by disproportionate development of the tunica albuginea of the corporal bodies. In the majority of cases the curvature is ventral but it can also be lateral but rarely dorsal. Acquired curvature is usually secondary to La Peyronie's disease. It presents with an initial acute inflammatory phase, which may be associated with pain at rest or during erection. The following stabilization phase is characterized by the formation of hard palpable plaques, that can be fibrotic or calcified, and by the presence of penile curvature (3). The treatment of the acute phase consists of oral drugs and topical treatments such as ionophoresis (4, 5).

The surgical approach is restricted to the phase of stabilization. In this phase the patient can present penile curvature, erectile dysfunction, and penile shortening. These problems can occur singularly or in combination. Surgery is indicated only in patients with stable disease for at least 3 or 6 months, without variations in penile curvature (6). Attesting the stabilization of the disease is very important in order to avoid relapses due to a still active disease rather than to errors or described complications of the technique used. Anyway surgery is indicated in patients with penile curvature that does not allow satisfactory intercourse and which is associated with sexual bother. Surgery of congenital curvature is deferred until after puberty and can be performed at any time in adult life. However, it is important to solve the problem as soon as possible because the sexual discomfort related to the penile malformation could lead to a loss of self-esteem and avoidance of sexual activity. Nesbit corporoplasty or plication techniques are currently recommended in order to adapt the long convex side to the shorter contralateral side allowing the patient to easily penetrate and reduce the psychological impact caused by the malformation.

In the acquired curvature the surgical strategies are varied in relation to the extent of the curvature, the patient's erectile function and the size of the penis. Possible surgical techniques are: straightening corporoplasties, in case of sufficiently long penis; plaque surgery, which lengthens the penis but can cause erectile dysfunction and with a high risk of recurrence; straightening corporoplasty in association with penile lengthening, in order to compensate the shortening due to the corporoplasty; penile prosthesis implantation, even in association with fracture of the plaque or plaque surgery in order to lengthen the penis. Corporoplasties can either shorten the longer convex side of the penis (Nesbit's procedure and its modifications) or lengthen the shorter concave side (plaque surgery) (7). Several surgical techniques for the correction of penile curvature have been described over the last few years.

The first operation to correct penile curvature was described by Nesbit in 1965 (2), consisting of the removal of tunical ellipses on the convex aspect of the penis at the

site of major bending of the corpora cavernosa so as to shorten the convexity and correct the curvature

This technique involves circumcision and complete degloving of the penis. The number of ellipses to remove, their size and positions are decided intraoperatively, under hydraulically induced erection, by clamping the tunica albuginea with an Allis clamp in order to simulate the effect of the correction

The Nesbit procedure is affected by a 25-30% recurrence rate due to a loss of tension of the suture and causes a considerable penile shortening, especially in patients with dorsal or ventral bending. Other reported complications are circumcision outcomes, postoperative haematoma, skin adhesions, unsightly suture tracks and loss of sensation in the glans due to neurovascular impairment (8).

On the other hand, the Nesbit technique is extremely simple and easy to perform, as such it is still commonly performed. Various modifications to Nesbit procedure were proposed along time, all requiring circumcision to expose the corpora.

The occurrence of complications, such as recurrence of curvature (15-33%), erectile dysfunction (20-32%), altered local sensation (4-10%), palpable and painful nodules (16-66%), and poor outcomes of circumcision, lead to the development of alternative techniques (9-16). Plication procedures are based on the same principle as the Nesbit operation but are simpler to perform. The use of non-absorbable sutures reduced recurrence of the curvature. Results and satisfaction rates are similar to the Nesbit procedure.

In the early 90's, we described a new technique with a different surgical access (at the base of penis rather than distally) and a different type of corporoplasty (double-breasted corporoplasty) (17). These minimally invasive surgical accesses allow the rapid resumption of sexual activity, have excellent aesthetic results, and allow to avoid circumcision and total penis degloving.

They are minimally invasive because of small incisions but also they minimally affect erectile function of patients. In our opinion, when allowed by penis length and functionality conditions, it is important to avoid aggressive procedures such as the Nesbit technique or plaque surgery.

In fact, the straightening corporoplasty does not aim to improve erection, however reducing the section of the corpora cavernosa it slightly increases the pressure inside them. This always causes an improvement in erection which is very useful in Peyronie's patients who may suffer from a degree of erectile dysfunction.

The data on erectile function is very important, the other techniques described can negatively affect the patient's sexual function, although they guarantee an excellent percentage of penile straightening.

The patient will never be satisfied if he has a longer penis but a worse functionality than before surgery.

CONCLUSIONS

In patients with congenital curvature and in those with acquired curvature and with good size and functionality it is important to perform a minimally invasive surgery. Furthermore, in light of the controversial results of medical procedures, it is correct to propose a resolute approach to

the patients. The present technique is easy to perform and overcomes the limitations of other techniques by reducing penile shortening, sensory and aesthetic alterations. The rate of straightening is excellent as well as the patient's final satisfaction rate which is 92%. This data results from the minimally invasive technique and above all on the absence of worsening of erectile function. The possibility of performing the operation in one-day surgery and under local anaesthesia reassures the patients.

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