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CORRECTION OF PENILE CURVATURE USING THE 16-DOT PLICATION TECHNIQUE: A REVIEW OF 132 PATIENTS

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ABSTRACT

Purpose: We review the results of 132 cases of congenital and acquired penile curvature corrected with our 16 or 24-dot, minimal tension technique using multiple parallel plications performed under papaverine induced erection.

Materials and Methods: Chart and telephone interviews were conducted on 132 consecutive patients 16 to 79 years old who underwent penile plication between December 1995 and November 2000. Patient data as well as outcomes were analyzed.

Results: We were unable to contact 8 patients. Of the patients 16 had congenital penile curvature, including 4 in whom the Nesbit procedure performed elsewhere had failed, and 116 had Peyronie's disease, including 8 in whom a previous Nesbit procedure had failed. Preoperative complaints included persistent penile pain with erection for more than 1 year in 15 of 132 cases, difficult intercourse or partner discomfort in 106 and poor self-image in 11. Curvature ranged from 30 to 120 degrees. Erections were evaluated preoperatively with duplex ultrasound after intracavernous injection and self-stimulation. Of the patients 63% had good erections, 25% moderate erections requiring sildenafil and 12% poor erections requiring injection therapy. Foreskin edema necessitating subsequent circumcision and an organized hematoma requiring evacuation occurred in 1 case each. At 6 months 93% of patients reported straight erections and 7% reported almost straight but acceptable erections. Recurrence of curvature was reported by 15% of patients at a mean of 2.6 years of followup. Four patients reported worsening of erectile function after the procedure.

Conclusions: Penile plication is a simple, safe method to correct congenital and acquired penile curvature. Using a minimal tension parallel plication technique, excellent durable results can be attained. This simplified repair avoids the neurovascular bundles and has a minimal to no detrimental affect on erectile function. Preoperative counseling must be given regarding penile shortening and the palpable small bumps from the nonabsorbable sutures.

KEY WORDS: penile induration, penis, techniques

Severe penile deformity was first described in 1743 by a physician of Louis XV, Francois Gigot de la Peyronie.[1] This disease is characterized by formation of a fibrous plaque invading the cavernous body causing curvature of the penis. This deformity may be severe enough to preclude vaginal intromission. Several surgical techniques have been described to repair the deformity. In 1965 Nesbit first described the surgical correction of curvature of the penis by 1 or multiple elliptoid resections of the tunica albuginea on the healthy convex aspect of the penis.[1] A variation of this procedure was described by Saalfeld et al[2] and Yachia,[3] which involved making longitudinal incisions on the healthy convex aspect of the penis and closing them horizontally using the Heineke-Mikulicz method.

Corporeal plication was popularized by Essed and Schroeder[4] as well as Ebbehoj and Metz[5] as valid treatment for Peyronie's disease. Nesbit also described plication of the penis on 1 patient but abandoned this procedure secondary to recurrence within 6 months.[1] In 1992 Donatucci and Lue[5] described simplified plication of penile curvature through the use of intracavernous papaverine injection.[6] Baskin and Lue reported the technique of multiple parallel plications in 10 young patients for correction of penile curvature also using papaverine to assist in intraoperative evaluation and correction.[7] We have since modified our previous technique[6,7] and review the results of 132 patients with congenital and acquired penile curvature corrected with our 16 or 24-dot minimal tension technique using multiple parallel plications and papaverine intraoperatively.

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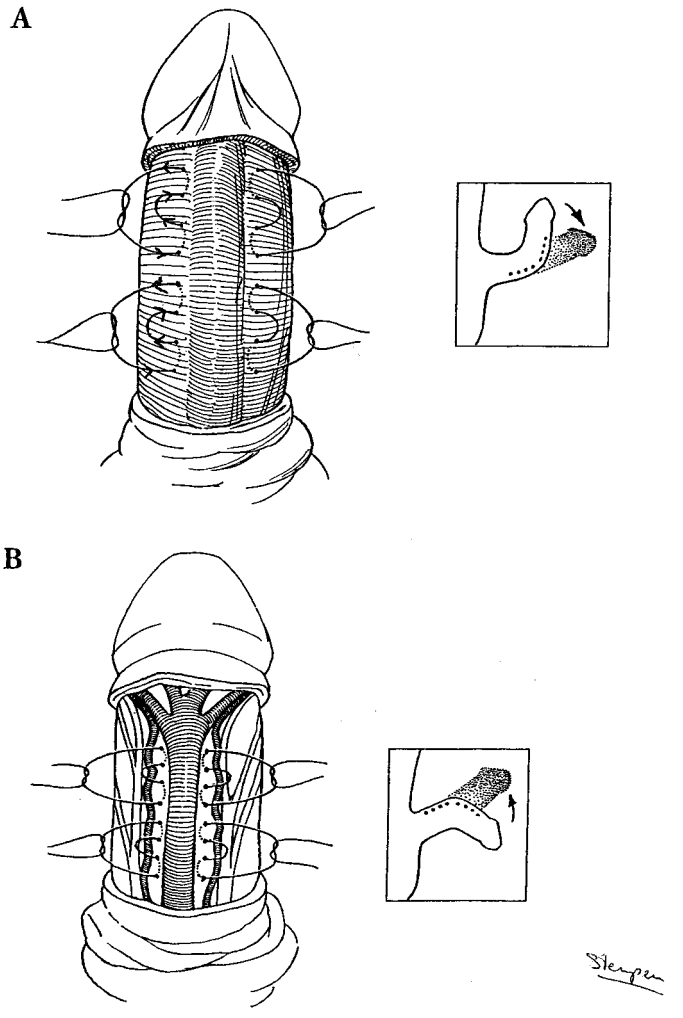
METHODS AND PATIENTS

From December 1995 to November 2000, 132 patients underwent surgical correction of penile curvature with plication surgery performed by a single surgeon as the sole form of therapy. Office and hospital records and operative reports were retrospectively reviewed. All patients were evaluated postoperatively either in the office or by telephone. Many patients were referred from out of state or abroad, and complete followup data were limited to 124 patients. Patients ranged in age from 16 to 79 years (average 49). Of the patients 16 had congenital curvature of the penis. Previous Nesbit procedures performed elsewhere had failed in 4 patients with congenital curvature and 8 with Peyronie's disease. All patients had a photograph or office drawing documenting the curvature.

Detailed medical and sexual history included duration and progression of symptoms, erectile function, medication use, history of trauma, and family history of Peyronie's disease or Dupuytren's contracture. Physical examination consisted of examination of the hands and feet for contractures, palpation of the penis to locate and outline the plaque, and measurement of stretched penile length. All patients received intracavernous injection with prostaglandin or papaverine plus phentolamine to evaluate penile curvature.

All patients with a significant deformity were offered surgical

correction except those with erectile dysfunction not responsive to any method of medical therapy. Patients with minimal curvature were reassured and followed. Patients with nonstable penile curvature of less than 1 year in duration were given colchicine and vitamin E, and followed. Surgery was offered only to patients with stable curvature and those with pain during erection as long as the pain or curvature had not changed for 1 year. All patients provided informed consent and were counseled preoperatively regarding penile shortening and the palpable small bumps under the penile skin from the nonabsorbable sutures. Patients with complete erectile dysfunction unresponsive to medical therapy were offered a penile prosthesis. Patients who desired a lengthening procedure and had good erectile function were offered plaque incision and venous grafting. Before plication surgery patients were informed of potential side effects (erectile dysfunction, pain, bleeding, numbness, shortening and palpable knots). The stretched length of the penis was measured with a ruler to demonstrate the approximate erect length of the penis after surgery.



Planned suture entry sites marked with pen. Erection attained throughout operation with papaverine. *A,* 16-dot repair of dorsal curvature with periurethral sutures of 2-zero Ticron. Procedure done with midline raphe incision (circumcising incision used for illustration purposes). *B,* 16-dot repair of ventral curvature. Peri-dorsal vein sutures without dissection of neurovascular bundles.

SURGICAL TECHNIQUE

Surgical correction was performed with the patient under local anesthesia with or without intravenous sedation and in rare cases under general anesthesia. Before preparing the patient 2 ml. (60 mg.) papaverine were injected into the corpus cavernosum with a 25 gauge needle. The genital area was prepared and, while the surgeons scrubbed, a full erection occurred. Bupivicaine was given at a concentration of 0.25% at the longitudinal incision site or at the base of the penis in a ring-like fashion for circumcising incision. The penile curvature during full erection was then assessed.

For ventral curvature of the penis (part *B* of figure) the choice of incision was between circumcising or dorsal longitudinal according to patient preference. In uncircumcised patients, if preservation of the foreskin was desired, a longitudinal incision was used. Buck's fascia was incised longitudinally above the neurovascular bundle and an intervascular space was developed between the dorsal vein and the paired dorsal arteries by blunt dissection using a hemostat. Almost all of the dorsal nerve fibers were lateral to the dorsal arteries and, therefore, placement of sutures in this space would least likely damage the nerves.

A marking pen was used to mark the center of the curvature and the entry and exit points of sutures with 16 (2 pairs) or 24 (3 pairs) dots about 0.5 cm. apart. Then 2 to 3 pairs of 2-zero braided polyester sutures were placed through the full thickness of the tunica albuginea. In a man with a 120-degree curvature, however, we used 4 pairs of sutures. One surgical knot was placed and clamped with rubber-shodded clamps. Once all plication sutures were placed, the erect penis was examined by all members of the operating room team for evaluation of its straightness.

Once a consensus was reached, then all of the sutures were tied with 5 knots. If the penis was over or under corrected, the sutures were unclamped and loosened or tightened to attain a straight erection. The sutures were tied with minimal tension to prevent tissue strangulation, which may result in cutting through the tunica during spontaneous rigid erection. If a small nerve fiber was seen medial to the dorsal artery, optical magnification was used to assist in the dissection. If the development of intervascular space was difficult, the dorsal vein was dissected free or transected so that the plication sutures could be placed at the bed of the dorsal vein. The longer the arch of curvature, the greater the number of pairs of plication sutures used (16 or 24 dots). Increasing the number of pairs of sutures ensures a minimal tension repair. At least 2 pairs of sutures (or 16 dots) should be used in any given repair to ensure minimal tension.

For dorsal curvature (part *A* of figure) a ventral longitudinal incision was made down to the dartos fascia overlying the corpus spongiosum, and a 1 cm. strip of corporus cavernosum was cleared of overlying tissues on either side. The sutures were placed about 2 mm. lateral to the corpus spongiosum after the dots were placed as described previously.

For lateral curvature either a circumcising or lateral longitudinal incision was used. The only difference from that described previously was the need for dissection of the neurovascular bundles under optical magnification. If the nerve bundles crossed the path of the sutures we would pass the sutures under the nerve to prevent injury.

For combined curvatures (dorsal lateral or ventral lateral) the same technique as described for pure dorsal or pure ventral curvature could be used except for placement of the dots. To correct both curvatures the space between the middle dots on the long side of the lateral curvature was widened to produce more shortening on the same side and thus correct both curvatures at the same time.

At the end of the procedure, if the penis was still rigid, 5 to 10 cc blood were aspirated from the corporus cavernosum with a 21 gauge scalp vein needle, and 500 μg. epinephrine were injected every 3 to 5 minutes until the penis was flaccid. The injection site was closed with a 5-zero polyglyconate suture ligature, dartos fascia was reapproximated over the sutures and the skin was closed. A Coban dressing was

applied snugly around the penis and ice was applied postoperatively for 1 day. The dressing was checked within an hour postoperatively to ensure that it was not too tight around the penis, and the patient was discharged home within 2 hours.

RESULTS

The majority (81%) of our patients presented with the complaint of difficulty with intercourse or partner discomfort. Other complaints included poor self-image (8%) and persistent penile pain for greater than 1 year (11%). The angle of penile curvature ranged from 30 to 120 degrees, with average curvature of approximately 64 degrees. More than 1 direction of penile curvature was noted in 34% of patients. Preoperative erectile function was graded as good in 63% of the cases, moderate requiring sildenafil in 25% and poor requiring injection in 12% with or without a vacuum constriction device. Erectile function was self-reported and confirmed by duplex color ultrasound after intracavernous injection and self-stimulation preoperatively. At 6 months postoperatively 93% of the 132 patients reported straight erections while 7% complained of slight curvature and 4 (3%) complained of worse erectile function. At telephone interview or office examination 7 months to 6 years (mean 2.6 years) postoperatively 15% of 124 patients reported recurrence of penile curvature but it was severe in only 4 (3%). All 12 patients who had undergone failed Nesbit procedures were satisfied with the plication procedure and had straight erections postoperatively.

The most common complaint postoperatively was shortening of the penis in 41% of patients. Loss of penile length ranged from 0.5 to 1.5 cm. and 7% of patients stated that loss of penile length affected sexual activity. Other common complaints included bother from suture knots in 12% of cases, pain with erection in 11%, narrowing or indentation of the penis in 9%, decrease in penile sensation in 6%, hematoma in 4% and pain when flaccid in 1%. Eight patients (6%) complained of worse erections at long-term followup (mean 2.6 years after procedure).

There was 1 case of phimosis that required subsequent circumcision and 1 case of organized hematoma that required surgical evacuation. Four other patients underwent secondary procedures, including penile lengthening procedure for recurrence of curvature with venous grafting (1), penile prosthesis surgery for erectile dysfunction not responsive to medical therapy (2) and penile lengthening procedure with cadaveric pericardium as well as prosthesis surgery for medically refractory erectile dysfunction (1). Overall satisfaction with the procedure was 96%.

Mean operative time was 45 minutes. Local anesthesia only was used in 85% of the cases, and local anesthesia and intravenous sedation with midazolam and fentanyl were used in the remainder. One patient fainted during office injection and the procedure was performed using laryngeal mask anesthesia.

DISCUSSION

Surgical correction of curvature of the penis can either be approached with a lengthening or shortening procedure. In the appropriate patient our institutional bias is to treat Peyronie's disease with a lengthening procedure. However, given that the peak incidence of this disease is in the fifth and sixth decades[1,8] and most patients present with other co-morbidities, including erectile dysfunction, which preclude them from involved lengthening procedures, many of our patients are offered plication surgery as a less involved surgical approach. We exclusively treated patients who were not candidates for lengthening procedures with tunical plication. Despite the fact that this type of repair as with a Nesbit technique is a shortening procedure, only 41% of our patients noted any penile shortening. Many (37%) of our patients had some degree of erectile dysfunction at presentation. Those patients with severe erectile dysfunction not responsive to medical management were treated with penile prostheses.

Plication surgery does not require excision or incision of the healthy tunica albuginea on the opposite corpus cavernosum to shorten the longer side of the curved penis. By incising Buck's fascia the neurovascular bundles can be visualized and an intervascular space devoid of nerves can be created with blunt dissection using a hemostat. Thus, this minimally invasive procedure can be confidently done in a population of patients with less than rigid erection without the risk of opening healthy tunica albuginea and possibly damaging the underlying erectile tissue. Failure of the Nesbit procedure does not preclude plication surgery. Our incidence of worsening erectile dysfunction is between 3% (6 months) and 6% (7 months to 6 years). We thought that it was important to evaluate our results in the short term (6 months) and long term (mean 2.5 years) due to the progressive nature of Peyronie's disease and erectile dysfunction. Some of the patients evaluated at a mean of 2.6 years after the procedure may have had de novo erectile dysfunction or worsening penile curvature due to the disease process and not related to the plication surgery.

Using the Nesbit procedure[1] or modifications of the procedure using a Heineke-Mikulicz principle,[3,9] the neurovascular bundle as well as healthy corporeal tissue is prone to injury. Andrews et al noted that 16% (8 of 51 cases) of Nesbit failures were secondary to suture breakage.[10] Essed and Schroeder popularized plication surgery as a viable treatment for Peyronie's disease.[4] Their technique as well as that described in the literature differs from our technique in many important ways. Essed and Schroeder performed all procedures through a circumcising incision. Our procedure is done through a longitudinal incision for dorsal or lateral curvature and a circumcising incision for ventral curvature. The technique of Essed and Schroeder required placement of a Foley catheter and either mobilization of the urethra off of the corpora cavernosa for dorsal curvature and or mobilization of the neurovascular bundles for ventral curvature. We do not mobilize these structures or place a Foley catheter. They also described creating an artificial erection with a tourniquet and saline injection. With our technique, all patients receive an intracavernous injection of papaverine to induce erection. The erection is maintained throughout the procedure, therefore, allowing us to evaluate and adjust our repair and prevent over or under correction in a real time manner. As described by Essed and Schroeder, we also place multiple nonabsorbable multifilament sutures to plicate the penis. However, we prefer to place these sutures in pairs along the length of the curvature to distribute the total force required to straighten the penile curvature among the multiple pairs of sutures. By doing this, all of these sutures are tied with minimal tension, thus preventing subsequent problems of suture breakage or cut through reported in other series.[10–14] Securing the plication sutures with minimal tension is the most crucial aspect of our procedure, and is most evident in young patients with congenital curvature of the penis. Nesbit, who originally described plication surgery, abandoned the procedure due to early failure. This failure may have been the result of the plication suture being tied too tightly.

CONCLUSIONS

Correction of congenital or acquired penile curvature can be adequately treated with plication surgery. This procedure can be used to correct all types and degrees of penile curvature successfully except indentation or hourglass deformities. Our technique of 16 or 24-dot minimal tension plication surgery has yielded satisfactory results with minimal mor-

bidity. It is a simple technique that can be done with local anesthesia in 45 minutes. We recommend the use of this technique in patients who are candidates for shortening procedures to treat congenital penile curvature and Peyronie's disease.

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