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Penile dermal flap for defect reconstruction in Peyronie's disease: Operative technique and four years' experience in 17 patients

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Peyronie's disease is not uncommon¹. Despite its self-limiting nature in many patients² and the multiplicity of available non-invasive treatment modalities³⁻⁵, a few patients will eventually require surgery if deformity or impotence is severe and conservative measures have failed.

Currently available operations for Peyronie's disease are less than ideal. The two most popular operations employed for this condition are the 'tucking' procedure of Nesbit (and its excision–plication variants)^{6–8} and the free dermal graft of Horton and Devine⁹. In addition, many other autografts and synthetic grafts have been described by different workers^{3–5}. Some have used prostheses in these patients for straightening the penis in the absence of proven concomitant organic impotence. Unfortunately, none of these operations has fulfilled all desiderata.

The author has worked at developing a live graft source (flap)^{10,11} which is free from many of the drawbacks experienced with other procedures. In this new operation, dermabraded penile dermis is raised on its vascular fascial pedicle and used to close the defect in the tunica albuginea consequent upon plaque incision. This technique is feasible in both circumcised and uncircumcised patients.

This is the first report of the use of a flap in Peyronie's disease. Operative technique and results in 17 patients over 4 years are presented. The author's experience seems to suggest that this is an ideal operation for Peyronie's disease.

Key words: penile induration, Peyronie's disease

INTRODUCTION

The clinical entity popularly known today as Peyronie's disease has been described as early as in 1561 by Fallopius and Vesalius³. Since then, a number of workers have worked on this disorder but exact etiopathogenetic mechanisms continue to remain

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obscure and the ideal cure remains elusive. By itself, the disease is basically benign and often runs a self-limiting course with the presence of a penile nodule and some pain (inconstant) in the early stages being the only symptomatologic concerns to the patient. Residual dysfunction is often minimal, except for psychogenic impotence which afflicts the especially anxious, and treatment is essentially conservative and aims at relief of pain and arrest of the fibrotic process. The extensive list of conservative treatment modalities employed in the past³⁻⁵ bears testimony to their overall inefficacy. Sometimes, however, the disease can run a more 'virulent' course causing severe deformity that precludes intercourse or by its constricting effect jeopardises distal penile vascularity and causes organic impotence¹². More recently, venogenic factors have been identified as an important cause of impotence in some of these patients¹³⁻¹⁶. These situations will sometimes require surgical intervention. Several operations have been described in the past to treat this condition. The two currently most favoured are the tucking procedure of Nesbit and the free dermal graft of Horton and Devine. The Nesbit procedure suffers from the drawback that it cannot be employed in patients with extreme curvature or for very large, deep or multiple asymmetrically located nodules. Besides, it causes penile shortening-a complication most would like to avoid, if possible. The free dermal graft, too, has an unacceptably high post-operative contracture and impotence rate and few have been able to reproduce the results of the original workers¹⁷⁻²³. Other techniques, likewise, have not met with high long-term success rates.

The primary aim of surgery in Peyronie's disease is to straighten the penis and relieve deformity. If one aims for a 'cure' rather than a 'compromise', this should be done by lengthening the short side to normalcy rather than by shortening the normal side. Such lengthening is best accomplished by incising the plaque and using a graft material to bridge the defect. The ideal graft should be strong and elastic and autologous rather than synthetic. Synthetic grafts stimulate fibrous reactions and contractions²⁴. Finally, the graft used should be at minimum risk of post-operative contracture.

All free grafts, sooner or later, will contract. This is a drawback inherent in them (see discussion). The only way to avoid this is by employing a flap rather than a free graft.

The other important consideration at operation is minimum interference with the tunica albuginea. Extensive resections of plaques and nodules and multiple incisions in the tunica predispose to a higher incidence of post-operative impotence. For this reason, incising and releasing operations are preferable to those where a lot of tunica is excised.

Penile prostheses should be employed only when there is proven concomitant organic impotence.

The penile dermal flap has been devised with these considerations in mind.

MATERIALS AND METHODS

The first penile dermal flap reconstruction was performed by the author in December, 1989. Between September and December 1989, the author histologically examined prepuces of ten adult patients who underwent circumcision at his center. At operation, an attempt was made to remove the preputial epidermis in four of these patients with a razor blade and in the other six with dermabrasion. Epidermis removal with a razor blade was very difficult and button-holing of skin in areas occurred quite frequently¹⁰.



FIGURE 1. Photomicrograph of full thickness penile skin. Hematoxylin–Eosin (× 50).

With dermabrasion, on the other hand, epidermis could be selectively separated (see Figs. 1 and 2). Micrometric measurements of preputial dermis ranged from 0.3 mm to 0.6 mm. It was concluded that, like its counterpart in the lower abdominal wall, it was suitable graft material.

Seventeen patients with Peyronie's disease who were operated upon using the current technique are chosen for inclusion in this study. The patients ranged in age from



FIGURE 2. Photomicrograph of dermabraded penile skin. Hematoxylin-Eosin (× 50).

40 to 66 (mean 53). All patients had end-stage Peyronie's disease with arrest of progression and failure of a trial of conservative therapy for a minimum of 18 months from the date of onset of symptoms. Three patients had been operated upon earlier at another center. Minimum nodule size was 2.5 cm in at least one axis. Deformity was severe enough (45° or more) to preclude intercourse in all patients. Five of the older patients had superadded concomitant organogenic impotence. Evaluation included duplex ultrasound scanning of the penis, plain soft tissue radiographs, intracavernosal injection (papaverine/prostaglandin), Rigiscan monitoring and erect penile photograhy. Of these, intracavernosal injections and Rigiscan monitoring were performed in all patients. We have not performed DICCs pre-operatively on any patient because there was no plan to offer vascular surgery even if these were to be abnormal. Four patients were circumcised and the other 13 were uncircumcised (see Table 1).

TABLE 1.Penile dermal flap. Current seriesDec '89 to Jan '94).

Operated patients	17
Mean age (40 to 66)	53
Minimum duration of disease	18 months
Circumcised : uncircumcised	4:13
Penile dermal flap only	12
Dermal flap + prostheses	05

OPERATIVE TECHNIQUE

The operation is usually performed under general anesthesia with the patient in the supine position. Peri-operative antibiotics are administered. An artificial erection is induced on the table for a final reassessment of the deformity and the location and extent of the plaque, to determine where the flap should be raised from and also to check how much penile skin is available for flap elevation in the erect state.

In the uncircumcised patient (see Fig. 3), the distal edge of the prepuce is picked up in mosquito forceps applied at 3 o'clock and 9 o'clock positions respectively, and put on the stretch by an assistant. The outer layer of the dorsal preputial skin (all plaques in this series were located dorsally or dorsolaterally) is infiltrated intradermally with normal saline using a 26 # or 28 # needle. A small right-angled retractor is interposed between prepuce and glans to steady the foreskin. The prepuce is then gently dermabraded using fine sandpaper (# 100 to # 400 but no coarser) cut into strips and rolled and mounted on a hemostat (see Fig. 4). The author finds this manual technique easier to control than the electric dermabrader. Using smooth circular motions, a rectangle of prepuce deemed large enough for defect coverage is thus shorn of its epidermal coat. This rectangular area is the potential flap (see Fig. 5).

Next, the mosquito forceps are removed and the entire foreskin is drawn back. A circumcoronal, circumcising incision is made on the inner preputial layer. The foreskin is then drawn forward all over again and a second circumcising incision is made on the outer preputial skin just behind the ridge created by the corona glandis. This second incision is then deepened to just beneath the skin and a plane is created between the skin of the penile shaft and the subjacent fascial layers. The entire skin of the penile



FIGURE 3. Schematic representation of operative technique in the un circumcised.

shaft is then degloved up to the mons pubis. We now have a distal cylindrical bridge of preputial skin, a portion of which has been denuded of epidermis and which has its vascularity intact. This skin will be subsequently converted into a flap and used to reconstruct the defect created after plaque incision.

The plaque is approached using the standard lateral approach after elevation of the dorsal neurovascular bundle. The entire neurovascular bundle, from the glans to the



FIGURE 4. Dermabrasion of prepuce.

mons pubis is separated from underlying tunica. This step effectively obliterates most circumflex and emissary veins. This dissection is accomplished strictly from one side taking great care not to interrupt the continuity of vascular fascia on the opposite side. The contralateral vascular fascia supplies blood to the prepuce and nourishes the dermal flap. Once the plaque has been reached, a conservative transverse incision is made at its densest point just sufficient to straighten the penis. This straightening is confirmed



FIGURE 5. Dermabrasion completed—potential flap ready.

visually and by palpation on applying traction on the glans. The feel of complete straightening is unmistakeable. (The incision in the tunica albuginea does not permit a good artificial erection.) The dorsal and ventral penile lengths should be equal. The transverse incision in the tunica changes into an elliptical defect on stretching. The entire plaque need not and should not be excised. As enunciated earlier, the aim of operation is to straighten the penis-not to excise the entire plaque. Too much interference with the integrity of the tunica albuginea will jeopardise post-operative potency. If cases are carefully selected for operation when the fibrotic process is quiescent, post-operative contractures will not occur. It is not necessary to make stellate or cruciate incisions in the tunica albuginea. It is the author's belief that such incisions are necessary only to make allowance for post-operative graft contracture in different axes. Transverse incisions are made when employing free grafts in the endeavor to prevent contraction in the long axis of the penis after operation. Since live flaps do not and will not contract, such extra damage to the tunica albuginea is unnecessary. A small crescent is excised from the edge of the defect in the tunica albuginea and sent for histopathological and/or electron microscopic studies. The author believes that histopathological studies on all plaques are necessary. In the first place, they reconfirm the diagnosis of Peyronie's disease and help differentiate it from other causes of penile fibrosis. Secondly, in rare instances, soft tissue sarcomas may masquerade as Peyronie's disease²⁵. This must be ruled out.

The defect in the tunica albuginea is now ready to be grafted. The size of the defect gives an idea about the size of flap required. The cylindrical bridge of preputial skin between the two circumcising incisions is picked up in mosquito forceps, put on lateral stretch and approached from the ventral aspect. A bisecting, midline incision is made to divide the skin bridge. This skin is then dissected with fascial pedicle intact and elevated as a dorsally based rectangular flap (see Fig. 6). After checking that the dermabraded area of the flap matches the defect, redundant skin and pedicle are sacrificed. The flap should be trimmed to the exact size as the defect (see Fig. 7). Since such grafts never



FIGURE 6. Dorsalisation of flap.



FIGURE 7. Trimmed dermal flap rised on pedicle.

contract, it is not necessary to employ a flap larger than the defect size. An exact match should be aimed for. This eliminates ballooning and a flail area on the tunica. The dermis is elastic enough to stretch during erection.

The flap is then sutured to the defect in one of two ways—face up or face down (see Figs. 8 and 9). More recently, the author has been suturing all his flaps face down i.e. the dermabraded surface is in contact with the corpus cavernosum. This eliminates the need for a hiatus for pedicle entry beneath the flap and allows for a more water-tight suture line. A continuous 3' 0 PDS suture is employed. Anchoring sutures to the midline septum are desirable but not always feasible. Any residual epidermal fringes on the flap are scrupulously trimmed away at this stage. Care should be taken to avoid any twists of the vascular pedicle. An artificial erection is created. Adequate straightening, rigidity and the absence of significant leaks and flap ballooning are confirmed. The dorsal neurovascular bundle is tacked back into position over the repair and the lateral fascial defect is meticulously reapposed. If penile prostheses are indicated, they are inserted through separate ventrally-sited corporotomies at this stage (for socio-economic reasons, the author has used only semi-rigid prostheses in this group of patients). Five patients in this series received prostheses.

The degloved skin of the penile shaft is pulled forward and sutured to the precoronal rim of the inner prepuce as after a routine circumcision procedure. No drains are placed. The bladder is catheterised and a light pressure dressing is applied around the penis. Glandular viability is inspected twice daily through a window and the catheter and dressings are removed after five days. Peri-operative antibiotics are administered to all patients.

In the circumcised patient, prepuce is not available but the laxity of the skin of the penile shaft allows a flap to be raised from the skin overlying the plaque (see Fig. 10).

An ellipse of skin overlying the plaque and deemed adequate for flap creation is marked with a skin pen. This ellipse is put on the stretch in two axes and dermabraded.



FIGURE 8. Face-up closure.

After dermabrasion is completed, the edges and apices of the ellipse are continued as a skin-deep incision around the penile circumference. The penile shaft is degloved proximally and distally. Fascia should be conserved in favour of flap pedicle rather than in favour of penile shaft skin. Using the lateral fascia of one side as the pedicle, the ellipse of skin is raised as a flap. The plaque is approached from the opposite side and the releasing incision and edge biopsy of the tunica albuginea are performed in the same manner as outlined previously. The edges of the flap are trimmed and sutured to the



FIGURE 9. Face-down closure.



FIGURE 10. Schematic representation of operative technique in the circumcised.

defect and the dorsal neurovascular bundle and fascial layers are reapposed. The proximal and distal edges of the degloved skin of the penile shaft are pulled back to their original positions and closed with absorbable suture.

This technique can be used to cover defects in other locations as well (though all plaques in this series were dorsal). The relative paucity of penile skin in the circumcised, in the author's experience, is not a deterrent to the employment of this technique because the author does not excise large areas of plaque and create big defects.

RESULTS

All 17 patients fared well after operation. Immediate post-operative recovery was uneventful in all patients. Two patients developed areas of duskiness on the skin of the penile shaft because of vascular compromise during flap elevation. These healed with light scarring after 2 weeks. One patient had glandular hypesthesia lasting three weeks. Waking erectile activity was encouraged at 6–8 weeks and 9 of 12 non-implanted patients were able to regain erection spontaneously and achieve vaginal intromission. The other three were rehabilitated with psychosexual therapy and the use of the vacuum device. Ten of these 12 were tested post-operatively with prostaglandin and

real-time Rigiscan recordings for adequacy of rigidity. The other two declined to undergo the test because they were functioning normally. After an initial indurated feel lasting in some up to four weeks, all flaps became supple to palpation and almost homogenous with surrounding tunica albuginea. Maximum follow-up is four years and minimum follow-up is three months. All patients reported satisfactory sex lives and pain-free straight penises at last follow up.

There was not a single case of post-operative contracture or impotence (see Table 2).

Number of patients	
(12 non-implanted—NI, 5 implanted—I)	17
Follow-up	3 months to 4 years
Post-op rigidity	12 NI + 5 I/17
Intercourse: 8 weeks	14/17
12 weeks	17/17
Contracture	0/17
Impotence	0/12
	(5 received implants)

TABLE 2. Penile dermal flap. Results

DISCUSSION

If any of the several free graft reconstructions employed for Peyronie's disease was really capable of providing the patient with long term contracture-free and rigid erections, the Nesbit procedure would have probably not been in such widespread use today. Neither surgeon nor patient would otherwise accept the compromise inherent in penile shortening so easily. It might not be a mere coincidence that the Nesbit procedure was adapted for use in Peyronie's disease and gained in popularity about the same time that (the) international literature was getting inundated with articles reporting post-operative contractures and impotence after grafting procedures and, barring a few workers, many were getting disgruntled with these. Several started looking for alternative graft sources in the hope of improving on the performance of free dermis– admittedly the best graft in its time and arguably among the best even today. Dermis certainly possesses many excellent qualities deemed desirable in a graft.

By their very definition, however, free grafts have limitations. For a free graft to survive and retain anatomical and functional integrity at its receptor site, neovascularisation from the subjacent vascular bed is a *sine qua non*²⁶. If, however, a loose graft, one and a half times to twice as large as the defect is placed on a lake of blood like the corpus cavernosum, it is difficult to imagine how this (such neovascularisation) might occur. It is more likely that a clot forms beneath the graft, gets organised into fibrous tissue and severs blood supply to the graft over a period of time. The graft then dies and gets converted into fibrous tissue thus causing recurrence of contracture. Certainly, this has been the author's finding in the three patients who came for a re-operation. Histological studies of the previously grafted site showed that there was no dermis at all, just a block of fibrous tissue. This is histologically quite distinct in appearance from the plaques of Peyronie's disease. This seems to be the fate that befalls other free grafts as well²⁷.

In sharp contradistinction, a flap, with its own blood supply, is free of this drawback and can be expected to survive indefinitely. This possibly explains why the author has not seen contractures in any of 12 patients (5 were implanted) even after 2, 3 and 4 years.

What is more difficult to explain, however, is that none of the 12 patients who were potent before operation became impotent post-operatively. This may be merely coincidental because some have been followed for relatively short periods. On the other hand, there are nine patients who have been potent for at last 24 months after operation.

The exact etiology of post-operative impotence following reconstruction with free grafts has not been unequivocally established although conjectures and theories abound. Certainly, some points of operative technique put the patient in a higher risk category. Among these are extensive incisions of tunica albuginea, increasing of defect size in the tunica with the additional employment of stellate incisions, multiple incisions and a loose graft. On the other hand, tunica-conserving release incisions which do not damage cavernosal tissue, snug-fitting grafts or flaps and wide mobilisation of the dorsal neurovascular bundle may be expected to minimise this risk. Recently, abnormal venous leaks have been reported even in patients with Peyronie's disease who have not undergone surgery. It is therefore difficult to hazard a guess as to whether operation creates impotence by aggravating already aberrant venous outflow or whether it does so by altogether new mechanisms. It is reasonable to postulate that a flap will minimise the stimulation of neocapillary formation and reduce the chances of abnormal fistulous outflow venous communications post-operatively. It is also interesting to note that incisions or excisions of normal tunica albuginea seldom cause impotence. Undoubtedly, more work needs to be done in this direction.

CONCLUSION

This is the first report of a flap being used for the treatment of Peyronie's disease. A penile flap is easily available locally and does not necessitate extra incisions or multiple operating teams. It is strong, elastic and thick enough. It can be harvested so as to cover a defect anywhere on the tunica albuginea. It can be used with equal facility in the circumcised as well as the uncircumcised. It possesses its own blood supply and does not contract. It does not cause penile shortening. Effective removal of epidermis

TABLE 3. Penile dermal flap-advantages

- 1. LIVE dermis; hence no contracture
- 2. Locally available; hence no extra incisions
- 3. Single operating team
- 4. Good elasticity and strength
- 5. No penile shortening
- 6. Can cover large/multiple defects (anywhere on penile shaft)
- 7. Can be employed in both circumcised and uncircumcised
- 8. No inclusion cyst formation
- 9. Post-operative impotence minimal
- 10. Satisfaction ratio $\sim 100\%$

allows it to be buried without the risk of inclusion cyst formation. Post-operative impotence rates are very low. Experience with seventeen patients over four years seems to suggest that this is a very good operation for most patients with Peyronie's disease (see Table 3).

NOTE ADDED IN PROOF

More recently, the author has used partial circumferential incisions in the circumcised rather than complete circumferential ones. This is adequate for flap harvest. Besides, the flap (in the circumcised) is elevated from the penile skin of the distal shaft rather than the mid-shaft. These simple precautions will prevent post-operative lymphedema of the distal penile shaft.

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