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The role of shortening procedures for the surgical therapy of Peyronie's disease

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In this article we briefly review the current surgical treatment options for Peyronie's disease (PD) in its stable phase. We emphasize the important role of tunical shortening procedures which account for the major share of operations for PD. Shortening procedures provide excellent curvature correction combined with a very low risk of new erectile dysfunction. Since erectile function is already heavily impaired by the disease and its comorbidities in many patients with PD, tunical shortening procedures often are the treatment of choice for the correction of penile curvature. While there is no hard evidence for the superiority of a specific shortening procedure, several authors prefer the classical Nesbit technique over simple plication techniques. We also present our experiences with the *Tunica albuginea* underlap technique (TAU-technique), a new modification of the Nesbit procedure, that might add further surgical advantages while preserving the strength of the classical Nesbit technique.

KEY WORDS: Penile diseases - Erectile dysfunction - Surgical procedures, operative.

Peyronie's disease (PD) is an acquired pathological condition, that is characterized by the formation of fibrotic plaques of the *Tunica albuginea*. The formation of these plaques usually is accompanied by painful erection and sexual dysfunction

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and can eventually lead to a fibrotic shrinkage of the *Tunica albuginea* that results in penile deformation (*e.g.* deviation, hinge-/hourglass-phenomenon and shortening). The typical course of the disease consists of an acute inflammatory phase that lasts about 12 months from onset and of a subsequent chronic phase. The chronic phase is characterized by the cessation of pain and progressing plaque formation. The etiology of the disease is unclear. Penile trauma in combination with a general predisposition is considered to initiate the disease and impaired wound healing seems to play an important role. There is no clear evidence for a specific genetic predisposition, but an association with other fibrotic diseases like Dupuytren's contracture is obvious. Molecular mimicry and bacterial antigens that trigger PD like an autoimmune disease¹ or a connection of PD with the human leukocyte antigen system is not confirmed by recent data.² There is an association of PD with older age, hypertension and diabetes.³ The prevalence of PD was 3,2% in a large survey of Schwarzer *et al.*,⁴ Mulhall *et al.* found an incidence of 8.9% in patients that were screened for prostate cancer.⁵

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Treatment of PD: general considerations

Since the etiology of PD is unclear there are no specific medical treatments that are based on a known pathophysiology. Nonsurgical treatment of PD includes oral medications like Vitamin E, potassium para-aminobenzoate (Potaba), tamoxifen, colchicine and carnitine. Other noninvasive treatment options are intralesional injections with steroids, collagenase, verapamil or interferon and extracorporal shock wave therapy (ESWT). In Germany and in some other European countries radiation therapy is quite common,⁶ although there is no recommendation of radiation therapy by the recent guidelines. Best candidates for nonsurgical therapy are patients in the early phase of PD. Although strong evidence for the efficacy of these therapies is lacking, especially as far as the reduction of the deformation is concerned, there are many reports of stabilisation and pain reduction by nonsurgical therapies.^{7, 8} In the stable phase of PD surgical therapy is the gold standard for correcting erect penile deformity.⁷ If the disease has been stable for at least 3-6 months and sexual function is impaired by the curvature, surgical therapy is indicated.⁸

Surgical therapy

If surgery is indicated to correct the curvature for patients with stable PD, then in principle there are three therapeutical options: tunical shortening procedures, tunical lengthening procedures and penile prosthesis placement with additional maneuvers to correct the curvature. In 2010 Ralph *et al.* published evidence-based guidelines for the management of PD⁷ and in 2012 the EAU Guidelines on penile curvature were released.⁸ These two guidelines agree on the following surgical algorithm for the treatment of PD: patients with adequate erectile function and a curvature less than 60° are candidates for a tunical shortening procedure. Patients with a short penis, good erectile function and curvature >60° or spe-

cial deformities (hourglass/ hinge) should rather undergo a tunical lengthening procedure. In the case of erectile dysfunction that does not respond to pharmacologic treatment the implantation of an inflatable penile prosthesis is the best option.^{7, 8} If there is still a residual curvature >30° after the implantation of a penile prosthesis, then the deviation should be corrected by additional maneuvers. The recommended surgical maneuvers are manual modeling that was described by Wilson and Delk in 1994⁹ and plaque incision with or without grafting. Ralph *et al.* recommend grafting of all tunical defects that are larger than 2cm after the incision to prevent recurrent deviation or cylinder herniation.⁷

Tunical lengthening procedures consist of a tunical incision at the concave side of the penis and of a graft that covers the defect. Total plaque removal can severely impair the veno-occlusive mechanism and is associated with high rates of postoperative erectile dysfunction, so total plaque removal can not be recommended.^{7, 8, 10} Today variations of the so-called small-incision-technique that was proposed by Lue *et al.* are preferred.¹¹ Different types of grafts have been used for PD surgery. Autologous grafts include for example dermis, saphenous vein, buccal mucosa and *Tunica albuginea*.^{12, 13} The use of synthetic grafts like Gore-Tex and Dacron has been abandoned since it lead to increased rates of infection and fibrosis.¹² Allografts from human cadaveric tissue or xenografts from animal tissues are another option for the surgery of PD. Depending on the type of the graft different advantages and disadvantages are described. The harvesting of autologous grafts for example includes additional surgical effort with potential complications, the use of allografts and xenografts might bear the risk of a graft to host infection. Postoperative erectile dysfunction and recurrence of penile curvature seem not to depend primarily on the type of the graft material.⁷ The graft material that is used most often is saphenous vein.¹⁴ Although lengthening procedures usually are well suited to correct complex deformations and curvatures >60° without heavy loss of

penile length, there is a significant risk of erectile dysfunction that is associated with tunical lengthening procedures. Since PD most commonly leads to dorsal deformities, lengthening procedures often involve mobilization of the neurovascular bundle and bear an additional risk of penile numbness.⁸

Tunical shortening procedures for the surgical therapy of PD

The risk to induce erectile dysfunction by tunical shortening procedures is very low.^{7, 8} These procedures were first introduced by Nesbit in 1965.¹⁵ Shortening the *Tunica albuginea* on the convex side of the penis opposite to the pathologically shrunk segment leads to the correction of the curvature. A small loss of overall penile length is reported by most of the patients, but this rarely leads to postoperative sexual dysfunction.^{8, 16} Many different tunical shortening techniques have been described and can be categorized into tunical excision techniques, tunical plication techniques and tunical incision techniques.

Tunical excision: the classical Nesbit procedure

In 1965 Nesbit proposed his classical technique for the correction of penile curvature. By excising elliptical wedges of *Tunica albuginea* on the convex side of the penis and subsequently closing the lesions by sutures straightening of the penis is achieved. As far as straightening of the penis and low risk for new erectile dysfunction are concerned excellent results have been achieved with the classical Nesbit procedure.¹⁷⁻¹⁹

Tunical placcation: method of Essed-Schroeder and modifications

In 1985 Schroeder and Essed described a series of 5 patients where plication of the *Tunica albuginea* was performed without the excision of tunical tissue.²⁰ Several other

authors reported their experiences with this simple form of tunical shortening. Recurrence of curvature and suture related complications like permanently palpable suture knots and erectile discomfort have been addressed as specific problems of pure plication techniques. The use of absorbable sutures has been proposed as a possible solution to these problems.²¹⁻²³ Another option to overcome the problems associated with simple plication procedures was introduced by Gholami and Lue. In 2002 they described the 16-dot plication technique for the correction of penile curvature. The 16-dot plication technique is also a simple plication technique, but uses multiple pairs of sutures to distribute the total force and prevent suture breakup.²⁴

Tunical incision: principle of Heineke and Mikulitz, method of Baskin and Duckett and the *Tunica albuginea* underlap technique

Yachia used the Heineke-Miculitz principle for the correction of penile curvature. Longitudinal tunical incisions were closed horizontally to achieve shortening of the convex side of the penis.²⁵ Licht and Lewis described a similar approach for PD surgery.²⁶ Another shortening procedure was initially introduced for the correction of hypospadias curvature by Baskin and Duckett.²⁷ This method uses the approximation of two horizontal tunical incisions to shorten the convex side of the penis. Van der Horst *et al.* took up the technique of Baskin and Duckett for the surgery of PD.²⁸ In 2012 we first described the *Tunica albuginea* underlap technique (TAU-technique) for the correction of penile curvature. Here flaps of *Tunica albuginea* are freed from the underlying corpus cavernosum after U-shaped incisions of the tunica. The flaps are brought under the remaining *Tunica albuginea* and fixated with single absorbable sutures. As the defects of the tunica are sealed tightly and with high tensile strength by double layers of *Tunica albuginea*, correction of the abnormal curvature is achieved.²⁹

The method of Baskin and Duckett and the TAU-technique are the two shortening techniques described in the literature that use tunical incision in combination with tunical doubling. In our opinion especially doubling of the *Tunica albuginea* leads to high tensile strength of the plications. A comparison of the technique of Baskin and Duckett *versus* the TAU-technique can be seen in Figure 1.

The role of tunical shortening procedures for the surgery of PD

Tunical shortening procedures play a major role for the surgical treatment of PD. There is a wide consensus that the risk of new postoperative erectile dysfunction with these procedures is very low. Furthermore

shortening procedures are relatively simple to perform and are associated with a low complication rate.^{7, 8, 14} A significant portion of the patients with PD also have diabetes, hypertension and are of older age. PD on its own usually causes erectile dysfunction and the associated comorbidities can significantly worsen the situation. The erectile function of many patients with PD, that present for a surgical straightening procedure, turns out to be at the borderline. According to the guidelines these patients are no good candidates for lengthening procedures that might further compromise the erectile function.^{7, 8} In this case shortening procedures often are the only viable surgical option. Unfortunately shortening of the penis is an inherent side effect of these straightening procedures but usually does not affect the sexual function as much as a total loss of an

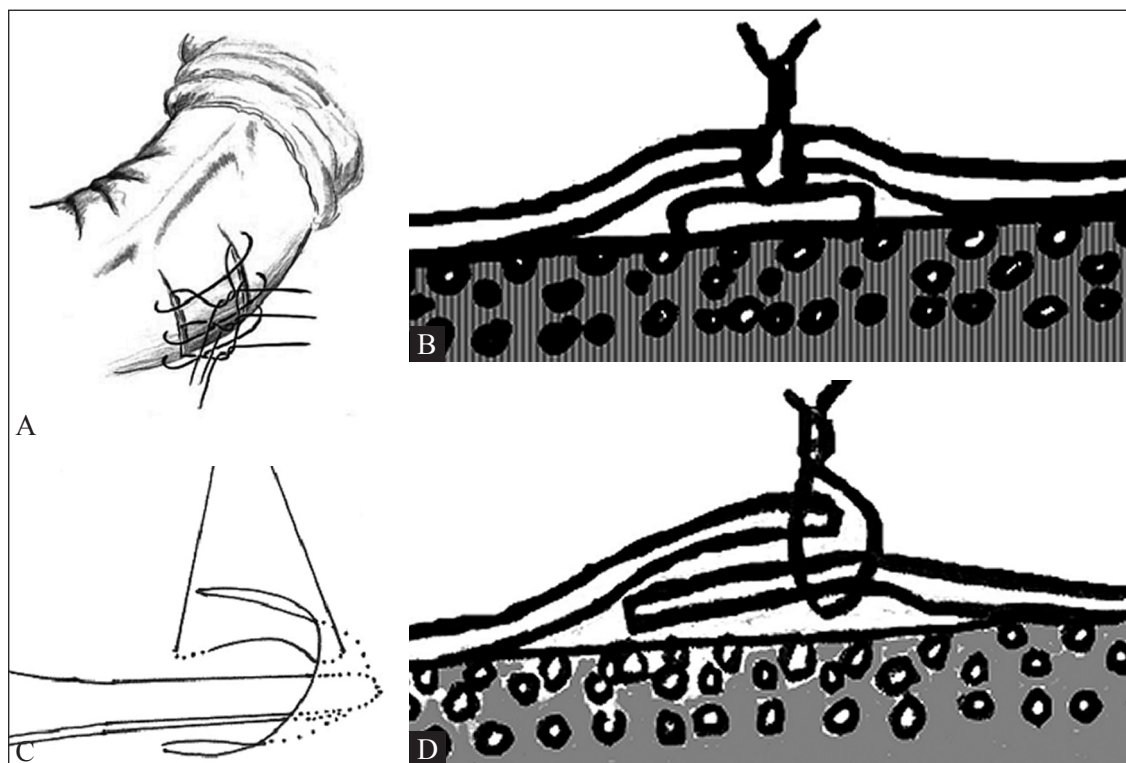


Figure 1.—Tunical incision and doubling - method of Baskin and Duckett versus the *Tunica albuginea* underlap technique. A) Shortening the convex side of the penis using two horizontal tunical incisions according to Baskin and Duckett; B) shortening is achieved by forming double layers of *Tunica albuginea*; C) shortening the convex side of the penis using U-shaped incisions according to the *Tunica albuginea* underlap technique; D) Shortening is achieved by forming double layers of *Tunica albuginea*.

From van der Horst C *et al.*²⁸; from Schwarzer JU *et al.*²⁹

already heavily impaired erectile function.

Although we perform the complete range of grafting procedures and also implantation of inflatable penile prosthesis in our center, that is specialized in penile surgery, more than two thirds of the patients with PD eventually undergo a tunical shortening procedure after thorough evaluation and comprehensive preoperative consent. So in our specialized center tunical shortening is the most important surgical option for our patients with PD.

According to the guidelines there is no hard evidence that a specific shortening procedure would provide better outcomes than another.⁷ Nevertheless there are several authors that see an advantage of the classical Nesbit procedure over simple plication with respect to recurrence of the cur-

vature.^{21, 22} Van der Horst *et al.* postulate that scar formation induced by incision of the *Tunica albuginea* might add to a higher tensile strength. Also in our own experience we think that simple plication techniques have disadvantages concerning the tensile strength of the plications. We feel that especially doubling of the *Tunica albuginea* allows to create plications of superior tensile strength. The method of Baskin and Duckett²⁷ and the TAU-technique,²⁹ that was introduced by Schwarzer in 2012, both realize this principle. A schematic illustration of the TAU-technique is given in Figure 2.

An intraoperative site of the TAU-technique is depicted in Figure 3. Figure 3A shows how a flap of *Tunica albuginea* can easily be freed from the underlying corpus cavernosum in an atraumatic way after a

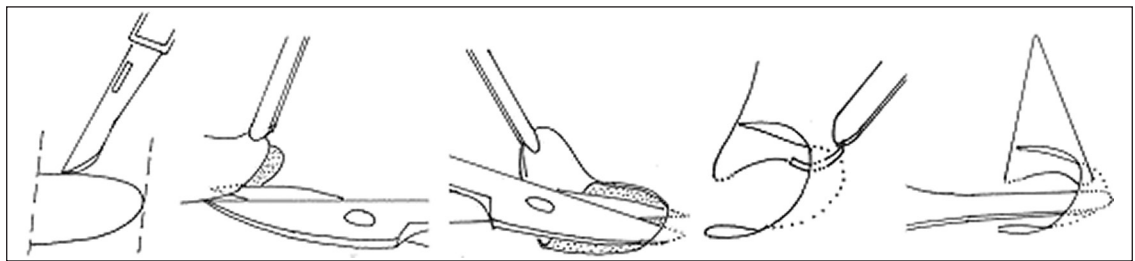


Figure 2.—Stepwise schematic illustration of the *Tunica albuginea* underlap technique. From Schwarzer JU *et al.*²⁹

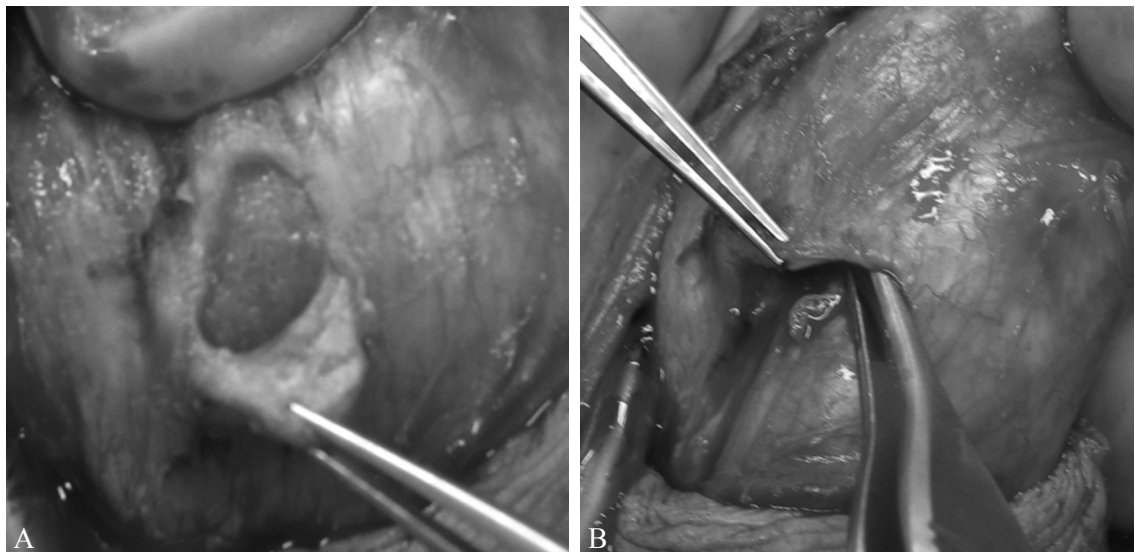


Figure 3.—*Tunica albuginea* underlap technique – intraoperative site. A) Flap of *Tunica albuginea* resulting from U-shaped incision; B) shortening is achieved by underlapping the flap under the remaining *Tunica albuginea*.

U-shaped incision. Figure 3B shows how shortening is achieved by underlapping the flap under the remaining *Tunica albuginea*.

Rather than a connection just between tunical edges a connection between double layers of *Tunica albuginea* is established over the whole length of the underlap. This can add tensile strength to the plication and provide a tighter sealing of the lesion. Furthermore the amount of the underlap can easily be adapted even after the incision of the *Tunica albuginea* has already been completed. So with the TAU-technique the excision of whole elipsoids is avoided in contrast to the Nesbit procedure. Rather U-shaped flaps are used to strengthen and to seal the lesions of the *Tunica albuginea*. Since no tissue has to be excised, a great intraoperative flexibility is preserved.

In Tables I, II we confront our preliminary results with the TAU-technique and the results of a large series of Savoca *et al.* with the Nesbit technique.¹⁹ It can be noted that the results with the different shortening procedures match to a large extent. With the TAU-technique the correction of the curvature is excellent in the short term and recurrence of the curvature is very low. In our series of 61 consecutive patients that were operated between 2008 and 2012 44 patients had PD and 17 patients had congenital penile curvature.

It is important to emphasize that in our

subgroup with congenital penile curvature no patient suffered from postoperative erectile dysfunction. We conclude that the complaint of erectile dysfunction in the long-term follow-up might have its reason in the underlying disease and its comorbidities rather than in the surgery. Tuncal shortening procedures play a major role for the surgical treatment of PD, since they account for a major share of PD operations. Procedures like the Nesbit technique and its modifications like the TAU-technique provide excellent correction of penile curvature with a low risk of new erectile dysfunction.

Conclusions

Surgical treatment of PD is indicated in the stable phase of the disease to correct penile curvature that compromises sexual function. Tuncal lengthening procedures that consist of plaque incision and grafting usually require a good preoperative erectile function. In many patients with PD erectile function is already significantly impaired by the disease and its comorbidities and tuncal shortening procedures are the treatment of choice. While there is no hard evidence for the superiority of a specific shortening procedure, several authors prefer the classical Nesbit technique over simple plication techniques. We presented

TABLE I.—*Early postoperative outcome with the Tunica albuginea underlap technique and with the classical Nesbit procedure.*

Early postoperative outcome	Tunica albuginea underlap (N.=61)	Nesbit (Savoca <i>et al.</i> 2004) ¹⁹ (N.=279)
Correction of curvature	100%	86.3%
Surgical revision necessary	4%	4%

TABLE II.—*Long-term outcome with the Tunica albuginea underlap technique and with the classical Nesbit procedure.*

Long-term follow-up	Tunica albuginea underlap (N.=39, median follow-up 23 month)	Nesbit (Savoca <i>et al.</i> 2004) ¹⁹ (N.=218, median follow up 89 month)
Correction of curvature	94%	85.8%
Significant shortening	13%	16.5%
Erectile dysfunction	13%	11.5%

the TAU-technique, a new modification of the Nesbit technique, that might add further technical advantages while preserving the strength of the classical Nesbit technique.

Riassunto

Ruolo delle procedure di accorciamento per la terapia chirurgica della malattia di Peyronie

Nel presente articolo passeremo brevemente in rassegna le attuali opzioni terapeutiche chirurgiche per la malattia di Peyronie nella sua fase stabile. Sottolineiamo l'importante ruolo delle procedure di accorciamento della tunica che costituiscono la maggior parte degli interventi chirurgici per la malattia di Peyronie. Le procedure di accorciamento forniscono un'ottima correzione della curvatura e sono associate a un rischio estremamente basso di nuove disfunzioni erettili. Poiché la funzionalità erettile è già pesantemente compromessa dalla malattia e dalle sue comorbilità in numerosi pazienti affetti dalla malattia di Peyronie, le procedure di accorciamento della tunica sono spesso il trattamento preferito per la correzione della curvatura peniena. Mentre non vi sono prove schiaccianti a sostegno della superiorità di una specifica procedura di accorciamento, numerosi autori preferiscono la classica tecnica di Nesbit rispetto alle semplici tecniche di plicazione. Presentiamo inoltre la nostra esperienza con la tecnica di sovrapposizione della *tunica albuginea*, una nuova variante della tecnica di Nesbit, che potrebbe aggiungere ulteriori vantaggi chirurgici preservando al contempo i punti di forza della tecnica di Nesbit classica.

PAROLE CHIAVE: Pene, malattie - Disfunzione erettile - Trattamento chirurgico.

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