

Original Article

Favourable multi-institutional experience with penoscrotal decompression for prolonged ischaemic priapism

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Objectives

To report our multi-institutional experience using penoscrotal decompression (PSD) for the surgical treatment of prolonged ischaemic priapism (PIP).

Materials and Methods

We retrospectively reviewed clinical records for patients with PIP treated with PSD between 2017 and 2020. Priapisms were confirmed as ischaemic based on clinical presentations and cavernosal blood gas abnormalities. Treatment with irrigation and injection of α -agonists in all patients had failed prior to PSD. Patient characteristics, peri-operative variables and outcomes, and changes in International Index of Erectile Function (IIEF) scores were evaluated.

Results

We analysed 25 patients who underwent a total of 27 PSD procedures. The mean duration of priapism at initial presentation was 71.0 h. Irrigations and injections in all patients had failed, while corporoglanular shunt treatment in 48.0% of patients (12/25) had also failed prior to PSD. Of the 10 patients who underwent unilateral PSD, two (20.0%) had priapism recurrence. Both were treated with bilateral PSD, with prompt and lasting detumescence. Among the 15 patients undergoing primary bilateral PSD, none had priapism recurrence. Of the 15 patients with documented sexual function status at last follow-up, nine (60%) reported spontaneous erectile function adequate for penetration, while six (40%) reported erectile dysfunction. The median (interquartile range) decrease in IIEF-5 score was 3.5 (0–6.75) points after PSD. Two patients underwent uneventful inflatable penile prosthesis placement following PSD.

Conclusions

Penoscrotal decompression presents a simple, safe, highly effective and easily reproducible procedure for resolution of PIP. PSD should be considered as a viable salvage or alternative strategy to corporoglanular shunt procedures.

Keywords

erectile dysfunction, priapism, surgical management, #priapism, #andrology, #erectiledysfunction

Introduction

Priapism is defined as a prolonged unwanted erection of the penis, typically unrelated to sexual stimulation. More than 95% of priapism cases are ischaemic [1], with obstruction of penile venous outflow leading to stasis of blood in the corpora, with progressive hypoxia, hypercarbia, and acidosis similar to a compartment syndrome [1–3]. Ischaemic

priapism is a urological emergency because of the risk of progressive cavernosal fibrosis and subsequent permanent erectile dysfunction.

Treatment of short-duration priapism is relatively straightforward, consisting of corporal irrigation/aspiration and α -agonist injection, followed by distal shunting in refractory cases [3,4]. For patients with refractory and/or

prolonged ischaemic priapism (PIP), the approach becomes more challenging. Irrigation/aspiration procedures, α -agonist injection, and distal shunting all carry a low likelihood of success for patients with priapism duration over 24 h [1,5,6].

Although current AUA and European Association of Urology guidelines recommend proximal shunting following a failed distal shunt, proximal shunt procedures tend to be technically challenging and unpopular [3,4,6]. Evidence supporting any role of proximal shunting in contemporary practice is far from robust. Alternatively, because prolonged priapism carries a known risk of inducing permanent erectile dysfunction [1,7], Ralph *et al* [8] advocated immediate penile prosthesis placement in this setting. However, prosthesis insertion in the acute priapism setting is associated with increased complication risk [8–12] and may be challenging from an insurance coverage and/or patient acceptance standpoint.

Given our poor experience with proximal shunting and the risks of acute prosthesis placement, we developed the penoscrotal decompression (PSD) technique as an alternative treatment option for PIP [10]. Given our favourable local experience with PSD for PIP, we conducted the present study to assess outcomes of unilateral and bilateral PSD in various geographic locations and clinical settings. We also aimed to report sexual outcomes in PIP patients recovering from PSD surgery.

Materials and Methods

After institutional review board verification, we retrospectively reviewed clinical records for patients with PIP treated with PSD between 2017 and 2020. Patients with prolonged priapism of various aetiologies were treated at both tertiary care referral and community centres across all regions of the USA (Table 1). Priapism episodes were confirmed as ischaemic based on clinical presentation and cavernosal blood gas abnormalities. All patients had a priapism duration longer than 24 h and no resolution of their priapism symptoms or pain after irrigation and penile injection of α -agonists prior to PSD.

Successful decompression was defined as resolution of pain, an improvement in penile rigidity, and no need for further intervention. In cases with significant penile oedema, woody fibrosis, and/or a questionable clinical examination following PSD, corporal blood gas analysis or penile Doppler ultrasonography were performed to confirm resolution of priapism. Patient characteristics and peri-operative variables and outcomes were evaluated. International Index of Erectile Function (IIEF)-5 scores were obtained at the time of postoperative clinic visit or by telephone questionnaire. Preoperative IIEF-5 scores were determined retrospectively during postoperative interview if not already on file.

The PSD procedure has been previously reported [10]. In brief, it consists of a transverse penoscrotal incision and

Table 1 Penoscrotal decompression patient characteristics (*n* = 25).

	No. patients, <i>n</i> (%)
Treatment location	
University of Texas Southwestern (Dallas, TX, USA)	17 (68)
Mount Sinai (Miami Beach, FL, USA)	3 (12)
University of California Irvine (Orange, CA, USA)	1 (4)
Hennepin County Medical Center (Minneapolis, MN, USA)	1 (4)
Saint Vincent's Hospital (Birmingham, AL, USA)	1 (4)
USMD Hospital (Arlington, TX, USA)	1 (4)
Baptist St. Anthony's Hospital (Amarillo, TX, USA)	1 (4)
Priapism aetiology	
Intracavernosal injection	9 (36)
Medication	10 (40)
Trazodone	4
Cocaine	3
Marijuana	1
Alprazolam	1
Testosterone	1
Sickle cell disease	2 (8)
Constriction device	1 (4)
Idiopathic	3 (12)

exposure of the ventral corporal bodies, similar to penile prosthesis placement. Once the tunica albuginea is visualized, stay sutures are placed, a 2-cm corporotomy is made, and a paediatric Yankauer suction tip is passed proximally and distally in the corpora cavernosa, with firm manual pressure used to express deoxygenated blood (Fig. 1). The corpora are copiously irrigated with normal saline.

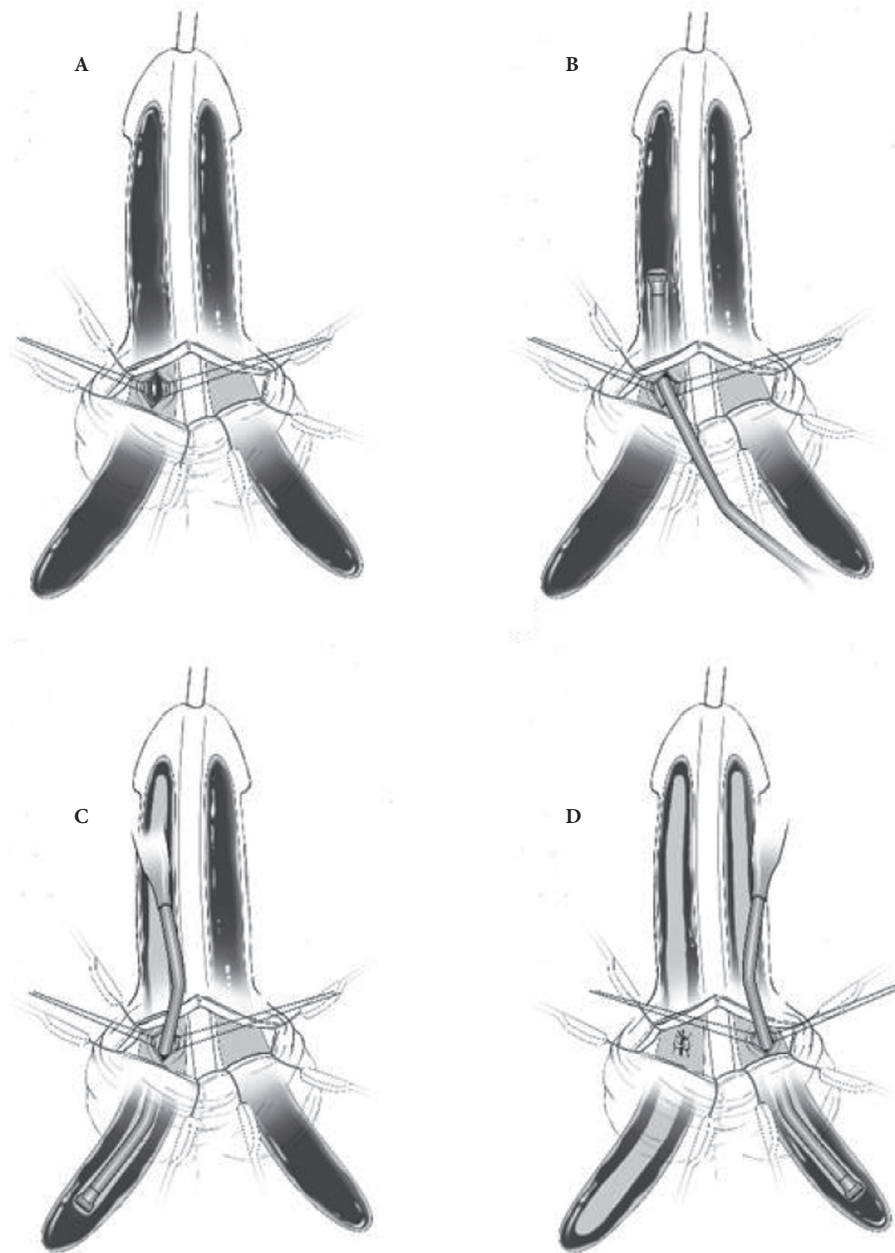
The procedure can be performed using a unilateral or bilateral approach. We favoured unilateral decompression early in our experience, with the goal of minimizing surgical trauma. Bilateral PSD was reserved for patients with incomplete decompression after a unilateral approach. After two failures were experienced with the unilateral approach, bilateral decompression has now become the preferred approach. Following detumescence, the corporotomy is closed, and patients are typically discharged on postoperative day 0 or 1.

Results

We identified 25 patients (mean [range] age 43.6 [18–68] years), who underwent a total of 27 PSD procedures during the time period examined. Of the 10 patients who underwent unilateral PSD, two (20.0%) had priapism recurrence, both of whom were successfully salvaged with bilateral PSD. These patients had longer-duration priapism at presentation (median 60 h) compared to the patients with successful unilateral PSD (median 36 h). Of the 15 patients undergoing primary bilateral PSD, none had recurrence of their priapism (Table 2). No complications were identified in any patients who underwent PSD.

The mean duration of priapism at presentation was 71.0 (24–168) h. In all patients irrigations and α -agonist injections

Fig. 1 Penoscrotal decompression: step by step. **(A)** Stay sutures placed and corporotomy made. **(B and C)** Distal and proximal dilatation with paediatric Yankauer. **(D)** Procedure repeated on contralateral side (if no detumescence accomplished with unilateral approach).



(phenylephrine 100–500 µg/mL) had failed, while distal corporoglanular shunt treatment also failed in 48.0% of patients (12/25 patients; Winter shunt and/or T-shunt) prior to PSD. No patient underwent proximal shunt or extensive corporal tunnelling treatment prior to PSD.

Of the 15 patients with documented sexual function status at follow-up (median [interquartile range] follow-up of 133.0 [56.5–248.5] days), nine reported spontaneous erectile function adequate for penetration with or without phosphodiesterase-5 inhibitors. Six of the 15 patients reported erectile dysfunction

with inability to penetrate. Patients who experienced return of spontaneous erections were slightly younger (mean age 40.3 vs 50.5 years) and had slightly shorter mean priapism duration (58.7 vs 72.0 h) than those who did not, although neither of these results reached significance ($P = 0.285$ and $P = 0.497$, respectively). The median (interquartile range) decrease in IIEF-5 score was 3.5 (0–6.75) points after PSD. Two patients with preoperative erectile dysfunction underwent inflatable penile prosthesis placement following PSD, without complication or need for revision surgery.

Table 2 Comparison of success rates based on hours of priapism at presentation.

	Unilateral <i>n</i> = 10	Bilateral <i>n</i> = 15
Successful, <i>n</i> (%)	8 (80)	15 (100)
Median duration of priapism at presentation, h	36	78
Unsuccessful, <i>n</i> (%)	2 (20)	0
Median duration of priapism at presentation, h	60	—

Discussion

The results of this multi-institutional study reinforce and amplify our promising preliminary results of PSD in managing PIP [10]. PSD is unique in that it is the first surgical treatment of priapism to emphasize an expanded role for intracorporal tunnelling throughout the entire corporal chamber. We now employ PSD in lieu of distal shunts on patients that present with prolonged priapism after failing first-line therapy (Fig. 2). We believe the expanded role of proximal corporal tunnelling is fundamental for corporal decompression in these refractory, long-duration cases. We hypothesize that because PSD disrupts the priapistic coagulum proximally – closer to the origin of the end-organ, cavernosal arterial blood supply – reperfusion of the corpora is facilitated.

Prolonged ischaemic priapism has been described as an acute compartment syndrome of the penis, with increased pressure

in a closed corporal compartment, which compromises circulation to the corporal tissues [3]. Acute compartment syndrome has been well described in the orthopaedic surgery literature, for which the only effective treatment is immediate decompression and restoration of perfusion [13]. The orthopaedic principles of compartment syndrome management appear to have relevance to PIP, with a primary goal of proximal corporal decompression.

As a glans-sparing procedure, PSD is the first surgical treatment of priapism to codify decompression over shunting. We believe that successful decompression functionally creates an internal shunt by reactivating the subtunical venous plexus network. Prompt reperfusion of bright red oxygenated blood has been universally observed intraoperatively throughout this cohort. Although some degree of reactive oedema and woody fibrosis commonly persists for several days to weeks following PSD, relief of ischaemic pain and continued gradual recovery was noted throughout in each patient.

Although improved efficacy of distal corporoglanular shunts has been documented with intracavernosal dilatation via ‘snaking’ or corporal tunnelling [14–16] for short-duration priapism, patients with prolonged priapism often seem to be refractory. The success rate for T-shunt with intracavernous tunnelling drops to 55% for those with priapism lasting 24–48 h, to 30% when priapism lasts >48 h, and to 0% when it lasts >96 h [17]. Our data suggest that PSD may represent a viable alternative to distal shunt with tunnelling for PIP (Table 3).

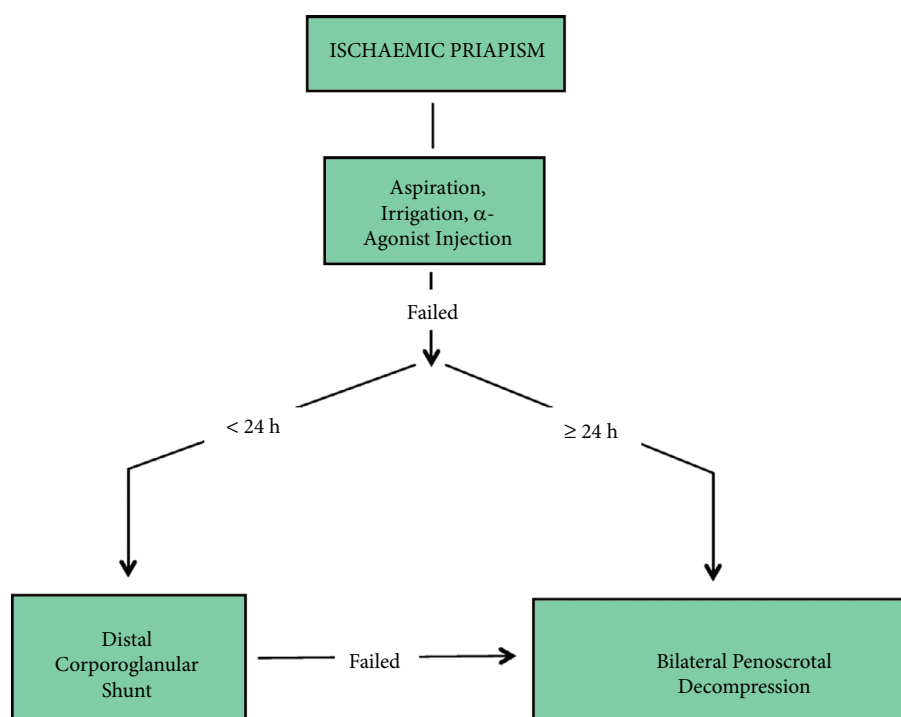
Fig. 2 Management of ischaemic priapism algorithm.

Table 3 Comparison of present study to studies using a combination of distal shunt and intracavernosal tunnelling.

Technique	Present study PSD	Zacharakis et al. (2014) [17] T-shunt with intracavernous tunnelling	Segal et al. (2013) [16] Burnett 'Snake' procedure
No. patients	25	45	10
Mean age, years	43.6	40.2	44.1
Mean duration of priapism, h	71	96	75
Success rate, %	80 (unilateral) 100 (bilateral)	64	80
Complications, %	0	NR	20*
IIEF decrease, points	3.5	16.3	NR
Postoperative erectile dysfunction, %	40	93	80

IIEF, International Index of Erectile Function; NR, not reported; PSD, penoscrotal decompression. *Wound infection and penile necrosis (1), urethrocuteaneous fistula with wound infection and penile necrosis (1).

Two patients had priapism recurrence following unilateral PSD; however, both resolved after repeat PSD with a bilateral technique. These two patients presented with longer duration of priapism compared to the median duration of those with successful unilateral PSD, although the sample size was too small for statistical analysis. We hypothesize that these two patients had thrombotic occlusion of the fenestrations of the septum pectiniforme, resulting in inadequate drainage of the contralateral corpora cavernosum. Bilateral PSD appears to outperform unilateral PSD for prolonged PIP cases.

Multiple reports have shown that approximately 90% of men presenting with priapism >24 h will develop permanent erectile dysfunction [18–20]. Our observation that erectile function was preserved in 60% of patients who reported normal prior sexual function follow-up compares favourably to other series [16,17,19]. The low median age of this cohort (41.9 years) is similar to that of other series. It is possible that, because PSD does not create a persistent new shunt from the corpora cavernosa to the glans or spongiosum, physiological erectile function may be more likely to recover.

Immediate prosthesis insertion in patients with PIP has been popularized to minimize corporal fibrosis and/or loss of penile length [8–12]. In fact, the 2012 European Association of Urology guideline gives a Grade B recommendation for immediate prosthesis insertion for priapism lasting more than 36 h [3]. However, high rates of infection and distal extrusion have been reported after device implantation in the acute setting [8–12]. Alternatively, because PSD uses a glans-sparing approach, we believe the risk of distal extrusion should be obviated if patients require subsequent penile prosthesis placement.

We acknowledge the potential limitations of this study. It was a retrospective study, which carries an inherent confounding and selection bias. Because priapism is a rare condition, this series is small, requiring data collection from multiple institutions. Priapism is a unique disease entity and obtaining follow-up can be a frustrating, if not futile, endeavour. Despite our best efforts, many patients could not be contacted

for follow-up information. For this reason, sexual function data were not available on all patients included in this series. Moreover, some preoperative IIEF-5 scores were retrospectively obtained, which introduces the possibility of recall bias. However, PSD was successful in various community and tertiary centres throughout the USA, and this cohort represents the largest reported US priapism series in more than 15 years.

Although our series represents a small number of patients, it highlights a challenging group of patients with prolonged priapism failing various treatments for more than 1 day. Many patients were referred to our centre from the community after failing multiple previous attempts at drainage; for this reason, our follow-up data reporting were incomplete. Some patients did not attend follow-up after their procedure or chose to be followed up more locally.

Although cases were performed at various centres nationwide, the attending surgeons in this multi-institutional series discussed PSD with the senior author in detail preoperatively, thus limiting variation in surgical technique. Future studies with objective data endpoints, such as postoperative corporal blood gas analyses or penile Doppler ultrasonography, are needed to validate our findings. Intra-operative corporal biopsies may help better predict which patients will recover sexual function, and preoperative MRI may elucidate smooth muscle viability prior to PSD. Overall, we believe that PSD represents a novel, promising new paradigm for prolonged priapism.

In conclusion, PSD represents a simple, effective, reproducible new procedure for resolution of prolonged and/or refractory ischaemic priapism. Bilateral PSD appears to outperform unilateral PSD for prolonged PIP cases. PSD should be considered as a viable salvage manoeuvre for patients who have failed corporoglanular shunt procedures, and perhaps as an alternative treatment strategy altogether.

Acknowledgements

None.

Conflicts of Interest

Dr. Allen Morey receives honoraria for being a guest lecturer/meeting participant for Boston Scientific and Coloplast Corp.

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Abbreviations: IIEF, International Index of Erectile Function; PIP, prolonged ischaemic priapism; PSD, penoscrotal decompression.