

## Sexual Dysfunction

# Transient Distal Penile Corporoglanular Shunt as an Adjunct to Aspiration and Irrigation Procedures in the Treatment of Early Ischemic Priapism

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**Purpose:** Ischemic priapism, a compartment syndrome, requires urgent treatment in order to nourish the corpora cavernosa. As the first step, aspiration of blood and irrigation of the cavernosal bodies is performed to prevent fibrotic activity and secure erectile capability. During aspiration, there are risks of cardiovascular side effects of adrenergic agonists. We aimed to evaluate a transient distal penile corporoglanular shunt technique in place of aspiration and irrigation techniques for treatment of early ischemic priapism.

**Materials and Methods:** A transient distal penile shunt was applied to 15 patients with early ischemic priapism between January 2011 and May 2012. Priapism duration, history, causes, pain, and any prior management of priapism were assessed in all patients. A complete blood count and penile Doppler ultrasonography were performed, which showed attenuated blood flow in the cavernosal artery. A sterile closed system blood collection set, which has two needles and tubing, was used for the transient distal penile shunt.

**Results:** Ten of 15 patients with early ischemic priapism were successfully treated with this transient shunt technique. No additional procedures were needed after the resolution of rigidity in the 10 successfully treated patients.

**Conclusions:** The transient nature of this technique is an advantage over aspiration and irrigation in the treatment of early ischemic priapism. Our results indicate that the technique can be offered for patients with an ischemic priapism episode of no more than 7 hours.

**Keywords:** Penile disease; Penile erection; Priapism; Urological surgical procedures

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### Article History:

received 28 December, 2012

accepted 4 March, 2013

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## INTRODUCTION

Priapism is defined as prolonged and persistent penile erection in the absence of sexual interest or excitation. A qualifying criterion for the disorder meeting a clinical definition is that it persists for more than 4 hours. Priapism represents a true disorder of erection physiology and is associated with risks of structural damage to the penis and erectile dysfunction (ED).

During a single episode of priapism, blood fails to drain from the corporal sinusoids, which results in prolonged

painful erection. The pain associated with priapism is perceived to be an end result of tissue ischemia and increased pressure generated within the corporal bodies.

Definitive first-line treatment of ischemic priapism (low-flow priapism) consists of evacuation of blood and irrigation of the corpora cavernosa, along with intracavernous injection of a sympathomimetic agent [1,2]. Although alpha<sub>1</sub>-selective adrenergic agonists are preferred, these agents carry risks of cardiovascular side effects. Additionally, the procedures of aspirating and irrigating with sympathomimetic injections over several hours may

be necessary to achieve detumescence. During aspiration, it is often difficult to guess how much blood needs to be taken out. In addition, the surrounding area becomes bloody, which can be a challenge for the surgeon.

We describe a transient distal penile corporoglanular shunt technique and discuss its possible advantages in the treatment of early ischemic priapism. The procedure involves a route designed to facilitate the evacuation of blood from the affected corpora cavernosa to the corpus spongiosum via transient use of a blood collection set. We also report on the use of this modification in a select group of patients with ischemic priapism.

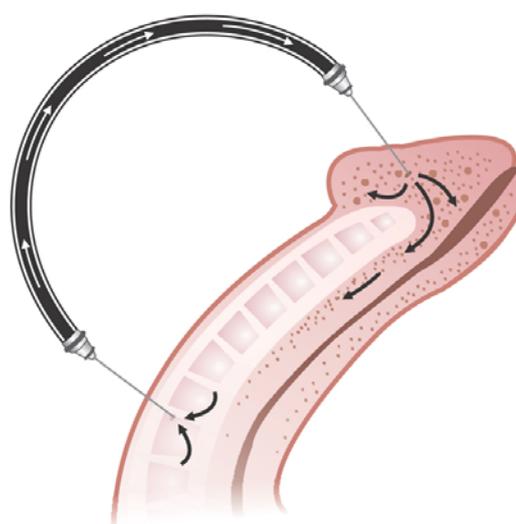
**MATERIALS AND METHODS**

The study population consisted of 15 men presenting to our clinic with priapism between January 2011 and February 2012. Priapism duration, history, causes, its relation to sexual stimulation, pain, and any prior management of priapism were assessed. The International Index of Erectile Function (IIEF)-5 questionnaire was used to assess erectile function, and the patients were stratified by domain scores of 22-25 (no ED), 17-21 (mild ED), 12-16 (mild to moderate ED), 8-11 (moderate ED), and < 8 (severe ED) [3]. Complete blood count assessment and color Doppler ultrasonography were performed. Baseline demographics and clinical profiles of the patients are shown in Table 1. We did not perform the presented shunt technique in patients who were admitted after 24 hours of priapism because of thrombocyte adherence and loss of contractile trabecular elements [4].

In this transient shunt technique, a sterile closed system blood collection set (BD Vacutainer, Cat. No.: 367282; NJ, USA), which has two 21G needles, was used. The length of the needle and tubing was 19 mm and 178 mm, respectively. This blood collection set was designed to be used not

only for blood collection but can also be used for short term infusions (maximum 2 hours).

The shunt technique was applied under local anesthesia in 2 patients (lidocaine, 20 mg/mL), which was done with a 26 G insulin injector, and under general anesthesia in 13 patients. One of the needles was inserted into the corpus cavernosum, and the blood flowing spontaneously from the corpora filled the set in 2 seconds. After the filling of the shunt-set, the needle on the other end of the set was inserted into the glans (Fig. 1) to utilize the corpus spongiosum. A decrease in the rigidity of the penis was achieved in 1 to 2 minutes. The needles were taken out when flaccidity was obtained and continued for at least 10 minutes. In some cases, this reduction was transient and



**FIG. 1.** One of the needles was inserted in the corpus cavernosum and the needle on the other end of the set was inserted in the glans.

**TABLE 1.** Baseline demographics and clinical profiles of the patients

Patient	Age (y)	Etiology	Characteristic	Prior interventions
1	61	CIS test	4 h	None
2	53	CIS test	4 h	None
3	42	CIS test	4 h	None
4	38	CIS test	4 h	None
5	43	CIS test	4 h	None
6	45	Idiopathic	5 h	None
7	57	CIS test	5 h	None
8	53	CIS test	6 h	None
9	33	Antipsychotic	7 h	None
10	55	CIS test	18 h	None
11	27	Sickle cell anemia	6 h	Ice packs
12	36	CIS test	7 h	None
13	24	Antidepressant	8 h	None
14	58	Alpha-blocker	12 h	None
15	26	Idiopathic	23 h	Cold shower

CIS test, combined intracavernous injection and stimulation test. Transient shunt technique was ineffective in the last 5 rows.



**FIG. 2.** Corporal bodies were squeezed to increase the pressure inside the corpus cavernosa.

stiffness occurred after a while. In such cases, the corporal bodies were squeezed (Fig. 2) to increase the pressure inside the corpus cavernosa. When the engorgement of the glans ceased while squeezing, the needle in the glans penis was replaced 2 to 3 mm forward or backward. After withdrawal of the needle, the physician applied firm pressure on the insertion site of the first needle over the corpus cavernosum for 1 or 2 minutes to prevent possible hematoma formation. Finally, a sterile compression dressing and an elastic Coban bandage was applied to the penis. The patients were discharged home if there was continued or sustained detumescence 1 to 8 hours following the procedure according to the type of anesthesia. We also evaluated blood outflow from the 21 G blood collection set and the volume of the corpus cavernosa by use of *in vitro* studies.

The present clinical study was carried out in an academic institution and was approved by the institutional ethical review board. All patients gave their informed consent in writing before study entry.

## RESULTS

Fifteen patients with ischemic priapism were treated with the presented transient shunt technique. The mean admission time of the study patients was 7.8 hours (range, 4–23 hours). Thirteen of 15 patients were admitted to the urology clinics within 12 hours (range, 4–12 hours). The remaining two patients were admitted for treatment after 18 and 23 hours, respectively. As shown in Table 1, the mean age of the patients was 43.4 years (range, 24–61 years). Ten of the 15 patients (66.6%) who were admitted to our clinic with an average of 6.2 hours of ischemic priapism were effectively treated with the transient shunt technique. The technique was ineffective in five patients who were admitted with an average of 12 hours of ischemic priapism (Table 1).

Permanent detumescence was achieved in the first 10

minutes in 9 of 15 patients. Nevertheless, the surgical team waited for an additional 10 minutes in accordance with previous literature [5]. The transient shunt technique was also tried in two cases of late priapism who presented after 18 and 23 hours. In the case with 18 hours of priapism after the combined intracavernous injection and stimulation (CIS) test, the technique was performed successfully. However, the procedure time to achieve flaccidity was longer (20 minutes) than the other patients' procedure time (about 10 minutes). We also needed more compression in order to increase pressure inside the corpora cavernosa, because the patient had full wax-and-wane erections four times during the procedure. In the other late priapism patient with 23-hour priapism and in three other patients, the transient technique was unsuccessful and the patients underwent snake shunt tunneling [6].

In one of the successfully treated cases, the transient shunt technique was applied bilaterally by using two blood collection sets, which led to a rapid decrease in rigidity. Although some of the patients had mild to moderate ED before priapism, four had normal erectile function according to the IIEF-5 questionnaire. All four men had been in relationships within the previous 6 months. The erectile capacities of the patients were not changed after the transient shunt technique.

The most common etiology of priapism was a CIS test applied for either diagnostic or therapeutic reasons. During the study period of 13 months, 243 patients had undergone the CIS test for a therapeutic reason in our clinic. Intracavernosal injections were administered clinically as a single agent (papaverine 30–60 mg/mL) or in a bi-mix combination (papaverine 30 mg/mL+phentolamine 0.5 mg/mL). Nine of 243 patients developed CIS test-related priapism. Seven and two of the nine CIS test-related cases were administered the single agent or the bi-mix combination, respectively.

We demonstrated that outflow from the 21 G blood collection set by gravity and high pressure (50 mmHg) were 1.5 mL/min and 15 mL/min, respectively. When we approximated the diameter and the length of the corpus cavernosum (as 1.0 cm and 20 cm, respectively), total cavernosal erectile volume was calculated as 31.4 mL by  $V = \pi \times r^2 \times \text{length}$ .

## DISCUSSION

Ischemic priapism typically features little or absent intracorporeal blood flow. Accordingly, it represents a true compartment syndrome involving the penis, in which there are characteristic metabolic changes and excessive intracorporeal pressure increases. On a practical level, ischemic priapism warrants emergency management after 4 hours. The disorder is also coupled with significant psychological and emotional trauma.

The insertion of a vein needle directly into the corpus cavernosum to aspirate blood has both diagnostic and therapeutic purposes. The techniques for penile blood aspira-

tion vary, ranging from insertion of a transglanular intracorporeal angiocatheter (16 or 18 gauge) in the manner of the Winter shunt to proximal corpora cavernosal needle placement for maximal corporal body irrigation [7]. Priapism resolves following aspiration with or without irrigation in approximately 30% of patient presentations [1].

Sympathomimetic agents are importantly applied because of their contractile effects, which may facilitate detumescence [8]. The medical literature suggests that a higher resolution of ischemic priapism follows the concomitant use of sympathomimetic agents with or without irrigation (43% to 81%) than aspiration with or without irrigation alone (24% to 36%) [9]. However, the active agents, mostly alpha-adrenergics, may lead to side effects, especially in older patients. Monitoring for side effects when using such agents is important, and blood pressure and electrocardiogram evaluation should be applied in patients with high cardiovascular risk [1].

Surgical shunting, as a second-line treatment, is instituted for priapism refractory to intracavernosal treatment [1,2]. The objective of surgical shunting is to facilitate blood drainage from the corpora cavernosa bypassing the veno-occlusive mechanism of these structures. Axiomatically, the least invasive surgical procedure is performed first, beginning with distal penile procedures before proceeding to more proximal ones.

A distal cavernoglanular shunt should be the first choice given the ease with which the procedure is performed and its association with few complications [1]. Distal shunt procedures include placing a large-bore biopsy needle of a Trucut or Biopty gun biopsy device (Winter shunt) [10] or a scalpel (Ebbehoj shunt) [11] percutaneously through the glans penis or excising the tunica albuginea at the tip of the corpus cavernosum (Al-Ghorab shunt) [12].

Modifications have also recently been described for the Ebbehoj shunt, such as the "T shunt" developed by Lue and Pescatori [13]. Burnett and Pierorazio [6] described corporal "snake" maneuver as a modification of the Al-Ghorab. The Al-Ghorab procedure is regarded to be the most effective distal shunt, although it is more invasive and thus is commonly performed secondarily [1].

Proximal shunting involves creating a window between the corpus cavernosum and the corpus spongiosum (Quackels or Sacher shunt) [14] or anastomosing the saphenous vein (Grayhack shunt) [15] to one of the corpora cavernosa. ED rates are higher for the proximal shunts, Quackels and Grayhack, (about 50%) than for the distal shunts (25% or less). However, patient selection and time to treatment may be the main explanation for these differences. Each surgical shunting procedure may have its own constellation of adverse events. Assessing the literature is difficult because patients frequently receive multiple treatments and therefore it is difficult to ascertain which treatment produced an adverse event. The possibility exists for ED to develop following a shunt procedure. This may be expected in some instances because the procedures do involve disrupting the veno-occlusive mechanism

of the penis required for maintenance of penile erection. However, if a shunt does not close in time spontaneously, shunt closure has succeeded in recovering erectile function [16].

The transient shunt technique described here can be classified as a variation of a distal cavernospongiosal shunt. In distal shunts, the idea is essentially to restore continuity between the corpus cavernosum and glans penis and to allow absorption of blood through the corpus spongiosum. It was previously demonstrated that intracavernosal pressure of <40 mmHg for >10 minutes was necessary for a successful shunt [5].

This time frame is easily achieved by the transient shunt technique, which is advantageous for and possibly limited to early priapism (priapism of up to 7 hours' duration).

In this study, we demonstrated that 73.3% of the patients with early ischemic priapism were treated effectively. The technique was not effective in five cases (26.7%). Mean admission time was 7 and 12.5 hours in three and two unresolved cases, respectively. One of the patients, who was admitted after 7 hours, had sickle cell disease. However, the other two patients (cases 12 and 13 in Table 1) were relatively young and did not have a long duration or complicated causes. According to previous studies, some drugs may have higher serotonergic, dopaminergic, and alpha-adrenergic antagonist properties [17]. We believe that this kind of higher affinity may have played a role in these two unresolved patients. We recommend that this technique be offered to patients with an ischemic priapism episode of no more than 7 hours, because the average admission time of effectively treated patients was 6.2 hours. The percentage of cases resolved is clearly higher than for previously reported aspiration or irrigation maneuvers. We suggest that the effectiveness of the transient shunt technique may be explained mainly by high blood turnover before organized clot formation in the corpus cavernosum, which leads to more oxygenated blood. The mean total erectile volume was approximately 34 mL by sonographic measurement of the corpus cavernosa [18]. We also verified that the approximate total erectile volume was 31.4 mL, which can be easily drained in 2 minutes by use of the 21 G blood collection set used in this study. This may lead to a fresher and more oxygenated blood supply via the arterial system to the penile tissue, which helps to eliminate active drug in the corporal tissue. Another explanation for the high success rate may be leaving the blood collection set in place for at least 10 minutes after achieving detumescence. In this way, the blood collected in the corporal bodies was more than five times that of the simple aspiration method. Additionally, it is unlikely that this technique will produce more trauma at the penile shaft than do the standard "transglanular" cavernospongiosal shunts. However, hematoma formation involving the penile shaft can be seen after removal of the needle from the corpus cavernosum. Because of this likely hematoma, an elastic bandage should be applied for about an hour.

Patients under local anesthesia tolerated this transient

distal penile corporoglanular shunt technique well. Patients under local anesthesia were cooperative, which smoothed the progress of the shunt. However, most of our shunt techniques were applied under general anesthesia. General anesthesia was requested mainly because of the delayed average admission time, which could lead to the use of one of the distal cavernoglanular shunt procedures. The patients' choice and their anxiety were other important reasons for choosing general anesthesia.

The transient shunt technique was performed bilaterally in one case. Naturally, flaccidity was reached faster; however, it was not easy to manage two blood collection sets at the same time. Actually, unilateral application was sufficient in effectively treated patients. Manual compression of the penis (Fig. 2) was also useful to assist in quicker blood evacuation.

## CONCLUSIONS

In conclusion, this presented technique is technically simple and can be performed under local anesthesia as an outpatient procedure. These case histories demonstrate the technical feasibility and potential role of this shunt technique. The intervention is not just feasible, but is also logically based on previous surgical techniques for priapism. Of further importance, patients treated by use of this technique were observed to preserve their baseline sexual function, which suggests that the intervention retained anatomical structures.

We consider that this novel technique, although simple to use, presents some advantages over aspiration and irrigation methods in the treatment of early ischemic priapism. First, because the surgeon does not need to aspirate blood and take it out, the technique offers a bloodless operation area. Second, the technique does not necessitate sympathomimetic agents; therefore, there is no need to monitor for or worry about side effects. Last, our findings did not indicate that the intervention created a greater display of priapism than the baseline situation or precluded other more invasive interventions, if needed. In cases of more delayed priapism episodes (i.e., 8 hours to a few days), patients will still require more aggressive blood evacuation throughout each corpus cavernosum, either by snake shunt or T shunt tunneling.

## CONFLICTS OF INTEREST

The authors have nothing to disclose.

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