

## ORIGINAL ARTICLE

# Unsatisfactory outcomes of prolonged ischemic priapism without early surgical shunts: our clinical experience and a review of the literature

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Ischemic priapism is a rare occurrence which can cause severe erectile dysfunction (ED) without timely treatment. This retrospective study reports our experience in treating prolonged ischemic priapism and proposes our further considerations. In this paper, a total of nine patients with prolonged ischemic priapism underwent one to three types of surgical shunts, including nine Winter shunts, two Al-Ghorab shunts and one Grayhack shunt. During the follow-up visit (after a mean of 21.11 months), all patients' postoperative characters were recorded, except one patient lost for death. Six postoperative patients accepted a 25-mg oral administration of sildenafil citrate. The erectile function of the patients was evaluated by their postoperative 5-item version of International Index of Erectile Function Questionnaire (IIEF-5), which were later compared with their premorbid scores. All patients had complete resolutions, and none relapsed. The resolution rate was 100%. Seven patients were resolved with Winter shunts, one with an Al-Ghorab shunt and one with a Grayhack shunt. The mean hospital stay was 8.22 days. There was only one urethral fistula, and the incidence of postoperative ED was 66.67%. Four patients with more than a 72-h duration of priapism had no response to the long-term phosphodiesterase type 5 (PDE-5) inhibitor treatment. These results suggest that surgical shunts are an efficient approach to make the penis flaccid after prolonged priapism. However, the severe ED caused by prolonged duration is irreversible, and long-term PDE-5 inhibitor treatments are ineffective. Thus, we recommend early penile prosthesis surgeries for these patients.

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## INTRODUCTION

Priapism is a urological emergency typified by a persistent and painful erection without sexual stimulation usually lasting for longer than 6 h and typically involving only the corpora cavernosa.<sup>1</sup> There are three subtypes of priapism according to episode history, blood gas analysis and color Doppler ultrasonography of the corpus cavernosum: ischemic, stuttering and non-ischemic. Ischemic priapism is the most common type.

Ischemic priapism is associated with a decrease in venous outflow and vascular stasis, which is also called low-flow priapism. Because of tissue ischemia, patients always feel pain, and immediate treatment is necessary to prevent penile fibrosis and even necrosis.<sup>2</sup> The options range from aspiration to surgical shunts and even penile prosthesis surgeries<sup>3</sup> in accordance with the clinician's judgment. However, in prolonged cases, subsequent erectile dysfunction (ED) is usually inevitable. Prolonged duration and surgical shunts are thought to be possible causes for ED. However, which is the primary cause and whether a long-term phosphodiesterase type 5 (PDE-5) inhibitor can restore erectile function remain under investigation. In this report, we discuss nine cases of ischemic priapism occurring within the past 7 years

resolved with surgical shunts. A 25-mg oral administration of sildenafil citrate was used to attempt to restore erectile function. We also present our clinical experience and lessons and attempt to propose our management algorithm for this condition.

## MATERIALS AND METHODS

Between March 2006 and September 2010, nine cases of emergency ischemic priapism were treated. The mean age of patients was 40.44 years (25–65 years), and the mean duration of priapism was 96.33 h (13–168 h), including two cases of under 24 h and seven cases of over 72 h. Of the nine patients, six had normal sexual capabilities before priapism, and three had experienced ED for a long time. Seven patients had concomitant diseases, such as chronic myelogenous leukemia (CML), infection and cancer. All of the patients had failed with first-line treatments in other hospitals, such as aspiration and intracavernous injection in turns.

All patients underwent a series of examinations, including a physical examination, blood gas analysis, color Doppler ultrasonography of the corpora cavernosa and complete blood cell count. The patients' histories of the episode and premorbid 5-item version of International

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Index of Erectile Function Questionnaire (IIEF-5) were also reviewed. In detail, one patient with CML had complete ED (IIEF-5 score of 5), and two with malignant tumors had no sexual activity for an extended period of time (IIEF-5 scores of 1). The other patients were normal (IIEF-5 scores of 25). The nine patients were initially treated with a Winter shunt,<sup>4</sup> and all but two patients were released. These two patients later underwent an Al-Ghorab shunt,<sup>5</sup> but one was still experienced erection. This patient then underwent a Grayhack shunt.<sup>6</sup> In addition, one patient with penile tumor underwent a biopsy during the operation. The patients' characteristics are summarized in **Table 1**.

## RESULTS

No patient reported dysuria, frequency or urgency, and no patient had hematuria on urinalysis. Effective resolutions were observed in all patients, and the resolution rate was satisfactory (100%): seven, one and one patients were resolved with Winter shunts, an Al-Ghorab shunt and a Grayhack shunt, respectively. The only early complication, urethral fistula, was observed and closed without any treatments in 7 months postoperatively. The biopsy indicated that the patient had a penile metastatic epithelial angiosarcoma, and a partial penectomy was performed later. The mean hospital stay was 8.22 days (6–11 days), and the mean follow-up period was 21.11 months (4–51 months). No additional priapism occurred during the follow-up. Long-term follow-up surveys were used through the outpatient service, combining telephone interviews during every other outpatient service. In the follow-up, only two patients whose durations were shorter than 24 h had normal erectile function. A different degree of ED was observed in the other seven patients with durations over 72 h. In these seven patients, three had obtained ED before priapism, and the other four lost their sexual capabilities after priapism, which indicates a high incidence of ED (66.67%). Patients No. 1, 2, 4, 5, 7 and 9 were treated with sildenafil citrate 1 month postoperatively at a 25-mg oral dosage taken three times weekly. Patients No. 7 and 9 had 3-month and 4-month medical managements, respectively, and subsequently discontinued the sildenafil, due to the recovery of sexual function. Patients No. 1, 2, 4 and 5 accepted the sildenafil treatment for at least 1 year, but their erectile function still remained unrecovered. Sexual capabilities of the patients were evaluated by IIEF-5 scores, and all postoperative scores are displayed in **Table 2**. An old man with penile epithelial angiosarcoma passed away in February 2011.

## DISCUSSION

Ischemic priapism is usually associated with many concomitant diseases and risk factors, such as hematological, traumatic, surgical,

neoplastic, neurological, infective and pharmacological factors. Numerous studies<sup>7,8</sup> have indicated that leukemia and malignant tumors are associated with priapism, and several psychotropic drugs have also been reported to cause priapism as a side effect.<sup>9,10</sup> In our series, seven patients had primary diseases, and the other two denied obvious precipitating factors, including three with CML, two with a malignant tumor, one with infection and one with schizophrenia. In these patients with original diseases, especially the hematological and coagulative disorders, a systemic therapy and prophylaxis must be encouraged in addition to emergency treatments.<sup>11</sup>

Because of the serious complications of ischemic priapism, emergency interventions should be performed as quickly as possible. In general, intracavernous injection of an  $\alpha$ -adrenergic sympathomimetic agent is the first choice when the duration is less than 4 h. When ischemic priapism lasts more than 4 h, decompression of the corpora cavernosa is recommended for releasing the ischemic effects, including pain sensations.<sup>12</sup> The therapy consists of evacuating blood and irrigation of the corpora cavernosa (corporal aspiration), along with the intracavernous injection of an  $\alpha$ -adrenergic sympathomimetic agent, which are the recommended first-line treatments.<sup>13</sup> However, in the long-duration or refractory ischemic priapism cases, particularly durations up to 48–72 h, the surgical shunting is more effective than intracavernous treatment. The technical design of penile shunt surgery is principally that of creating an opening in the tunica albuginea of the corpora cavernosa, which communicates with the glans, corpus spongiosum or a vein for blood drainage. Four subdivisions of shunt procedures are described by various contributors.<sup>14</sup> The resolution is characterized by making the penis completely return to a flaccid state. From our limited cases' experience, the Winter shunt is effective for most prolonged ischemic priapism. The Al-Ghorab shunt and Grayhack shunt are other choices for cases of failure after a Winter shunt. Several investigators have indicated patients with refractory ischemic priapism of 2- to 6-day durations whose priapism resolved after receiving Al-Ghorab distal penile corporoglanular shunt and partial erection recovery was observed.<sup>15</sup> This finding indicates that a surgical shunt is occasionally feasible to resolve prolonged priapism efficiently and to preserve a certain degree of erectile function.

In our follow-up survey, the postoperative sexual function of all patients was evaluated at different time periods by IIEF-5 scores, and our results indicated that most patients had severe or even complete ED. ED was influenced by two factors: shunt surgery and a prolonged duration of ischemic priapism. The persistence of a shunt has been considered to be a cause for ED.<sup>16</sup> However, Brant and colleagues<sup>17</sup> reported 13 patients with ischemic priapism who underwent surgical

**Table 1 Summary of patient characteristics and results**

No.	Age (year)	Precipitating factor	Duration (h)	Treatment (result)	Complication	Relapse
1	48	None	102	Winter+intracavernous injection (failed) Al-Ghorab (successful)	None	None
2	30	Risperidone	72	Winter+intracavernous injection (failed) Al-Ghorab (failed) Grayhack-shunt (successful)	Fistula	None
3	47	CML	96	Winter+intracavernous injection (successful)	None	None
4	27	CML	144	Winter+intracavernous injection (successful)	None	None
5	25	CML	84	Winter+intracavernous injection (successful)	None	None
6	65	Liver cancer	168	Winter+intracavernous injection (successful)	None	None
7	41	Sacroiliac abscess	20	Winter+intracavernous injection (successful)	None	None
8	41	Epithelial angiosarcoma of the penis	168	Winter+intracavernous injection (successful) partial penectomy	—	—
9	31	None	13	Winter+intracavernous injection (successful)	None	None

Abbreviation: CML, chronic myelogenous leukemia.

**Table 2 Outcomes of the follow-up and the evaluation of patients' sexual capabilities**

No.	Follow-up (month)	Postoperative sildenafil management (month)	Penile length	Premorbid IIEF-5	Postoperative IIEF-5	
					6 months	12 months
1	48	12	Unchanged	25	5	5
2	32	15	Unchanged	25	5	5
3	14	—	Unchanged	5	5	5
4	18	12	Unchanged	25	5	6
5	13	13	Unchanged	25	6	6
6	51	—	Unchanged	1	1	1
7	13	3	Unchanged	25	20	23
8	4	—	—	1	Dead	Dead
9	15	4	Unchanged	25	23	23

Abbreviation: IIEF-5, 5-item version of International Index of Erectile Function Questionnaire.

shunts, and erection recovery was observed in eight of 11 patients who did not have pre-existing ED, which indicated that the surgical shunt was not the major influencing factor. However, Nixon and colleagues<sup>18</sup> suggested that ED in patients after shunting procedures may be a direct result of the prolonged priapism itself. A prolonged duration of ischemic priapism is well-known to cause functional and structural impairments of the penis and subsequently interfere with sexual activity.<sup>19,20</sup> Many investigators have reported that corporal fibrosis caused by a notably prolonged duration greatly influences erectile function.<sup>21</sup> The corporal fibrosis will lead to secondary ED despite successful resolution of prolonged priapism with effectively administered first-line or second-line (penile shunt surgery) treatments.<sup>22</sup> Our follow-up survey also indicated that patients' sexual capabilities were influenced by the duration of priapism and not the shunts because shunt closure will cause erectile function to recover successfully, as observed in patients No. 7 and 9.

In the subsequent treatment, we attempted to recover erectile function with a 25-mg dosage of sildenafil citrate, which has been reported to be effective and safe for the treatment of ED.<sup>23</sup> In recent years, long-term PDE-5 inhibitor treatment has been used to alleviate priapism recurrences by many investigators.<sup>24,25</sup> Levey *et al.*<sup>26</sup> also suggested long-term PDE-5 treatment for the medical management of ischemic stuttering priapism. This treatment's efficacy was usually observed within 2–4 weeks of dosing.<sup>27</sup> PDE-5 inhibitors should be started in patients under conditions of complete penile flaccidity and not during a recurrent episode. Thus, we began the medical treatments after confirming that the patient was not experiencing a recurrent episode. In the 2-year clinical management program led by Burnett, the results demonstrated that erectile function was unchanged in six patients who accepted long-term PDE-5 inhibitor treatment and improved in one patient at the last follow-up compared with baseline status.<sup>24</sup> In our follow-up survey, all patients undergoing sildenafil treatment had no priapism recurrences, and four patients with prolonged durations had no response to the small dose sildenafil citrate, which was consistent with Burnett's results. It indicated that ED caused by prolonged priapism is always irreversible. This study also indicated that prolonged duration was the primary factor of ED after shunt surgery.

Patients who underwent surgical shunts in our series experienced ED, indicating that this approach was not effective in preserving sexual capability. The patients also had no response to the long-term PDE-5 inhibitor treatment. In this scenario, any man experiencing severe ED should undergo penile prosthesis surgery because other options for treating the problem are undesirable or ineffective.<sup>22</sup> In contrast to the normal and selective penile prosthesis surgeries, this intervention is required as early as possible. The

International Society for Sexual Medicine Standards Committee guidelines recommend immediate penile implant surgery when the duration of erection is over 72 h.<sup>28</sup> Patients who failed with conventional treatment, including penile shunt surgery, have shown evidence of cavernosal smooth muscle necrosis and a reduction of penile length caused by corporal fibrosis after a significant delay.<sup>19</sup> Corporal fibrosis increased the difficulties of a prosthetic devices implant.<sup>29,30</sup> Occasionally, corporal dilation may be performed unsuccessfully without corporal tissue excision.<sup>31</sup> An additional advantage of early penile prosthesis surgery is that it is easier to limit major penile scarring, which may reduce the risk of procedural complications.<sup>22</sup> This consideration is why the early implantation before extensive corporal fibrosis develops is preferred. Sedigh and colleagues<sup>32</sup> reported that the early insertion of prosthesis resulted in long-term high satisfaction rates. The investigators acknowledged the challenges of corporal fibrosis and promoted the concept of early implantation within 6–18 months after priapism.<sup>31</sup>

Due to the lack of standby prosthesis for an immediate penile implant operation, we had to use surgical shunts to first make the penis flaccid and advised four of the patients to accept secondary penile prosthesis surgeries within 6 months postoperatively. This two-stage surgery could also preserve sexual capability, as well as early penile implant surgery.<sup>31</sup> However, all of the patients refused because of the high surgical costs. Rough oral communications with our patients suggested that all of the 5 patients considered the curative fee first. Conservative sexual attitudes made the patients less interested in retaining their sexual capabilities, and a number of the patients also had apprehensions regarding prosthesis implant surgery. In addition to medical factors, sociocultural and economic factors also influenced patients' choices. However, these results are limited to our clinical experience in this series. Further investigation should determine what influences patient decision-making in a large sample survey of patients with ED.

## CONCLUSION

Our results were not satisfactory in the long term, but we still gained clinical experience in the treatment of prolonged priapism. Surgical shunt is an efficient approach to relieve priapism, even in those patients presenting a priapic duration of more than 72 h. However, the subsequent ED caused by prolonged duration is irreversible, and long-term PDE-5 inhibitor treatment is ineffective. Therefore, we agree with the guidelines of the International Society for Sexual Medicine Standards Committee and recommend early penile prosthesis surgeries for these patients.

## AUTHOR CONTRIBUTIONS

DCZ and HJY conceived of the study, participated in its design and coordination and drafted the manuscript. HJY, KZ, MXX, QC and ZKC participated in the study design, performed the surgical shunts and conducted the outpatient service. DCZ, HJY, MJL and YBC participated in the data acquisition. DCZ, MJL and ZW made critical revisions to the manuscript regarding important intellectual content.

## COMPETING FINANCIAL INTERESTS

All authors declare that there are no competing financial interests.

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