

## ORIGINAL RESEARCH—SURGERY

### Methylene Blue-Guided Repair of Fractured Penis

Osama Shaeer, MD\*†

\*Department of Andrology, Faculty of Medicine, Cairo University, Cairo, Egypt; †Andrology and ART, Kamal Shaeer Hospital, Cairo, Egypt

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#### ABSTRACT

**Introduction.** Fracture of the penis is a condition where excessive force applied to the long axis of the penis in the erect state results in rupture of the tunica albuginea of the corpus cavernosum. Surgical management can be confusing and time-consuming due to the concealment of the tear in organized blood and edematous tissue, necessitating extensive dissection in friable traumatized tissues, especially if the tear is a small one, or if there are multiple tears.

**Aim.** The present work investigates the value of methylene blue in aiding the localization of tunical and urethral tears in such cases.

**Patients and Methods.** Twelve cases with delayed presentation of fracture penis were managed. In six patients, methylene blue was injected into the corpora cavernosa and through the urethral meatus to point out tears. In the other six patients, methylene blue was not used.

**Main Outcome Measures.** Operative time and complication rate.

**Results.** Operative time was considerably less in the group that received methylene blue, and the repair was more straightforward. Complications issued only in the group that did not receive methylene blue considering the extensive lengthy dissection.

**Conclusion.** Methylene blue-guided repair for trauma of the penis is an easy, reliable, safe, and fast method for spotting tears in the tunica albuginea of the corpora cavernosa or in the urethra, eliminating the need for unnecessary lengthening. **Shaeer O. Methylene blue-guided repair of fractured penis. J Sex Med 2006;3:349–354.**

**Key Words.** Blunt Trauma and Sexual Dysfunction; Fracture; Tunica Albuginea

#### Introduction

Fracture of the penis is one of several ways by which blunt trauma can result in tearing of the tunica albuginea of the corpus cavernosum. Excessive force applied to the long axis of the penis in the erect state forces the penis to comply by bending, commonly in a dorsal direction, considering the reinforced dorsal aspect of the corpora cavernosa that makes ventral bending less likely. Dorsal bending results in rupture of the tunica albuginea of the ventral surface.

Injury usually occurs during intercourse, in the event that the erect penis presses forcibly against the perineum rather than slipping into the vagina.

This occurs mostly in the female-on-top position. Characteristically, a painful snap is felt, erection is lost immediately, a hematoma forms, and edema develops (Figure 1). In most cases, the hematoma stops progressing in size shortly after injury, since pain results in vasoconstriction of the penile arterial supply. The hematoma is formed of the blood that stretched the cavernosal spaces right before the injury rather than persistent progressive bleeding.

Management can be either by immediate surgical intervention or by conservation, considering that the hematoma is nonprogressive and the tunica albuginea can heal spontaneously. However, considering the large size of tears that have



**Figure 1** The penis at presentation: irregular swelling giving no specific clue as to where the tear is.

been encountered in many cases, and considering that erection may cause re-progression of the hematoma, and that organization of the hematoma and scarring of the tunical tear may cause penile deformity or curvature, immediate surgical intervention is highly recommended [1].

Surgical management centers upon evacuation of the hematoma, finding and repairing the tear (or tears) in the tunica albuginea, and exclusion or repair of urethral injury. Unfortunately, the tear in the tunica albuginea may be difficult to spot, being concealed in organized blood and edematous tissue, necessitating extensive dissection in friable traumatized tissues, especially if the tear is a small one, or if there are multiple tears. This confusion

may cause unnecessary lengthening of the operative time and predisposes to infection due to creation of multiple planes within traumatized edematous tissues of low vascularity.

The present work investigates the value of methylene blue in aiding the localization of tunical and urethral tears, in cases of trauma to the penis.

## Methods

Thirty-two cases of fractured penis were managed through the period from 2001 to 2005, 12 of which were selected for the study based on the delayed presentation (more than 12 hours). The study was confined to cases with delayed presentation as diagnosing the site and number of tears using ultrasonography was more difficult in these patients in comparison with those with early presentation.

The 12 patients were divided into six patients for whom methylene blue was used (group a) and six managed without methylene blue (group b). Mean age for group a was 36.7 years, and for group b: 35.8. All cases had the same mode of injury where the erect penis pushed forcibly against the perineum during intercourse, followed by immediate snapping, pain, loss of erection, and swelling of the penis. Average time lapse before presentation was 15.7 hours for group a, and 15.8 for group b. Further clinical data are summarized in Table 1.

Swelling involved most of the shaft, irregularly (Table 1). In most cases, edema could not be

**Table 1** Clinical data

	Clinical data						
	Patient data		Time laps (hours)	Site and size of the swelling	Associated Injuries	Duplex	
	Number	Age				Site of tear	Site and size of hematoma
Methylene blue	1	35	14	All ventral aspect	None	Not visualized	Indistinguishable
	2	37	14	Ventral, distal two-thirds	None	Not visualized	Ventral, distal third
	3	33	18	All ventral aspect	None	Not visualized	Indistinguishable
	4	28	13	Ventral, distal two-thirds	None	Ventral, distal third	Ventral, distal two-thirds
	5	45	20	All ventral aspect	None	Not visualized	Indistinguishable
	6	42	15	Ventral, distal two-thirds	None	Not visualized	Ventral, distal third
No methylene blue	1	44	16	Ventral, distal two-thirds	None	Not visualized	Ventral, distal third
	2	34	12	Ventral, distal two-thirds	None	Ventral, middle third	Ventral, distal two-thirds
	3	32	16	Ventral, proximal two-thirds	None	Not visualized	Indistinguishable
	4	46	19	All ventral aspect	None	Not visualized	Indistinguishable
	5	29	19	All ventral aspect	None	Not visualized	Indistinguishable
	6	30	13	All ventral aspect	None	Not visualized	Ventral, proximal two-thirds

sharply demarcated from hematoma, especially if the hematoma is not tense (Figure 1). Swelling progressed during the first 3 hours (on average) following trauma, and then stabilized. Micturition was normal in all cases, and no blood issued per the urethral meatus.

Ultrasonography showed an organized hematoma that could not be sharply distinguished from the surrounding edema or the tunica albuginea. The site of the hematoma aided planning the incision for exploration, but a definitive tear in the tunica albuginea was visualized only in the minority of cases, mainly in those with earlier presentation, where the hematoma is hypoechoic relative to the surroundings.

Surgical exploration started by a semicircular ventral incision, 1 cm below the borders of the hematoma, or if the hematoma cannot be distinguished, in the least edematous ventral skin. We try to avoid an incision in edematous skin because our experience was that the incision may gape with the first episode of morning erection in the post-operative period. By delivering the shaft through this incision, we had access to the whole length of the ventral shaft. The hematoma was then evacuated. An alternative incision is the dorsal penopubic incision. The virtue of this incision is that it is away from the edematous traumatized skin, ensuring better wound healing. On the other hand, being away from the traumatized aspect of the penis, it adds some difficulty to the procedure and necessitates avoidable manipulation.



**Figure 2** The first encountered tear is far from the site of another tear in the tunica albuginea.



**Figure 3** Methylene blue injected into the corpora cavernosa and seeping from the tear in the tunica albuginea.

As for the six patients where methylene blue was not to be used (group b), Buck's fascia was dissected off the tunica albuginea proximally and distally until the tear was encountered and multiple tears were excluded. Because a tear in Buck's fascia does not necessarily overlie one in the tunica albuginea, therefore an intact Buck's fascia was not dependable for exclusion of tunical tears (Figure 2).

In the other six cases, methylene blue was used (group a): a tourniquet was applied to the base of the penis, a butterfly cannula was inserted into each corpus cavernosum, and methylene blue was injected. The tourniquet decreased bleeding that concealed the surgical field, and methylene blue was seen issuing from the tunical tear, or tears, allowing accurate and fast localization of the tears (Figure 3). Each corpus was cannulated individually so that the minimum of injected volume will be sufficient for diagnosing the site of the tear on either side. Otherwise, a large volume of methylene blue would have been needed to fill up one corpus then seep into the other across the intercommunication.

If after spotting a tear, methylene blue still seeped from an obscure location, dissection was extended in the direction from which methylene blue issues. The tourniquet was then removed and the tear was repaired by freshening the edges and sealing by continuous interlocking slowly absorbable sutures. Methylene blue was re-injected to ensure a water-tight repair. It was also injected into the urethra by inserting the lubricated nozzle of the syringe without the needle into the meatus, to exclude urethral injury.

**Table 2** Operative and postoperative data

	Patient data Number	Operative data				Postoperative data	
		Tear site	Tear number	Rout to the tear	Operative time (minutes)	Hospital stay (days)	Complications
Methylene blue	1	Ventral, proximal third	1	Direct	14	1	None
	2	Ventral, middle third	1	Direct	13	1	None
	3	Ventral, proximal third	1	Direct	14	1	None
	4	Ventral, middle third	1	Direct	15	1	None
	5	Ventral, middle third	2	Direct	14	1	None
	6	Ventral, middle third	1	Direct	13	1	None
No methylene blue	1	Ventral, middle third	1	Indirect	25	1	None
	2	Ventral, proximal third	1	Direct	35	5*	Missed tear
	3	Ventral, proximal third	1	Indirect	32	1	None
	4	Ventral, middle third	1	Indirect	30	2	None
	5	Ventral, middle third	1	Indirect	32	1	None
	6	Ventral, middle third	1	Indirect	31	4	Wound infection

\*Two days initially, then 3 days for the repair of the missed tear.

Buck's fascia was then approximated and sutured, and the skin was sealed with interrupted sutures to allow drainage of issuing blood, if any. Snugly fitting but noncompressing dressing was applied, changed after 3 days and permanently removed after 6 days.

## Results

In terms of operative time, the group that received methylene blue had considerably shorter operative time (14 minutes on average) and less dissection as compared with the group that did not receive methylene blue, where the operative time was an average of 32 minutes and total degloving of the penis was necessary (Table 2).

The postoperative period was uneventful for all patients. Follow-up for 2 months showed regaining of normal erection as well as normal anatomical form. The exceptions were two patients among those who did not receive methylene blue. One patient had a missed tear (diagnosed upon reoperation) that lead to hematoma formation after 5 days of the initial surgery. The other patient had infection and sloughing of a limited area of the ventral skin (Table 2).

Edema persisted in the patient group not receiving methylene blue for an average of 10 days, as compared with 2–3 days in the patient group managed using methylene blue.

## Discussion

In the process of surgical management of fractured penis, a number of questions are posed such as whether there is a tear in the tunica albuginea or

not, whether it is single or multiple, the whereabouts of the tear/tears, and whether the urethra is injured or not. These questions can render the procedure lengthy and confusing, and require unnecessary dissection.

Unlike sharp trauma to the penis, the tunical tear resulting from blunt trauma can be difficult to spot without extensive exploration of the shaft, the tears being concealed within the resulting hematoma and edematous tissues. This is more evident in cases presenting late, where the hematoma starts being organized and becomes less distinguishable from the surrounding edema, both clinically and sonographically. Edema conceals the hematoma (especially if it is a small collection), misleading the surgeon who intends to incise right over the hematoma, taking it as a guide for the site of the tear (Figure 1). This makes ruling out the presence of more than one tunical tear even more difficult (Figure 2).

It is reported that it may be difficult to find the tear in cases of ruptured penis [2]. This had led to proposing delayed repair (7–12 days) of the tear after the edema resolves and the hematoma organizes adequately, at which time surgical exploration will be limited to the area underneath the organized hematoma, which acts as a guide to the best point for surgical exploration [2]. However, our experience was that the tear does not necessarily underlie the hematoma. Blood may issue from the tunical tear, seep under Buck's fascia to emerge subcutaneously far from the tear. Moreover, morning erections that may follow the injury and precede the delayed repair may aggravate the hematoma. In our opinion, delayed repair also leads to unnecessary prolongation of morbidity,

hospital stay, delayed return to work, and a heavy psychological impact.

Cavernosography was proposed as a preoperative test to determine whether or not there is a tunical tear, and if there is, to determine its exact site [3,4]. Some authors adopting cavernosography proposed conservative treatment if no tear in the tunica can be demonstrated [3]. However, other studies showed that if cavernosography is negative for tunical tears, a torn deep dorsal vein may be the source of bleeding [4]. Accordingly, if there is a hematoma, we believe that surgical exploration is the safest way to go, even if cavernosography excludes a tear in the tunica. This is in agreement with a review of the literature for complications of conservative treatment which highly recommended surgical exploration to avoid deformity, pulsatile diverticulum, failure of conservation, and loss of penile turgidity [1]. Therefore, taking the decision for operating is not dependent on cavernosography, and delaying surgical intervention until diagnosis is confirmed by cavernosography is not necessary. Methylene blue can replace cavernosography for demonstrating a tear in the tunica albuginea, without a delay in surgical intervention in anticipation for cavernosography. It is also less costly. While cavernosography requires a painful injection to the traumatized patient unless there are intraoperative imaging facilities, methylene blue can be injected after the patient is anesthetized, sparing the patient the pain, and the physician the need for imaging facilities.

Ultrasonography is a simple, fast, and accurate tool by which the tear may be demonstrated in cases with early presentation, where the hematoma is still hypoechogenic (fluid collection) and distinguishable from edema and the tunica albuginea. In our experience, it failed to localize the exact site of the tear (as checked by surgical exploration) and failed to diagnose multiple tears in most cases. Instead, it gave provisional information about the probable site of the tear, by demonstrating the size and aspect of the hematoma. It was also useless in evaluating the urethra for tears. Only in the minority of cases with early presentation was sonography able to demonstrate and sharply demarcate a tear in the tunica albuginea. In cases with later presentation, the progressive organization of the hematoma renders its echogenicity similar to that of the surrounding edema and tunica albuginea. A tear cannot be demonstrated.

While urethrography may be required in some cases suspicious of urethral injury [5], methylene

blue injected via the urethral meatus can serve the same purpose with the minimum of diagnostic facilities.

In the absence of methylene blue, isotonic saline can be used instead. The vivid color of methylene blue provides more contrast against the penile tissues, helping tear localization. Saline lacks this property, but does not stain the tissues, a character of methylene blue that may be undesirable by some surgeons.

As a general surgical rule, gentle and minimal handling of tissues preserves more healing power and decreases the incidence of complications such as wound infection and dehiscence. The use of methylene blue can decrease operative time and dissection.

Thus, methylene blue-guided repair of fracture penis combines the virtues of urethrography on one hand, cavernosography and ultrasonography on the other, while being faster, more readily available, and less expensive. It can be used also to check that the repair is water-tight before closure.

Methylene blue is known to be safe for intravenous use and for injection into the penis, having been used to treat priapism [6]. It can be applied in the localization of tunical and urethral tears in all modalities of trauma to the penis, including fracture penis.

## Conclusion

Methylene blue-guided repair for trauma of the penis is an easy, reliable, safe, and fast method for spotting tears in the tunica albuginea of the corpora cavernosa or in the urethra, eliminating the need for unnecessary lengthening of the surgical repair, as well as the need for more complex imaging procedures.

**Corresponding Author:** Osama Shaer, MD, Faculty of Medicine, Cairo University—Andrology, 21 Gaber Ibn Hayan Street-Dokki, Cairo 12311, Egypt. Tel: (0020) 106600606; Fax: (0020) 27605181; E-mail: dr-osama@link.net

*Conflict of Interest:* None.

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