

RADIOLOGICAL EVALUATION OF CORPORA CAVERNOSA AFTER PRIMARY REPAIR OF PENILE FRACTURE

By

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Objectives: Evaluation of the effects of penile fracture on corporal anatomy after primary repair using cavernosography and post-cavernosography CT-scanning to demonstrate healing of tunical tear and its effects on penile shape and penile venous system.

Patients: Twenty-one men who underwent primary repair of penile fracture were included in this study. Patients selected had a normal penile anatomy before injury.

Methods: Patients were clinically evaluated for erectile function before and after injury. Primary repair was done within 24 hours of injury through a circumferential sub-glandular incision and penile skin de-gloving. Primary repair of the tear was done using continuous 5/0 suture. After a mean period of nine months of follow up, cavernosography was done for eight patients followed by post-cavernosography CT scan of the penis. Post-cavernosography reconstructed CT imaging formats were obtained to demonstrate the corpora in coronal and sagittal views.

Results: Two cases only had associated incomplete corpora cavernosal injury. Post-operative period was uneventful in all patients. Twenty patients regained normal erection after primary repair (95%). One patient only (5%) had erectile dysfunction in the form of failure to sustain erection. Twenty patients had no penile deformity during erection (95%). Penile curvature developed in one patient but has been insignificant. Cavernosography demonstrated tunica as black line at site of healing. Only one patient (4.8%) has venous leakage away from the healed tunical tear.

Post-cavernosography CT imaging demonstrated slight irregular indentation at the site of healing in all patients. Post-cavernosography reconstructed CT images in both sagittal and coronal views demonstrated distortion of the tunica albuginea at the healed tear as an irregular area and bulging to outside in the coronal views.

Conclusion: Primary repair of the penile fracture is effective in restoration of penile anatomy and erection in almost all patients. Cavernosography and CT scan of penis demonstrated the healed tear. Post-cavernosography CT and reconstructed CT views are the best means to demonstrate the healed tear in the tunica albuginea.

Key words: Penis, Penile fracture, Cavernosography, CT-scan

INTRODUCTION

Penile fracture is defined as rupture of the tumescent corpora cavernosa due to non-physiological bending of the penile shaft^(1,2). Tunica albuginea becomes thinner during erection (0.25 mm) and the sudden increase in the intracorporeal pressure leads to its rupture^(1,3). Vaginal intercourse is the most common etiology. It may occur after any type of blunt trauma affecting the tumescent shaft as rolling over onto an erect penis^(2,4). Patients typically present with complaints of a classic snapping or popping

sound, sharp penile pain, rapid detumescence and swelling with or without ecchymosis of the penile shaft^(3,4). Inspection may reveal an eggplant deformity as well as ecchymosis confined to Buck's fascia. Palpation may reveal a palpable defect in the tunica. Long-term results of conservative management indicated significant complications, such as curved or painful erection, fibrotic plaque precluding erection, arteriovenous fistula, infection and impotence^(1,2,3,5,6,7). The immediate primary repair of penile fracture is advocated because it showed excellent long-term results, including a decrease in the complications

associated with conservative management as well as decreased hospital stay^(8,9). Radiological work up was used for confirmation of the diagnosis of fracture penis to delineate the exact site of the tear and to exclude urethral involvement. Preoperative cavernosography and urethrography when indicated are important in demonstration of the cavernosal tear⁽¹⁰⁾. Pre-operative sonography helps to demonstrate the exact site of a tear in the tunica albuginea⁽¹¹⁾.

The aim of this study is radiological delineation of the tunical healed tear after penile fracture. Cavernosography and post-cavernosography CT-scanning were done at mean follow up of nine months. These procedures have not been presented before in the literature to demonstrate the healing process at the healed tunical tear.

PATIENTS AND METHODS

This study was conducted at El-Minia university hospital in the period from May 2000 to June 2002 as a prospective study. Twenty-one individuals with a mean age of 34 ± 8.5 years who had penile fracture were included in this study. All patients underwent primary repair within 24 hours of trauma. A Foley's urethral catheter is introduced. A circumferential incision was done two millimeters proximal to the corona. Penile skin was degloved till the penile base was reached. Clotted blood was evacuated and the tear was explored. The tunical tear was repaired with (5/0) sutures: proline (7 patients) and Vicryl suture (14 patients) in a continuous manner that was locked at each other stitch. Intra-corporeal injection of saline was done after repair to test the integrity of repair and to exclude other tears. A compressive band around the penis was left for two days. The catheter was removed after 24 hours of operation.

After a mean period of 8.9 ± 3.7 months, patients were clinically evaluated for their erectile function and presence of any penile deformities. Cavernosography followed by post-cavernosography CT-scans during artificial erection was done for eight patients. A 21-plastic canula is inserted into the distal part of ipsilateral corporal body. Papaverine is injected (10-30 mg) intracavernosally. After artificial erection, a saline-diluted contrast material (1:2) was infused at a rate of 30 ml/min and films were performed in an oblique projection. CT scan imaging was followed with dye flowing in the corpora using narrow-sections technique (3 mm) from the penile root distally to the corona. "GE Pro-speed CT scanner" was the CT apparatus used in this study. All CT-scan sections are processed in the computer of the CT apparatus to get reconstructed images including the whole corporal bodies in Saggittal and coronal sections.

RESULTS

Surgical exploration was done based on history and physical findings without preoperative radiographic studies. Exploration revealed unilateral transverse-shaped corporeal tear on the ventral and lateral aspect in all cases. The tear was in the proximal shaft in 19 patients (90.5%) and in mid shaft in only two patients. The length of the tunical tear ranges from one to two centimeters in twenty cases (95%) and more than two centimeters in one patient (5%). There was also extended tear to the corpus spongiosum in two patients but the urethra was intact in both (9.5%). Seventeen cases had the tear in right corpus cavernosum (81%). No intra-operative complications were encountered. Postoperative period was uneventful in all patients.

Morning erections were still preserved in all patients. All patients denied any curvature during erection. All patients reported erection adequate for intercourse in married individuals. One patient out of all patients in this study (4.7%) has been impotent after repair. This patient was 64 years old at injury. He has impotence in the form of inability to sustain erection that had been a previous complaint before injury.

Examination revealed homogenous tissue consistency on palpating the overlying area of the tear in patients whom tears were repaired by vicryl suture. In the seven patients whom tunical tear was repaired using proline suture can be felt as a small irregular line. CT- scan demonstrates irregular area of tunica at site of injury but there were neither scarring nor plaques at the tear site. Cavernosography demonstrated tunical tear as an oblique blackish line at the lateral aspect of the injured corpora showing the site of healing in the eight patients as shown in (Fig 1).

The colour of the tear is more blackish than the rest of the normal tunica albuginea. The patient with weak erection demonstrated venous leakage. The cavernosogram demonstrated venous leakage in the contralateral corpus spongiosum and not related to the tunical tear.

Post-cavernosography CT imaging demonstrated slight irregular indentation at the site of healing in six out of the eight patients who underwent CT Scan as shown in (Fig 2). The corporal expansion at the site of the tear is less than the same area in the contralateral corporal body. The tear itself is different in thickness and color than the normal surrounding tunica albuginea. Post-cavernosography reconstructed CT images in both saggittal and coronal images demonstrated the healed tear as an irregular area bulging to outside in the coronal views as shown in (Fig 3).

Operative data of the tunical tear

| <i>Operative Findings</i> | <i>Pathology</i> | <i>Number</i> | <i>(%)</i> |
|---------------------------|------------------|---------------|------------|
| 1. Extent: | -Unilateral | 21 | 100% |
| 2. Corpus cavernosum: | -Right side | 17 | 81% |
| 3. Corpus spongiosum: | -Superficial | 2 | 17% |
| 4. Urethral affection: | -Non-involved | 0 | 0.0% |
| 5. Site of tunical tear: | -Proximal shaft | 19 | 90.5% |
| 6. Length of tear: | -Mid shaft | 2 | 9.5% |
| | - 1-2 cm. | 20 | 95% |
| | -More than 2 cm. | 1 | 5.0% |



Fig. (1) Cavernosography: Healed tear in the right corpus cavernosum

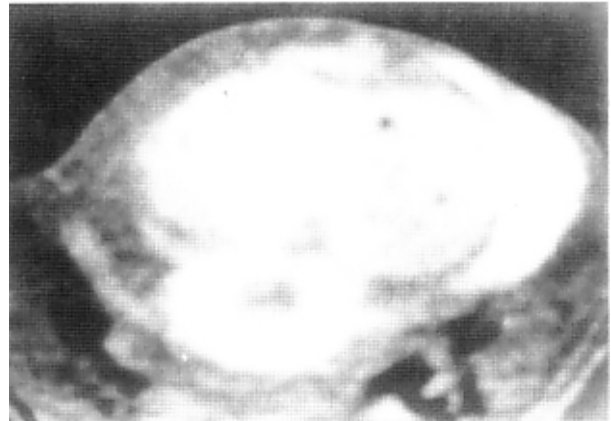


Fig. (2) Post-Cavernosography CT scan: Attenuated and irregular tunica at the healed tunical tear.

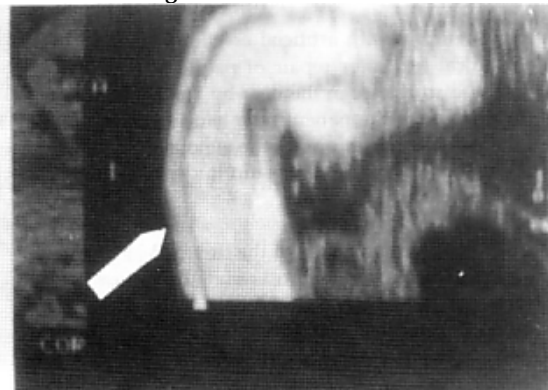
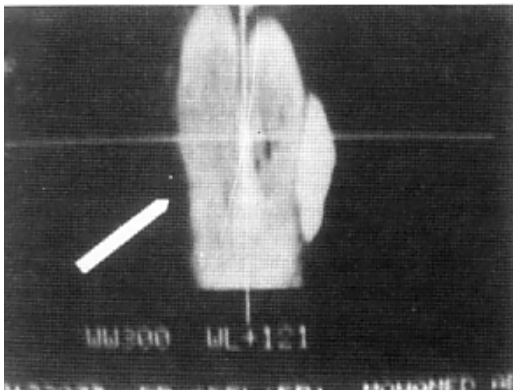


Fig. (3) Post-Cavernosography coronal and sagittal reconstructed CT-scan formats: Thinned irregular tunica in coronal view and irregular scarring in sagittal view at the site of tear

DISCUSSION

The penis is protected against trauma by its dependent position and mobility⁽¹²⁾. The erect penis is more prone to

blunt injury that lead to sudden increase in the intracavernous pressure beyond the tensile capacity of the thinned out tunica albuginea⁽¹³⁾. The diagnosis of penile fracture is usually based on typical clinical features and

associated history. Rupture of deep dorsal vein and the dorsal penile artery are reported in the literature and cause similar clinical situation⁽¹⁴⁾.

In our study, Penile fracture was unilateral in all cases. The right corpus cavernosum was more commonly injured than the left side (81%). Corpus spongiosum injury occurred in (17%) but the urethra was intact. The frequency of urethral injury reaches to 20-38% in the United State and Europe 13. One of the twenty-one patients (5%) has developed impotence. Twenty patients had no penile deformity during erection. One has insignificant that does not preclude intercourse. Pharmacological erection revealed normal erected penis in the eight patients who underwent cavernosography. In Mydlo's series, thirty three out of 34 patients reported erection adequate for intercourse without erectile or voiding dysfunction, while two reported mild to moderate curvature¹⁵. Delayed complications were reported in (12.2%) in the form of mild penile curvature on erection, plaques, and/or mild erectile dysfunction¹⁶. In our study, there were neither significant penile curvature nor plaques. In Uygur series, two patients had slight penile curvature that did not impede coitus. At long-term follow-up all patients reported satisfactory erectile function ¹⁷. Other series reported a successful outcome, with preservation of sexual function and without significant penile curvature

Radiographic preoperative work up as cavernosography, sonography and magnetic resonance imaging were reported in the literature to confirm diagnosis of penile fracture. Radiological post-operative evaluation including cavernosography and enhanced CT-scanning of the corporal bodies termed as post-cavernosography CT-scanning was not described in the literature.

Cavernosography with artificial erection revealed that the healed tunical tear after repair of penile fracture does not lead to any disturbance in the near-by venous occlusive mechanism. Even with the patient who had impotence that is proved to be venogenic in origin, the venous leakage was in the contralateral corpus spongiosum and not related to the prior tunical tear.

Blackish discoloration at site of the tunical tear denotes that healing does occur with fibrosis and the tunica itself does not regenerate to cover the linear gap after nine months of the trauma. This blackish discoloration at the healed tunical tear was demonstrated in all cavernosograms.

The post-cavernosography CT is a new imaging modality we use to facilitate the demonstration of the healed area during penile erection. The irregular indentation at the site of healing was demonstrated in all cases. These indented healed areas do not thin out and expand fully with corporal tumescence. On follow-up magnetic resonance

imaging (MRI) in Uder's study, the tunical suture shortly after the repair showed an increase in signal intensity on pre-contrast T1 WI that was strongly enhanced with the administration of contrast material. Then the tear site gradually recovered low signal intensity on all spin-echo sequences by four months after surgery. These serial findings may suggest the formation of vascularised granulation tissue during cicatrisation ⁽¹⁹⁾.

Post-cavernosography reconstructed CT images in both Saggittal and coronal images improve the demonstration of the effects of the healed tear on copora during tumescence and reveals these tears as an irregular area bulging to outside especially in the coronal views. Reconstructed CT viewing is the best imaging modality that can demonstrate the healed tunica.

CONCLUSION

Primary repair of penile fracture regains a normal penile anatomy and erection. Cavernosography demonstrates the healed tunica well. The healed tear does not lead to any disturbance in the near-by venous occlusive mechanism. Post-cavernosography CT imaging is a new imaging modality that facilitates the demonstration of the healed tear beside demonstration of venous leakage. Reconstructed CT imaging, in both saggittal and coronal views, is the best imaging modality that can demonstrate tunical defects.

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