Isolated injury to the left distal corpus cavernosum from a through-and-through penile gunshot wound

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ARTICLE INFO
Keywords:
Penile gunshot wound
Corpus cavernosal injury
Penile exploration
Artificial erection test

ABSTRACT
We describe a case of an isolated injury to the left distal corpus cavernosum from a bullet involving the glans penis, an injury location not previously described in the literature. This case illustrates the importance of performing an artificial erection test during penile exploration and the focal nature of civilian gunshot wounds. If a bullet wound is obviously superficial to either the urethra or erectile bodies, conservative management is acceptable. While retrograde urethrogram or flexible cystoscopy is warranted to rule out urethral injury, immediate operative exploration is recommended in cases suspicious for corporal defects due to limitations of diagnostic testing.

Introduction
Less than 1% of civilian trauma involves the penis, making penile trauma a rare occurrence, let alone penile injury from a gunshot wound. Indeed, a tertiary hospital in a large metropolitan area cited an average incidence of only 3 cases of gunshot wounds involving the penis per year.1 The infrequent nature of this trauma precludes high quality evidence based protocols regarding its diagnosis and management. Here we describe a penile gunshot wound resulting in an isolated injury to the left distal corpus cavernosum, a location which, to our knowledge, has not specifically been described in the literature. We emphasize the importance of performing an artificial erection test during penile exploration and review the role of preoperative imaging in cases suspicious for corporal defects.

Case presentation
A 28 year old African American male presented to our hospital after sustaining a gunshot wound to his penis. Mild swelling was noted over the dorsal penile shaft, and he was bleeding from the dorsal right and ventral left side of the glans. Pain precluded further examination of the glans penis. Blood was noted at the urethral meatus, although he was able to void. He also had a left medial thigh wound which was shown on XR to be the resting site of the bullet (Fig. 1). Given the inability to adequately assess the depth of the glans wounds, patient was brought to the OR for penile exploration.

Flexible cystoscopy revealed no urethral abnormalities. Based on the dorsal swelling, a subcoronal degloving incision was performed to optimize corporal exposure to evacuate any associated hematoma. However, only edema was noted upon degloving with no corporal defects noted. Probing of the two wounds in the glans penis revealed that they were connected, as noted by the Kelly clamp in Fig. 2. The bullet likely traveled from the right side to the left side of the glans penis before lodging in the left medial thigh. A tourniquet was placed at the base of the penis, and 50 cc of saline was instilled into each corpora. Significant extravasation of saline was noted from the wound in the left side of the glans penis with impaired left sided erection, indicating a corporal defect. An incision was made vertically from the left glans wound joining the subcoronal incision for increased exposure. A 2 cm defect was noted in the tunica albuginea of the left distal corpus cavernosum. The surrounding tissue was noted to be viable with irrigation performed within the defect followed by primary repair with Vicryl suture. Repeating the artificial erection test demonstrated significantly reduced extravasation and improved left sided erection with no penile curvature. 6 weeks postoperatively, patient had no problems with erections.

Discussion
In this case, the most common surgical approach to penile exploration, the subcoronal degloving incision,1 was not able to identify the corporal defect due to its distal location. It was not until the artificial erection test was performed that a defect was apparent. Thus, we advocate the use of artificial erection tests in all cases of penile...
exploration for penetrating trauma, both initially and after corporal repair. In the latter case, it tests for adequacy of anastomosis and ensures no undue penile curvature has occurred.

Contrary to war experiences which emphasize operative exploration of all penetrating penile trauma, recent civilian series have demonstrated successful conservative management of approximately 30% of patients with bullet wounds to the penis. Unlike the battlefield, civilian gunshot wounds come from lower velocity projectiles, which tend to create just focal damage. Indeed, despite the proximity of the bullet trajectory to both distal corpora cavernosa and urethra in our patient, only the left corpus cavernosum was affected. Thus, if a bullet wound appears superficial to the erectile bodies and urethra, patients can safely be managed with local wound care only.

However, if a patient has urinary retention; blood at the urethral meatus/gross hematuria; and/or bullet trajectory suspected to involve the urethra, performing either a retrograde urethrogram or cystoscopy to rule out urethral injury is warranted. Findings suspicious for corporal involvement include palpable corporal defect, expanding penile hematoma, and bullet trajectory in the location of the corpora. In our case, we performed penile exploration to rule out a corporal defect due to inadequate assessment of glanular wounds at bedside. As is often done with the urethra, might we have performed diagnostic tests to increase our certainty of corporal involvement before taking the patient to surgery?

This question has been investigated in the penile fracture literature, the blunt corporal trauma analogue to the present case. One study showed a 100% positive predictive value with cavernosograms in patients with suspected penile fractures. However, cavernosograms have been associated in other studies with false negative results, such as when a hematoma overlying a corporal defect blocks extravasation. Furthermore, these studies are relatively invasive and are not routinely performed in many centers. Penile U/S represents a non-invasive and cheap diagnostic option, but it has been shown to have only modest sensitivity at best, missing tunical defects that are small or obscured by a hematoma. MRI of the penis addresses the false-negatives of the two previous diagnostic modalities by providing exquisite soft tissue resolution but has significant cost and time expenditure. Ultimately, unless a penile MRI can be performed at any hour of the day with little delay, exploring penetrating penile wounds apart from those that are obviously superficial may be the most pragmatic solution for most health care centers, as the consequences of missing or delaying primary repair of a corporal defect can be significant. Penile fracture studies have shown that erectile dysfunction (ED) not only is more likely to occur in patients treated conservatively (50% of time) but also in those with > 8 hr delay between ER presentation and operative repair.

Conclusion

We illustrate the first explicitly reported case of successful primary repair of an isolated distal corpus cavernosal injury to the penis from a through-and-through bullet involving the glans penis, exemplifying the focal nature of civilian penile gunshot wounds and the diagnostic utility of an intraoperative artificial erection test. If wounds are obviously superficial to the urethra and corpora, patients can be managed...
conservatively with local wound care only.\textsuperscript{1} Urethral involvement can
be assessed with either a retrograde urethrogram or flexible cystoscopy.\textsuperscript{2} Immediate operative exploration should generally be performed
in cases suspicious for corporal defects due to limitations of existing
modalities for imaging the corpora.\textsuperscript{3,4}

Consent

Informed consent for allowing intraoperative pictures to be taken
was obtained prior to penile exploration.

Conflicts of interest

None to report.

Funding sources

This research did not receive any specific grant from funding
agencies in the public, commercial, or not for-profit sectors.

Acknowledgments

None.

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