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Rupture of the superficial dorsal vein of the penis

Ruslan N. Simanov[1,2], Aleksey A. Romanov[1], Refat E. Amdiy[3]

[1] Petrozavodsk State University, Petrozavodsk, Russia;
[2] V.A. Baranov Republican Hospital, Petrozavodsk, Russia;
[3] Academician I.P. Pavlov First St. Petersburg State Medical University, Saint Petersburg, Russia

ABSTRACT

This article presents a clinical case of one of the rarest pathologies in emergency urology, previously described only five times in the global medical literature — rupture of the superficial dorsal vein with penile deviation. Clinical diagnosis of this condition is quite difficult without the use of additional imaging methods, which may not be available in emergency settings. However, establishing an accurate diagnosis in the shortest possible time allows for the most appropriate treatment using conservative or surgical methods. The paper provides an analysis of the causes, differential and clinical diagnosis, management strategies, and therapeutic principles with clear indications for surgical intervention. Currently, there are no clinical guidelines for the management of patients with rupture of the superficial dorsal penile vein. Patient complaints and physical examination, as well as Doppler ultrasound imaging, which allows assessing the vascular network of the penis, including the superficial dorsal vein, can assist in establishing a diagnosis of this condition. Magnetic resonance imaging can help identify tunica albuginea rupture, vascular injury, and penile fracture. If there is any doubt regarding the diagnosis, surgical intervention should be performed, including exploration of the corpora cavernosa and the urethra.

Keywords: penile fracture; sexual trauma; penile vein rupture.

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Разрыв поверхностной дорсальной вены полового члена

Р.Н. Симанов[1,2], А.А. Романов[1], Р.Э. Амдий[3]

[1] Петрозаводский государственный университет, Петрозаводск, Россия;
[2] Республиканская больница им. В.А. Баранова, Петрозаводск, Россия;
[3] Первый Санкт-Петербургский государственный медицинский университет им. И.П. Павлова, Санкт-Петербург, Россия

АННОТАЦИЯ

В статье представлен клинический случай одной из редчайших патологий экстренной урологии, до этого описываемых в мировой литературе только 5 раз, — разрыв поверхностной дорсальной вены с девиацией полового члена. Для клинической диагностики это состояние достаточно трудно дифференцируемо без использования методов дополнительной визуализации, которые могут быть недоступны в экстренных условиях. Однако установка правильного диагноза в кратчайшие сроки позволяет провести наиболее подходящее лечение с использованием консервативных или хирургических методов. Подробно рассмотрены причины, дифференциальная и клиническая диагностика, тактика и принципы терапии с указанием четких показаний к оперативному пособию. В настоящее время не существует клинических рекомендаций по ведению пациентов с разрывом поверхностной дорсальной вены полового члена. В установлении диагноза могут помочь жалобы и осмотр пациента, ультразвуковое исследование с допплерографией, позволяющее оценить состояние сосудистой сети полового члена, включая поверхностную дорсальную вену. Магнитная резонансная томография позволяет диагностировать разрыв белочной оболочки, повреждение сосудов и перелом полового члена. При сомнениях в постановке правильного диагноза необходимо прибегнуть к хирургическому вмешательству — ревизии кавернозных тел полового члена и уретры.

Ключевые слова: перелом полового члена; сексуальная травма; разрыв вены полового члена.

Как цитировать

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ЭКО•ВЕКТОР

INTRODUCTION

Penile fracture is a rare urological emergency, and rupture of the superficial penile dorsal vein is even less common. In the Russian Federation, reliable epidemiological data on penile fracture are lacking. In the Middle East, the incidence ranges from 1.14 to 10.48 per 100,000 male population, whereas in the United States, the rate is significantly lower: approximately 1 per 175,000 men [1]. A false penile fracture, defined as a vascular trauma without disruption of Buck's fascia, is extremely rare in the scientific sources. According to available data, this type of injury accounts for approximately 5% of all diagnosed cases of penile fracture [2], equating to approximately 0.05 cases per 175,000 hospital admissions.

CASE DESCRIPTION

A 25-year-old man presented to the emergency department of the V.A. Baranov Republican Hospital (Petrozavodsk) on the weekend night with complaints of penile swelling, deviation, enlargement, and marked dark bluish skin discoloration. The injury occurred during sexual intercourse when the penis struck the partner's perineum during thrusting. According to the patient, he did not initially feel pain, which emerged a few seconds later (the patient did not report the characteristic cracking sound associated with penile fracture and, upon further inquiry, denied it). He noted gradual but rapid swelling, penile deviation, and progressive discoloration from blue to dark blue, while maintaining an erection. He denied urethrorrhagia. To monitor progression, the patient documented the condition photographically (Fig. 1 and Fig. 2).

On examination, the clinical presentation was consistent with penile fracture, evidenced by pain, rapid hematoma expansion into the pubic region, and classic "eggplant deformity" (Fig. 3). Emergency surgery was recommended and consent was obtained. After a brief preoperative assessment, including blood tests and evaluation by the anesthesiologist, which revealed no abnormalities, the patient was transferred to the operating room.

Under general anesthesia and after antiseptic preparation of the operating field, a dorsal penile skin incision was made with "eversion" of the glans outward. Subsequently, 1.5 cm proximal to the coronal sulcus, a classic circular incision was made to perform circumcision of the foreskin, exposing the penile shaft in a "sleeve-like" manner. All visible infiltrated tissues and blood clots were removed. Due to significant edema and hemorrhagic infiltration of the skin and underlying tissues, adequate visualization of the penile shaft was not possible. A ventral penile skin incision from the glans to midshaft was

Fig. 1. Appearance of the penis 1 min post-trauma. Photo from the patient's personal archive. Published with the patient's permission.
Рис. 1. Вид полового члена через 1 мин после травмы. Фото из личного архива пациента. Публикуется с разрешения пациента.

Fig. 2. Appearance of the penis 5 min post-trauma. Photo from the patient's personal archive. Published with the patient's permission.
Рис. 2. Вид полового члена через 5 мин после травмы. Публикуется с разрешения пациента.

Fig. 3. Appearance of the penis during surgical intervention.
Рис. 3. Вид полового члена непосредственно на операционном столе.

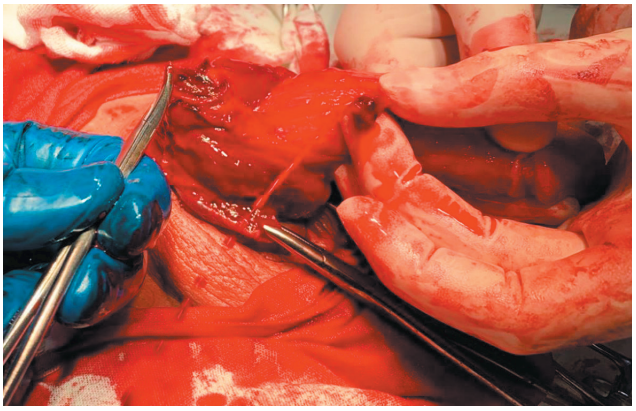

Fig. 4. Proximal and distal edges of the superficial dorsal vein of the penis with bleeding.
Рис. 4. Проксимальный и дистальный края поверхностной дорсальной вены полового члена с кровотечением из нее.

Fig. 5. The vein ligated with double silk sutures.
Рис. 5. Вена перевязана двойными шелковыми лигатурами.

Fig. 6. Appearance of the penis 6 months post-surgery.
Рис. 6. Половой член через 6 мес. после операции.

made to allow broad exploration of corpora cavernosa. The tunica albuginea and urethra were intact; however, a ruptured superficial dorsal vein with active bleeding was identified (Fig. 4).

During further exploration, the proximal end of the vein, extending into the pubic region, was identified and extracted using forceps. The calloused edges were excised, and double ligation was performed. The distal end of the vein was treated according to the previously described technique (Fig. 5). A segment of the excised vein was sent for histopathological analysis. Final hemostasis was achieved, followed by a thorough re-exploration of the corpora cavernosa and urethra, with no visible injuries identified. Intraoperative fibrocystoscopy showed an intact and patent urethra up to the bladder. A Foley catheter Ch18 was placed without difficulty, yielding clear urine. The penile skin was closed with absorbable 4–0 Vicryl sutures, leaving a glove drain. The surgery was completed without complications.

The early postoperative course was uneventful. The urethral catheter was removed the following morning, and spontaneous voiding resumed. The wound healed by primary intention, and sutures were removed as scheduled. Edema, hematoma, and pubic and scrotal swelling resolved completely within 13 days. Histopathology revealed a vein fragment with an exposed lumen, likely due to wall rupture, and intraluminal thrombotic masses without signs of organization.

At 6-month follow-up, the patient had no complaints. Fine scars were noted without penile curvature, and erectile function was preserved (Fig. 6). The patient reported satisfactory sexual function.

DISCUSSION

Rupture of the superficial dorsal vein of the penis is among the rarest conditions in emergency urology. According to a meta-analysis by Agostini et al. [3], 73 cases of this injury have been reported in the articles, but only 5 (7%) involved penile deviation without palpable evidence of tunical disruption. Thus, the present clinical case is the sixth described globally. Rupture of the superficial dorsal vein accounts for a small percent of urological emergencies but often mimics true penile fracture. Coitus is the most frequent cause (78%), followed by rolling over in bed (7%), manipulations during masturbation (15%), and, more rarely, falls or direct trauma during physical altercations [3, 4]. Although specific risk factors have not been definitively identified, circumcision in childhood may increase susceptibility. Tension and elongation of the tight penile skin during intercourse can predispose to venous rupture [5, 6]. Kurkar et al. [7] suggested a potential association between venous injuries and the use of phosphodiesterase type 5 (PDE5) inhibitors, resulting in increased pressure within the penile vascular system.

Only one report has documented spontaneous rupture of the superficial dorsal vein associated with Mondor disease [8].

Penile fracture is typically characterized by an audible cracking sound, followed by sudden pain, rapid detumescence, swelling, hematoma, and penile deformation. An urethral injury may result in gross urethrorrhagia, dysuria, or hematuria [9]. Meta-analysis by Agostini et al. [3] showed that a pathognomonic sign of true penile fracture is the "rolling sign" hematoma, while rupture of the dorsal vein typically produces a ridge-like hematoma. The "rolling sign" hematoma refers to a firm thrombus palpable near the fracture site as an immobile, hard swelling, over which the penile skin can be easily rolled. A hallmark of total rupture of the superficial dorsal vein is a rectangular-shaped ecchymosis in the pubic area with pronounced distal penile edema [10]. In most cases, disruption of the tunica albuginea is indicative of penile fracture and usually results in the classic "eggplant deformity," which, in this case, prompted surgical intervention. Some reports indicate that rupture of the superficial dorsal vein does not lead to rapid detumescence, unlike true fracture, which causes immediate loss of erection [5]. Our case corroborates this observation.

Currently, there are no standardized clinical guidelines for the diagnosis and management of patients with rupture of the superficial dorsal vein. In penile fracture or rupture of the superficial dorsal vein, patient complaints, history, and physical examination are critical but often insufficient for definitive diagnosis due to overlapping clinical presentation. Koifman et al. [11] advocate for imaging modalities in the differential diagnosis, although these are often unavailable in emergency settings. Ultrasonography enables assessment of the tunica albuginea, dorsal veins, hematoma, and the presence of dilation or rupture of veins surrounding the penis. The penile vascular anatomy, including the superficial dorsal vein, can be visualized effectively using Doppler ultrasonography [11–13]. Doppler imaging is widely regarded as the most effective and rapid radiologic tool for penile trauma, facilitating monitoring of hematoma resolution and restoration of penile hemodynamics post-treatment, especially postoperatively [3]. Attempts have been made to enhance ultrasound sensitivity using intracavernosal methylene blue injection; however, this approach has not gained clinical acceptance due to its invasiveness and limited diagnostic value [6]. Notably, ultrasonography has limited capabilities and low sensitivity in diagnosing superficial dorsal vein rupture of the penis, as it depends on the knowledge, skills, and expertise of the performing specialist. Thus, ultrasonography is an option for noninvasive and widely available imaging but requires an experienced specialist. Its use in acute penile trauma is justified and feasible primarily in large specialized centers [3]. In our case, ultrasonography was not feasible due to rapid hematoma formation and the absence of trained personnel and equipment during nighttime hours. Cavernosography remains controversial because of its invasiveness, low diagnostic yield, potential risk of penile fibrosis, and radiation exposure [12]. Magnetic resonance imaging (MRI) is considered the gold standard for diagnosing rupture of the tunica albuginea, penile fracture, and vascular injuries [13, 14]. Nevertheless, MRI is costly, time-consuming, and not always accessible in emergency settings.

Given the diagnostic challenges in differentiating rupture of the superficial dorsal vein from true penile fracture, incorrect management strategies may be chosen. When diagnosis is uncertain, surgical exploration with direct inspection of the corpora cavernosa and urethra is warranted. If no evidence of tunical disruption is found, a previously unidentified vascular injury — most commonly rupture of the superficial dorsal vein — should be suspected. During exploration, it should be noted that a hematoma located above Buck's fascia suggests a rupture of the superficial dorsal vein of the penis, whereas a hematoma below it indicates a rupture of the deep dorsal vein. Our clinical observation confirms the validity of this statement.

Rupture of the superficial dorsal vein may be treated either conservatively or surgically. Conservative treatment includes nonsteroidal anti-inflammatory drugs and/or analgesics, compression dressings, ice application, elevated positioning of the penis, hemostatic agents, and antibiotics. Conservative therapy can result in full recovery without complications [15]. However, surgical intervention may still be necessary. Truong et al. [16] advocate for emergent surgery in all cases of penile venous trauma due to the risk of infectious complications, including necrotizing fasciitis secondary to hematoma. Feki et al. [17] have also reported both infectious complications such as penile abscesses and hematoma suppuration, and also erectile curvature and Peyronie disease. In experienced hands, surgical management offers excellent functional and cosmetic outcomes and is indicated in cases of diagnostic uncertainty [6, 18].

CONCLUSION

Not all penile injuries involve true rupture of the tunica albuginea. The absence of a cracking sound, delayed detumescence, rapid hematoma expansion involving the penis and pubic area, and marked edema of the distal penis are reliable indicators of superficial dorsal vein rupture. This type of injury may be managed conservatively. Currently, no imaging modality can definitively differentiate between rupture of the tunica albuginea and venous injury with 100% accuracy. When diagnostic uncertainty persists, surgical exploration is warranted.

ADDITIONAL INFO

Authors' contribution. R.N. Simanov, concept and design of the study, literature review, collection of data and clinical materials, processing of information, writing the manuscript text, preparing figures, preparation of data for publication; A.A. Romanov, collecting and processing information, manuscript design; R.E. Amdiy, scientific support, editing the manuscript text. The authors have approved the version for publication and have also agreed to be responsible for all aspects of the work, ensuring that issues relating to the accuracy and integrity of any part of it are properly considered and addressed.

Consent for publication. The authors received written informed voluntary consent from patient to publish personal data in a scientific journal, including its electronic version (date of signing 2024 Oct 21). The scope of published data was agreed with the patients.

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ДОПОЛНИТЕЛЬНАЯ ИНФОРМАЦИЯ

Вклад авторов. Р.Н. Симанов — концепция и дизайн исследования, обзор литературы, сбор данных и клинических материалов, обработка информации, написание текста рукописи, подготовка рисунков, подготовка данных для публикации; А.А. Романов — сбор и обработка информации, оформление рукописи; Р.Э. Амдий — научное сопровождение, редактирование текста рукописи. Авторы одобрили версию для публикации, а также согласились нести ответственность за все аспекты работы, гарантируя надлежащее рассмотрение и решение вопросов, связанных с точностью и добросовестностью любой ее части.

Согласие на публикацию. Авторы получили письменное информированное добровольное согласие пациента на публикацию персональных данных, в том числе фотографий, в научном журнале, включая его электронную версию (дата подписания 21.10.2024). Объем публикуемых данных с пациентом согласован.

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Оригинальность. При создании настоящей работы авторы не использовали ранее опубликованные сведения (текст, иллюстрации, данные).

Генеративный искусственный интеллект. При создании настоящей статьи технологии генеративного искусственного интеллекта не использовали.

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AUTHORS' INFO

***Ruslan N. Simanov,** MD; address: 33 Lenina av., Petrozavodsk, Republic of Karelia, 185910, Russia; ORCID: 0000-0003-1246-7233; eLibrary SPIN: 3747-8245; e-mail: ruslansimanov@yandex.ru

Aleksey A. Romanov; ORCID: 0009-0005-4373-3970; eLibrary SPIN: 8302-1205; e-mail: Rmnvlx@yandex.ru

Refat E. Amdiy, MD, Dr. Sci. (Medicine); ORCID: 0000-0003-1305-5791; eLibrary SPIN: 2399-7041; e-mail: r.e.amdiy@mail.ru

ОБ АВТОРАХ

***Руслан Николаевич Симанов;** адрес: Россия, 185910, Республика Карелия, Петрозаводск, пр. Ленина, д. 33; ORCID: 0000-0003-1246-7233; eLibrary SPIN: 3747-8245; e-mail: ruslansimanov@yandex.ru

Алексей Андреевич Романов; ORCID: 0009-0005-4373-3970; eLibrary SPIN: 8302-1205; e-mail: Rmnvlx@yandex.ru

Рефат Эльдарович Амдий, д-р мед. наук; ORCID: 0000-0003-1305-5791; eLibrary SPIN: 2399-7041; e-mail: r.e.amdiy@mail.ru

* Corresponding author / Автор, ответственный за переписку