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# PENETRATING SCROTAL TRAUMA - CASE REPORT AND LITERATURE REVIEW

# TRAUMA ESCROTAL PENETRANTE - RELATO DE CASO E REVISÃO DE LITERATURA

# TRAUMATISMO ESCROTAL PENETRANTE: REPORTE DE CASO Y REVISIÓN DE LA LITERATURA

https://doi.org/10.56238/sevened2025.036-038

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## ABSTRACT

**Introduction and Objective:** Penetrating scrotal trauma is a rare but potentially serious condition, with a risk of compromising genital structures. The objective of this study is to review diagnostic and therapeutic approaches to penetrating scrotal injuries, proposing a clinical flowchart to guide medical care.

**Method:** A case report of scrotal trauma by a metal bar in a patient treated in an emergency room was conducted, followed by a systematic literature review in the PubMed and SciELO databases, without language or period restrictions. Case reports with penetrating or transfixing scrotal injuries were included. The extracted data included the mechanism of trauma, diagnostic tests used, and procedures adopted, allowing for descriptive analysis and the construction of a management flowchart.

**Results:** Twenty-one cases were analyzed (including the case presented). The most frequently used diagnostic methods were ultrasound (33.33%), computed tomography (33.33%), and radiography (28.57%). Regarding management, surgical exploration was performed in 71.42% of cases; debridement in 47.61%; drain use in 28.57%; and primary closure in 80.95%. Based on these data, a clinical flowchart was developed encompassing hemodynamic assessment, detailed physical examination, imaging studies, and indications for surgical intervention according to suspected injury to scrotal and adjacent structures.

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**Conclusion:** Penetrating scrotal trauma requires a systematic and individualized approach. The publication of reports such as this contributes to the improvement of medical conduct in the face of varied clinical presentations, expanding the diagnostic and therapeutic repertoire of professionals in the areas of emergency medicine and urology.

**Keywords:** Puncture Wounds of the Scrotum. Transfixing Wounds of the Scrotum.

**RESUMO**

**Introdução e objetivo:** O trauma escrotal penetrante é uma condição rara, mas potencialmente grave, com risco de comprometimento das estruturas genitais. O objetivo deste estudo é revisar condutas diagnósticas e terapêuticas diante de lesões penetrantes de escroto, propondo um fluxograma clínico para guiar o atendimento médico.

**Método:** Foi realizado um relato de caso de trauma escrotal por barra metálica em paciente atendido em pronto-socorro, seguido por revisão sistemática de literatura em bases de dados PubMed e SciELO, sem restrição de idioma ou período. Foram incluídos relatos de casos com lesões penetrantes ou transfixantes escrotais. Os dados extraídos incluíram mecanismo de trauma, exames diagnósticos utilizados e condutas adotadas, permitindo análise descritiva e construção de fluxograma de manejo.

**Resultados:** Foram analisados 21 casos (incluindo o relato apresentado). Os métodos diagnósticos mais utilizados foram ultrassonografia (33,33%), tomografia (33,33%) e radiografia (28,57%). Em relação ao manejo, a exploração cirúrgica foi realizada em 71,42% dos casos; debridamento em 47,61%; uso de dreno em 28,57%; e fechamento primário em 80,95%. Com base nesses dados, foi elaborado um fluxograma clínico contemplando avaliação hemodinâmica, exame físico detalhado, exames de imagem e indicações de intervenção cirúrgica conforme a suspeita de lesão de estruturas escrotais e adjacentes.

**Conclusão:** O trauma escrotal penetrante exige abordagem sistemática e individualizada. A publicação de relatos como este contribui para o aprimoramento da conduta médica frente a apresentações clínicas variadas, ampliando o repertório diagnóstico e terapêutico de profissionais das áreas de emergência e urologia.

**Palavras-chave:** Lesões Perfurantes de Escroto. Lesões Transfixantes de Escroto.

**RESUMEN**

**Introducción y objetivo:** El traumatismo escrotal penetrante es una afección poco frecuente pero potencialmente grave, con riesgo de comprometer las estructuras genitales. El objetivo de este estudio es revisar los abordajes diagnósticos y terapéuticos de las lesiones escrotales penetrantes, proponiendo un diagrama de flujo clínico para orientar la atención médica.

**Método:** Se realizó un reporte de caso de traumatismo escrotal por una barra metálica en un paciente atendido en urgencias, seguido de una revisión sistemática de la literatura en las bases de datos PubMed y SciELO, sin restricciones de idioma ni período. Se incluyeron reportes de casos con lesiones escrotales penetrantes o transfixiantes. Los datos extraídos incluyeron el mecanismo del traumatismo, las pruebas diagnósticas utilizadas y los procedimientos adoptados, lo que permitió el análisis descriptivo y la elaboración de un diagrama de flujo de manejo.

**Resultados:** Se analizaron veintiún casos (incluido el caso presentado). Los métodos diagnósticos más utilizados fueron la ecografía (33,33%), la tomografía computarizada (33,33%) y la radiografía (28,57%). En cuanto al manejo, se realizó exploración quirúrgica en el 71,42% de los casos; Se realizó desbridamiento en el 47,61 % de los casos; drenaje en el 28,57 %; y cierre primario en el 80,95 %. Con base en estos datos, se elaboró un diagrama de flujo clínico que abarca la evaluación hemodinámica, la exploración física detallada, los estudios de imagen y las indicaciones para la intervención quirúrgica según la sospecha de lesión en el escroto y las estructuras adyacentes.

**Conclusión:** El traumatismo escrotal penetrante requiere un abordaje sistemático e individualizado. La publicación de informes como este contribuye a la mejora de la práctica médica ante la variabilidad de las presentaciones clínicas, ampliando el repertorio diagnóstico y terapéutico de los profesionales de urgencias y urología.

**Palabras clave:** Heridas Punzantes del Escroto. Heridas Transfixiantes del Escroto.

## 1 INTRODUCTION

Penetrating scrotal trauma is an uncommon injury within medical practice, mainly because of the location of the scrotum and its mobility. Genitourinary lesions occur in about 10% of cases of abdominal trauma, and scrotal or testicular lesions are present in only 1% of these cases.[1]

Penetrating trauma is an open injury with the possibility of injuring, in addition to the outermost layers of the skin, the subcutaneous, blood vessels, and even the various structures that make up the spermatic funiculus.[2] In this case, in the case of scrotal injury, there is the possibility of injury to structures such as testicles, epididymis, spermatic cords, nerve structures and blood vessels.

Anatomically, the scrotum is formed by two pouches divided by an internal septum and a cutaneous raphe, connected to the perineum. Each pouch has six layers, including the skin and cremaster muscle. The testicles, which are oval in shape and measure between 4.1 and 5.1 cm in length, contain seminiferous tubules and Leydig cells in the interstitial space, responsible for the production of testosterone.

The vas deferens, a muscular tube, connects the epididymis to the spermatic cord, which connects the testicle to the abdominal structures, involving arteries, veins, lymphatic vessels, and nerves, under a fibrous-connective layer called the spermatic fascia.[2] Arterial irrigation of the scrotum comes from branches of the internal pudendal artery, external pudendal artery, and cremasteric artery, while venous drainage occurs through the scrotal veins.

The innervation of the scrotum is anterior, by the genitofemoral nerve, and posterior, by the posterior scrotal nerves. In addition, the ilioinguinal and genitofemoral nerves innervate the cremaster muscle, which aids in thermoregulation.[3]

The diagnosis of scrotal injury is based on the physical examination of the affected area, which can often be difficult in post-trauma cases, due to various factors such as the patient's non-cooperation due to pain, excess blood hindering vision, hematoma or edema. Thus, the inability to perform a reliable physical examination leads to the use of imaging tests for a more assertive diagnosis, when possible. Ultrasound is the most used imaging method in practice for cases of penetrating trauma, being able to evaluate the involvement of deep structures. In addition, ultrasonography using the Doppler technique allows providing information about the blood supply to the testicles, which is critical to indicate or not surgical treatment.

Although ultrasonography is the main diagnostic means for penetrating scrotal trauma, there are still limitations regarding its use, since it is an operator-dependent method, reducing its diagnostic accuracy.

Computed tomography and magnetic resonance imaging also have a well-established role in the literature as an effective method for the diagnosis of penetrating trauma. However, they present important barriers to their use, such as high cost, low availability and inability to use them depending on the penetrating material (metal, for example).

The following case reports a transfixing trauma, isolated in the scrotum, in an 18-year-old man, by a metal bar. In addition, a flowchart for the management of penetrating scrotal trauma, and a table analyzing the conducts and diagnostic methods of a series of cases present in the literature are also presented below:

## 2 GOAL

The objective of this study is to review the management of traumatic cases and perforating scrotal injuries, in order to systematize the diagnosis and treatment, in order to help urologists and emergency physicians to deal with these situations, based on the elaboration of a flowchart.

## 3 METHOD

The following study addresses a case report of penetrating scrotal trauma by a metal bar in the emergency room of the Sorocaba Hospital Complex. This case encouraged the search for other reports based on a mechanism of trauma that is not very prevalent and the production of a systematic review based on other cases obtained in the current medical literature. The studies analyzed were obtained exclusively from the PubMed and Scielo databases. In order to select the appropriate studies, the advanced search tools 'perforating scrotal lesions' and 'transfixing scrotum lesions' were used, in addition to the 'case report' filter. There was no restriction on the date or nationality of the study.

Based on the bibliography obtained, a table was created, which will be shown below, structured in 6 columns, which are the numeral identification of the report within this article, its authors, the number of patients within the report, the mechanism of trauma, the diagnostic method and the conduct in the face of the accident. From the

table, the qualitative data, especially the conduct of the cases, could be more easily observed, which facilitated the performance of a descriptive analysis of the information. This analysis, in addition to the description of a case report of its own, provided us with the support for the construction of a flowchart about the treatment of perforating scrotum injuries, making it possible to achieve the objective of the study.

## 4 RESULT

From the analysis of 19 articles containing case reports with the trauma mechanism evaluated, added to the description of the case in our service, we obtained a sample of 21 cases involving perforating scrotal injuries. Based on the data obtained from these reports, the following percentages of imaging tests were requested: US in 33.33% of the cases; X-ray in 28.57%; Computed Tomography in 33.33%; Cystoscopy in 4.76% and Urethrography in 9.52%.

Regarding the approach to trauma: scrotal surgical exploration was performed in 71.42% of the cases; exploratory laparotomy in 19.04%; incisions on the route in 9.52%; debridement in 47.61%; Penrose drain was used in 28.57%; primary closure at 80.95%; Closing by second intention in 4.76% of the cases. In the remaining cases, the closure of the lesion was not explicit.

In view of the survey of the aforementioned data, it was possible to perform a flowchart of care for penetrating scrotal trauma. Taking into account primary care and evaluation of testicular, spermatic cord, penile, urethral and non-genitourinary structures.

## 5 DISCUSSION

Proper management of penetrating scrotal trauma is of paramount importance to save genital structures that may have been affected in the trauma. In parallel with our study, in the cases of Zhang7, Wen13 and Ofori20, there was also scrotal involvement by a metal bar. In Zhang7, several structures of the body were affected by the bar, which required an abdominal computed tomography scan as an imaging method to evaluate tissue involvement. Regarding scrotal damage, the conduct was surgical exploration, in addition to debridement of non-viable tissues and primary closure. In Wen13, the lesion extended to the abdomen. Therefore, a simple abdominal X-ray and computed tomography were requested to assess the extent of

the lesion. The approach in this case was the delicate removal of the metal bar, with subsequent insertion of a Jackson-Pratt drain. There were no lesions in scrotal structures, and only saline irrigation of the wound was performed. Finally, Ofori20 only needed evaluation through physical examination before performing surgical exploration with debridement and placement of a penrose drain.

Thus, after analyzing the cases listed above and their conducts, we assess that in the face of scrotal trauma, we should initially perform primary care following the protocol described by the ATLS, with the stabilization of the patient's vital signs, as well as any other trauma victim. Once stable, broad-spectrum antibiotic prophylaxis should be initiated, in addition to the tetanus vaccine.

During the complementary evaluation, a specific physical examination of the scrotum is performed in order to evaluate deep structures, which include the testicle, spermatic cord, penis, urethra, and non-genitourinary structures, such as vessels and nerves. If the physical examination is normal, scrotal repair is performed in the emergency room. However, if there is a suspicion of injury to any of the segments listed above, the patient must undergo different procedures. Signs of testicular or spermatic cord injury require the performance of a color Doppler USG; signs of penile injury point to the need for a cavernography; signs of urethral injury require retrograde urethrography for diagnostic complementation; and finally, in cases of lesions involving non-genitourinary structures, the physician should evaluate whether there is blood in the digital rectal examination, and if positive, indicate a rectosigmoidoscopy; in addition, the pulses in the lower limbs should be checked, and if altered, an arteries Doppler ultrasound or arteriography should be requested.

If the complementary examination is altered, the approach involves surgical exploration and subsequent debridement of any non-viable tissue. During exploration, the surgeon needs to pay attention so as not to injure structures of the spermatic cord and the vas deferens. The goal of the exploration is to save the gonads, control infectious, and maintain hemostasis. However, penetrating trauma often causes testicular injury, with values between 32 and 65%, and orchiectomy is often necessary.[1]

In the case described, it was initially seen that the patient was hemodynamically stable, and antibiotic prophylaxis and tetanus vaccine were then performed, as recommended. Regarding the physical examination of the scrotum, it

was negative for lesions of other organs or active bleeding, which allowed the surgeons to take the patient to the operating room without the need to request other imaging tests, as described above. The excision of the metal bar was done, in addition to a surgical exploration to assess damage, which was not observed. In this way, only the repair of the affected skin was done.

## 6 CONCLUSION

Because this is a diverse case with variable clinical presentations and different forms of injury to the scrotal structures, it is important that reports such as this one be published in order to increase the arsenal of colleagues in specialties to have versatility in the surgical approach and techniques at the time of lesion interventions such as those presented in this review.

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## APPENDIX

**Figure 1**

*Scrotal transfixing trauma*

**Figure 2**

*Approximate transfixing scrotal trauma*

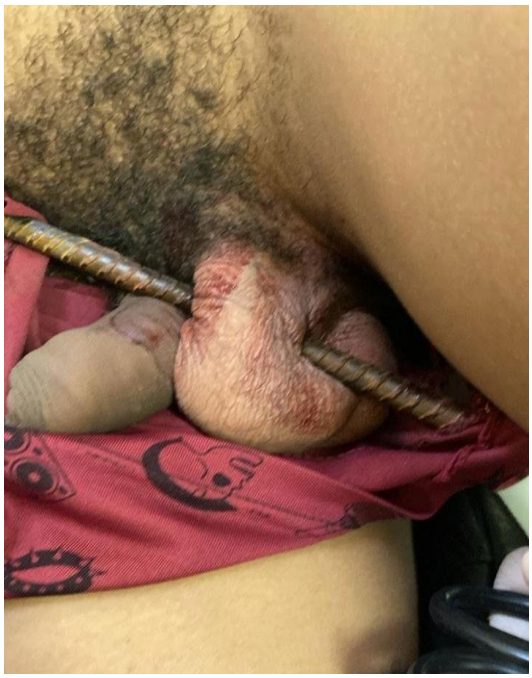

**Figure 3**

*Removal of the object under intraoperative vision*

**Figure 4**

*Intact testicle exteriorized for evaluation*

**Figure 5**

*Flowchart of the management of penetrating scrotal trauma*

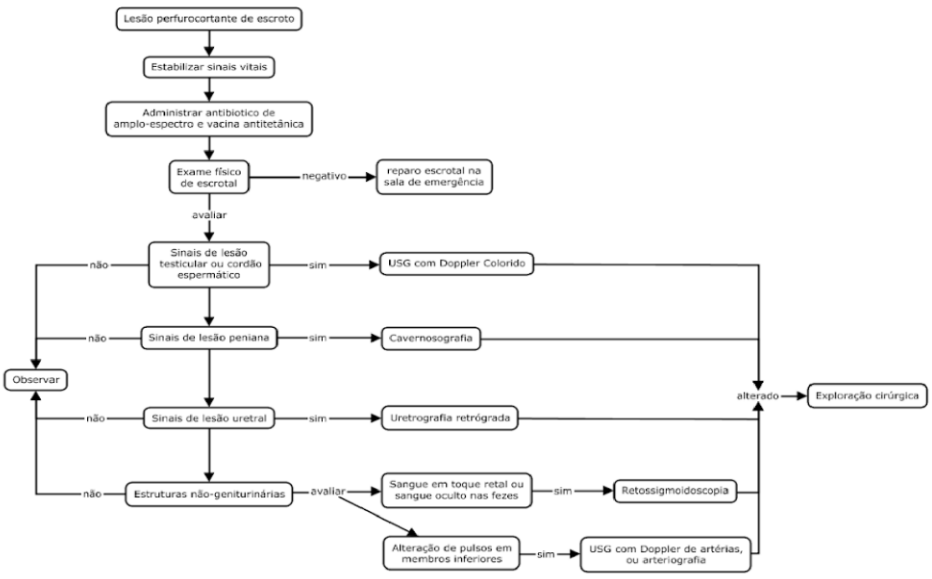

**Table 1**

*Table referring to the cases analyzed, taking into account the trauma mechanism, diagnostic method and management*

| Relato | Autores | Número de pacientes | Mecanismo | Método diagnóstico | Conduta primária |
|---|---|---|---|---|---|
| 1 | Palinrungi | 1 | Tronco de árvore | EF, TC | ECE + debridamento + fechamento primário com dreno penrose |
| 2 | Pavia | 1 | Pistola de pregos | USG | ECE + fechamento primário |
| 3 | Theisen | 1 | Arma de Taser | USG | ECE + debridamento + fechamento primário |
| 4 | Dar | 1 | Vara de bambu | EF, TC | ECE + debridamento + fechamento primário com dreno penrose |
| 5 | Zhang | 1 | Barra metálica | EF, TC | ECE + debridamento + fechamento primário |
| 6 | Migliorini | 1 | Pistola de pregos | USG, Raio X | ECE |
| 7 | Bickel | 1 | Arma de fogo (projétil) | EF, Raio X | ECE + orquiectomia + fechamento primário com dreno penrose |
| 8 | McKitterick | 1 | Cabo de vassoura | EF, TC | Laparotomia exploratória + fechamento primário |
| 9 | Mbuyamba | 1 | Galho de árvore | EF, TC | Laparotomia exploratória por herniação traumática abdominal |
| 10 | Ferlise | 1 | Dardo | EF, USG com doppler | ECE + debridamento + drenagem pela sutura + retirada do objeto no intraoperatório |
| 11 | Wen | 1 | Barra metálica | EF, Raio X, TC | 2 incisões sobre o trajeto do objeto + debridamento + dreno jacson prattes + fechamento primário |
| 12 | Datta | 1 | Cabo de vassoura | EF, Raio X, USG | Laparotomia exploratória + fechamento primário |
| 13 | Mante | 1 | Objeto metálico (explosão de navio) | EF, Raio X | ECE + fechamento primário com dreno penrose |
| 14 | Ficarra | 1 | Arma de fogo (projétil) | EF, Raio X, USG, TC | ECE + fechamento primário com drenagem de hematoma |
| 15 | Tan | 1 | arbusto espinhoso | EF, USG, Cistoscopia, Uretrografia | ECE + debridamento da lesão escrotal com fechamento por segunda intenção + colocação de cateter urinário via fio-guia |
| 16 | Reed | 1 | chifre de veado | EF, Uretrografia retrógada | ECE + colocação de cateter urinário via fio-guia + fechamento primário + dreno penrose |
| 17 | Dorairajan | 1 | Ferimento de arma branca | EF | Laparotomia exploratória + ligadura de vasos deferentes bilaterais + fechamento primário escrotal após drenagem |
| 18 | Ofori | Paciente 1 | Galho de árvore | EF | ECE + debridamento + fechamento primário |
| | Ofori | Paciente 2 | Barra metálica | EF | ECE + debridamento + fechamento primário com dreno penrose |
| 19 | Telussa | 1 | Assento de bicicleta | EF | ECE + debridamento + fechamento primário |

EF: Exame físco; USG: ultrassonografia; TC: tomografia computadorizada