CASE REPORT

Management of a large traumatic hemipelvectomy defect following a truck crush injury: a case report

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ABSTRACT

This case report explores the management of a traumatic hemipelvectomy—a rare and devastating injury characterized by a high mortality rate. The patient, a 12-year-old male, suffered right lower extremity amputation and right hemipelvectomy due to a degloving injury from a non-vehicle-related accident at another institution. Initially, an urgent reconstruction of the right pelvic region and suprapubic tissue defects was performed using a posterior-based fasciocutaneous flap. Following this, the patient was transferred to the pediatric intensive care unit at our hospital with a suspected diagnosis of necrotizing fasciitis. Treatment included broad spectrum antibiotics and multiple debridements to avert the onset of sepsis. Eventually, reconstruction of a 60 x 25 cm defect covering the lower back, abdomen, gluteal, and pubic regions was achieved through serial split-thickness skin grafts and a pedicled anterolateral thigh flap. The patient made a remarkable recovery, regained mobility with the aid of a walker, and was discharged in good health 22 weeks after the initial accident. This case report underscores the importance of serial debridements in preventing sepsis, the use of negative pressure vacuum dressing changes, the initiation of broad-spectrum antibiotics based on culture results during debridements, and prompt closure of the defect to ensure survival after traumatic hemipelvectomy. Familiarization with the principles discussed here is crucial to minimizing mortality rates and optimizing outcomes for this rare injury.

Keywords: Crush injury; traumatic hemipelvectomy; traumatic hemipelvectomy defect.

INTRODUCTION

Traumatic hemipelvectomy typically results from high-energy injuries associated with traffic accidents, motorcycle crashes, and machinery incidents.[1] It is a rare and severe injury that frequently results in high mortality rates due to the severity of the initial trauma. Open pelvic fractures are already linked with a mortality rate exceeding 40%, which escalates to between 60% and 100% in cases of traumatic hemipelvectomy. However, with advancements in trauma care, more patients with severe injuries are now arriving alive to trauma centers. Consequently, it is anticipated that the incidence of traumatic hemipelvectomy will also increase in the future.[2]

The limited number of articles published on this topic in the literature can be attributed to the high mortality rates associated with this injury. Consequently, reconstruction options for these types of defects have not been extensively discussed. In this case report, we aim to share our experiences managing this type of high-energy trauma and to highlight key considerations for successfully minimizing mortality and reconstructing the resulting defects.

CASE REPORT

This case report was conducted following ethical guidelines, and written consent was obtained from the patient's parent. In August 2022, a 12-year-old male sustained a traumatic hemipelvectomy and a degloving injury to his right lower extremity, resulting from an incident where he was crushed by a truck in a non-vehicle traffic accident. The patient underwent multiple surgical procedures including right lower extremity amputation, right hemipelvectomy, cystostomy, and colostomy at an external institution. The tissue defect in the

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Figure 1. (a) The patient immediately after the injury. **(b)** Postoperative status following the initial procedure at the initial center. **(c)** Initial debridement of the patient's wound. **(d)** Wound condition after continuous serial debridement and Vacuum-Assisted Closure (VAC) dressings. **(e)** Post-reconstruction of the wound using Split-Thickness Skin Graft (STSG). **(f)** The lower back area repaired with STSG. **(g)** Partial repair of the open anterior abdominal wound with a pedicled Anterolateral Thigh (ALT) flap. **(h)** Utilization of a pedicled ALT flap to close the defect in the anterior abdominal wall. **(i)** The patient standing with a walker prior to discharge.

right pelvic and suprapubic regions was reconstructed at the same center using a right thigh posterior-based fasciocutaneous flap, which had been previously traumatized during the accident (Figures 1a, 1b).

Subsequently, due to the development of flap necrosis, the patient was transferred to our hospital's pediatric intensive care unit for advanced care. To manage a suspected case of necrotizing fasciitis, the patient underwent serial debridement and received a regimen of vancomycin, clindamycin, cefotaxime, and antifungal therapy. Additionally, intravenous immunoglobulin (IVIG) and hyperbaric oxygen therapy were initiated. The patient's treatments with meropenem and linezolid were maintained in the intensive care unit (ICU). Within one week, the patient underwent four consecutive operations for wound debridement. After debridement, an extensive open wound measuring approximately 60 x 25 cm remained, spanning the lower back, anterior abdomen, and right hemipelvic region. A Vacuum-Assisted Closure (VAC) dressing was applied for wound management. Cultures taken during the operations identified S. maltophilia and E. faecalis, with white plaques observed at the wound site. The infectious diseases team recommended adding levofloxacin, trimethoprim-sulfamethoxazole, and fluconazole to the treatment regimen. Two weeks later, the patient was transferred from the ICU to the ward for continued care and monitoring.

Subsequently, the patient underwent debridement and VAC dressing changes twice weekly. During one session, a 15x8 cm split-thickness skin graft (STSG), harvested from the left thigh, was used to reconstruct the granulating open wound on the patient's back (Figures 1c, 1d, and 1e).

Two weeks after the accident, serial debridements continued. In one session, the anterior abdominal wall was reconstructed using a partial-thickness skin graft, and a 22 x 8 cm anterolateral thigh (ALT) flap with three perforators from the anterior thigh was utilized to reconstruct the suprapubic region (Figures 1f and 1g). The ALT flap was designed as a pedicled flap; its pedicle was passed under the rectus femoris muscle to increase the rotational arc and ensure optimal adaptation to the defect area, minimizing the risk of injury to motor nerves in the thigh. Following the surgery, the donor site was primarily closed, and a Hemovac drain was placed (Fig. 1h). During post-operative follow-ups, no viability issues were noted with the reconstructed flaps, and the donor area healed well.

During the six-week follow-up and treatment period, VAC dressing changes and serial debridement were performed under general anesthesia. Six weeks post-accident, the remaining open wound areas were repaired with STSG. The patient was monitored in the plastic surgery ward for eight weeks, during which time his cystostomy tube was replaced once by the urology team. In the last month of his stay, the patient was mobilized with the assistance of a walker. After 22 weeks of inpatient care, the patient was discharged and advised to attend outpatient follow-up appointments (Fig. 1i).

DISCUSSION

This case posed significant challenges due to the substantial risk of mortality and the complexity of the repairs required. However, the patient's defects were successfully closed, and after a lengthy hospitalization, he was discharged safely (Fig. 1e).

Infection, bleeding, and associated injuries are the main reasons for death following traumatic hemipelvectomy. Key interventions to minimize the risk of sepsis and necrotizing fasciitis included serial debridement, the use of broad-spectrum antibiotics and antifungal therapies as guided by culture results from debridements, and prompt closure of the defect areas. Effective removal of necrotic tissue through serial debridement and the use of VAC dressings is of paramount importance.

Another critical intervention for ensuring the survival of patients with traumatic hemipelvectomy involves effective blood and fluid therapy to manage bleeding and compensate for blood loss. The cessation or control of bleeding is closely related to the extent of the traumatic hemipelvectomy. Complete ruptures of the thigh at the time of injury are more likely to lead to the cessation of blood flow, as the iliac vessels retract and become thrombosed, which can be life-saving for the patient.[3] In cases of partial hemipelvectomy, particularly when there is partial vascular injury, the iliac vessels may not contract and thrombose, leading to continuous bleeding and potentially fatal outcomes. Effective intervention at the site of bleeding can be more challenging in partial hemipelvectomy cases, which may partly explain the higher incidence of survival in complete traumatic hemipelvectomy cases. In the case presented, the veins were thrombosed without acute bleeding, but this led to necrosis of the local flap that was intended to close the patient's defect. However, it also reduced the patient's risk of mortality during the acute phase. The importance of these interventions was highlighted in a study by Labler et al. in 2006.[4]

Associated injuries are another reason for mortality. Related consultations should be performed. Over 85% of patients undergoing traumatic hemipelvectomy will have genitourinary injuries, more than 60% will have anorectal injuries, and 15% will have orthopedic injuries at distant sites. Surviving patients may also sustain intra-abdominal injuries. In this case, only limited intra-abdominal injury was noted, which may have contributed to the reduced mortality risk.[5,6]

When reconstructing traumatic hemipelvectomy defects, options include graft coverage and reconstruction using flaps from the abdominal or gluteal region.[3] Contrary to popular belief, in some cases, closure with skin grafts may be sufficient, as documented in the literature.[6] Another option to consider is tissue expander repair. Raftos et al. reported successful repair of a sacral defect in a patient with traumatic hemipelvectomy using a tissue expander.[7] In this case, tissue expander repair was not employed due to the infected state of the defect area and the risk of expander infection from prolonged stoppage. Moreover, retaining the tissue expander within the pouch was not feasible as the border of the defects were widely open. Furthermore, adequate expansion was considered unachievable due to the softness of the defect area's floor in the anterior abdominal wall and the open lateral borders of the tissue that required expansion. However, in the future, graft-repaired areas can be excised and reconstructed using flaps expanded with tissue expanders.

Given that the abdominal and pelvic defect was nearly circular, grafting the entire open wound was not preferred to avoid

potential complications such as lymphedema, severe contracture formation, and circulatory disturbances in the leg below the defect area. Additionally, some areas of the abdominal defect were thin due to the loss of some outer layers of the abdominal muscles. Upper abdominal flaps were not considered due to damage to the right pedicle (deep inferior iliac vessels) and the presence of a colostomy on the left. Alternatively, rare reports of successful traumatic hemipelvectomy reconstructions with the ALT flap are emerging in the literature.[8] In this patient's case, we opted for an ALT flap to close the defect on the anterior abdominal wall. Special attention was paid to nerve preservation during the procedure, given the patient's condition of having only one limb. To enhance the rotational arc of the pedicled ALT, the flap was adapted to the defect area by threading it under the rectus femoris muscle as highlighted by Kimato et al.[9]

In addition to the aforementioned points, protein levels are also crucial. Extensive trauma resulting in large defects can lead to protein loss and nutritional issues. Albumin levels were closely monitored, and albumin replacement therapy was initiated when they fell below 2mg/dL. A high-protein diet was maintained throughout the entire treatment period. We believe all these considerations regarding defect reconstruc- tion are crucial to ensure uneventful postoperative healing.

CONCLUSION

This case report underscores the importance of serial debridements in preventing sepsis, the use of negative pres- sure vacuum dressing changes, the initiation of broad-spectrum antibiotics based on culture results during debridements, and prompt closure of the defect to ensure survival after traumatic hemipelvectomy. Familiarization with the principles discussed here is crucial to minimizing mortality rates and optimizing outcomes for this rare injury.

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REFERENCES

1. Kayalar M, Gurbuz Y, Sugun TS, Kaplan I. Traumatic hemipelvectomy: case presentation. Acta Orthopaedica et Traumatologica Turcica 2014;48:226–30. [CrossRef]
2. Yalniz E, Ciftdemir M, Durukan T. Traumatic hemipelvectomy: a case report and a review of the literature. European J Trauma & Emergency Surg 2007;33(3):306–9. [CrossRef]
3. Eroğlu L, Güneren E, Akbaş H, Demir A. Travmatik hemipelvektomi: olgu sunumu ve rekonstrüksiyon seçeneklerinin gözden geçirilmesi. Türk Plastik, Rekonstrüktif ve Estetik Cerrahi Dergisi (Turk J Plast Surg) 2003;11:139–41.
4. Labler L, Trentz O. The use of vacuum assisted closure (VAC™) in soft tissue injuries after high energy pelvic trauma. Langenbeck's Archives of Surg 2007;392:601–9. [CrossRef]
5. Weiss WM, Egan MC, Amundson DE. Traumatic hemipelvectomy: a survivable injury. Military Med 1994;159:164–6. [CrossRef]
6. Klasen H, Ten Duis H. Traumatic hemipelvectomy. J Bone and Joint Surg British Vol 1989;71:291–5. [CrossRef]
7. Raftos JR, Ethell AT, Bye WD, Giles JS, Cameron-Strange A. Traumatic hemipelvectomy associated with contralateral hip dislocation: case report. J Trauma and Acute Care Surg 1994;36:583–8. [CrossRef]
8. Kamitomo A, Hayashi M, Tokunaka R, Yoshida Y, Tatsuta S, Sasaki Y. Reconstruction of the pelvis after traumatically induced bilateral partial hemipelvectomy: a case report. J Medical Case Reports 2019;13:1–5.
9. Kimata Y, Uchiyama K, Sekido M, Sakuraba M, Iida H, Nakatsuka T, et al. Anterolateral thigh flap for abdominal wall reconstruction. Plastic and reconstructive Surg 1999;103:1191–7. [CrossRef]

OLGU SUNUMU - *ÖZ*

Tır altında ezilme sonrası büyük bir travmatik hemipelvektomi defektinin yönetimi: bir olgu sunumu

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Bu olgu sunumu, yüksek mortalite oranına sahip nadir ve yıkıcı bir yaralanma olan travmatik hemipelvektominin yönetimine ışık tutmaktadır. 12 yaşında erkek hasta araç dışı trafik kazasında meydana gelen bir degloving yaralanması nedeniyle dış merkezde sağ alt ekstremite amputasyonu ve sağ hemipelvektomi geçiren geçirdi. Sağ pelvik ve suprapubik bölgedeki doku defekti dış merkezde posterior bazlı ezilmiş fasyakutanöz flep ile acil rekonstrükte edilmişti ve hasta nekrotizan fasiit olasılığı ile hastanemiz çocuk yoğun bakım ünitesine sevk edildi. Geniş spektrumlu antibiyotik başlandı ve sepsis gelişimini önlemek için seri debridmanlar yapıldı. Son olarak, bel, karın, gluteal ve kasık bölgelerindeki 60x25 cm'lik defekt rekonstrüksiyonu için kısmi kalınlıkta deri grefti seansları ve pedikküllü anterolateral uyluk flebi kullanıldı. Sorunsuz iyileşme gösteren hasta, yürüteç yardımıyla mobilize oldu ve kazadan 22 hafta sonra sağlıklı bir şekilde taburcu edildi. Bu vaka raporu, travmatik hemipelvektomi sonrası hayatta kalmayı sağlamaya yönelik, sepsisi önlemek için seri debridmanların, negatif basınçlı vakumlu pansuman değişikliklerinin, debridman ile alınan kültürler sonucunda geniş spektrumlu antibiyotiklerin başlanmasının ve defektin mümkün olan en kısa sürede kapatılmasının önemini vurgulamaktadır. Ölüm oranlarını en aza indirmek ve sonuçları optimal hale getirmek için tartışılan yöntemlere aşina olmak bu nadir yaralanmada önemli hale gelmektedir.

Anahtar sözcükler: Ezilme yaralanması; travmatik hemipelvektomi; travmatik hemipelvektomi defekti.

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