

## Life-saving therapy for complete traumatic hemipelvectomy: a case report

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*To the Editor:* Traumatic hemipelvectomy (THP), which was first described by Turnbull in 1978, is an unstable ligamentous or osseous hemipelvic injury that involves rupture of the pelvic neurovascular bundle (either open or closed integuments).<sup>[1]</sup> THP is a rare and catastrophic injury that is usually caused by high-energy trauma, as in a traffic, motorcycle, and machinery-related accident, and is accompanied by pelvic fractures.<sup>[2]</sup> THP usually leads to other associated injuries.<sup>[3]</sup> The mortality associated with open pelvic fracture is approximately 40%, while the mortality associated with THP may reach as high as 100%.<sup>[4]</sup> However, few studies describe a standardized approach for handling this fatal trauma.<sup>[2]</sup> Here we present a case of complete THP with massive pelvic injuries and severely contaminated wounds associated with neurovascular, colorectal, genitourinary, and soft-tissue injuries. Based on our experience, a rapid and multidisciplinary therapeutic strategy is required to save the patient's life.

The patient, a 55-year-old man, was pulled into a cement mixer in a work-related accident, and his right lower limb was completely torn off. During the preliminary physical examination, the patient was conscious and drowsy. He presented with a patent airway, injury severity score was 75, blood pressure was 70 to 85/40 to 50 mmHg, and a pulse of 120 beats per min. At the scene of the accident, bandaging applied with strong mechanical pressure was administered by the paramedic doctor to stop the hemorrhaging, and intravenous rehydration treatment and oxygen inhalation were immediately initiated.

The patient was admitted to our hospital about 1 h after injury. Physical examinations revealed an open wound over the right costal arch traversing toward the right pubic tubercle, extending through the perineum, and ending near the right sacroiliac joint. The entire area was stripped of skin, and the peritoneum was the only structure holding in the abdominal contents. There were cement and other foreign matters covering the wound [Figure 1A]. The displaced extremity was cold, extensively crushed, and pulseless.

Upon his arrival in the department of emergency, the patient received immediate fluid resuscitation through one central venous and two peripheral lines. Tetanus prophylaxis and broad-spectrum antibiotics were applied. Computed tomography (CT) images demonstrated loss of the right lower limb and right lower abdominal wall, including the right ilium, right pubis, and right ischium [Figure 1B and 1C]. There was no intra-abdominal injury, and the bladder and rectum were intact. CT angiography revealed transection of the right common iliac vessels [Figure 1D].

A team comprising an orthopedist, a urologist, and a general surgeon developed a therapeutic strategy. The patient was immediately placed on the operating table and given general anesthesia. Systemic exploration of the pelvic

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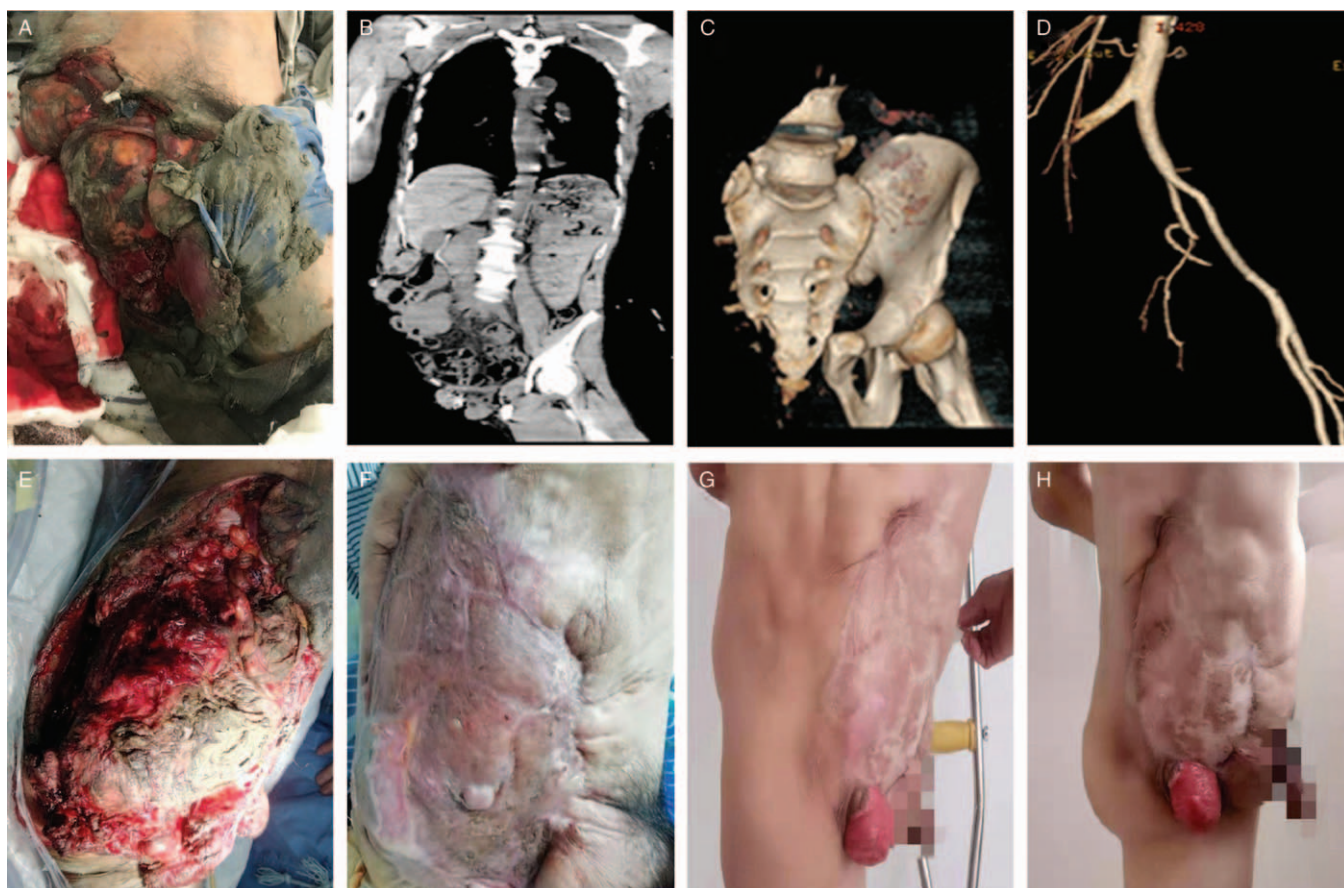
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**Figure 1:** (A) The traumatic wound to the right hemipelvis; (B–C) Total disruption of the hemipelvis from the sacrum and symphysis pubis; (D) Transection of the right common iliac vessels; (E) Appearance of the wound in the theater before debridement; (F) The healed traumatic wound after transplantation of a skin graft; (G–H) Recovery of the patient at 12 months post-injury.

wound revealed a gross loss of skin from the right lower abdomen [Figure 1E]. The severely contaminated peritoneum was the only structure covering the right side of the abdomen. Bowel peristalsis was observed. The right side of the scrotum was avulsed, and the exposed testis and spermatic cord extravasated through the wound. Some of the soft tissue surrounding the anus and right ilium missed, leaving the sacrum exposed. Arterial bleeding was observed in the pelvic cavity. The right external and internal iliac vessels were transected and thrombosed. The main vessels were ligated and sutured to stop the pelvic hemorrhage. Then we repeatedly washed the wound with saline, hydrogen peroxide, and iodophor diluent. Due to extensive skin loss, the wound was left open, but covered with a vacuum-sealing drainage (VSD) device for temporary wound management. The patient was managed with a rectal tube to preserve bowel integrity.

During surgery, the patient was given the following fluids: 800 mL packed red blood cells; 1000 mL crystalloids; and 1500 mL colloids (total: 3300 mL). The patient was then transferred to the intensive care unit (ICU) with mechanical ventilation support post-operation, where he received a blood transfusion (600 mL), aggressive fluid resuscitation, and preventive treatment with broad-spectrum antibiotics (imipenem [0.5 g, q6h], metronidazole [1 g, q8h]) and antifungal medication (linezolid [0.6 g, q12h]) for 12 days.

Despite the empirically antibiotic treatment, the patient's fever persisted throughout his stay in the ICU. White blood cell count reached a peak of  $16.95 \times 10^9/L$  on Day 5 in the ICU. Closed drainage was performed after X-rays taken on Day 5 which showed pneumothorax in the right lung and pneumonia in the left lung. CT demonstrated no localized pelvic abscess. On Day 6, the patient received a second operation for debridement. Granulation tissue was observed on the surface of the wound. The devitalized tissue was removed, and pus samples were collected for culture. Repetitive irrigation and debridement were performed weekly for 2 months, and VSD therapy was continued. Analysis of the pus sample obtained during the second operation revealed the presence of *Proteus mirabilis* and *Providencia alcalifaciens*. A blood sample obtained on Day 9 showed evidence of *Pseudomonas aeruginosa*. The antibiotic regimen was changed to a combination of meropenem (1 g, q8h), levofloxacin (0.5 g, qd), tigecycline (0.1 g, q12h), and fluconazole (0.4 g, qd) for 2 weeks. To prevent fecal contamination of the pelvic wound and preserve function of the digestive system, a diverting colostomy was performed on Day 14. The patient's body temperature remained high, fluctuating slightly until Day 20 in the ICU, then dropping steadily to baseline values on Day 25.

On Day 21 post-admission, the skin defect was well defined, with an area of  $28 \times 21 \text{ cm}^2$ . During his 7-week's

stay in the ICU, extensive psychiatric, nutritional, and chronic pain management were provided. Two months after complete THP, the patient's skin regenerated, and the skin defect decreased 50% in size. VSD therapy was discontinued, after then the well-defined skin defect was closed by a split-skin graft from the patient's left thigh [Figure 1F].

At 10 weeks post-injury, the patient was able to walk with crutches and successfully performed squatting maneuvers. The patient stayed in hospital for a total of 72 days, and received a semi-laparotomy prosthesis for physical rehabilitation at 5 months post-operatively. At the last follow-up examination (12 months after the injury), the wound healed uneventfully [Figure 1G and 1H]. The patient has retired due to the disability but can take care of himself in daily life. He occasionally suffers from phantom pain, which is bearable, and has been prescribed any narcotic or non-opioid pain medicine. No symptoms of depression have been reported.

Due to the high energy involved in a THP, most patients experience injury to multiple bodily systems. These injuries may result in death due to large amount of blood loss and hypovolemic shock,<sup>[3]</sup> which is the most common cause of death among patients with THP.<sup>[1]</sup> Initial management of the patient at the scene of the accident should focus on terminating the hemorrhage. Nasal packing, surgical ligation, and embolization can be used to reduce blood loss. Blood transfusion and aggressive fluid replacement are necessary to stabilize blood pressure.<sup>[1]</sup>

As regards to this case, which was a complete THP, the decision to retain the limb is difficult and controversial. On one hand, an attempt to reimplant the limb could lead to more complications, such as life-threatening hemorrhaging, reperfusion injury, organ failure, acute respiratory distress syndrome, and sepsis.<sup>[2]</sup> On the other hand, a leg without motor function or sensation may still be useful for sexual, urinary, anal functions, and has a significant impact on the patient's psychological wellbeing.<sup>[5]</sup> To date, there has been no predictive scale or scoring system available for assisting in decision-making in this context.<sup>[2]</sup> In general, immediate hemipelvectomy is recommended as a lifesaving therapy, because extremity-saving approaches incur more risks and increase mortality.

Sepsis after THP is another common life-threatening complication during hospitalization, which is still a vital risk factor referring to systemic inflammatory response syndrome, infection, and secondary multiple organs dysfunction.<sup>[1,6]</sup> Infection may be caused by severe contamination of the wound, soft tissue necrosis, inadequate debridement, and contaminations from the urinary and intestinal system. Although there was no rectal injury in the case described here, a proximal diverting colostomy is necessary to prevent further contamination of the wound and sepsis.<sup>[7]</sup> Due to the extensive skin loss, a VSD device was used to temporarily cover the large tissue defect until skin regeneration progressed sufficiently to allow for a skin graft. This approach is beneficial not only for healing large wounds, but also for infection management.<sup>[7]</sup> During the

stay in the ICU, our patient had pneumothorax and pneumonia, resulting in persistent fever. To prevent infection caused by bacteria, a combination of meropenem, levofloxacin, tigecycline, and fluconazole was administered throughout the perioperative period.

In the unusual case described above, emergency admission to our hospital and consultation with a multidisciplinary team of health-care providers contributed to the patient's survival and recovery [Supplementary Figure S1, <http://links.lww.com/CM9/A457>].

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the article. The patient understands that his name and initials will not be published and due efforts will be made to conceal the identity of the patient, although anonymity cannot be guaranteed.

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### Conflicts of interest

None.

### References

1. Kayalar M, Gurbuz Y, Sugun TS, Kaplan I. Traumatic hemipelvectomy: case presentation. *Acta Orthop Traumatol Turc* 2014;48:226–230. doi: 10.3944/aott.2014.2629.
2. Smith AC, Flinn DC, Jang Y, Faulkner AM, Dinnan KA. Traumatic hemipelvectomy with a contralateral unstable pelvis and acetabular fracture: a case report and review of the literature. *JBJS Case Connect* 2017;7:e52. doi: 10.2106/jbjs.cc.16.00211.
3. Evans RN Jr, Foss FE. Traumatic hemipelvectomy in combination with traumatic amputation of an upper extremity. *J Trauma* 1984;24:342–345. doi: 10.1097/00005373-198404000-00011.
4. Yalniz E, Ciftedemir M, Durukan T. Traumatic hemipelvectomy: a case report and a review of the literature. *Eur J Trauma Emerg Surg* 2007;33:306–309. doi: 10.1007/s00068-007-6063-3.
5. Osti M, Mittler C, Putzke M, Benedetto KP. Traumatic hemipelvectomy: a report of successful reimplantation. *Injury* 2006;37:1015–1018. doi: 10.1016/j.injury.2006.06.022.
6. Zhao XG, Wu JS, He XD, Ma YF, Zhang M, Gan JX, *et al.* Risk factors of mortality in road traffic injury patients with acute respiratory distress syndrome. *Chin Med J* 2008;121:968–972.
7. Schoderbek RJ, Battaglia TC, Dorf ER, Kahler DM. Traumatic hemipelvectomy: case report and literature review. *Arch Orthop Trauma Surg* 2005;125:358–362. doi: 10.1007/s00402-005-0814-6.

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