

Case report

Limb salvage vs amputation in crush injury due to high energy injury: A case report

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Corresponding author: **Panji Sananta**. Email: panjisananta@ub.ac.id**ABSTRACT**

Limb injury possesses significant problems, both for the treating physician and patient. Numerous problems ranging from disability, limb amputation or even death can occur to the patient. However, the definitive therapy is still debated. A 50 years old man came to the emergency room with a chief complaint of an open wound of his right leg because of a traffic accident. Subsequently, the repair, secondary closure, and skeletal traction were done following the exploration and debridement. During the next follow up, the surrounding tissues seemed to be non-viable. Therefore, the surgeon decided to do an operation with a urologist to perform hip disarticulation and scrotum necrotomy. The patient undergoes repeated debridement in operating theatre and also using negative pressure wound therapy (NPWT). After three months from the first admission, the patient's condition started to deteriorate, and unfortunately, the patient died. There are several scoring systems that can be used to help determine the management of high energy lower extremity injuries. The most used is Mangled Extremity Severity Score (MESS), Limb Salvage Index (LSI) and Predictive Salvage Index (PSI) scores. Hospital type will surely determine the facility and personnel availability. If the facility and personnel are sufficient, limb reconstruction should be attempted first. However, in the end, the family's consent after considering the risk of the surgery will determine the chosen surgery to perform. The surgeon in charge should consider the decision with high vigilance regarding the patient's clinical condition. The decision between limb salvage and amputation should consider the long-term effect which influences the patient's quality of life.

Keywords: Crush injury; high energy injury; limb salvage; amputation; NPWT.**INTRODUCTION**

Limb injury poses significant problems for the treating physician and the patient. Numerous problems ranging from disability, limb amputation, or even death can occur to the patient. Multiple and complex injuries to the blood arteries, bones, nerves, and soft tissue are common with lower extremity trauma. Unfortunately, with the rise of high-speed road traffic, especially in developing countries, this challenging burden is unlikely to disappear in the near future. Microvascular tissue transfer, fracture fixation techniques, and trauma care have all improved in recent years, allowing limb salvage of severe traumatic lower leg injuries that would have previously required amputation (1). However, infection, nonunion, prolonged pain, or functional limitations after limb salvage procedure may result in delay amputation (2).

Despite countless discussions regarding the optimal method, whether to amputate or salvage the involved limb, there is still no exact method to determine the best condition to implement it. The condition of the patient, the condition of the limb tissue, and the surgeon's experience all go into this decision. When deciding between amputation and salvage, functional and survival consideration are crucial (2).

In this case report, we presented a 50 years-old-man with severe lower limb injury who underwent limb salvage as a first effort but later should undergo amputation and extensive debridement as well as negative pressure wound therapy (NPWT). This report has followed the SCARE checklist and guidelines, and consent was given to our patient regarding the data obtained in this case would be submitted for publication (3).

Case presentation

A 50 years' old man was referred to our emergency room with a chief complaint of pain and an open wound of his right leg because of a traffic accident between a motorcycle and a truck. When the patient was riding a motorcycle, he was hit by a truck, fell off, and was run over by the truck. There was no history of decreased consciousness or projectile vomiting. This patient was a heavy smoker. From physical examination on the right thigh and knee, we found deformity and two open degloving wounds. The first wound was 40x14 cm, located on the posteromedial side, with muscle exposed and a bone base. The second wound was 20x12 cm, located on the anteromedial side, with a muscle base (Fig. 1). We found anesthesia on the anteromedial side of the thigh and paresthesia on the whole foot and leg. The femoral artery, dorsalis pedis artery, and tibialis posterior artery pulses were still felt on palpation.

There was no range of motion on hips, knee, and ankle.

Right femur plain X-ray radiograph reveals intertrochanteric comminuted fracture with reverse oblique pattern (Fig. 2). We diagnosed this patient with open degloving of the posteromedial side of the right thigh and anteromedial side of the right knee; partial rupture of muscle belly of the right adductor longus, adductor brevis, adductor magnus muscles, vastus medialis, semitendinosus, semimembranosus, and biceps femoris; total rupture of the femoral and sciatic nerve; and open fracture intertrochanter of the right femur.



Fig. 1. The clinical picture of the right thigh



Fig. 2. Plain radiograph showing intertrochanteric comminuted fracture with reverse oblique pattern

Subsequently, the repair, secondary closure, and skeletal traction were performed following the exploration and debridement (Fig. 3). After one week,

we found necrotic tissue on the wound. Consequently, urgent debridement was performed (Fig. 4). Five days later, the surrounding tissues seemed to be non-viable. Therefore, the surgeon decided to do an operation with a urologist to perform hip disarticulation and scrotum necrotomy (Fig. 5). After that, the patient underwent repeated debridement in the operating theatre and negative pressure wound therapy (NPWT) for one month. After three months from the first admission, the patient's condition deteriorated. The resuscitation was performed, but unfortunately the patient died.



Fig. 3. Clinical picture after debridement, exploration, repair, secondary closure, and skeletal traction



Fig. 4. Clinical picture after urgent debridement

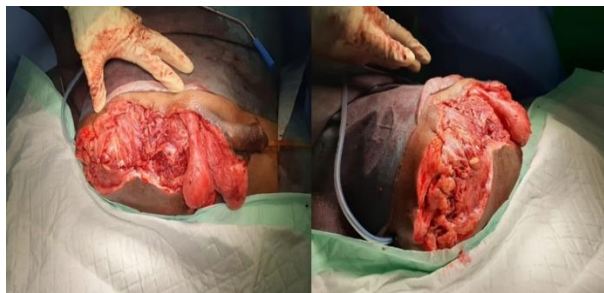


Fig. 5. Post hip disarticulation and scrotum necrotomy

DISCUSSION

High energy lower limb trauma is a case that we often find in daily practice. Surgeons often face a dilemma when choosing the therapies. Until recently, the most common definitive treatment options were limb salvage or amputation. In the end, both therapy options have their own advantages and disadvantages (4).

In this case, several scoring systems can be used to help determine the management of high energy lower extremity injuries. The most used is (Mangled Extremity Severity Score) MESS, which consists of age, shock, limb ischemia and skeletal/soft tissue injury. For this case, a total score of 6 was obtained, which means that limb salvage was possible to perform (5). Apart from that, Limb Salvage Index (LSI) and Predictive Salvage Index (PSI) scores can also be used. Based on the LSI score, which has parameters in the form of warm ischemia time, bone injury, muscle injury, skin injury, nerve injury, deep vein injury and time to treatment, the score is 9, which means amputation can be performed (6). Based on the PSI score, which has parameters in the form of level of arterial injury, degree of bone injury, degree of muscle injury, the interval from injury to the operating room, the score is 6, which means that limb salvage can be carried out. Based on the consideration of the scoring, in this case, the option of limb salvage can still be done (6).

In this case, the patient had a crush injury to the right leg and was subjected to debridement and limb salvage. Based on guidelines from AAOS crush or blunt injuries, some patients with massive soft tissue injuries who did not immediately undergo amputation would develop organ failure, septic shock and/or death as in this case (4). Another developmental study concluded that, in this case, primary amputation was better than reconstruction because there were more complications (7). In Mullenix study, he stated that early amputation may be the best treatment for some badly mangled extremities, and limb salvage is an option in most blunt and penetrating vascular injuries (8). In the case of high-energy lower limb injury, the physician must consider the existing organ damage (neurovascular, soft tissue, bone, and joints) in the limb and the outcome when choosing limb salvage or amputation (7).

Other than the patient's medical status, the choice between limb salvage and amputation will be greatly affected by the medical provider's healthcare facility. Limb salvage would be possible in the well-facilitated hospital, such as in the tertiary referral hospital. In contrast, limb salvage may not be possible in smaller hospitals due to more limited resources.

Hospital type will surely determine the facility availability. In the countries where hospitals are classified, the highest referral hospitals will have more sufficient facilities for limb reconstruction. In the highest referral hospitals, the medical centers are equipped with better supporting facilities to help manage limb reconstruction post-operatively. On the other side, it also means there are more surgical techniques and skilled personnel that are used to limb reconstruction.

If the facility is sufficient, then limb reconstruction should be attempted first. With that decision, the quality of life can be maintained, socialization can be pertained, and the patients themselves can accomplish daily live activity (9). These factors will significantly improve the patient's mental status in their daily life (10).

Meanwhile, if there is a limitation regarding the facility, such as in rural areas, then amputation should be considered because the prognosis will be significantly affected by the surgical site hygiene and infection status (9). Furthermore, the facilities and nursery quality during admission in the ICU will also affect it.

In the end, from this case, we learn that the decision between limb salvage and amputation is challenging. In order to determine which surgery to conduct by the surgeon, several circumstances should be considered, including the hospital's facility, the experience of the personnel, and the availability of equipment. Finally, the family's consent will be the most important factor in the decision making between limb salvage or amputation. If the hospital's facility, the personnel, and the equipment supports the decision to conduct limb salvage, we have to tell the family about the risk of the surgery, including several stages of surgeries that we will conduct to salvage the limb, the higher cost, and death. If after all the explanation we told the family about why we chose to conduct limb salvage surgery and the family still chose the amputation, we must respect the decision.

CONCLUSION

There is still no definite consensus regarding choosing between limb salvage and amputation in the case of high energy lower extremity trauma. Therefore, the surgeon in charge should consider the decision with high vigilance regarding the patient's clinical condition. The decision between limb salvage and

amputation should consider the long-term effect which influences the patient's life and their social ability as a human.

CONFLICT OF INTEREST

Authors declare no conflict of interest.

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