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## Full-Thickness Skin Avulsion of Right Leg Following Car Accident Trauma

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**Abstract:** The report presents a 24 year-old man who admitted at the orthopedic center with full-thickness skin avulsion of the right leg, due to his leg being caught under the wheel of a truck and subsequently traumatized. The day after injury, plastic and reconstructive surgery consult was done. After thoroughly irrigation, the 20 cm laceration was repaired above the knee. There was full-thickness skin necrosis below the knee down to the dorsal surface of the right leg (atypical form of skin avulsion). Debridment and graft was performed for the first stage. During the second stage, re-grafting was performed and the gasterocnemious flap was transposed to cover the Tibia bone. This study confirms early Plastic and reconstructive surgery consult from the trauma of lower extremities associated with skin lesion.

**Key words:** Skin avulsion, leg, graft, trauma

### INTRODUCTION

Extensive skin avulsion of extremities is a severe damage that is most commonly seen in individuals run over by motor vehicles, or experienced sudden and severe compression by movable machines (such as roller or drier). As a result, skin and subcutaneous tissue are removed from muscle and fascia, including perforator vessels, which was injured. In an animal study on pig, following avulsion of skin flap, vessels perforation associated with complete or incomplete intra vascular thrombosis were seen (Guo *et al.*, 1999). There are three types of skin avulsion as following:

- Typical form of skin avulsion
- Atypical form of skin avulsion
- Skin avulsion in specific sites (Kudsk *et al.*, 1981)

Atypical skin avulsion is most commonly seen in individuals whose extremities traumatized under heavy vehicles, particularly buses (Hidalgo, 1986). Viability of avulsed tissue is mainly difficult. Although several therapeutic methods were utilized, none of them were ideal due to being invasive and not reliable. In a study by Ziv *et al.* (1988), a split-thickness skin graft was taken by dermatome and the excision of tissue was performed at the Surface of dermal capillary bleeding. Then the graft was placed on viable tissue (Ziv *et al.*, 1988). Coverage is one of the most important issues in plastic surgery (Popescu, 2007). Today, using the skin of avulsed skin flap is the best method (Seng-Feng and Fu-Chan, 1997; Huemer *et al.*, 2004). Kudsk *et al.* (1981) and Ziv *et al.* (1988) in separate studies concluded that there was no

difference between full-thickness and split-thickness skin graft. The advantages of full-thickness skin graft were more popular when Farmer (1939) initially used this method. However, other methods such as the latissimus dorsi free flap are proved to be well suited to cover distal bone (Takami *et al.*, 1983; Muneuchi *et al.*, 2003). Although, there are some reports similar the presented case, this type of extensive skin avulsion of leg without bone fracture and intact sensory-motor activity and blood supply is rare, also it has never reported in Iran.

### CASE REPORT

The patient was a 24 year-old man who was admitted to the orthopedic center, with full-thickness skin avulsion of the right leg, after his leg had caught and traumatized under the truck Tier in 2004. There was about 20 cm skin laceration on his right knee, which was repaired. Plastic and reconstructive surgery consult was performed the day after injury. The chief complain of the patient was pain in the injured extremity. The vital signs were normal. There were no evidences of head, chest and abdominal trauma. In physical examination of the involved extremity, the sensory reflex of the leg including deep praneal nerve, medial and lateral plantar, surral and saphenous nerves were all normal. Plantar Flexion and dorsy-flexion movement, internal and external rotation was normal. In addition, blood supply and capillary refill of distal extremity were normal and there were no ischemic signs. There was Full-thickness necrosis of skin and subcutaneous tissue extended from below the knee down to the foot. Another extremity was normal in patients' physical exam (Fig. 1).



Fig. 1: Complete necrosis of skin and subcutaneous tissue before first debridement



Fig. 3: Meshed graft in re-operation



Fig. 2: The extremity after debridement



Fig. 4: The proximal part of tibia without skin covering

Complete debridement of skin and subcutaneous tissue was performed (Fig. 2).

The proximal part of tibia bone was exposed about 5 cm, but periosteum of the bone was intact. The avulsed flap resulted in complete necrosis, so that it could not be used for graft. Thus, a Split-thickness skin graft was taken from both thighs of the patient and used as graft to cover all the exposed area. Compressed dressing was done. Intravenous antibiotic was started for the patient. Patient was then transferred to department of Plastic and Reconstructive Surgery at Zare Hospital for following treatment. The dressing was opened after 5 days. The skin grafts had 30% rate of success. Due to localized purulent discharge, dressing with silver-sulfasalazin ointment 1% was performed once a day. After one week, the patient underwent a second operation and the Split-thickness skin graft, which was harvested from posterior of the thighs, were meshed. Then, the meshed graft applied to cover the exposed area (Fig. 3).

There was about 5 cm exposed bone at the proximal part of tibia (Fig. 4).

A medial semi gastrocnemius muscle flap rotated to proximal part of tibia (Fig. 5).



Fig. 5: Medial gastrocnemius flap for covering the proximal part of tibia

The dressing was opened 5 days later. The flaps and skin graft were sufficient. The patient was discharged with good condition and normal sensory- motor activity of the involved extremity. The patient visited one year after operation. The sensory activity of plantar surface, the medial and lateral part of the leg was normal. The range of motion and activity of the right lower extremity was normal but hypertrophic scar was seen because the patient refused pressure garment dressing (Fig. 6, 7).



Fig. 6: The appearance of anterior part of the extremity one year after surgery



Fig. 7: The appearance of posterior part of the extremity one year after surgery



Fig. 8: Dorsiflexion



Fig. 9: Plantar flexion

Plantar Flexion and dorsi-flexion movement of the leg were normal (Fig. 8, 9).

#### DISCUSSION

Lower extremities skin avulsion is common. These injuries are due to shearing forces of tier in motor vehicle accident or by roller machines. Incomplete treatment of these lesions may lead to full-thickness necrosis of skin flaps or the development of sepsis. The primary goal of treatment is immediately covering of skin defect following thorough debridement. Most surgeons recommended skin graft at this first stage (Seng-Feng and Fu-Chan, 1997; Huemer *et al.*, 2004). There are several kinds of graft. However, to obtain best results, it should be free of hematoma, infection and graft movement. If the avulsed skin used for full-thickness graft after removing of subcutaneous fascia and fats, it should be penetrated to prevent of discharge accumulation (McCurdy, 1977; Hunt *et al.*, 1979). In a study done on 23 children with skin avulsion, Split-thickness skin graft was taken from an area in two stages and then, the graft applied to cover the wound. Although there was no difference between the results of superficial and deep skin graft, the deep graft needed more time to complete recovery (Yu *et al.*, 1997). Skin avulsion is caused by rotating force. The skin and subcutaneous tissue can be injured by direct trauma. Some parts of avulsed skin can be burned due to crushing of the extremity on the road. Although most of authors recommended not using of burned skin, in fact it is a superficial burn. If the basal layer of graft is intact, it will be used (Rees and Casson, 1966; Serafini, 1962).

The presented patient is a rare case of lower extremities trauma (atypical type of skin avulsion according to kudsk classification) (Ziv *et al.*, 1988). Despite of full- thickness skin avulsion of the right leg, all vessels, sensory-motor nerves, muscles, tendons, tibia

and fibula bones were intact. Fortunately, the involved limb was saved with normal function after reconstructive surgery. Finally, in traumatized lower extremities associated with skin damages, the plastic and reconstructive surgery consult is recommended to achieve best function and form of the involved extremity.

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