

Femoral neck fracture after electrical shock injury

J. M. L. G. Gehlen · A. G. M. Hoofwijk

Received: 19 October 2009 / Accepted: 22 December 2009 / Published online: 20 April 2010
© The Author(s) 2010. This article is published with open access at Springerlink.com

Abstract A case of femoral neck fracture is reported after electrical shock injury with 300 V direct current in a 41-year old male. He had two small full thickness burns on his left heel, probably the exit wounds. A fracture after electrical shock due to musculoskeletal contractions is a very rare condition. Surgeons caring for patients with electrical injury should be aware of the possibility of skeletal injuries. Without vigilance for these injuries, delay in diagnosis may occur.

Keywords Electrical injury · Femoral neck fracture · Musculoskeletal contractions

Introduction

Fractures after electrical injury are very rare. When they occur, they are usually the result of a fall from a height. A review of literature showed eight cases of bilateral femoral neck fractures after electrical injury [1–5]. We report a case of a 41-year old male with a femoral neck fracture on his left side after he placed his hand on a plate with 300 V direct current for several seconds. On his left heel there were two small full thickness burns, probably the exit wounds of the current. The electric current probably affected only the left side of his body.

Clinical summary

This case report concerns a 41-year old male who was working as an electrician. At his workplace, he accidentally

placed his left hand on an iron plate with 300 V direct current. For several seconds he was “stuck” to the electrical plate. After a few seconds, he fell backwards on his buttocks, he did not lose consciousness. He then complained of pain at his left hip, and he was not able to stand or walk. At the emergency department, he was stable, with a pulse of 70 and blood pressure of 130/85. There were two small full thickness burns under his left heel (Fig. 1), probably the exit of the electrical current. Roentgenograms showed a femoral neck fracture on the left side (Figs. 2, 3). A further cardiac analysis was normal, EKG was normal and CK levels were slightly elevated. The femoral neck fracture was treated the same day with a dynamic hip screw. After 1 year, the patient had fully recovered, and there were no signs of malunion or avascular necrosis.

Discussion

Fractures after electrical injury are very rare. They are usually the result of a fall after electrical injury. Only a few cases of fractures caused by violent muscle contractions associated with electrical injury have been described. A review of literature showed eight cases of bilateral femoral neck fractures after electrical injury [1–5]. The reason that our patient had a unilateral femoral neck fracture could be that the current had an exit through the left heel, and that the current therefore affected only the left side of his body. We do not believe that the fracture was due to the fall on his buttocks from standing height in this otherwise healthy 41-year old man, but that the fracture is a result of violent muscle contractions.

Bone has the greatest electrical resistance of any tissue, therefore it generates the greatest heat when conducting an electric current. Additionally, fractures or dislocations can

J. M. L. G. Gehlen (✉) · A. G. M. Hoofwijk
Department of Surgery, Orbis Medical Center,
P.O. Box 5500, 6130 MB Sittard, The Netherlands
e-mail: jolandagehlen@hotmail.com



Fig. 1 Two small full thickness burns under the left heel

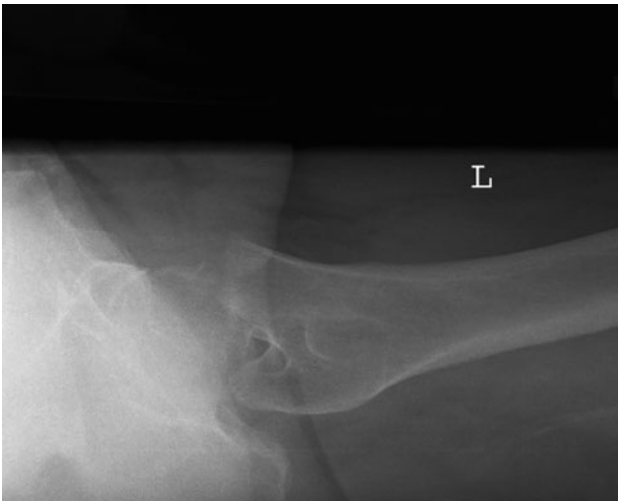


Fig. 2 Femoral neck fracture on the left side

result from tetanic contractions. The threshold for damage from direct current is about 50 V. Muscle contractions may result from contact with a direct current of at least 20 mA or an alternating current of 10 mA. Most skeletal injuries are in the upper extremities, especially the shoulders. Further injuries include fractures of the vertebral bodies, scapular fractures, and femoral fractures [6].

Atkinson et al. [1] reported a delay of diagnosis in this injury of up to 1 week, because there is no direct trauma to the musculoskeletal system, the fractures being caused, rather, by tetanic muscle contractions. The pain is thought to be due most likely to deep muscle contractions. A thorough, complete physical examination of the musculoskeletal system should therefore be performed in these patients, with a high index of suspicion. X-ray studies are often unnecessary in alert cooperative patients with no significant tenderness, full active range of motion of the joints, and good function. In the unconscious or



Fig. 3 Femoral neck fracture on the left side

uncooperative patient, x-ray studies of the shoulders, spine, and pelvis are warranted if these structures were in the path of the electric current [7].

Furthermore, in young patients, complications after femoral neck fractures are common. In this case we do not yet have a long-term follow-up, but frequent checkups at the outdoor clinic will be done because of these possible complications.

Conclusion

We reported a case of a 41-year old male with a femoral neck fracture after electrical injury caused by violent muscle contractions. This is a very rare condition and has been described only a few times in literature. A delay in diagnosis is common, and therefore a thorough, complete physical examination of the musculoskeletal system should be performed in these patients, with a high index of suspicion.

Conflict of interest statement None.

Open Access This article is distributed under the terms of the Creative Commons Attribution Noncommercial License which permits any noncommercial use, distribution, and reproduction in any medium, provided the original author(s) and source are credited.

References

1. Atkinson RE, Kinnett G, Arnold WD Simultaneous fractures of both femoral necks, review of the literature and report of two cases. *Clin Orthop*. 1980;152:284–7.
2. Tompkins GS, Henderson RC, Peterson HD Bilateral simultaneous fractures of the femoral neck: a case report. *J. Trauma* 1990;30(11):1415–6.
3. Slater RR Jr, Peterson HD. Bilateral femoral neck fractures after electrical injury: a case report and literature review. *J Burn Care Rehabil*. 1990;11(3):240–3.
4. Shaheen MA, Sabet NA. Bilateral simultaneous fracture of the femoral neck following electrical shock. *Injury*. 1984;16(1):13–4.
5. Nyoni L, Saunders CR, Morar AB. Bilateral fracture of the femoral neck as a direct result from electrocution shock. *Centr Afr J Med*. 1994;40(12):355–6.
6. Evans RH, Little K. Fracture due to shock from domestic electricity supply. *Injury*. 1991;22(3):231–2.
7. Fish RM. Electrical injury, part II: specific injuries. *J Emerg Med*. 2000;18(1):27–34.