LEG CONQUASATION CAUSED BY PETROL TILLER WITH OPEN LOWER LEG FRACTURE

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We present a 71-year old patient admitted to Plastic and Reconstructive Surgery Clinic, Clinical Center Niš for the right leg conquasation. The patient was injured accidentally by a petrol tiller. On admission, both thigh and lower leg conquasation was observed with large wound on anteromedial thigh and one on medial side of the lower leg. Soft tissue and bones were covered with dirt and pieces of clothing. The wounds were thoroughly rinsed and dirt was removed followed by detailed debridement. After primary surgical treatment of the wound, open proximal lower leg fracture was stabilized with external skeletal fixation using two nails in the proximal and two nails in the distal fragment. Soft tissue defect was treated by plastic surgeon. The patient was administered anti-tetanus protection, antibiotic treatment and anticoagulant prophylaxis of deep vein thrombosis and pulmonary thromboembolism. Physical therapy was initiated subsequent to successful healing of the soft tissue wounds. External skeletal fixation was removed after three months for infection around the proximal nails and the treatment was continued using functional Sarmiento’s plaster immobilization leading to full recovery of open lower leg fracture.


Key words: leg conquasation, petrol tiller, open lower leg fracture, primary surgical treatment, external skeletal fixation

Introduction

Both thigh and lower leg conquasation injuries caused by engine tiller are among the most severe ones in bone and joint traumatology. The injury mechanism consists of firm strokes produced by sharp tiller knives which produce strong force easily damaging both soft tissues and bones. Since tillers are used in soil processing, the wounds are highly contaminated with anaerobic spore-forming bacteria, such as Clostridia. Skin and soft tissue desctruction, comminution and bone defect, high level of both anaerobic and aerobic contamination and threatening infection make the treatment of these injuries, particularly open lower leg fracture, complex and challenging (1,2). Meticulous irrigation of these wounds, removal of all foreign bodies and dirt and thorough surgical debridement of damaged tissue are the prerequisites of successful prevention of healing complications, especially infection, both non-specific and specific (tetanus and gas-gangrene). Also, fracture stabilization with external skeletal fixation, antibiotic therapy and anti-tetanus protection are of greatest importance. High-quality physiotherapy following successful healing of soft tissue wound(s) and bone fracture(s) is necessary for patient early recovery and faster return to everyday activities. The most common complications of leg conquasation include soft tissue and bone infection, gas-gangrene, fracture malunion and finally amputation (3-6).

Aim

The aim of the paper was to present our results in the treatment of severe thigh and lower leg conquasation injury with open lower leg fracture made by petrol tiller. Moreover, we aimed to highlight the therapeutic difficulties and complications of these complex injuries.

Case report

We present a 71-year old patient referred from regional hospital and admitted to Plastic and Reconstructive Surgery Clinic, Clinical Center Niš...
for right leg conqueasation with lower leg open fracture, Gustilo type IIIB (7,8). The patient was injured accidentally by a petrol tiller. He was administered anti-tetanus protection and anti-coagulant prophylaxis of deep vein thrombosis and pulmonary thromboembolism. After preoperative evaluation, the patient underwent surgery.

On admission, both thigh and lower leg conqueasation was observed with large wound on anteromedial thigh and one on medial side of the lower leg (Figure 1).

Soft tissue and bones were covered with dirt and pieces of clothing. Wounds were thoroughly rinsed and dirt was removed followed by detailed debridement (Figure 2).

Wounds were thoroughly rinsed with saline, hydrogen peroxide and iodine solution (Figure 3). Detailed debridement followed (Figures 4,5,6). Soft tissue defect was treated by plastic surgeon using Thiersch-Ollier’s skin graft (Figures 7,8,9).

Subsequently, the patient was transferred to Orthopaedics and Traumatology Clinic. Two directions X-rays of lower leg with knee joint was done (Figure 10). Afterwards, he was released and the treatment continued ambulatory with regular 7-day follow-up that included wound cleaning and changing of the dressing (Figure 11).

Gradually, progressive increase of injured leg usage was then allowed and physical therapy was initiated. However, on follow up three months after external skeletal fixation, an infection around the proximal nails was observed (Figure 12).

Antibiotic treatment and everyday wound cleaning and dressing were introduced, but without expected results. As infection persisted, the external skeletal fixation was removed and the treatment was continued using functional Sarmiento’s plaster immobilization leading to full recovery of the open lower leg fracture (Figure 13). Right lower leg X-ray was performed through plaster (Figure 14). The patient continued walking with crutches and with full leaning on the injured leg. Six months after sustaining the injury, the plaster was removed followed by control X-rays that revealed the healed lower leg fracture (Figure 15).

Subsequently, the patient was referred to Ribarska spa for further physiotherapy which led to full recovery and return to normal life.
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Figure 5. Removed devitalized tissue

Figure 6. Wound appearance after detailed debridement and irrigation

Figure 7. Placement of external skeletal fixation after reposition of proximal tibia open fracture

Figure 8. The appearance of the wounds after application of Thiersch-Ollier’s skin grafts

Figure 9. The appearance of the wounds after application of Thiersch-Ollier’s skin grafts – another angle
Figure 10. Right lower leg X-rays depicting tibia’s proximal third fracture after reposition and stabilization with external skeletal fixation

Figure 11. Patient’s status on regular follow up

Figure 12. Infection around proximal nails of external skeletal fixation

Figure 13. Right lower leg immobilized with functional Sarmiento’s plaster

Figure 14. Right lower leg x-rays through plaster depicting healing of tibia’s proximal third fracture
Discussion

A conquasant injury with open fracture of the lower leg requires urgent surgical treatment assuming good general status of the patient. It includes thorough wound rinsing and removal of the dirt, foreign bodies and cellular debris, followed by primary surgical care – debridement, fracture stabilization with external skeletal fixation, antibiotic therapy, anti-tetanus protection and delayed wound closure (1,6).

Primary surgical care – debridement of the open fracture wound is crucial for prevention or successful treatment of infection (non-specific soft tissue infection and osteitis, gas gangrene and tetanus). If possible, it has to be done within six hours after injury, since delayed primary surgical treatment - debridement allows progressive wound contamination. Wound smear, microbiological examination for contaminating microorganisms’ identification and their sensitivity to antibiotics (biogram and antibiogram) are necessary before primary treatment. First step is meticulous wound irrigation using saline and hydrogen peroxide (sometimes more than 10L) followed by detailed cleaning and removal of all foreign bodies – dirt, pieces of clothing and cellular debris. Debridement must include extensive surgical removal of devitalized soft tissue (skin, fat, fascia, muscle and bone) (8,9). Since necrotic muscle tissue represents the environment susceptible for both aerobic and anaerobic bacteria, special care has to be made during muscle debridement regarding adequate assessment of its color, consistence, contractility and bleeding. If necessary, open fracture wound debridement may be repeated after 24 or 48 hours (secondary debridement) after demarcation and exposure of further (new) tissue devitalization. Successful prevention and curing of infection, especially deep osteitis, is one of the most important factors for leg salvation (9-11).

Further treatment includes bones reposition and external skeletal fixation which is the method of choice for lower leg open fracture stabilization except for Gustilo type I fractures when internal fixation is possible. External skeletal fixation provides optimal biomechanical conditions for successful fracture healing, good approach for wound care and does not interrupt knee and ankle joint movements. Postoperatively, patients are being mobilized early and start walking (12). Recently, in contemporary traumatology, primary intramedullary fixation of types I, II and IIIA open fractures preceded by thorough wound debridement is becoming more and more preferable (13,14). However, the role of intramedullary fixation in type IIB open fracture treatment is still controversial. Also, delayed intramedullary fixation after primary external skeletal fixation may be used as alternative treatment method for severe open fractures (11,15). If lacking external skeletal fixation devices, plaster immobilization of the
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Fracture may be applied after primary surgical care of the wound, with creating an aperture in the plaster above the wound site for wound assessment and care. In these circumstances, wound care is much more difficult compared to external skeletal fixation. Functional Sarmiento’s plaster immobilization in the treatment of open lower leg fracture provides satisfactory results and is applicable upon healing of the wound and removal of external skeletal fixation.

Problems related to external skeletal fixation include common soft tissue and bone infection around the device nails, especially if applied more than six months (12,16-18). Edwards and al. reported 50 (29,24%) patients with soft tissue infection and 4 (2.33%) with local osteitis around the nails in a study of 171 patients with open fracture treated with external skeletal fixation (19). Marsh et al. reported the incidence of 39 (38.61%) patients with complications related to device nails among 101 patients with open tibia fracture treated with external skeletal fixation and 10 of them required device replacement (20). However, in the same study low incidence of deep bone infection around fracture (6%) was observed (20).

Open fracture wound, after primary surgical treatment and external skeletal fixation, is not to be closed primary. Delayed wound closure is preferable and is performed after infection is definitely ruled out, using suturing or plastic and reconstructive surgery procedures (fasciocutaneous or microvascular flap), depending on the soft tissue defect size (4,12,21).

Early intravenous antibiotic therapy in patients with lower leg open fractures should be initiated immediately on admission (22). It may include benzylpenicillin for anaerobes (4-6000000 IU/4h) and aminoglycoside for gram-negative flora (1gr/24h). In cases of highly contaminated open fracture (dirt), additional metronidazole or lincosamide may be administered to prevent gas gangrene. Suggested treatment should be administered three days after which benzylpenicillin should be replaced with third or fourth-generation cephalosporin. After completed microbiological examination, further antimicrobial treatment should be administered according to anti-biogram results and continued for additional 48-72 hours for types I and II open fractures and 120 hours for type III (22-25). Anti-tetanus protection is mandatory for all patients with open fractures.

Conclusion

Conquasant lower leg injuries caused by petrol tiller are among the most severe ones in bone and joint traumatology. Since tillers are used in soil processing wound are almost always covered with dirt. Therefore, beside soft tissue and bone destruction, high level of both anaerobic and aerobic contamination of the wound are very common. Most frequent complications of these injuries include soft tissue infection and deep osteitis, fracture malunion and loss of the limb – amputation. Thorough irrigation of these wounds, removal of all foreign bodies and dirt and adequate surgical debridement of damaged tissue are mandatory for successful prevention of infection, both non-specific and specific (tetanus and gas-gangrene). Also, fracture stabilization with external skeletal fixation, antibiotic therapy and anti-tetanus protection are of greatest importance. Early physiotherapy following successful healing of soft tissue wound and bone fracture is necessary for full recovery. Strict adherence to these basic principles of open conquasant lower leg fracture treatment in presented patient resulted in good clinical and functional outcome and return to normal life.

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Reference


KONKVASANTNA POVREDA NATKOLENICE I POTKOLENICE FREZOM SA OTVORENIM PRELOMOM POTKOLENICE

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Bolesnik S.B., star 71 godinu, primljen je na Kliniku za plastičnu i rekonstruktivnu hirurgiju KC u Nišu zbog konkvasantne povrede desne potkolenice i natkolenice. Prilikom obavljanja poljoprivrednih poslova, ubacio je frezu u rikvec i ona je promenila smer kretanja, podvukla se ispod njega i teško ga povredila. Pri prijemu, kod bolesnika je registrovana konkvasantna povreda desne potkolenice i natkolenice sa velikom ranom na prednjoj medijalnoj strani desne natkolenice i medijalnoj strani desne potkolenice. Meka tkiva i koštano tkivo potkolenice i natkolenice bila su veoma zaprljani delovima zemlje i odeće. Urađeno je obilno ispiranje svih delova povređene potkolenice i natkolenice i odstranjivanje delova zemlje i odeće. Urađen je detaljan debridman oštećenih tkiva natkolenice i potkolenice. Otvoreni prelom potkolenice u proksimalnoj trećini nakon primarne obrade rane otvorenog preloma stabilizovan je spoljnim skeletnim fiksatorom sa dva klina u proksimalni fragment i dva klina u distalni fragment. Defekt mekih tkiva zbrnut je od strane specijaliste plastične i rekonstruktivne hirurgije. Bolesniku je ordinirana antitetansna zaštitita, antibiotika terapija (Amp. Azarana 2,0g/24h, Amp. Amicacin a 1g/24h i Amp. Orvagila a 500mg/8h), kao i Amp. Fraxiaparine 0,6 mg u prevenciji duboke venske tromboze i tromboembolije pluća. Po saniranju rana mekih tkiva, bolesnik je uključen u fizičku terapiju. Zbog infekcije oko proksimalnih klina spoljnog skeletnog fiksatora, nakon tri meseca od povrede i operativnog zahvata, spoljni skeletni fiksator je odstranjena, a lečenje nastavljeno funkcionalnim gipsom po Saremientu, što je dovelo do zarastanja otvorenog preloma potkolenice. Acta Medica Medianae 2014;53(1):34-41.

Ključne reči: konkvasantna povreda noge frezom, otvoren prelom potkolenice, primarna obrada rane, spolna skeletna fiksacija