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TIBIAL SHAFT FRACTURES TREATED BY THE EXTERNAL FIXATION METHOD

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Summary. *The external fixation of tibial shaft fractures with Mitkovic's external fixator is a simple and effective method for everyday orthopaedic-traumatology praxis. The fixation is unilateral with convergent pins orientation (45-90 degrees), and there is also possibility for compression and distraction. Pins are placed without any guidance. The result of external fixation in 49 patients with tibial shaft fractures, 30 (61.22%) men and 19 (38.77%) women, average age 43.92 years old (16-84), are presented in this work. The open tibial shaft fractures was 14 (28.57%). All fractures are treated with Mitkovic external fixator type M 20. The results applied external fixation method are excellent and good. Union rate was 83.68%. Pin tract infection appeared in 4 (8.16%) patients. In only 3 cases the external fixator was removed and treatment continued with application the functional braces. Nonunion rate was in 6 (12.24%) patients, of which 4 with opened fractures (two Gustilo type IIIB, one Gustilo type IIIA, one Gustilo type II) and 2 with the segment fractures. Compartment syndrome was observed in 1 (2.04%) patient with closed fracture. Malunion rate was in 2 (4.08%) patients. External fixation of tibial shaft fractures is a simple and effective method that enables the safe healing of the fractures, early mobilization of patients, early weight-bearing, as well as early rehabilitation.*

Key words: *External fixation, Tibial shaft fractures*

Introduction

Tibial shaft fractures are one of the most common shaft fractures of long bones (1). Open, but also many closed tibial shaft fractures can be a very difficult orthopaedic problem. There are many methods of conservative and operative treatment. Among operative treatments, the methods of external (2,3,4,5) and internal fixations (6,7,8) are applied. The external fixation is a method of choice in the treatment of open tibial shaft fractures. Most of unstable closed tibial shaft fractures can be treated with method of the external fixation in a more efficient manner than with other methods. Due to its subcutaneous localization is suitable for the application of the external fixator (9).

Material and Methods

The paper shows the results of treating 49 patients with tibial shaft fractures. All fractures were treated with the external fixation method in the Orthopaedic & Traumatology Clinic Nis. The fractures were fixed with Mitkovic's external fixator, type M 20 (Figures 1–4). The follow-up was 16–24 months postinjury.

Fig. 1. The open tibial shaft fracture, Gutilo type IIIA

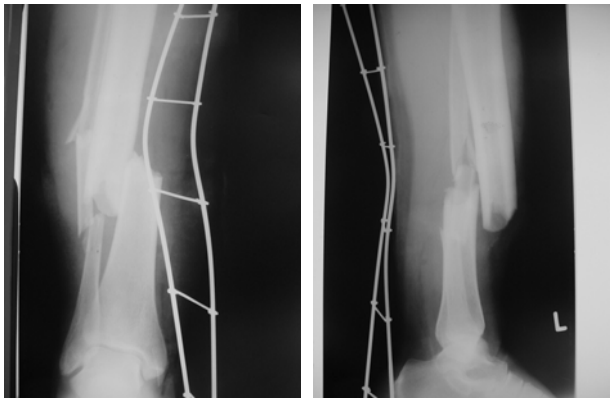

Fig. 2. Radiographs (AP and lateral views), the Gustilo type IIIA open tibial shaft fracture.

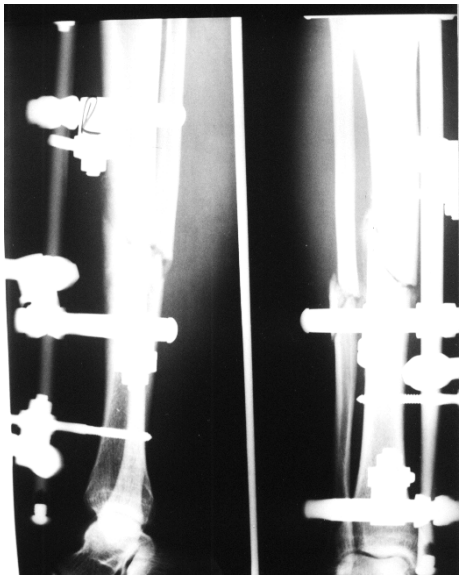

Fig. 3. Radiographs (lateral and AP) views after the external fixation.

Fig. 4. The external fixation enables early rehabilitation and weight-bearing on the operated leg.

Results

The paper shows the results of the external fixation of 49 tibial shaft fractures, 30 (61.22%) men and 19 (38.77%) women, average age 43.92 (16–84). There were 14 (28.57%) of open tibial shaft fractures. The results of the external fixation of the tibial shaft fractures are excellent and good. The union rate was 83.68%. Nonunion rate was 12.24% (Fig. 5). There were 4 patients with the open tibial shaft fractures (2 Gustilo type IIIB, 1 Gustilo type IIIA, 1 Gustilo type II) and 2 patients with segment fractures. The patients who had atrophic pseudoarthroses had the external refixation with bone grafting. In hypertrophic pseudoarthroses the external compressional- distractional fixation was done. Malunion rate was 4.08%. Pins tract infection rate was 8.16%. One patient (2.04%) developed a compartment syndrome. The patient had a fasciotomy done and the external fixator applied. The average time of fractures healing was 17.7 weeks (15–20).

Discussion

Operative treatment of the tibial shaft fractures usually leads to healing, without any consecuences on life and working ability (10). The most common methods used in treating tibial shaft fractures are intramedullary nail, conventional, AO compression plates and external fixator (3,6,7). When a surgeon is to choose an operative method for the treatment of tibial shaft fractures, they have to pay attention not only to the fracture but also to the state of soft tissue of the injured extremities, including vascular status, muscles, and the state of the cutaneous cover. Attitudes of schools with regard to indications for operative treatment of closed tibial shaft fractures are different. The external fixation is an excellent method for the treatment not only open, but also closed tibial shaft fractures. Due to its subcutaneous localization, tibia is often exposed to injury, but subcutaneous localization is very suitable for the external fixation. The external fixation used for treating unstable tibial shaft fractures minimizes the possibility of the appearance of postoperative osteitis. The application of external fixator enables an almost perfect control of the fracture, owing to a possibility of intraoperative and postoperative reduction of the fracture. During the healing of the fracture treated with the external fixation method there is a possibility of adapting biomechanical condition of healing- dynamization of the external fixator. The external fixation method enables early postoperative rehabilitation and functioning of extremities which reduces the time of treatment and provides good results (9). Shaw et al. obtained 100 per cent union in a group of 44 closed tibial shaft fractures and open fractures Gustilo type I and Gustilo type II, treated with the external fixation method (11). Keating et al. obtained 95 per cent union rate after the external fixation of 100 tibial shaft fractures (47 closed and 53 open) with Orthofix external fixator. The same authors had 6 per cent nonunion in the same series after the external fixation, 14 per cent malunion after the external fixation of closed tibial shaft fractures, and 32 per cent malunion after the external fixation of open fractures (3). Krettek et al. obtained 10.9 per cent nonunion after the external fixation of 202 tibial shaft fractures (70 closed and 132 open) (4). Mitkovic's external fixator type M 20 is unilateral, and allows a possibility of convergent pins ori-

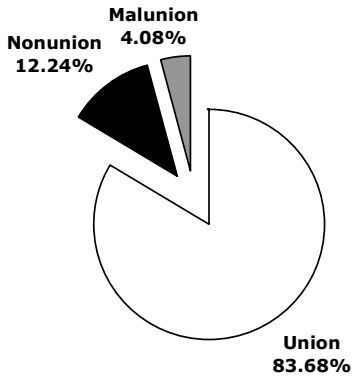

Fig. 5. The union, nonunion and malunion rate after the external fixation of the tibial shaft fractures.

entation (0–90 degrees). The application of the external fixator is simple and does not require any special guidance due to clamps which allow moving along the clamp carrier. The apparatus allows three- dimensional stability simulating natural bone mechanics. The application of the external fixator lasts briefly, there is no blood loss, bone vascularization is minimally aggravated, postoperative hospitalization is short (12).

Conclusion

Mitkovic's external fixator type M 20 is unilateral, simple and effective when used in treating all types of open tibial shaft fractures and in treating closed fractures with damaged soft tissues, comminution and fragments dislocation. The apparatus is applied without any guidance, and pins are placed convergently which allows three- dimensional stability of the fixed bone. The external fixation with Mitkovic's external fixator minimizes the appearance of postoperative osteitis in the treatment of tibial shaft fractures. If this method implemented, an almost perfect control of the fracture is allowed, owing to a possibility of intraoperative and postoperative reduction of bone fragments. During the healing of the fracture, it is possible to adapt biomechanical conditions of the dynamization of the external fixator. The method of the external fixation allows early postoperative rehabilitation and functioning of extremities, which reduces the time of treatment and provides good functional results.

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SPOLJAŠNJA FIKSACIJA PRELOMA POTKOLENICE

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Kratak sadržaj: *Spoljašnja fiksacija preloma potkolenice spoljašnjim fiksatorom po Mitkoviću je jednostavna i efikasna metoda za svakodnevnu ortopedsko- traumatološku praksu. Fiksacija je unilateralna sa konvergentnom orijentacijom klinova (45-90 stepeni), sa mogućstvom kompresije i distrakcije. Klinovi se plasiraju bez posebnih vodilica. Rezultati spoljašnje fiksacije kod 49 pacijenata sa prelomima potkolenice, 30 (61,22%) muškaraca i 19 (38,77%) žena, prosečne starosti 43,92 (16- 84) godine, su prikazani u ovom radu. Otvorenih preloma potkolenice je bilo 14 (28,57%). Svi prelomi su fiksirani pomoću spoljašnjeg fiksatora po Mitkoviću, tip M 20. Rezultati spoljašnje fiksacije su odlični i dobri. Procenat zarastanja preloma je iznosio 83,68%. Pin tract infekcija u toku nošenja spoljašnjeg fikatora je bila prisutna kod 4 (8,16%) pacijenata. Kod samo 3 pacijenta spoljašnji fiksator je skinut i lečenje nastavljeno aplikacijom funkcionalnog gipsa. Nezarastanje preloma je bilo prisutno kod 6 (12,24%) pacijenta, kod 4 sa otvorenim prelomom (2 Gustilo tip IIIB, 1 Gustilo tip IIIA, i 1 Gustilo tip II) i 2 pacijenta sa segmentnim prelomom potkolenice. Kompartment sindrom je dijagnostifikovan kod 1 (2,04%) pacijenta. Loše zarastanje je bilo prisutno kod 2 (4,08%) pacijenta. Spoljašnja fiksacija preloma potkolenice je jednostavna i efikasna metoda koja omogućava sigurno zarastanje preloma, ranu mobilizaciju, oslonac i ranu rehabilitaciju operisanih pacijenata.*

Ključne reči: *spoljašnja fiksacija, prelomi potkolenice*