



Original article

ACTA FAC MED NAISS 2009; 26 (3): 127-133

Predrag Stojiljković¹, Zoran Golubović¹,
Desimir Mladenović¹, Ivan Micić¹,
Saša Milenković¹, Saša Karalejić¹,
Saša Stojanović¹, Sonja Stamenić¹,
Danilo Stojiljković², Milan Mandić³

¹ Clinic for Orthopaedic Surgery and
Traumatology, Clinical Center Niš, Niš, Serbia

² Clinic for Plastic and Reconstructive
Surgery, Clinical Center Niš, Niš, Serbia

³ Clinic for Physical Medicine and
Rehabilitation, Clinical Center Niš, Niš, Serbia

DAMAGE CONTROL STRATEGY IN THE TREATMENT OF CLOSED FEMORAL SHAFT FRACTURES IN POLYTRAUMA PATIENTS

SUMMARY

Polytrauma is the leading cause of death in adults up to the age of 50 years. Proper management of closed femoral shaft fractures in polytrauma patients can greatly reduce mortality and morbidity.

The prospective study followed and analyzed 68 polytrauma patients with 70 closed femoral shaft fractures, who were operatively treated in the Clinical Center Niš from June 1, 1999 to June 1, 2006.

Worsening of the overall patients' condition following the external and internal fixation of the fractures pointed to statistically significant difference ($X^2=16.40$ $p<0.001$). Exacerbation of the condition of the polytrauma patients with femoral fractures was more frequently documented after internal fixation within initial 24 hours. External fixation of the fracture was followed by longer period of fracture healing, worse functional outcome and more frequent complications related to fracture management compared to the applied methods of internal fixation.

The obtained results confirm the hypothesis that early internal fixation of the femoral fractures in the polytrauma patients poses great and additional trauma for the injured, and it can be safely performed after stabilizing the patient condition. External fixation stands for a safe operative method for accomplishing temporary stability of the femoral fracture in the polytraumatized patients and a minimally additional operative trauma. However, it is associated with a number of complications and a worse functional outcome when compared to the internal fixation method. External fixation of the femoral fracture in the polytraumatized patients should be converted into internal fixation when the patient's condition allows.

Key words: femoral shaft fractures, polytrauma, external fixation, internal fixation

INTRODUCTION

Trauma is the leading cause of death in the population under fifty years of age (1). Polytrauma has been defined as a simultaneous injury of different regions of the body, while one or the combination of these injuries is life-threatening (2). Successful management of polytrauma patients has a tremendous

social and economic importance (3). Major advances in the management of polytrauma patients in the last twenty years has included the development of trauma teams, institutional commitment to trauma care and protocol based on prioritization (4). Advances in prehospital care, resuscitation, surgical technique, implants and intensive-care medicine have all contributed to better treatment of patients in physio-

logical crisis after trauma. Successful surgical treatment of polytrauma patients requires the approach based on prioritizing injuries (5).

An isolated femoral fracture rarely poses any threat, but in association with multiple injuries, a fracture assumes greater importance. Proper management of femoral fractures in polytrauma patients can greatly reduce mortality and morbidity (6).

While the benefits of early internal fixation (early total care) of fractures have been well-documented, in some situations such as severe chest trauma, injuries to the pelvic ring or brain injury, the patient may not be stable enough to have definitive surgery performed initially (7). "Damage control orthopaedics" is an approach that stabilizes orthopaedic injuries, so that the patient's overall physiology can improve. Its purpose is to avoid worsening of the patient's condition by the "second hit" of a major orthopaedic procedure and to delay the definitive fracture stabilization to the moment when the overall patient's condition is optimized. Minimally invasive surgical techniques, such as external fixation, are used initially (8).

The aim of the paper was to present the advantages of the 'damage control' strategy in the management of closed femoral shaft fractures in polytrauma patients.

PATIENTS AND METHODS

The prospective clinical study involved and analyzed 68 polytrauma patients who were treated in the Clinical Center Niš during the seven-year period from June 1, 1999 to June 1, 2006. In the analyzed group, there were 70 closed femoral shaft fractures. In two polytrauma patients, femoral fractures were diagnosed bilaterally.

In the group of the polytraumatized, the male subjects prevailed. There were 48 (70.59%) male and 20 (29.41%) female subjects. The mean patient age was 34.27 years. The youngest injured patient was 16, while the oldest one was 67 years of age. The largest number of the polytrauma patients was in the third decade of life – 17 (25.00%); second -15 (22.06%), fifth – 15 (22.06%) and in the fourth decade -13 (19.18%).

In the analyzed group of the polytrauma patients with femoral fractures, a dominant etiological factor of sustaining an injury was traffic traumatism reported in 54 (79.41%) patients. Also, a very frequent way of getting injured was a fall from height, documented in 12 (79.41%) cases. The smallest number of the injured belonged to the group of the industrial and agricultural traumatism – 2 (2.94%).

The severity of the polytrauma was estimated by Trauma Score (Trauma Score –TS) (9). In the least polytraumatized - stable cases - 13 (19.12%) subjects, there was a high TS, ranging from 13 to 16 scores. The mean TS from 9 to 12 scores was reported in more severe cases - the borderline patients - 26 (38.23%) subjects, while the lowest TS from 1 to 8 scores was noted in the most severe cases - unstable and critical - 29 (42.65%) subjects. The mean TS value in the group of the polytraumatized with high TS was 13.4 scores; in the group with mean TS it was 10.8 scores, and in the group with the lowest TS it equaled 7.5 scores.

In the group of the multiply-injured patients, the head injuries prevailed, reported in 29 (42.65%) subjects, followed by abdominal injuries in 11 (16.17%) subjects; injuries of the locomotor system registered in 16 (23.53%) subjects and chest injuries reported in 12 (17.65%) subjects.

In all polytraumatized patients in whom the method of external fixation (EF) was applied in the treatment of closed femoral shaft fractures, the Mitković external fixator was applied. In the examinees in whom the method of internal fixation (IF) was applied, Kuntsher nail (intramedullary fixation) and self-dynamisable internal fixator (SIF) by Mitković (extramedullary fixation) were used. The fractures were temporarily managed by the skeletal traction and coxofemoral plaster cast immobilization until the surgical treatment of femoral fracture.

In the group of polytraumatized patients, medical documentation was thoroughly analyzed (history of disease, operative and anesthesiological protocols, etc.) and the examinees were followed for fourteen to sixteen months after being released from hospital throughout regular ambulatory control check-ups. In the polytraumatized patients, the following items were analyzed: the time and choice of the operative method for the treatment of femoral fracture (external or internal fixation); length of the orthopaedic intervention; blood loss during and after the orthopaedic intervention; time to healing and functional outcome for the shaft fractures (according to Nerr numerical criterion) (10) as well as local complications associated with the fracture management.

During the data processing, the methods of analytical and descriptive analyses were used. The choice of methodological procedures was adjusted to the aims of the study and the scientific hypothesis put forward.

RESULTS

The median time interval between sustaining an injury and orthopaedic intervention external fixation was 2.11 days and internal fixation 6.97

days. Between external skeletal fixation and internal fixation of the femoral fracture there was a statistically significant difference related to median time (expressed in days) from sustaining an injury to the time of the operation ($t=2.974$ $p<0.05$). The method of external fixation was favored in the past.

The median time of operation with external fixation of the femur was 32.88 min (25-50 min); both open and closed methods of the fracture reposition were applied. The length of external skeletal fracture fixation was much shorter compared to the methods of internal fixation (time of operation by Kuntsher nail was 56.00 min (45-70 min) and with self-dynamisable internal fixator by Mitković 65.00 min (45-110 min) (Kruskal Wallis $\chi^2=65.523$ $p<0.0001$).

In regard to the chosen fixation method, there was statistically significant difference in blood substitution during the intervention ($\chi^2=18.60$ $p<0.005$) and the postoperative blood loss through the operative wound drainage after orthopaedic intervention ($\chi^2=77.53$ $p<0.001$). Blood loss during external skeletal fixation (operative and postoperative) in our series was statistically significantly smaller than in the applied methods of internal fixation.

Of 68 polytrauma patients, deterioration of the overall patient condition after operative treatment of the femoral fracture was reported in three subjects (in two patients ARDS developed and in one patient there was worsening of the brain function). Worsening was documented in two subjects in whom internal fixation of the femoral fracture was performed within initial 24 hours, and in one subject in whom internal fixation of the fracture was undertaken three days after injury. Worsening of the overall patients' condition following the external and internal fixation of the fractures pointed to statistically significant difference ($\chi^2=16.40$ $p<0.001$). Exacerbation of the condition of the polytrauma patients with femoral fractures was more frequently documented after internal fixation within initial 24 hours.

The method of external skeletal fixation with a Mitković unilateral fixator as a definitive treatment method was applied in the polytrauma patients in the management of 9 (12.86%) closed femoral shaft fractures. Fifty-six (80.00%) fractures were treated by the method of internal fixation. Conversion of external skeletal fixation into internal fixation was performed in 5 (7.14%) femoral fractures.

The average time of conversion of external into internal fixation was 21.6 days (range, 21 to 40 days). In one patient we performed bilateral conversion (Figure 1).



Figure 1. Bilaterally closed femoral shaft fracture in polytrauma patient treated by «damage control» strategy

In one fracture, the external fixation was converted into internal fixation in one-stage procedure. The other four fractures were associated with draining pin sites, and skeletal traction to allow pin-site healing was used for an average of 11 days (range, 8 to 13 days) after fixator removal and before internal fixation. In all conversions, we used SIF by Mitković.

By testing the mean time to fracture healing after the applied operative methods in the management of the femoral shaft fractures which prevailed, a statistically significant difference was determined (ANOVA $F=4.670$ $p<0.005$). Post hoc test showed that the median healing time of fractures treated by external skeletal fixation of 6.11 ± 0.81 months was significantly longer compared to other values. The median healing time of the femoral fractures treated by external skeletal fixator in our group of the polytrauma patients was 6.11 months (4.5-8 months), and it was longer (statistically significant difference) when compared to the healing time of the fractures treated by the methods of

internal fixation and conversion of external into internal fixation (Figure 1).

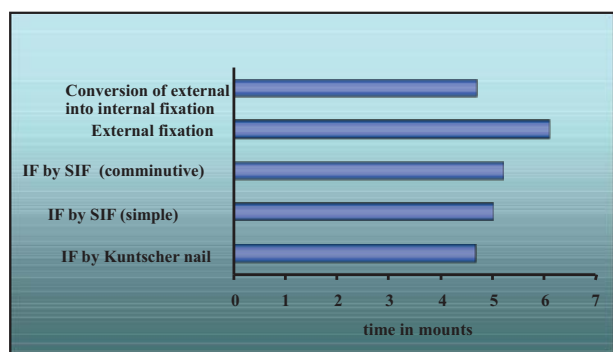


Figure 1. Mean time to healing of closed femoral shaft fractures

In the group of fractures managed by the method of external skeletal fixation, good functional outcomes prevailed. In the groups of fractures managed by the method of internal fixation and conversion of external into internal fixation, excellent functional outcome prevailed. In regard to the chosen treatment method, the difference among them was not statistically significant ($\chi^2=6.86$ n.s) (Table 1).

Table 1. Final functional results after fracture healing in polytrauma patients

Method of fixation	Functional outcome				Total
	bad	poor	good	excellent	
IF by Kuntcher nail (simple)	1 8.3%	0 0.0%	3 25.0%	8 66.7%	12 100.0%
IF by SIF (simple)	1 5.5%	0 0.0%	5 27.8%	12 66.7%	18 100.00%
IF by SIF (comminutive)	1 3.9%	0 0.0%	7 26.9%	18 69.2%	26 100.00%
EF	1 11.1%	1 11.1%	5 55.6%	2 22.2%	9 100.00%
conversion of EF into IF	0 0.0%	0 0.0%	2 40.0%	3 60.0%	5 100.00%
Total	4 5.7%	1 1.5%	22 31.4%	43 61.4%	70 100.00%

The occurrence of the local complications in regard to the applied surgical method of the femoral fracture management is shown in Table 2.

The presence or absence of the local complications in regard to the femoral fracture management showed statistically significant difference ($\chi^2=9.34$ $p<0.01$), i.e. there were more complications which followed external skeletal fixation as the definitive treatment method.

Table 2. Local complications in regard to the applied surgical method of the femoral fracture management

The local complications	IF	EF	Conversion of EF into IF
Pin track infection	0 0.0%	2 22.22%	0 0.0%
Deep pin track infection	0 0.0%	1 11.11%	0 0.0%
Early disintegration of implants	1 1.78%	0 0.0%	0 0.0%
Nonunion	2 3.58%	1 11.11%	0 0.0%
Osteitis	1 1.78%	0 0.0%	0 0.0%
Total	4 7.14%	4 44.4%	0 0.0%

DISCUSSION

The general aims in early fractures fixation in polytrauma patients include the control of haemorrhage, suppression of exaggerated inflammatory response, relief from pain and facilitation of nursing care (11, 12).

The most recent studies on the management of the femoral fracture in the multiply-injured patients offer the management algorithm focused on two standard protocols: early total care (ETC) and damage control (DC) (7, 8).

In the early 1990s, a variety of unexpected complications related to the early internal fixation of fractures of femur were described. Further reports appeared describing an adverse outcome after ETC including an increased incidence of adult respiratory distress syndrome and multiple organ dysfunction. These complications mostly developed in patients with severe chest injuries and after severe haemodynamic shock (13-15).

It has been clearly shown that secondary brain injury will occur in patients with severe head injuries exposed to hypotension, hypoxemia and increased intracranial pressure or reduced cranial perfusion pressure. It follows, therefore, that operative intervention for orthopedic stabilization of long-bone fractures may cause secondary brain injury if intraoperative hypotension or hypoxia are allowed to occur (16-18).

Based on the clinical estimation of the patient condition and polytrauma severity, the line of treatment is decided. In the recent years, there have been differentiated four clinical conditions based on various clinical parameters: stable, borderline, unstable and critical. The strategy of early total care, i.e. internal fixation can be applied in less severe cases (the polytraumatized in stable condition) who can endure the extensive orthopaedic interventions of internal fixation, which pose an additional trauma. The strategy of "damage control", which is applied in

the management of borderline, unstable and critical polytraumatized subjects, is based on the positive post-traumatic inflammatory and metabolic response of an organism, aiming to decrease both these responses, as well as mortality of the most injured (3).

Pape in his study, analyzing the values of interleukin 6 in two groups of the polytraumatized subjects treated with early and delayed internal fixation, concluded that the definitive operation, i.e. internal fixation of the femoral fracture is best to delay and perform four days after the initial surgery (19). In his other study, he concluded that the strategy of "damage control" stands for a good method for the treatment of fractures in the polytraumatized at high risk of post-traumatic systemic complications' development (ARDS, MOF) (20).

The study of Nowotarski conducted between 1989 and 1997 on 112 polytrauma subjects with femoral fractures showed the initial treatment with external fixator. During hospitalization, 33 examinees died; external fixation of the femur was the definitive treatment method without conversion in 16 subjects; in 59 polytraumatized (40 closed and 19 open fractures) subjects, the conversion of external into internal fixation was undertaken. All external fixations of femoral fractures were performed within initial 24 hours, by means of unilateral external fixator; the mean length of the operation was 30 minutes. On average, conversion into intramedullary nailing was performed 7 days after the initial treatment (from 2 to 48 days). In 55 subjects, conversion was completed within one act, while in 4 subjects it was delayed (after removal of external fixator, skeletal traction was applied and lasted 8-15 days). Healing was attained in 97% of cases, with the mean healing time of 6 months. Among the complications, there were 1.7% of infections and nonunions, respectively (21).

Scalea et al. compared two groups of the multiply-injured patients with femoral fractures treated initially by external skeletal fixation and intramedullary nailing. The first group comprised 43 examinees treated by external fixator, and the second one involved 284 examinees treated by intramedullary nailing. The first group of examinees had higher injury severity score (26.8 v 16.8), lower Glasgow coma scale (11 v 14.2), required significantly more fluid (11.9 vs. 6.2 L) and blood (1.5 L vs. 1 L) in the initial 24 hours. The length of external skeletal fixation was shorter compared to intramedullary nailing (35 min vs 130 min), and intraoperative blood loss was considerably smaller (90 ml vs 400 ml) (22). Nowotarski and Scalea concluded that external fixation is a safe method by means of which a temporary rigid fracture fixation in the severely polytraumatized can be attained.

Analyzing the influence of the femoral fracture fixation method in respect to the time interval from the moment of getting injured on the overall patient condition, our results confirm the advantage of "damage control" strategy in the management of the polytraumatized with femoral fractures, and emphasize the advantage of external skeletal fixation as a safe method for accomplishing early stabilization of the fracture in the severely injured.

Current studies emphasize that conversion of the external into internal fixation of the femoral fracture is a safe method within the "damage control" strategy applied in the polytraumatized subjects. The method is associated with good healing, good functional outcome followed by minor complications, while the percentage of deep bone infection ranges from 1.7 to 3% (21).

External skeletal fixation, as an initial method for the treatment of the lower extremities' fractures, followed by early conversion into intramedullary nailing (in the first two weeks), is a safe and efficient method in the strategy of "damage control", but not the definitive method for the fracture management, especially femoral shaft fractures, because of the frequency of complications (nonunion, deep pin-track infection, knee contracture)(22), which is also confirmed by our results.

CONCLUSION

In the group of the polytraumatized patients treated by early internal fixation of the closed femoral shaft fracture in the initial 24 hours, statistically significant deterioration of the overall patient condition was reported, which confirms the hypothesis that early internal fixation of the femoral fracture in the polytraumatized subjects poses great and additional trauma for the injured. Delayed definitive management of the femoral fracture by internal fixation is safe to perform after stabilizing the polytraumatized condition, and is followed by good functional outcome and low percentage of complications.

In the group of the polytraumatized patients with closed femoral shaft fractures treated by external skeletal fixation, deterioration of the overall condition was not reported in any of the patients. External skeletal fixation stands for a good operative method for accomplishing the initial stability of the femoral fracture in the multiply-injured patients, and poses minimally additional operative trauma.

External skeletal fixation as a definitive treatment method was followed by a number of complications and worse functional outcome compared to the applied methods of internal fixation

in the management of the femoral fracture in the polytraumatized. External skeletal fixation of the femoral fracture in the polytraumatized should be converted into internal fixation, when the patient's condition allows.

The obtained results confirm the advantage of “damage control” strategy in the management of the closed femoral shaft fracture in severely polytraumatized subjects.

REFERENCES

1. Shires GT, Thal ER, Jones RC, Shires III GT, Perly MO. Trauma. In: Schwartz SI (ed). Principles of surgery-sixth edition. McGraw-Hill Onc, 1994:175-224.
2. Lawrence B. Management of polytrauma, In: Champan MW (ed). Operative Orthopaedics. JB Lippincott Company, Philadelphia, 1993: 299-304.
3. Krettek C, Simon R, Tscherne H. Managment priorities in patients with polytrauma. Langenbeck's Arch Surg 1998; 383(3-4): 220-7.
4. Bose D, Tejwani NC. Evolving trends in the care of polytrauma patients. Injury 2006; 37(1): 20-8.
5. Jurkovich JG, Carrico CJ. Trauma-Management of Acutely Injured Patients. In: Sabiston D (ed). Textbook of surgery: The Biological basis of modern surgical practice-fifteenth edition. W.B. Saunders Company, 1997: 296-340.
6. Giannoudis PV, Veyesi VT, Pape HC, Krettek C, Smith MR. When should we operate on major fractures in patients with severe head injuries. Am J Surg 2002; 183(3): 261-7.
7. Roberts CS, Pape HC, Jones AL, Malkani AL, Rodriguez JL, Giannoudis PV. Damage control orthopaedics: evolving concepts in the treatment of patients who have sustained orthopaedic trauma. Instr Course Lect 2005; 54: 447-62.
8. Giannoudis PV. Surgical priorities in damage control in polytrauma. J Bone Joint Surg Br 2003; 85(4): 478-83.
9. Champion HR, Sacco WJ, Carnazzo AJ, Copes W, Fouty WJ. Trauma Score. Crit Care Med 1981; 9(9): 671-6.
10. Neer CS 2nd, Grantham SA, Shelton ML. Supracodylar fractures of adult femur. A study of one hundred and ten cases. J Bone Joint Surg Am 1967; 49(4): 591-613.
11. Beckman SB, Scholten DJ, Bonnell BW, Bukrey CD. Long bone fractures in the polytrauma patient. The role of early operative fixation. Am Surg 1989(6); 55: 356-8.
12. Pape HC, Giannoudis P, Krettek C. The timing of fracture treatment in polytrauma patients: relevance of damage control orthopedic surgery. Am J Surg 2002; 183(6): 622-9.
13. Bone LB, Babikian G, Stegemann PM. Femoral canal reaming in the polytrauma patient with chest injury. A clinical perspective. Clin Orthop Relat Res 1995; 318(9): 91-4.
14. Bone LB, Johanson KD, Weigelt J, Scheinberg R. Early versus delayed stabilization of fractures: a prospective randomized study. Clin Orthop Relat Res 2004; 422(5): 11-6.
15. Boulanger BR, Stephen D, Brenneman FD. Thoracic trauma and early intramedullary nailing of femur fractures: are we doing harm? J Trauma 1997; 43(1): 24-8.
16. Bhandari M, Guyatt GH, Khera V, Kulkarni AV, Sprague S, Schemitsch EH. Operative management of lower extremity fractures in patients with head injuries. Clin Orthop Relat Res. 2003; 407(2): 187-98.
17. McKee MD, Schemitsch EH, Vincet LO, Sullivan I, Yoo D. The effects of a femoral fracture on concomitant closed head injury in patients with multiple injuries. J Trauma 1997; 42(6): 1041-5.
18. Schmeling GJ, Schwab JP. Polytrauma care. The effect of head injuries and timing of skeletal fixation. Clin Orthop 1995; (318): 106-16.
19. Pape HC, van Griensven M, Rice J. Major secondary surgery in blunt trauma patients and perioperative cytokine liberation. Determination of the clinical relevance of biochemical markers. J Trauma 2001; 50(6): 989-1000.
20. Pape H, Stalp M, v Grinsven M, Winberg A, Dahiweit M, Tscherne H. Optimal timing for secondary surgery in polytrauma patients: an evaluation of 4.314 serious-injury cases. Chirurg 1999; 70(11): 1287-93.
21. Nowotarski PJ, Turen CH, Brumback RJ, Scarboro JM. Conversion of external fixation to intramedullary nailing for fracture of the shaft of the femur in multiply injured patients. J Bone Joint Surg Am 2000; 82(6): 781-8.
22. Scalea TM, Boswell SA, Scott JD. External fixation as a bridge to intramedullary nailing for patients with multiple injuries and with femur fracture: damage control orthopaedics. J Trauma 2000; 48(4): 613-23.

STRATEGIJA KONTROLA ŠTETE U LEČENJU ZATVORENIH PRELOMA DIJAFIZE BUTNE KOSTI KOD POLITRAUMATIZOVANIH

Predrag Stojiljković¹, Zoran Golubović¹, Desimir Mladenović¹, Ivan Micić¹, Saša Milenković¹, Saša Karalejić¹, Saša Stojanović¹, Sonja Stamenić¹, Danilo Stojiljković², Milan Mandić³

¹ Ortopedsko-traumatološka klinika, Klinički centar Niš, Niš, Srbija

² Klinika za plastičnu i rekonstruktivnu hirurgiju, Klinički centar Niš, Niš, Srbija

³ Klinika za fizikalnu medicinu i rehabilitaciju, Klinički centar Niš, Niš, Srbija

SAŽETAK

Politrauma je vodeći uzrok smrti u populaciji mlađoj od 50 godina. Pravilan izbor vremena i metode stabilizacije preloma butne kosti u značajnoj meri smanjuju morbiditet i omogućavaju brži oporavak uz minimalni invaliditet.

Prospektivnom kliničkom studijom praćeno je i analizirano 68 povređenih sa zatvorenim prelomima dijafize butne kosti (70 preloma) koji su hirurški lećeni u Kliničkom centru u Nišu u periodu od 1999. do 2006. godine.

Pogoršanje opšteg stanja nakon spoljne ili unutrašnje fiksacije preloma pokazuje statistički značajnu razliku ($\chi^2=16.40$ $p<0.001$), odnosno da smo pogoršanje opšteg stanja kod politraumatizovanih sa prelomom butne kosti imali značajno češće nakon rane operacije unutrašnje fiksacije preloma. Spoljna skeletna fiksacija preloma bila je praćena dužim vremenom zarastanja preloma, lošijim funkcionalnim rezultatom i češćim komplikacijama u odnosu na primenjene metode unutrašnje fiksacije i konverzije spoljne u unutrašnju fiksaciju.

Rana unutrašnja fiksacija preloma butne kosti kod politraumatizovanih predstavlja dodatnu traumu za povređenog i nju je bezbedno uraditi po stabilizaciji opšteg stanja. Spoljna skeletna fiksacija predstavlja bezbedniju metodu za postizanje inicijalne stabilnosti preloma butne kosti kod politraumatizovanih uz minimalnu dodatnu operativnu traumu, ali je praćena većim brojem komplikacija i slabijim funkcionalnim rezultatom u odnosu na metode unutrašnje fiksacije. Spoljna skeletna fiksacija zatvorenih preloma dijafize butne kosti kod politraumatizovanih zahteva naknadnu unutrašnju fiksaciju kad se za to steknu uslovi.

Ključne reći: zatvoreni prelomi dijafize butne kosti, politrauma, spoljna skeletna fiksacija, unutrašnja fiksacija