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The authors declare that they

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INTRAMEDULLARY BLOCKING IMPLANTS ARE NEW POSSIBILITIES IN THE TREATMENT OF PATIENTS WITH FRACTURES OF TUBULAR BONES

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Abstract

We have produced 49 shoulder, femur and tibia osteosynthesis by blocking internal fixation in 47 patients with multiple and combined trauma. Paraarticular and diaphyseal femur fractures were predominated and found in 18 patients (39%), humerus fractures were detected in 9 (20%) of victims of diaphyseal shin fractures were observed in 22 (47%) patients. Multiple injuries of two or three segments were identified in 6 (13%) patients. We have applied the primary dynamic blocking concerning the stabilization of the transverse and oblique diaphyseal fractures, and we have performed static blocking fragments with comminuted fractures. Postoperative complications were observed in 8 (17%) patients patients. Outcomes were followed up in 39 patients in terms of 8 to 18 months. Favorable anatomical and functional results were stated in 32 (68%) patients.

Интрамедуллярлық блоктаушы имплантаттар – түтік тәрізді сүйектердің сынуы бар науқастарды емдеудегі жаңа мүмкіндіктер

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Түйінді сөздер:

түтік тәрізді сүйектер, емдеу

Тұжырым

Барлығы 49 ота иық, жамбас және жіліншік сүйектерінің интрамедуллярлық остеосинтез блоктау әдісімен көптеген біріктірілген жарақаттары бар 47 науқасқа жасалынды. Сан сүйегінің периартикулярлық және диафиздік сынықтары басым болды және 18 науқаста (39%) анықталды, 9 (20%) иық сүйегінде зардап шеккендерде анықталды, 22 (47%) пациенттерде балтыр сүйектерінің диафиздік сынықтары байқалды. Екі және үш сегменттердің бірнеше зақымдануы 6 (13%) науқастарда анықталды. Көлденең және қиғаш көлденең диафиздік сынықтарды тұрақтандыру кезінде бастапқы динамикалық блоктау қолданылды, ал сынған сынықтар кезінде сынықтарды статикалық блоктау орындалды. Отадан кейінгі кезеңде науқастардың 8-де (17%) асқынулар байқалды. Ұзақ мерзімді нәтижелер 39 пациентте 8 айдан 18 айға дейінгі мерзімде байқалды. 32 (68%) пациентте қолайлы анатомиялық-функционалдық нәтижелер анықталды.

Интрамедуллярные блокирующие имплантаты – новые возможности в лечении больных с переломами трубчатых костей

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Аннотация

Произведено 49 операции остеосинтеза плечевой, бедренной и большеберцовой костей методом блокирующего интрамедуллярного остеосинтеза у 47 больных с множественной и сочетанной травмой. Околосуставные и диафизарные переломы бедренной кости преобладали и констатированы у 18 больных (39%), плечевой кости выявлены у 9 (20%) пострадавших, диафизарные переломы костей голени отмечены у 22 (47%) пациентов. Множественные повреждения двух и трех сегментов были определены у 6 (13%) больных. При стабилизации поперечных и косопоперечных диафизарных переломов применялось первичное динамическое блокирование, а при оскольчатых переломах выполнено статическое блокирование отломков. В послеоперационном периоде наблюдались осложнения у 8 (17%) пациентов. Отдаленные результаты прослежены у 39 пациентов в сроках от 8 до 18 месяцев. Благоприятные анатомо-функциональные результаты констатированы у 32 (68%) пациентов.

Конфликт интересов:

Авторы заявляют об отсутствии конфликта интересов

Ключевые слова:

трубчатые кости, лечение

Relevance

The existing trend of increasing the number of severe skeletal injuries dictates the need to improve the tactics and methods of treatment of combined and multiple injuries, which is an urgent problem in modern traumatology.

The main principles in the treatment of diaphyseal fractures of the lower extremities in patients with concomitant and multiple trauma remain stable surgical fixation, the timing of surgical intervention. Pathogenetic justification is the early stabilization of damaged segments in order to prevent complications of traumatic disease, as well as in a complex of anti-shock measures [1, 2]. Numerous injuries of various organs and systems lead to the effect of the syndrome of mutual burdening and the development of traumatic disease [1, 3]. Fixation of fractures of the lower extremities in the acute period of traumatic disease with external fixation devices in severe concomitant trauma is an alternative method, however, in 57-71% of cases, osteosynthesis with devices is not final, the treatment of fractures often takes a two-stage character, inflammation of the soft tissues around the pins and rods often occurs [3, 4, 5]. In the countries of near and far abroad, for more than two decades, intramedullary locking rods have been used in the treatment of diaphyseal and periarticular fractures.

The undoubted advantage of the technique is low trauma, which is associated with extra-focal antegrade insertion of the pin and the absence of the need for reaming the medullary canal. Minimally invasive implantation of a metal construct causes minimal disruption of periosteal

vascularization, which subsequently contributes to the consolidation of bone tissue. The insertion of a nail into the medullary canal away from the fracture site minimizes the risk of postoperative infectious complications - 2.3-4.1% [2, 4, 6, 7, 8, 9, 10].

Material and methods

Over the past two years, 2020-2022, 49 operations of osteosynthesis of the humerus, femur and tibia using the method of blocking intramedullary osteosynthesis were performed in 47 patients with multiple and combined trauma in the traumatology departments of the CEH (City emergency hospital) in Almaty. There were 26 (56%) men and 21 (45%) women. By age categories, patients were distributed by the following: 20 years - 9 (20%) patients, 22 (47%) patients in the group of 20-40 years, 12 (26%) victims were noted from 40 to 60 years, over 60 years - 4 (9%). The majority of 35 (75%) patients were admitted within the first three days after the injury, 10 (22%) patients came in from 3 to 10 days, and only 2 (5%) injured were admitted later than 10 days. Among the skeletal injuries, periarticular and diaphyseal fractures of the femur prevailed and were diagnosed in 18 patients (39%), the humerus was found in 9 (20%) victims, diaphyseal fractures of the tibia were noted in 22 (47%) patients. Multiple injuries of two and three segments were identified in 6 (13%) patients. The dominant place among comorbidities is occupied by closed craniocerebral injury, noted in 51% of cases (24 patients), chest trauma was detected in 34% (16 patients), abdominal trauma only in 15% (7 victims) (Figure 1, 2, 3).

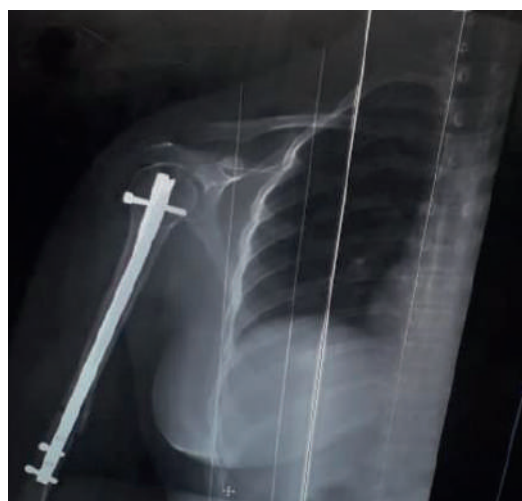
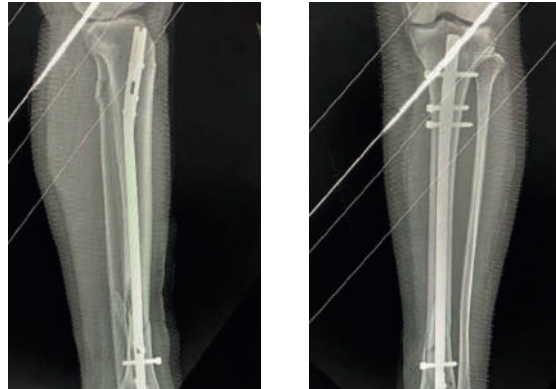


Figure 1. Before and after operation

Figure 2.
Before operation



Figure 3.
After operation



Surgical interventions were performed at various time from the moment of injury. The majority of 29 (60%) patients were operated on within 3 to 10 days from the moment of injury, in the early period on days 1-3, osteosynthesis was performed in 11 (23%) patients, and in the later period after 10 days or more in 7 (15%) of patients.

The choice of optimal terms for surgical intervention and the method of primary fixation of fractures was carried out based on the severity of the patient's general condition.

We used this method of osteosynthesis for fixation of periarticular and diaphyseal fractures of different localization. In 30 cases, the fractures were transverse or oblique transverse according to AO classification A2, A3. In other cases, the fractures were comminuted: type B1-3 in 12 patients, C1-3 in 7 cases.

Metal structures manufactured by ChM were used - a system of lockable intramedullary rods CHARFIX®system, including femoral rods - universal, trochanteric and telescopic, tibial rods - reconstructive and retrograde, shoulder rod reconstructive and compression. When stabilizing transverse and oblique diaphyseal fractures (type A), primary dynamic blocking was used, and for comminuted fractures (type B and type C), static blocking of fragments was used with intraoperative correction of the length of the damaged segments. Insertion of nails is carried out by a closed antegrade method under the control of an electron-optical converter. The correct determination of the point for the introduction of a metal construct is essential, which determines the non-traumatic insertion of the rod through the medullary canal and the success of closed reposition of bone fragments, especially in comminuted and fragmentary fractures. As stabilizing comminuted

diaphyseal fractures, an important point is preoperative planning, selection of a nail of the appropriate size, and intraoperative restoration of the length of the damaged segment after distal blocking. In these cases, static blocking was used, which prevented the possibility of secondary displacement of fragments along the length.

Results and discussion

In the postoperative period, additional plaster immobilization was not used, and active movements in the adjacent joints of the damaged segment were performed from the second day after the operation. Walking with a partial load on the injured limb was allowed from 3–5 days for diaphyseal fractures of the femur and tibia, depending on the general condition of the patients, for periarticular fractures at 4–5 weeks after X-ray control. Dynamic X-ray and clinical observation had been performed in 38 patients. Consolidation of fractures and restoration of the support function of the injured limbs had been achieved in 30 patients 6–8 months after the operation. Of this group of patients, in 18 cases, the removal of fixators had been performed 14-16 months after the operation. 20 patients with different stages of fracture consolidation are being monitored as outpatients. In 6 patients with comminuted and fragmentary fractures of the tibia, the nail had been dynamized 2-3 months after the operation by removing the static blocking screws, which can make it possible to create physiological compression in the fracture area without the risk of shortening the damaged segment. Postoperative complications had been observed in 8 (17%) patients. Suppuration of soft tissues in the area of the postoperative wound had been detected in 1 patient. In this case, it is possible to stop the infectious process without removing the metal structure. In 1 patient, after osteosynthesis

of a diaphyseal fracture of the femur, angular deformity had been detected within 7-9 degrees. In 1 patient with an injury, a fracture of the distal screws had occurred 1.5 months after osteosynthesis of diaphyseal fractures of both tibia due to repeated trauma. Broken screws had been removed. In 1 patient with a periarticular fracture of the distal humerus, a nail fracture had occurred against the background of delayed consolidation. The rod had been removed and osteosynthesis had been performed with a plate with bone grafting. In 3 cases, there had been a delayed consolidation of comminuted fractures of the tibia, in which the nail had been dynamized. In 1 patient with delayed consolidation of a fragmentary fracture of the humerus, after 3.5 months, the nail had been removed, and osteosynthesis with a locking nail with reaming of the medullary canal. Long-term results had been followed up in 39 patients within 8 to 18 months. Favorable anatomical and functional results had been

observed in 32 (68%) patients.

Conclusions

Our chosen tactics of blocking intramedullary osteosynthesis of diaphyseal and periarticular fractures of tubular bones without reaming the medullary canal in patients with polytrauma is a modern and low-traumatic method. Blocking metal constructions allows to create a strong stabilization in the early stages after surgery, preserve the endosteal blood supply to bone fragments and thereby create optimal conditions for reparative osteogenesis. Early painless rehabilitation (exclusion of bed rest in the postoperative period, active restoration of movements in adjacent joints, walking with a dosed load, no need for external immobilization). The usage of this treatment approach in patients with polytrauma significantly expands the capabilities of the surgeon, significantly reduce the period of disability and recovery, and often save patients' lives..

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