

SURGICAL TREATMENT OF MEDIAL FRACTURES OF THE FEMORAL NECK WITH THE USE OF MONONUCLEAR FRACTION OF AUTOLOGIC BONE MARROW

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XULOSA

Maqsad. Ushbu maqolaning maqsadi autologik suyak iligining mononuklear fraksiyasidan foydalangan holda medial son suyagi bo'yin sinishlarini jarrohlik davolashni ko'rib chiqishdir.

Materiallar va usullar. Son suyagining bo'yin qismi singan 506 bemor. Shulardan 124 nafar bemorda (24,5%) konservativ davolash, 204 nafarida (40,3%) birlamchi sonni almashtirish, 178 nafarida (35,2%) son suyagi bo'yining metall osteosintezi amalga oshirildi. Bemorlarni kasalxonaga yotqizish joyida klinik va instrumental tekshiruv (rentgen tekshiruvi), laboratoriya testlari (qonning to'liq ro'yxati), biokimyoviy qon testlari va oqim sitometriyasi metodlari qo'llanildi.

Natijalar. Medial son suyagining bo'yin qismi singan bemorlarda qo'llanilgan autologik mononuklear fraksiya to'rtta bemorda suyak to'qimalarining regeneratsiyasiga sezilarli osteoinduktiv va optimallashtiruvchi ta'sir ko'rsatdi.

Kalit so'zlar: jarrohlik yo'li bilan davolash, mononuklear fraksiya, autologik suyak iligi, regenerativ tibbiyot, mezenximal o'zak hujayralari, gemapoetik o'zak hujayralari.

Treatment of patients with femoral neck fractures is a hot topic in clinical traumatology of the human musculoskeletal system [1, 2]. The problem is also of great social importance, because the number of patients with femoral neck fractures is increasing every year due to the "aging" of the population in many countries of the world [3], approximately 80% of women and 50% of men with femoral neck fractures are over 70 years of age [4]. Mortality during the first year after injury is up to 33%, mainly from the development of congestive pneumonia and progression of heart failure [5]. Treatment of such patients requires an integrated approach, including stabilization of the patient's somatic condition, choice of fixation method, and optimal timing of surgical intervention [6]. Unsatisfactory results after surgical treatment of this pathology in the form of nonunion of fractures and avascular necrosis of the femoral head reach 25–30% [7]. A widely known method of surgical treatment of medial femoral neck fractures is by replacing the joint with an artificial one (endoprosthetics). Hip replacement makes the affected person mobile [8]. However, this operation

РЕЗЮМЕ

Цель. Целью данной статьи является обзор хирургического лечения медиальных переломов шейки бедренной кости с использованием мононуклеарной фракции аутологичного костного мозга.

Материалы и методы. Под наблюдением находились 506 больных с переломами шейки бедра. Из этого числа консервативное лечение проведено у 124 пациентов (24,5%), первичное эндопротезирование тазобедренного сустава - у 204 (40,3%), металлоостеосинтез шейки бедра - у 178 (35,2%). Клиническое обследование больных по месту госпитализации включало клинико-инструментальное обследование (рентгенологическое исследование), лабораторные исследования (общий анализ крови), биохимические исследования крови и метод проточной цитометрии.

Результаты. Клиническое применение аутологичной мононуклеарной фракции костного мозга при медиальных переломах шейки бедренной кости показало значительный остеоиндуктивный и оптимизирующий эффект на регенерацию костной ткани у всех четырех наблюдавшихся пациентов.

Ключевые слова: хирургическое лечение, мононуклеарная фракция, аутологичный костный мозг, регенеративная медицина, мезенхимальные стволовые клетки, гемопоэтические стволовые клетки.

itself is technically complex, traumatic and associated with the possibility of serious complications (pulmonary embolism, massive blood loss, purulent infectious complications, aseptic loosening of the endoprosthesis components, its dislocations, periprosthetic fractures, etc.) [9]. There is a method of surgical treatment of medial femoral fractures with cannulated screws [2]. This method is low-traumatic and technically simple. However, it, like other traditional types of osteosynthesis, additionally injures the head of the femur, which is already damaged during a fracture, dooming it to the development of avascular necrosis and nonunion of the fracture [10]. The purpose of this study was to increase the activity of reparative regeneration processes of medial femoral neck fractures by fixing the fracture with cannulated screws and intraosseous implantation of the mononuclear fraction of autologous bone marrow cells (MFCACM) into the fracture zone.

MATERIAL AND METHODS

For the period from 2007 to 2010. At the Department of Traumatology and Orthopedics of the State Healthcare

Institution “City Pokrovskaya Hospital” 506 patients with femoral neck fractures were treated. Of this number, conservative treatment was performed in 124 patients (24.5%), primary hip arthroplasty was performed in 204 (40.3%), and metal osteosynthesis of the femoral neck was performed in 178 (35.2%). Four patients from the last group with closed medial fractures of the femoral neck, along with metal osteosynthesis, underwent injection of the mononuclear fraction of autologous bone marrow (MFACBM) into the fracture zone. There were 2 men, 2 women. The age of the patients varied from 50 to 66 years, the average age was 56 years. The cause of injury in all patients was a fall on a horizontal plane (from height).

The collection of autologous bone marrow with subsequent transplantation of MFACBM, as well as surgical treatment of injuries, were performed on the basis of the informed consent of the patients. The technique used is protected by invention patent No. 2371131. Results and discussion. Under spinal anesthesia, closed reduction of femoral neck fragments was performed on an orthopedic surgical table using an electron-optical converter (Image intensifier). Autologous bone marrow was collected in a volume of 100 ml by puncture of the wings of the iliac bones of the pelvis with needles for myelotransplantation with mandrin.

After aspiration, the resulting bone marrow was additionally filtered from small bone fragments and debris and placed in a sterile plastic container (containing 25

thousand units of heparin), after which the mononuclear fraction of autologous bone marrow cells was isolated from the resulting volume of bone marrow using the Sepax cell separation system S-100” produced by Biosafe (Switzerland).

Then a 5–6 cm long incision was made in the skin and subcutaneous tissue along the outer surface of the thigh in the subtrochanteric region. The subtrochanteric region of the femur was exposed layer by layer. Using a standard guide (130°), three parallel wires were inserted into the femoral neck, and the depth of insertion of the cannulated screws was determined. Three cannulated screws were installed in parallel along the previously inserted guide wires, fixing the femoral neck fracture.

The mononuclear fraction of autologous bone marrow cells isolated using the Sepax S-100 cell separation system in an amount of 10 ml (9.2×10^7 mononuclear cells/ml) was intraosseously injected into the site of a femoral neck fracture. To do this, under the control of an image intensifier, parallel to the inserted cannulated screws, a myelotransplantation needle with a mandrel was brought to the fracture site and, through it, a mononuclear fraction of autologous bone marrow cells was slowly injected intraosseously. The wound was sutured layer by layer. In the postoperative period, active movements were performed in the hip joint without static load on the leg for 4 months. Additional immobilization of the damaged joint was not performed.

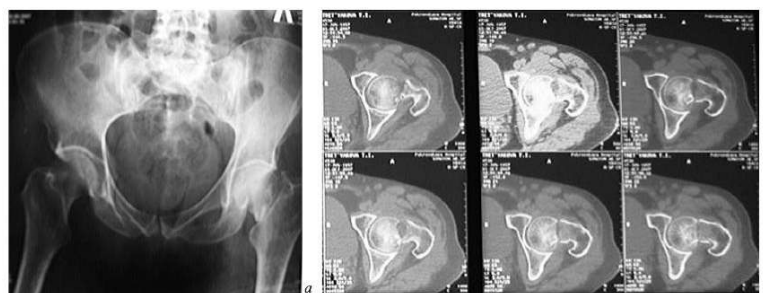


Fig. 1. Radiological examination of B. T. before surgery: a - radiological examination - a medial fracture of the neck of the left femur was revealed; b — CT scan — the subcapital nature of the fracture is clarified.



Fig. 2. Radiological examination of B. T. 5 months after the operation: a - radiological - metal osteosynthesis with cannulated three screws; b — CT scan confirmed consolidation of the subcapital fracture of the femoral neck.

As an illustration, we present a brief extract from the medical history: Patient T., 50 years old, was admitted to the department of traumatology and orthopedics of the St. Petersburg State Healthcare Institution “City Pokrovskaya Hospital” with a diagnosis of a closed medial (subcapital) fracture of the neck of the left femur with displacement. After the examination, the patient 10/12/07. — under spinal anesthesia on the orthopedic operating table, a closed reduction of fragments of the left femoral neck fracture was performed, and the position of the bone fragments was monitored under an image intensifier.

Autologous bone marrow was collected by puncture of the wings of the iliac bones of the pelvis. The resulting bone marrow is filtered, after which its mononuclear fraction is isolated. During the separation, osteosynthesis of the fracture was performed with three cannulated screws. Under the control of an image intensifier, a bone needle with a mandrel was brought to the fracture site. The isolated mononuclear fraction of autologous bone marrow cells in an amount of 10 ml (9.2×10^7 mononuclear cells/ml) was slowly injected intraosseously into the site of the neck fracture and the head of the femur. The wound is sutured in layers.

Healing of femoral neck fractures after osteosynthesis using the traditional method occurs within 6–6.5 months from the date of surgery [11]. Using cellular technologies, we were able to achieve consolidation within up to 5 months after surgery.

The results of the clinical use of the mononuclear fraction of autologous bone marrow cells in medial fractures of the femoral neck indicate that when transplanted to the fracture site, it has a pronounced osteoinducing and optimizing effect on the course of reparative regeneration of bone tissue in all four observed patients. The presented 4 observations are the first positive experience of using the mononuclear fraction of autologous bone marrow in the treatment of femoral neck fractures. Of course, further scientific research in this direction is required with the participation of morphologists and other specialists.

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