

OSTEOCHONDRAL AUTOPLASTY OF THE EXTENSIVE POST-TRAUMATIC DEFECT OF THE PROXIMAL TIBIA

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Application of the original method of autoplasty of the extensive osteochondral defect of the proximal part of the tibia from the posterior femoral condyle is described. A patient was operated on for the malunion of the intraarticular fracture of the lateral condyle of the tibia with the impression of osteochondral fragments. Autoplasty of the osteochondral defect of the tibia was performed from the posterior parts of the femur condyle, using fixation by tension-locked K-wires. Osteotomy zone for obtaining a transplant may vary depending on the intensity of the cartilage covering and condyle curvature. The authors tried to exert minimum damage to the weight-bearing zones of the posterior femur condyle obtaining a sufficient size of the graft and zone of its coverage by the cartilage. The remote result was evaluated in a year and 10 months after the operation and revealed neither misalignment of a clinical axis of the extremity, nor knee instability, and its full extension. The patient performed full deep squats without any additional support. On the control radiograph the knee joint surface was congruent, any signs of loosening of metal components were not observed. Remodelling of the posterior femur condyle in the form of contour smoothing in the zone of osteotomy was noted. The autoplasty technique used showed a high efficacy, and allowed to restore completely the function of the knee joint to the degree enabling participation in the sports activities.

Key words: osteochondral autograft; tensely-locked K-wires; fracture of the proximal tibia.

Osteochondral autoplasty is the main method of treating the defects of large joint surfaces with the clinically proved efficacy [1, 2]. Beginning with 1992, when L. Hangody et al. [3] published the results of their research on the replacement of the local osteochondral defects of the femoral condyles, called “mosaic” plasty, this method became widely used in orthopedics, especially with the application of arthroscopic techniques. However, this approach was of little use in large-sized osteochondral defects, for replacement of which H. Wagner in 1964 and later W. Muller offered a method of autologous transfer of the posterior femoral condyle [4, 5], which was improved by the application of MegaOATS system [6], comprising a special hollow mill for collecting a transplant and a workstation for its preparation. Of 33 patients operated on using this system, 27 returned to recreational sports. Nevertheless, this technique is designed to replace the defects of the weight-bearing surface of the femoral condyles, is accompanied by the removal of the whole

posterior femoral condyle, and is made by an extensive parapatellar arthrotomy of the knee joint.

The authors of this article applied an original method of autoplasty of the osteochondral defect of the proximal tibia part from the posterior femoral condyle.

Clinical observation is given below.

Patient P., 34 years of age, was injured in the automobile accident on 8 August 2011. He addressed Nizhny Novgorod Research Institute of Traumatology and Orthopedics in January 2012 (6 months after the trauma) for a consultation complaining of instability in the right knee joint.

A written informed consent was obtained from the patient on the application of his data for the scientific purposes.

On clinical examination valgus deformity of the right lower limb in the region of the knee joint, and lateral instability up to 5° in this joint were determined.

Computed tomography of the knee joint was performed (Fig. 1). A series of computed tomograms showed a consolidating intraarticular impression fracture of the tibia

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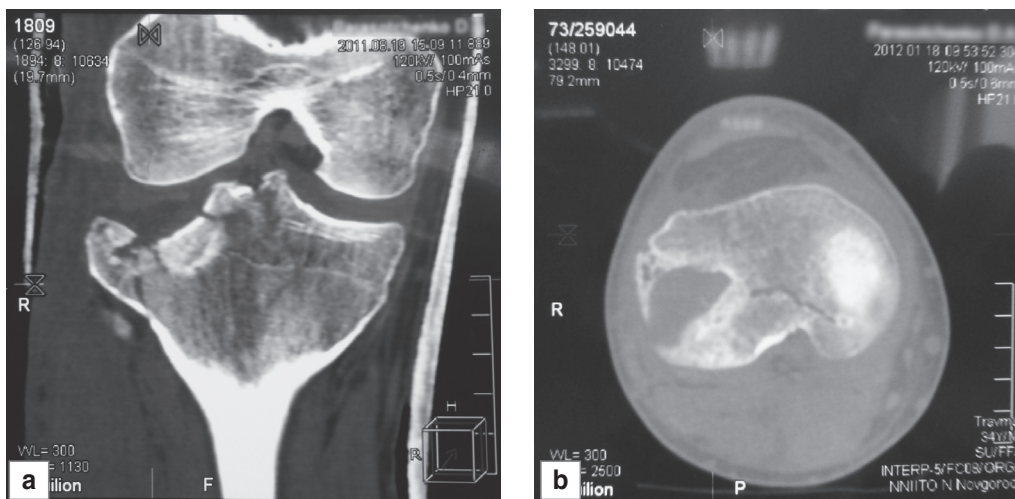


Fig. 1. CT-scan of patient P., 34 years old, before the operation: frontal (a) and axial (b) views

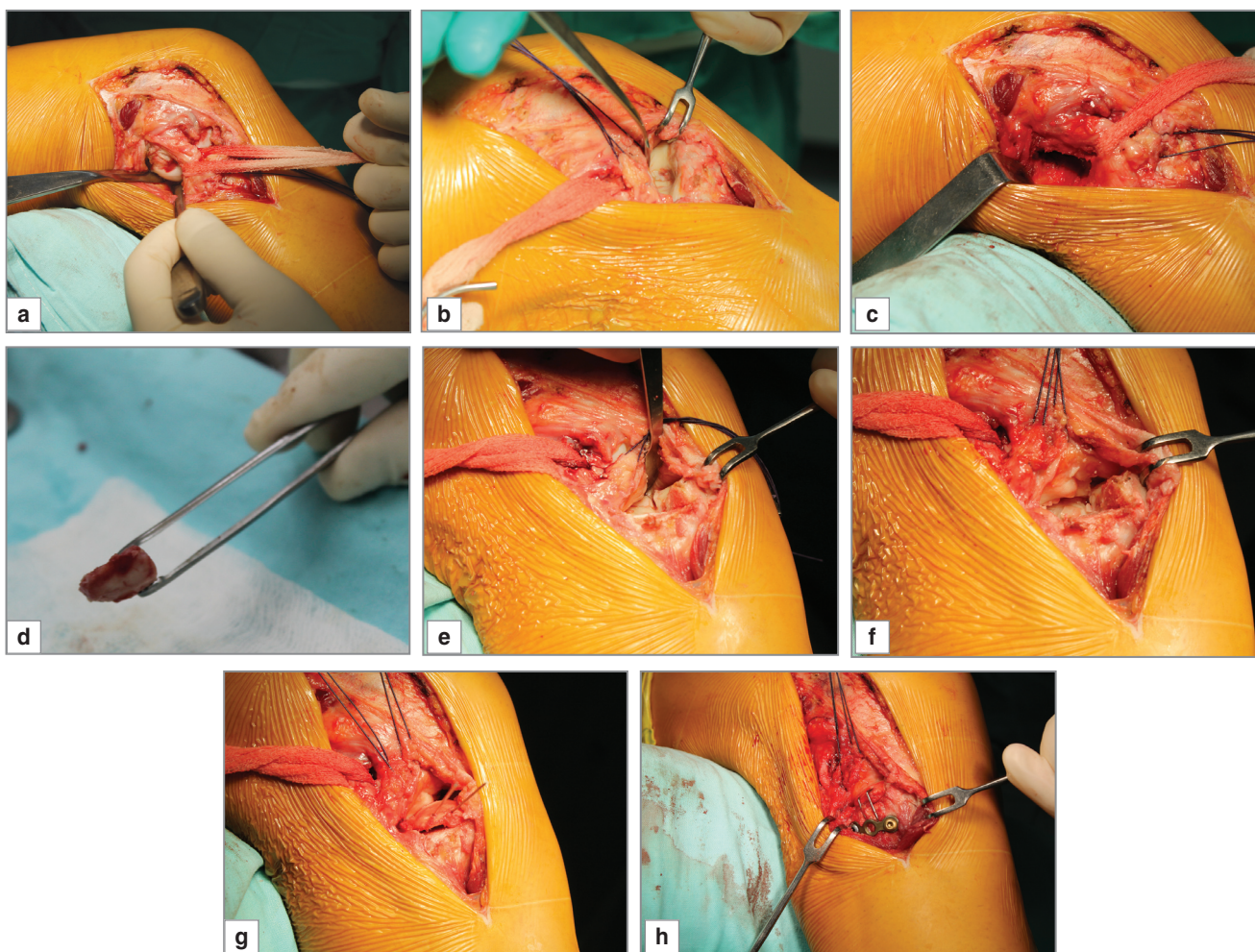


Fig. 2. Stages of replacing osteochondral defect of the tibia lateral condyle with an autograft taken from the posterior parts of the femoral condyle

lateral condyle with a deformation of the joint surface over the length of 26.4 mm, with the impression up to 8.1 mm of the 14.2×18.0 mm bone fragment. The knee joint surfaces were discongruent, cartilage space in the lateral part was widened,

tenon-like deformity of the intermediate eminences was noted. Consolidation of subchondral layers in the area of the tibia medial condyle was observed, there was also a small amount of fluid in the external part of the joint cavity.

CASE REPORTS

On 23 January 2012 the patient was performed autoplasty of the osteochondral defect of the tibial lateral condyle and fixation by the tension-locked K-wires.

The operation was done with a patient in the supine position. Pneumatic arterial tourniquet was applied to the medial third of the femur. Lateral approach to the knee joint was used. Arthrotomy was made under the meniscus which was stiched and retracted to make visualization of the joint surface better. Fibular collateral ligament, m.popliteus tendon, posterior parts of the femoral lateral condyle, centralposterior parts of the tibia lateral condyle were exposed (Fig. 2, a).

Revision of the tibia lateral condyle revealed the defect of the centralposterior part having the size of $3 \times 3 \times 1$ cm (Fig. 2, b). From the posterior parts of the tibia lateral condyle an osteochondral transplant (graft) $3 \times 3 \times 1$ cm was taken using an oscillator saw (Fig. 2, c, d). Cicatricial tissues, and residues of the degeneratively changed cartilage were removed from the defect zone (Fig. 2, e) to provide a good contact of the graft with the bone bed (Fig. 2, f). The defect was replaced by the autograft and fixed by the tension-locked k-wires (Fig. 2, g) with the compression of the osteochondral fragment. Locking of the wires was performed by a fragment of the calcaneal plate

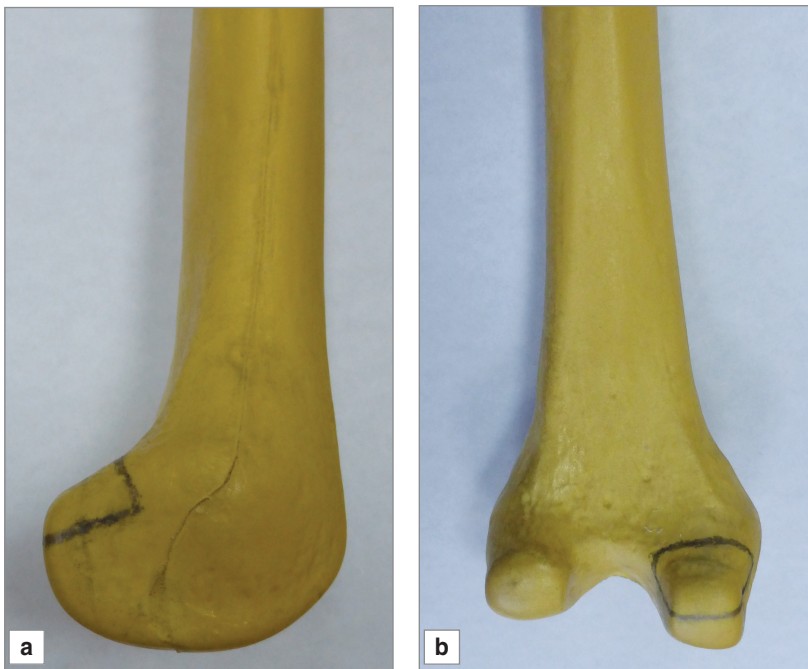


Fig. 3. The scheme of the autograft sampling from the posterior parts of the femoral condyle: distal part of the femur, lateral (a) and rear (b) views

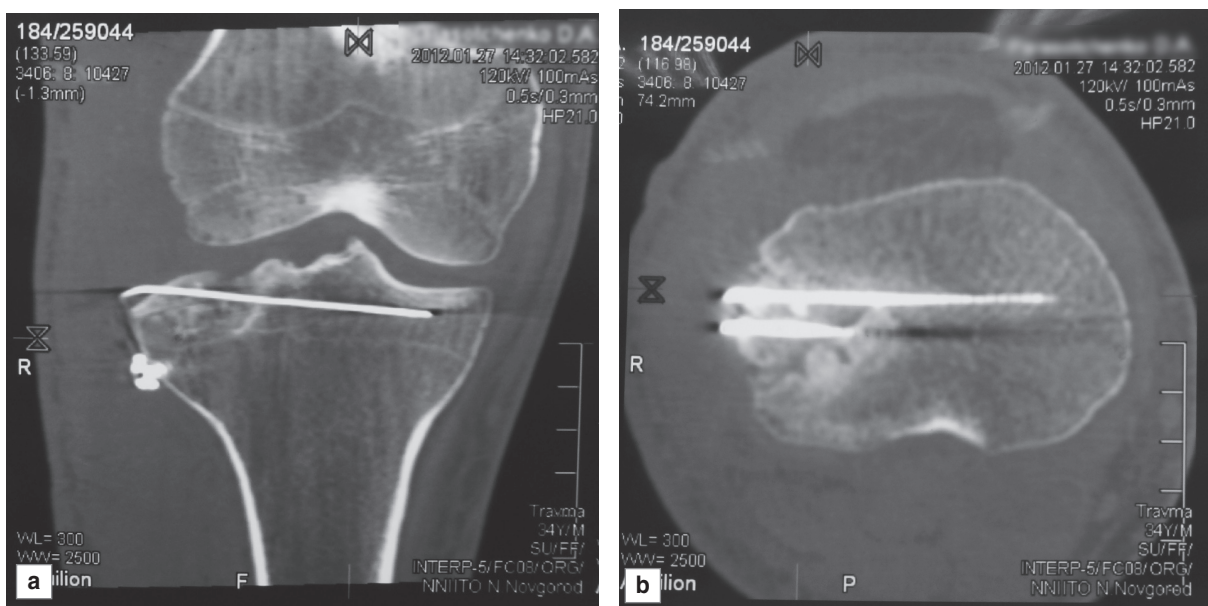


Fig. 4. CT-scan after the operation, frontal (a) and axial (b) views

(AO-ASIF, Switzerland) (Fig. 2, h) The meniscus was sutured using an anchor “Fastin” with a double thread, then the wound was closed in layers with a rubber tube drainage.

The scheme of the graft taking is presented on Fig. 3. The zone for graft collection may vary depending on the intensity of the cartilage cover and condyle curvature, and the authors tried not to damage the weight-bearing zones of the posterior

parts of the femoral condyle, obtaining a sufficient transplant size and zone of its coverage by the cartilage.

The control CT of the knee joint after the operation (Fig. 4) showed that osteochondral defect was filled by the autotransplant.

The post-operative period was uneventful. The wound healed by the primary intention. Flexion was limited to 90° for



Fig. 5. Functional result of treating patient P., 34 years old, in 1 year 10 months after the operation

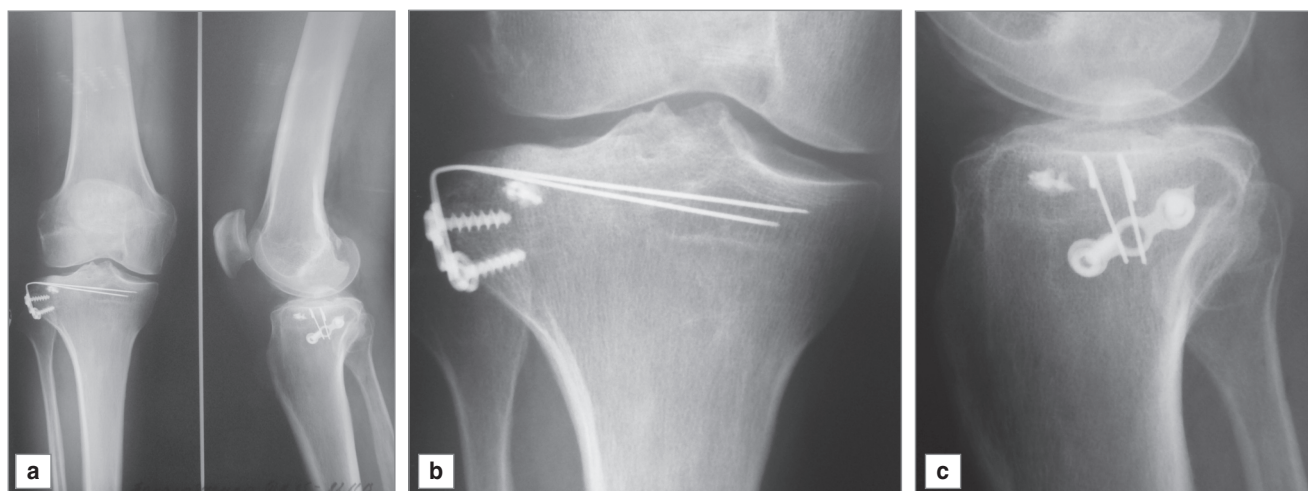


Fig. 6. Control radiographs of patient P., 34 years old, in a year and 10 months after the operation: a — anteroposterior and lateral view; b — anteroposterior magnified view; c — lateral magnified view

6 weeks. On the second day after the operation an isometric physical training was started, as well as exercises on the functional splint "artromot"; the restriction of weight-bearing on the operated limb was provided with the help of crutches. Gradually increasing axis weight-bearing on the operating limb began since the 8th post-operative week, the patient began to walk without any support, resumed his work in 4 months following the operation.

The remote results were evaluated in November 2013 (in a year and 10 months after the operation).

There was neither clinical axis misalignment (Fig. 5, a), nor instability in the knee joint, extension of the joint was full (Fig. 5, b). The patient made a deep squat without any additional support (Fig. 5, c). The patient covered 1100km distance on the bicycle (from Nizhny Novgorod to the Ukraine) for 10 days in summer 2013, and 6000 km — during the whole summer period.

On the control radiograph (Fig. 6) the surface of the knee joint was congruent, any signs of loosening of metal components were not observed. Remodelling of the posterior parts of the femoral condyle in the form of contour smoothing was noted in the zone of osteotomy.

Clinical follow-up showed a high efficacy of the method of autoplasty of the extensive osteochondral defect of the tibia proximal part from the posterior femoral condyle, suggested by the authors. Application of the method described allows to restore the function of the

knee joint to the degree that enables patients to perform any sports.

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References

1. Malanin D.A., Pisarev V.B., Novochadov V.V. *Restoration cartilage injuries in the knee joint: experimental and clinical aspects*. Volgograd: Volgograd. nauch. izd-vo; 2010; 455 p.
2. Bryanskaya A.I., Tikhilov R.M., Kulyaba T.A., Kornilov N.N. Surgical treatment of patients with local defects of joint surface of femur condyles (review). *Travmatologiya i ortopediya Rossii* 2010; 4(58): 84–92.
3. Hangody L., Kish G., Kárpáti Z., et al. Autogenous osteochondral graft technique for replacing knee cartilage defects in dogs. *Orthop Int* 1997; 5: 175–181.
4. Wagner H. Surgical treatment of osteochondritis dissecans, a cause of arthritis deformans of the knee. *Rev Chir Orthop Repar Appar Mot* 1964; 50: 335–352.
5. Müller W. *Osteochondrosis dissecans. Progress in orthopedic surgery*. Vol. 3. Hastings D. (editor). New York: Springer; 1978; p. 135–142.
6. Braun S., Minzlaff Ph., Hollweck R., Wörtler K., Imhoff A.B. The 5.5-year results of MegaOATS — autologous transfer of the posterior femoral condyle: a case-series study. *Arthritis Research & Therapy* 2008, 10: R68, <http://dx.doi.org/10.1186/ar2439>.