

Knee replacement surgery using computer navigation for posttraumatic femoral deformity

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Introduction: Posttraumatic deforming osteoarthritis of the knee joint is often combined with posttraumatic deformity of the femur and tibia at different levels. Whereas extramedullary guide can be used to place cutting blocks for tibial resection, intramedullary guide would be needed for the distal femoral resection. In such cases difficulties arise with alignment of the distal femoral cuts during TKR. It occurs due to the difficulties with intramedullary orientation caused by the femoral deformity, and a valgus correction angle can hardly be identified. In addition, medullary canal may be obliterated with fixators and debris inside. The difficulties can be resolved with computer assistance. Stryker navigation system has been used for knee replacement procedures since October 2008 at the Russian Ilizarov Scientific Centre for Restorative Traumatology and Orthopaedics.

Computer navigation allows for accurate (perpendicular to the biomechanical axis of the limb) orientation of the distal femoral cuts without exposure of the medullary canal, identifying rotation alignment of the femoral component, biomechanical axis of the limb of varied extension-flexion positions, stability of the knee joint of varied extension-flexion positions pre- and post implantation.

Materials & Methods: There were 17 TKR procedures for gonarthrosis combined with sequelae of the femoral shaft fractures. Arthritis of the knee joints with evident pain syndrome was an indication to the surgery. Most of the patients (n=15 (88.2%) had femoral deformity that measured 10° and over in 7 patients (41.2). Twelve patients (70.6%) had varus and 3 (17.6%) had valgus. Two patients (11.8%) had no deformity.

Seven TKR procedures were produced without computer assistance. With the availability of computer navigation system all TKR procedures for posttraumatic deformity of the femoral shaft were performed using computer assistance. Varied tactics was employed for TKR procedures depending on the amount of the deformity. With the deformity of 10° staged replacement procedure was used, and mechanical axis was realigned by corrective implant component placement. With greater deformity there might be difficulties with ligament balancing, so the procedure can be divided into two phases. The deformity of the femoral shaft can be eliminated at the first stage, and TKR produced at the second stage. Deformity correction and TKR procedure were performed at one surgical session in two cases. Osteotomy at the apex of the deformity, realignment and IM interlocking osteosynthesis were performed with TKR using computer navigation to follow.

Results: We compared the results of correction of

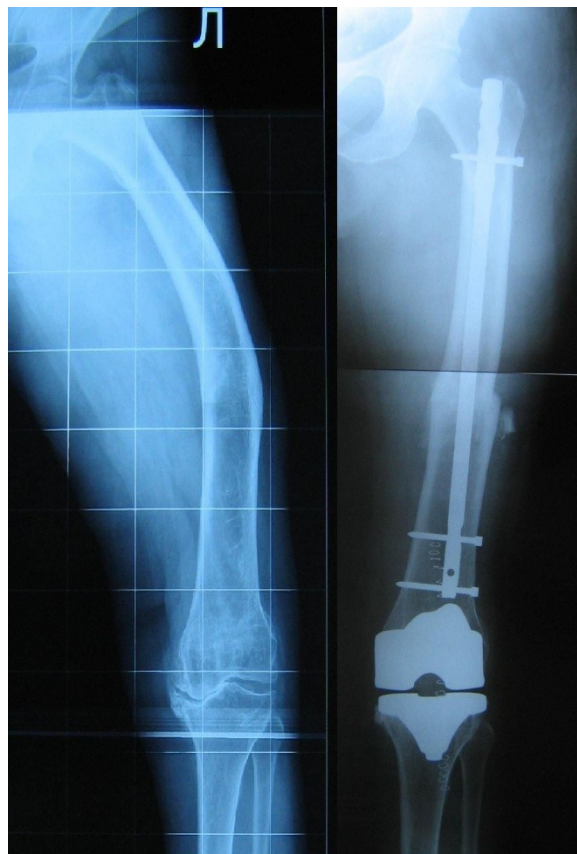


Fig. Acute correction of biomechanical axis using navigation in femoral deformity

lower limb biomechanical axis with TKR employing computer navigation and without computer assistance. Complete correction (varus/valgus of 0°) using computer navigation was achieved in 9 (90) cases against 3 (42.8) patients without navigation. Varus deformity of 2° was observed postoperatively in one patient (10) (varus or valgus deformity of 3° developed in 2 cases (28.6%). In two TKR cases (28.6%) without computer navigation the deformity measured more than 3°.

Conclusion: Deforming arthritis of the knee joint combined with deformity of the femoral shaft is a severe pathology that poses great difficulties with determining cutting planes. The difficulties can result in errors and postoperative malalignment. The usage of computer navigation allows for considerable improvements in producing accurate femoral cuts, and presence of the deformity of the femoral shaft, obliteration or metal constructs does not interfere with determining adequate plane for the cuts.

Deformity correction and TKR procedure can be performed at one session in greater deformities using computer navigation. We assess the usage of computer navigation as an advanced and rewarding trend that contributes to better results of challenging primary TKR with a thoughtful and considerate approach.