Research Article

Our experience of patient treatment with knee fractures: A case report

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ABSTRACT

In 2000–2012, the Center of Traumatology of the Republican Clinical Hospital of the Ministry of Health of the Republic of Tatarstan treated 145 patients with different types of intra-articular fractures of the knee joint. All patients underwent transosseous osteosynthesis (TOOS) with external fixation devices. They studied the results of treatment among 136 patients out of 145. The observation period was from 1 to 12 years. The results were evaluated on the basis of clinical X-ray examination data of patients. Thus, the analysis of the long-term results after the treatment of 136 patients with different kinds and types of intra-articular fractures of the knee region showed good reposition capabilities of TOOS by external fixation devices. In all cases, reposition was achieved on the operating table. Excellent and good results were noted in 118 of 136 fractures, which made 86.8%. Positive results obtained in most cases allow to consider this method of treatment as the method of choice for intra-articular fractures of knee joint area. TOOS by external fixation devices provides an accurate reposition and a stable fixation of fractures, and it is the gentlest method of surgical treatment. TOOS by external fixation devices can be used for various types of knee joint fractures.

KEY WORDS: External fixation device, Knee joint fractures, Transosseous osteosynthesis

INTRODUCTION

The fractures of the knee joint area are one of the most severe limb bone injuries. The incidence of such fractures ranges from 4.0 to 6.1% of all lower extremity fractures and from 4.0 to 12.0% of all intra-articular fractures.[1] Most authors note a significantly higher incidence of tibia proximal articular end fractures as compared with the fractures of the distal part of femur.[2-4,18]

The treatment of such fractures is a difficult task. According to the data of different authors, the complications and unsatisfactory outcomes make up over 50.0%.[5-11] The incidence of disability reaches 34.8%.[7,12,13]

In 2000–2012, the Center of Traumatology of the Republican Clinical Hospital of the Ministry of Health of the Republic of Tatarstan treated 145 patients with different types of intra-articular fractures of the knee joint. All patients underwent transosseous osteosynthesis (TOOS) with external fixation devices. They studied the results of treatment of 136 patients among 145 ones. The observation period was from 1 to 12 years. The results were evaluated on the basis of clinical X-ray examination data of patients. In most cases, positive treatment outcomes have been achieved. TOOS by external fixation devices provides an accurate reposition and a stable fixation of fractures and is the gentlest method of surgical treatment. TOOS by external fixation devices is the method of choice for this category of damage and can be used for various types of knee joint fractures.

At present, TOOS by external fixation devices is the method of choice for the treatment of intra-articular fractures of knee joint region since it allows an accurate fracture repositioning with the elimination of all kinds of dislocations and provides a stable fixation for the consolidation period.[1,6,14-17]

MATERIALS AND METHODS

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"Restorative Traumatology and Orthopedics" - nowadays the Department of Traumatology of GAUZ RKB MZ RT - developed and successfully applies the original assemblies of wire-rod apparatus of external fixation on the basis of G.A. Ilizarov's method with various types of intraarticular fractures of condyles in the femoral and tibia bones, which allow to improve the outcomes of treatment.

The device assembly depends on the type of fracture, the degree of displacement and the size of fragments, the type of surgical intervention, and, as a rule, includes two or three ring supports of the Ilizarov's set and one or two movable reposition nodes. Each node consists of arc support with brackets, which is mounted on annular support in the area of damaged condyles with the ability to move in three planes.

In 2000–2012, 145 patients with different types of intra-articular fractures of the knee joint region were treated in the department of traumatology center. There were 62 women and 83 men. The lesions of the left knee joint were noted among 80 patients; right joint lesions were noted among 65 patients.

During the admission, the general condition of the patient was assessed, as well as clinical and radiological examination of the injured knee joint. During the treatment and long observation times, clinical and radiologic methods of the study (including computed tomography) were used.

METHOD

Basic Principles of Operative Treatment for Intraarticular Fractures of Knee Joint Area

The operation of TOOS was performed on the operating orthopedic table. Anesthesia is the central segmental blockade. When the analgesic effect was achieved, arthroscopy was performed with washing and knee joint revision. Further, the traction along the axis of the lower limb was carried out on the orthopedic table with the aim of repositioning and elimination of fragment gross dislocations, which was controlled by knee radiography in standard projections. At that, when the reposition was achieved with the restoration of articular surface congruence, a closed TOOS was used with an external fixation device. If the closed reposition was unsuccessful (in 36 cases of tibial condyle fractures), open surgical intervention was used to ensure the elimination of all kinds of dislocations, and then the needles with stops were introduced through the condyles of the femoral and tibia bones, and Shantz screw-rods were inserted which provided the coaptation of fragments, as well as an optimal stability of fixation. Similar Shantz screw-rods were inserted in the main fragments of the femur or tibia, which were fixed on the support of the external fixation apparatus. The supports were joined together by threaded rods.

During the fractures of femur condyles after the preliminary reposition of the femur fracture, Schantz screw-rods were introduced at the level of the upper and the lower third of the diaphysis (or a combination of spokes and screws) and were fixed in two circular or arcuate supports of the device. Similar Schantz screws were inserted in the proximal metaphysis, or in the upper third of the tibial bone diaphysis, or a combination of spokes and screws was also used, which were fixed in the distal support of the external fixation device. All supports were joined in pairs by threaded rods. A screw-rod of Schantz was inserted in the damaged condyle of the femur, and it was fixed to the bracket in support of the mobile reposition node, which was mounted on the intermediate support of the device. The displacement of the Schantz screw in support of the mobile reposition node provided the final repositioning of the condyle fracture and the coaptation along the fracture plane. On reaching the reposition through the condyles of the femur, a spoke with an abutment was introduced and fixed to the device support along the side of the damaged fragment. The introduction of this spoke provided the reliability and the stability of fixation increased [Figure 1]. 1 month after the operation, the support installed in the proximal end of the tibia was dismantled, the screws-rods and spokes were removed, which provided the possibility of early active movement initiation in the knee joint.

In the case of polyfragmental fractures of the femoral condyles, the difference in the layout of the external fixation device was provided by the installation of two reposition nodes on each of the damaged condyles.

The duration of treatment in the device was 2.5–3 months.

At the fractures of the tibial condyles after the reposition in the femur at the level of n/3 of the diaphysis, the Shantz screws-rods were inserted, the same Shantz screws were inserted in the tibia at the upper level and the boundary of the upper and middle third of the diaphysis, or a combination of spokes and screws was fixed in the device supports. The supports were connected in pairs by threaded rods. A screw-rod of Schantz was inserted in the damaged condyle of the tibia, and it was fixed on the bracket mounted on the support of the mobile reposition unit. An exact repositioning of the fracture was achieved with the congruence restoration in the knee joint by the movements along the screw-rod of the reposition node. After the completion of the reposition, tapered spokes were introduced through the tibial condyles in the opposite direction, which were fixed to the

device support located in the area of tibia proximal metaphysis. The stability of fracture fixation increased by the introduction of these spokes.

The fixation of the knee joint was not performed at minor displacements of the condyle fracture, taking into account the reposition and the high stability of osteosynthesis. This did not exclude the possibility of early active movement initiation in a joint.

In the case of polyfragmental fractures of tibia proximal epithetaphysis (T_1-V_1-Y-shaped fractures), the developed layout of the external fixation device ensured the accurate reposition and stable fixation of each of the damaged condyles. A special feature was the installation of two mobile reposition nodes on each of the damaged condyles of the tibia. Schantz screw-rods were inserted in the shifted fragments and were fixed in the brackets of the corresponding reposition nodes. Reposition was achieved with the restoration of the articular surface congruence by repositioning along the screws of reposition nodes [Figure 2]. The duration of treatment in the device was 2.5–3.5 months.

In the cases of significant condyle compression, as well as at comminuted impression-compression fractures, when the closed reposition of the fracture on the operating orthopedic table was unsuccessful, we used open surgical intervention. Reposition was performed with the restoration of the articular bone surface congruence and bone autoplasty of the tibial condyle defect under visual control. The spokes with the stops in opposite directions were introduced and fixed in the device support through tibia condyles, taking into account the mounted autograft. Schantz screw-rods were inserted in the condyles of the tibia femur at the level of the upper and the middle third of the diaphysis border, which were fixed in brackets on corresponding supports. All supports were connected in pairs by threaded rods. They performed the installation of a three-section external fixation device. The fixation period by the device made 2.5 months on the average.

The issue of spoke and screw removal, the dismantling and the removal of the device was decided individually, based on the data of clinical and radiological research. After the dismantling and the removal of the external fixation device, strict implementation of the entire complex of restorative treatment is necessary, including a dosed, increasing load, which can be brought to a full one during 4–8 weeks, as well as an early function of limb joints. Clinical-X-ray control is carried out after the dismantling of the device and further until the end of treatment at least 1-time in 1,5–2 months.

A Clinical Example

The patient R., born in 1960, medical history No. 4564, was treated at the Department of Traumatology of the NITS "WTO" from 24.11. to 21.12.2000. The patient fell on the right knee joint diagnosis: Closed intra-articular impression-compression fracture of the external condyle of the right tibia. The operation was performed on 01.12.2000 - the arthroscopy of the right knee joint, an open fracture reposition with bone autoplasty of the external condyle defect, TOOS with an external fixation device. The reposition of the fracture with the elimination of all kinds of displacements was achieved on the operating table. The device of external fixation was dismantled and removed on February 20, 2001. Restorative treatment courses were conducted at the hospital. Follow-up examinations were performed in dynamics for 1.5 years and after 3, 4, 7, and 10 years after surgery. The patient does not complain. The activity and

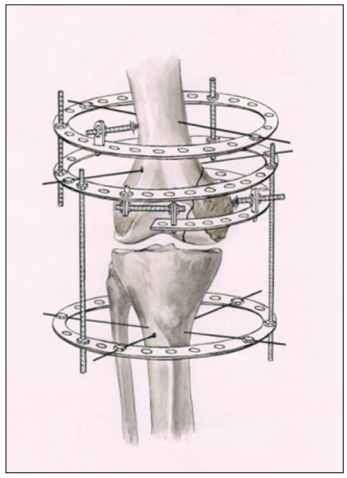

Figure 1: The scheme of transosseous osteosynthesis and the layout of the external fixation device at femoral condyle fractures

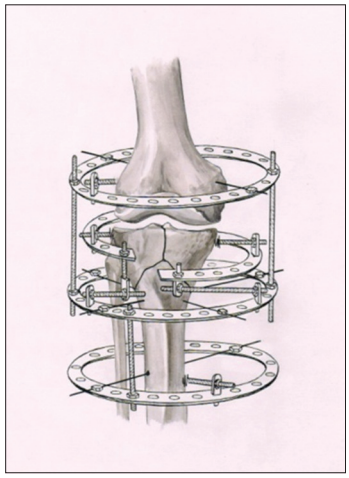

Figure 2: The scheme of transosseous osteosynthesis and the layout of the external fixation device at tibial condyle fractures

ability to work have been restored. The movements in the knee joint are normal. There is an insignificant narrowing of the knee joint articular fissure on the control radiographs [Figure 3a-d]. The outcome of treatment is rated as good.

CONCLUSIONS

They performed the analysis of the treatment of 136 patients with the fractures of the knee joint area, among them were 24 patients with intra-articular fractures of the femoral condyles and 112 patients with the fractures of the tibial condyles. The observation period made 1–12 years from the moment of the operation.

We used a comprehensive clinical and radiological assessment of treatment outcomes,[18] as well as the assessment of life quality conditioned by health.

The results of knee joint fracture treatment are given in Table 1.

As follows from the table data, among all intra-articular fractures of the knee joint region, excellent outcomes were achieved during the treatment of 48 patients (35.3%), good results during the treatment of 70 patients (51.5%), satisfactory - during the treatment of 16 patients (11.8%), and poor - during the treatment of 2 (1.5%) patients.

The analysis of patient treatment results with intra-articular fractures of the knee joint area showed that the outcomes depend on the damage type and severity, the quality and the accuracy of repositioning with the restoration of congruence in the knee joint. The greatest number of satisfactory, as well as unsatisfactory results, was obtained with polyfragmentary and impression - compression fractures of the tibial condyles, which was determined by the severity of the lesions with massive destruction of bone articular surfaces that make up the knee joint.

Thus, the analysis of the long-term results of treatment among 136 patients with different kinds and types of intra-articular fractures of the knee region showed good reposition capabilities of TOOS by external fixation

Table 1: Results of knee joint fracture treatment

Item №	Fracture type	Evaluation of results				Total
		Perfect	Good	Satisfactory	Poor	
1	Fractures of femur condyles	6	14	4	-	24
2	Fractures of tibia condyles	42	56	12	2	112
	Total amount of fractures	48	70	16	2	136

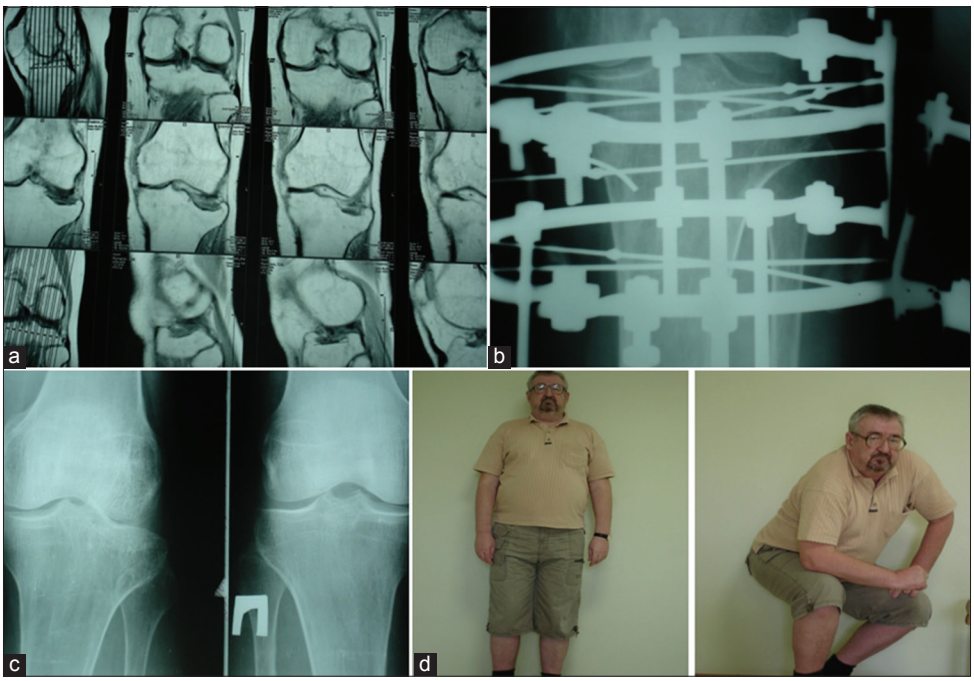

Figure 3: Radiographs and photographs of the patient R., born on 1960, m/h No. 4564 with the fracture of the external condyle of the right tibia (a) before the operation; (b) in the process of treatment by the apparatus of external fixation; and (c and d) the outcome of treatment 9 years after the operation

devices. In all cases, reposition was achieved on the operating table. Excellent and good results were noted in 118 of 136 fractures, which made 86.8%. Positive results, obtained in most cases, allow to consider this method of treatment as the method of choice at intra-articular fractures of the knee joint area.

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