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Correction of post-traumatic deformity of tibia, with bone loss, to 20 cm from center of rotation angle

The following is the first case reported in the literature of a patient with post-traumatic deformity of the tibia associated with bone loss, that was subjected to reconstruction surgery to 20 cm from center of rotation angle (CORA).

We treated a male patient aged 34 years old who had a motorcycle accident. Polytrauma patient with head trauma and facial fractures associated with the nasal bones, lung contusion associated with multiple rib fractures, fracture of the left upper limb, (ISS 22) and open tibia fracture (G-A 3B, AO 41-A3) associated to bone and soft tissue loss associated with injury of lateral popliteal nerve (Supplementary Digital Material 1: Supplementary Figure 1). He was treated in the trauma center with both trauma surgery (removal avascular bone fragment and fix tibia with external fixator) and plastic surgery (debridement of soft tissue, neurolysis and Vacuum Therapy), before reaching the Intensive Care Unit. Five weeks after the trauma, the patient, hospitalized in Plastic Surgery Department to allow the healing of soft tissue, Vacuum Therapy and hyperbaric oxygen therapy, developed bone necrosis and infection due to *Acinetobacter baumannii* in the proximal tibia (Supplementary Digital Material 2: Supplementary Figure 2), treated with bone resection, removal of necrotic bone, compression of the bone segment, soft tissue coverage and systemic antibiotics therapy.

To allow a more rapid healing of soft tissue and bone infection, we preferred not to change the stability of fracture treated with external fixation resulting in residual varus of 16° and 4 cm of bone defect (Figure 1).

Seven weeks after the second surgery the clinical examination showed neuropraxia of the tibial nerve, deficiency of envelope in proximal metaphyseal area of the tibia.

As not to alter the status of the soft tissue in the healing process of the fracture in the proximal metaphyseal area, we preferred to correct the deformity and the bone

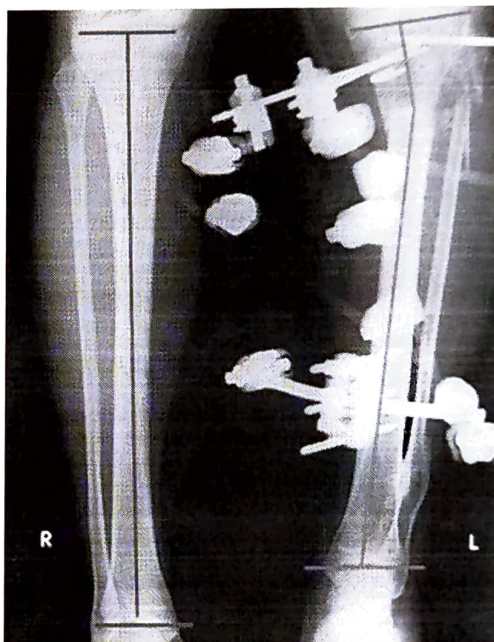


Figure 1.—Preoperative planning.

defect in the metaphyseal area of the distal tibia 20 cm from the CORA.

We performed the reconstructive surgery of the limb through a partial correction of the varus with valgus compression of about 8° to CORA associated with a distal metaphyseal osteotomy and correction with elongation-translation of an additional 8 degrees of varus and 4 cm of bone loss remaining.¹

While choosing when, how or if to rebuild a limb, you have to take into account various parameters such as functional demands and expectations of the patient, the presence of comorbidity conditions for both systemic and local, social and environmental conditions. Our patient had all the characteristics to undergo reconstructive surgery of the leg to get a rapid functional recovery. The reconstruction surgery of a limb to correct a deformity should be performed at the CORA, to obtain a restoration of anatomical and mechanical axes of the limb. A displacement above or below of the osteotomy line to correct a deformity from CORA must be accompanied by a translation of the bone segment. Greater is the displacement of the osteotomy line than the CORA

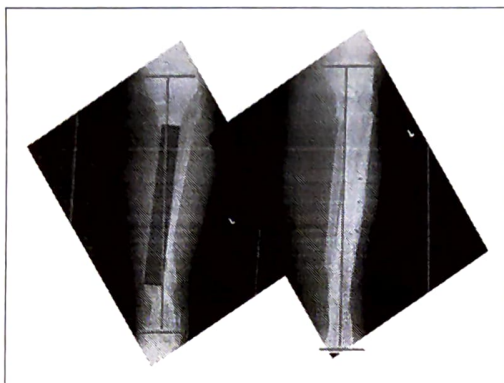


Figure 2.—Bone healing more anatomical axes.

greater will be the translation of the bone segment during the reconstruction of the deformity.^{2,3}

But is it possible to correct 16 degrees of proximal tibial varus more than 20 cm from the CORA? Is the tibia mechanically stable? Thanks to a computerized external fixation⁴ we were able to simulate all possible corrections (Supplementary Digital Material 3: Supplementary Figure 3) and simulating a translation not exceeding 50% of the bone segments. We managed to correct a deformity of 20 cm away, only for 8°, so we have corrected the remaining 8° for the compression valgus to CORA, trusting to the high vascularity in this proximal metaphyseal area (Supplementary Digital Material 4: Supplementary Figure 4). The bone healing was 270 days and the bone healing index of 55 days. The mechanical axis deviation (MAD) was 3 mm lateral (Figure 2) (Supplementary Digital Material 5: Supplementary Figure 5; Supplementary Digital Material 6: Supplementary Figure 6). Upon removal of the external fixator, the patient had a full active movement of the knee, with signs of recovery of the tibial nerve. Four months after removal we witnessed a recovery of walking without pain (Supplementary Digital Material 7: Supplementary Figure 7).

As not to alter the status of the soft tissue in the healing process of the fracture in the proximal metaphyseal area of the tibia, we preferred to correct the deformity and the bone defect in the distal metaphyseal area of the tibia to 20 cm from the CORA. The reconstruction of a limb with external fixator must be highly customized and shows a great variety of options based on the characteristics of the patient. Moreover, as in this case, the system of external fixation computerized allowed us to bypass the site of the lesion and avoid complications on the regenerated bone, reduce the time of bone healing, and allow a more rapid functional recovery.

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Conflicts of interest.—The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

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Lateral parapatellar approach in total knee arthroplasty for valgus knee: an update

Valgus deformity in total knee arthroplasty (TKA) is a challenging and low frequent issue, representing about 10% overall of the cases in primary replacement. TKA in valgus knee often lead to worse results because of a more difficulty in achieving a proper soft tissue balance and a correct component rotation.

According to Ranawat *et al.*,¹ valgus knee can be classified in three degrees of increasing deformity (Figure 1).¹

Grade I, where the axial deviation is within 10°, the medial collateral ligament (MCL) is intact and the deformity is correctable. It represents the most of cases (about 80%) and there are no great surgical difficulties; a standard medial parapatellar approach can be performed, the bone cuts provide to restore a neutral me-

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