

Circular type external fixator assisted acute femoral deformity correction and subsequent lengthening over an intramedullary nail: Case report

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Background:

Intramedullar nails can be used together with external fixators in treatment of deformity correction. In the case presented here, femoral malunion with 90 degrees external rotation deformity together with shortness of the affected limb is corrected using these two methods together.

Methods:

The patient presented at our polyclinic with a malunion sub trochanteric region of femur with complaints of pain in the right thigh, shape deformity and limping. In the physical examination, shortness in the right femur and external rotation deformity were seen. To confirm the deformity and shortness, standing AP and lateral axis radiographs were taken. Associated with the nonunion of the femoral sub trochanteric fracture, external rotation deformity of almost 90° was seen in the right femur and nearly 2cm shortness. Surgery was planned for the patient. It was decided to make acute correction to the deformity with an osteotomy in the supracondylar metaphyseal area and by applying a retrograde femoral intramedullar nail together with a unilateral external fixator to the right femur, to gradually eradicate the shortness using the external fixator.

Although the preferred fixator was a unilateral external fixator, as the proximal fixation area would be the malunion area, it was planned to apply Schanz screws to different areas to avoid the development of fractures around the Schanz screws. Therefore, rather than a unilateral external fixator, a circular type external fixator was selected to be used. In the preoperative examination by the Anesthesia and Reanimation Dept, the patient was evaluated as ASA 1 and no findings of infection were encountered in the laboratory tests. In addition to the existing pathology, the patient had no other health problems. The surgical procedures were applied under spinal-epidural anesthesia in a supine position on a radiolucent table. One full circle and 1 half circle were connected to each other using 3 telescopic rods to form a circular type external fixator. As the 25cm-long retrograde nail which was to be applied needed to be more proximal in the proximal of the half circle, the length of the external fixator was obtained by adjusting the lengths of the telescopic rod connection intervals appropriate to the amount of lengthening. A one-sided external fixator was applied with one 6x220mm Schanz screw placed in both the femur distal and proximal under fluoroscopy with the anatomic axis vertical and so as not to contact the intramedullar nail. Under fluoroscopy control, an intramedullar guide was placed within the intramedullar canal retrograde from the intercondylar notch.

As the nail to be applied was 11.5mm in thickness, the intramedullar canal was hollowed out with guide wires of increasing thicknesses and the last 13mm with a reamer. Then the 11.5mm x 25 cm nail was prepared and kept ready for use on the table. The osteotomy was made by applying the multiple drill-hole technique under fluoroscopy of the metaphyseal area in the femoral distal supracondylar region and the prepared nail was placed in the medullar canal. After checking with fluoroscopy, 3 distal locking

screws of 5 x 75mm, 5 x 75mm and 5 x 70mm dimensions were placed. No proximal locking screws were placed to enable the lengthening to be applied.

Then the one-sided external fixator which had been applied temporarily was removed, leaving the Schanz screws in the bone. Using these Schanz screws as a joy-stick, acute correction was applied to the external rotation deformity. The previously prepared circular type external fixator was fixed to the femur with a total of 6 screws, using the existing Schanz screws and by placing a further 2 pairs of 6 x 220mm Schanz screws to the proximal and distal rings. That the Schanz screws did not make contact with the nail and would not hinder the lengthening was checked under fluoroscopy. The distraction test was applied to the osteotomy line with the external fixator and there were seen to be no problems. By checking the mechanical and anatomic axes of the femur for a final time with fluoroscopy, the deformity was seen to have been corrected and the operation was concluded by covering the ends of the Schanz screws with dressings. No intraoperative complication was encountered. On postoperative Day 1 isometric quadriceps and knee movements were started and full weight-bearing was allowed with two crutches.

The patient was discharged on postoperative Day 3 and was called for follow-up after 1 week for the lengthening to be able to be started. On postoperative Day 10 distraction was started at the rate of 4 x 0.25mm/day and the patient was instructed in this procedure. During the lengthening process, weekly radiological examinations were made. After reaching the desired amount of lengthening, with the patient under spinal anesthesia, 2 proximal locking screws of 5 x 35mm and 5 x 40 mm were applied under fluoroscopy to the proximal of the intramedullar nail and the external fixator was removed. Until consolidation in the distraction area was seen radiologically, partial weight-bearing with crutches was continued.

Results:

Satisfactory deformity correction and limb lengthening was achieved.

Conclusions:

Malunion may develop following treatment of fractures caused by trauma and deformities and limb length discrepancy may be seen associated with this (4). In the case presented here, after having been struck by a vehicle in a traffic accident, the patient had undergone 5 operations at different times for a subtrochanteric femoral fracture and deformity and shortness had developed associated with malunion. Circular type external fixators have been used for a long time in the treatment of long bone deformities and shortness (5). However, problems such as pin-tract infection, discomfort and joint stiffness may be encountered in the use of circular type external fixators (6). The frequency of these types of problems being observed is in direct proportion to the duration of the fixator.

At the same time, deformities and shortness which develop based particularly on metabolic bone disease may recur after the fixator is

removed in the subsequent consolidation period after treatment with circular type external fixator (7). In recent years, the combination of intramedullar nails and external fixator has started to be more widely used in the treatment of deformities and shortness (8). Due to the combined treatment, the duration of the external fixator is shorter and therefore problems associated with that which may develop, such as pin-tract infection, discomfort and joint stiffness are seen less. In a study by Paley et al where cases of femoral lengthening using combined treatment were compared with the use of external fixator alone, it was reported that there were fewer complications associated with the fixator in the cases with combined treatment, which was related to the shorter duration of the external fixator (2). In cases where an external fixator is used combined with intramedullary nailing, the external fixator only remains in place until distraction is complete. When the distraction period is finished, the fixator is removed. In the case presented here, the circular type external fixator was removed one month postoperatively, following the end of the distraction period. Another advantage of the combined treatment is that recurrence of deformity and fractures that may develop in the regenerated bone area, which may be seen following removal of the fixator in cases where an external fixator is used alone, are prevented by the intramedullar nail (9). Physiotherapy is of great importance during and after the treatment of deformities and shortness. With the early removal of the fixator in combined treatment, rehabilitation can be started in the early period.

In the case presented here, rehabilitation was accelerated following the removal of the fixator. Attention must be paid in combined treatment to there not being any contact between the intramedullar nail and the external fixator pins, otherwise intramedullar infection may be seen (2). In the case presented here, care was taken that there was no contact between the Schanz screws and the nail by applying all the Schanz screws under fluoroscopy. During acute correction of deformities, neurovascular complications may sometimes be encountered (10). In the case presented here, no such complications occurred.

With combined treatment using an external fixator together with intramedullary nailing, both acute correction of deformities and gradual correction of the limb length discrepancy can be applied. In addition, with this combined treatment, a significant decrease has been recorded in the duration of the external fixator and in the rates of associated complications which may develop. In the case presented here, it has been shown that a high degree of external rotation deformity of nearly 90°, together with shortness of the limb, was successfully treated with the combined treatment of external fixator and intramedullary nailing. or MDD diagnosis and prognosis.