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A novel fixation technique for transverse patella fractures

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ABSTRACT

Fractures of the patella account for approximately 1% of all trauma cases. Various fixation methods or modifications of previous methods have been described for the internal fixation of patella fractures. However, high complication rates are common in most metal implants and secondary surgery for removal of prominent implants is often required.

To overcome the problem of prominent implants without compromising stable fixation, we describe a novel standardised surgical technique for the fixation of simple transverse patella fracture, using the Arthrex syndesmosis Tightrope®.

We propose this method as an alternative treatment that may reduce the rate of complications and reoperation because of them.

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INTRODUCTION

Fractures of the patella are not very common. They account for approximately 1% of all trauma cases with a higher incidence amongst males (2:1) and approximately 1.2 per 100,000 per year. The diagnosis is made via the injury mechanism as well as the physical and radiological findings. Radiographic evaluation should consist of anteroposterior (AP) and lateral knee radiographs. Lateral views are useful to assess possible displacement of the patellar fragments. However, in conventional x-ray imaging the extent of injury often is underrated. That usually leads to the necessity of a computed tomography (CT) scan

The evolution of patellar fracture fixation continues to maximize options to balance rigid fixation with low-profile fixation constructs. The modified tension band wiring technique using either Kirschner wires (k-wires) or screws perpendicular to the fracture with an anterior figure-ofeight metallic cerclage wire is probably the most commonly used. However, high complication rates are common in most metal implants and secondary surgery for removal of prominent implants is often required

To overcome the problem of prominent implants without compromising stable fixation, we describe a standardised method for the fixation of simple transverse patella fractures, using the Arthrex syndesmosis Tightrope®, a nonabsorbable fiberwire suture looped twice through center holes of anchored cortical metal buttons

METHODS AND MATERIALS

INCLUSION AND EXCLUSION CRITERIA

The inclusion criteria are patients diagnosed with patellar fractures classified according to the Arbeitsgemeinschaft für Osteosynthesefragen (AO) guidelines as AO/OTA 34-C1

The exclusion criteria were: (i) comminuted fractures of the patella, (ii) osteoporotic bone, (iii) open fractures and (iiii) insufficiency of the extensor mechanism of the knee.

PATIENT POSITIONING AND VISUALIZATION

Under general anesthesia, the patient is positioned supine on a radiolucent operating table. Prophylactic antibiotics are administered according to guidelines. The lower extremity is prepared and draped in the usual sterile fashion. After the inflation of a pneumatic tourniquet at 320mm Hg, the knee is positioned in extension. A 1-cm anterolateral incision is made in order for the hematoma to be drained. Rinsing of the arthrosis is carried down through the same incision. The patellar fracture is identified with the use of C-arm, and it is reduced over the skin using a reduction clamp (Figure 1)

METHODS AND MATERIALS

SURGICAL PROCEDURE

Four skin incisions of 0,5 cm are made. Two of them medial and lateral of the upper pole of the patella and the other two antidiametrically of the first ones on the lower pole of the patella. Through the medial upper and lower incision, a bone tunnel is made using a guide wire followed by a 3,7mm drill, in a longitudinal axis. At this stage of the procedure is crucial that the knee is flexed in 300angle in order to achieve the correct positioning of the guide wire. A needle containing the pull-through suture is advanced through the drilled hole from a downward approach. The same procedure is repeated through the lateral incisions. The two bone tunnels must be parallel to each other. Afterwards, the suture pulls the oblong button longitudinally across the hole until it can be flipped and attached to the lower patellar cortex. With traction to the ends of the suture, the round button is attached. Mimicking a stage of the ACL procedure, the knee is bended and stretched ten times and after that new traction is applied to the ends of the suture. Afterwards, the suture is tightly tied by hand to stabilize compression. The reduction of the patellar fracture is confirmed with the use of C-arm. (Figures 2 - 4)

OPERATIVE TIME AND BLOOD LOSS

The operative time was recorded for a general assessment of the difficulty and complexity of the surgical procedure and it was 36 minutes. The intraoperative blood loss was minimal.

Figure 1.

Figure 2

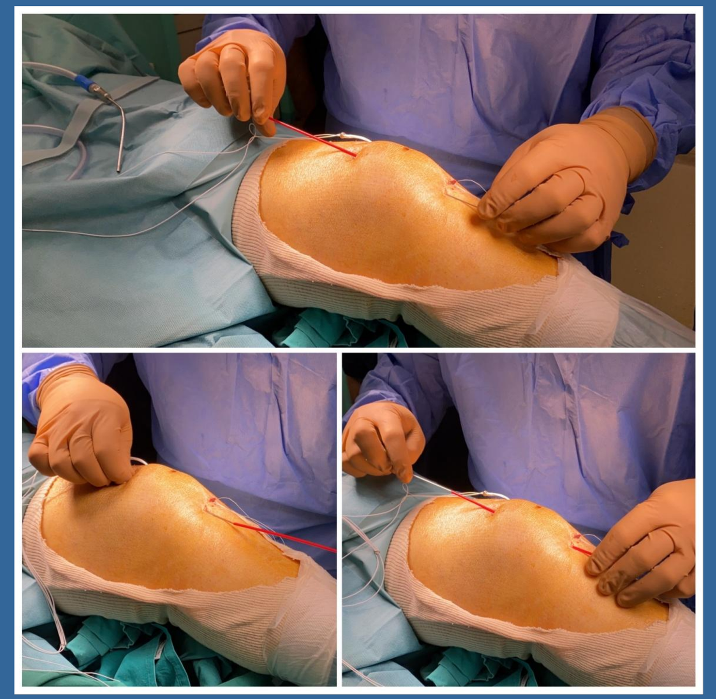

Figure 3

Figure 4

RESULTS

Motion of the knee and partial weight-bearing with two crutches, are encouraged postoperatively. In the first 2 weeks after the operation, the knee is restricted in a cast that allows flexion up to 30^0. In the following 2 weeks the flexion range raises up to 60^0 until the final 2 weeks when the flexion of the knee is up to 90^0 and full weight –bearing is recommended.

Activities with intensity or flexion of more than 90^0 were completed without any restarin, after 6 weeks postoperatively followed by physical and radiographical assessment.

According to Knee Injury and Osteoarthritis Outcome Score (KOOS) and 2000 IKDC Subjective Knee Evaluation, all the patients were very happy with their results. They were able to return to their daily activities and hobbies faster and painless.

One key factor that every patient noted was the absence of hardware and the fact that they would not undergo a new surgical procedure in order to remove any hardware.

DISCUSSION

The treatment of patella fractures is technically demanding. Although the radiological results are mostly satisfactory, this often does not correspond to the satisfaction of the patients. The classical treatment with tension band wiring with K-wires is considered the gold standard for transverse patella fracture. Several modifications and novel techniques have been introduced.

To our knowledge, the Arthrex Tightrope® syndesmosis system has never been used before as a fixation technique for transverse patella fractures. The advantages of our technique is that because of the reduction of the fracture with the use of sutures there will not be observed any dislocation or migration of K-wires, no screw breakage, osteolysis or radiolucent zones around any screws or other hardware that could be used. Moreover, due to the fact that it is a percutaneous technique, there is meticulous handling of the soft-tissue envelope which is of the utmost importance, given the patella's tenuous blood supply and limited soft-tissue envelope.

The novel technique has limitations. First, we have not performed a biomechanical test for this technique yet. Although the intraoperative test demonstrated a stable fixation, a biomechanical evaluation is necessary before further clinical use of the technique. Second, only one patient has received this kind of fixation. Third, this technique is suggested for patella fractures classified as AO/OTA 34-C1.

CONCLUSIONS

We describe a novel surgical technique for transverse patella fracture, as an alternative treatment that may reduce the rate of complications and reoperation because of them.

The Arthrex Syndesmosis system fixation technique is described in details in the present report, in a stepwise, standardised way and can be adapted to AO/OTA 34-C1 patella fractures.

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