Fixation of Comminuted Patellar Fracture with Combined Cerclage and Tension Band Wiring Technique

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ABSTRACT

In comminuted patellar fractures, a combination of cerclage wiring and tension band fixation is said to provide good mechanical stability. This is a retrospective review of four patients treated with this method. All fractures described herein were classified as 45-C3 (based on Orthopaedic Trauma Association classification) and were fixed with a 1.25mm cerclage wire and tension band wire proximally looped through the quadriceps tendon and distally through the patellar ligament in a figure-of-eight configuration. The average follow-up period was 10 months. The Activity of Daily Living Scale (ADLS) of the Knee Outcome Survey was used to assess symptoms and functional capability of the knee. In all the cases, fracture union was achieved at an average of 11 weeks. The average ADLS score was good (92.5 %). Full range of knee motion was achieved by end of the third postoperative month. None of the patients had complications, such as infection and implant failure.

Key Words:
Patella fracture, Cerclage wiring, Tension band wiring

INTRODUCTION

Patella fractures account for 1% of all skeletal fractures [1]. Comminuted patellar fractures usually occur with direct trauma. About one third of patella fractures require surgery, which is indicated if there is damage to the extensor mechanism or in fractures associated with 2 mm step-off incongruity [2]. The objectives of surgical treatment include precise anatomic reduction of the articular surface by stable fixation, and restoration of the knee-extensor mechanism, thus allowing early mobilization.

Currently, several fixation methods of patellar fractures are in use, including tension band wiring, cerclage wiring, and screw fixation. Curtis, in a cadaveric study comparing the AO method to the Pyrford technique using a cerclage wire and an anterior tension band wire looping through the quadriceps tendon, found that the latter gave greater strength of fixation [3].

We reviewed a series of four patients with comminuted fracture of patella, treated with a combination of cerclage and tension band wire in figure-of-eight configuration (Figure 1).

Case Series

Four patients with a mean age of 28 years (range 18 to 46) were treated with the combined cerclage and tension band wiring method (Table I). All patients were male and injuries occurred due to involvement in a motor vehicle accident. Fractures occurred on the right knee in three patients, on the left side in one patient. One patient also had a closed fracture of the ipsilateral femur, requiring internal fixation with an interlocking nail. According to Orthopaedic Trauma Association (OTA) classification, all fractures were coded as 45-C3 - characterized by comminuted and complete articular involvement with loss of the extensor mechanism (Figure 2). Three fractures were closed and one was opened requiring wound debridement, arthrotomy washout and osteosynthesis of the patella within twelve hours of the injury.

Surgical technique

Surgery was performed with patients in the supine position with the injured knee extended. A longitudinal midline skin incision was made over the patella. After incision of the superficial fascia, the extensor apparatus was exposed and any tear in the auxiliary extensor was identified. This was followed by a medial parapatellar arthrotomy. Using a 14G cannula, a 1.25mm cerclage wire was passed around the equator of the patella, as close as possible to the bone. Another wire was passed proximally through the quadriceps tendon and distally through the patellar ligament, posterior to the cerclage wire and in the form of a figure-of-eight (figure 1). The cerclage wire is tightened to prevent further displacement of bone fragments. While tightening the second wire, congruity of the articular surface was checked by palpating the retropatellar surface. The affected knees were protected with a cylinder backslab for 4 weeks, followed by a course of physiotherapy that included knee bending, quadriceps and hamstring exercises. Full weight bearing was allowed in all cases 8 weeks after the surgery.

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Table I: Patient Characteristics and Outcome of Treatment using the combined cerclage and tension band wiring method

Patient	Age	Fracture type*	Other injury	Range-of-motion		Time to Union (weeks)	ADLS score (%)
				6 weeks	3 months		
1	18	C3	none	130	full	12	93
2	46	C3	none	130	full	12	86
3	30	C3	none	90	full	8	96
4	18	C3	fracture of ipsilateral femur	120	full	12	91

* Based on OTA classification for patellar fracture
ADLS = activity of daily living scale

Fig. 1: immediate post-operative radiograph of the fractured patella.

Fig. 2: pre-operative radiograph of the patella.

Fig. 3: Radiograph taken 1 years postoperatively.

There was full range of knee motion three months after the surgery. There were no complications, such as infection, malunion, non-union or implant failure in any of the cases. None of the patient required revision of the surgery. The average score on the Activity of Daily Living Scale was 92%[4]. Three out of four patients returned to work within three months of surgery, while the fourth who had the closed fracture of the ipsilateral femur was given a six-month medical leave. During the latest follow up, all patients were completely pain free and only one patient had mild swelling of the knee, which did not affect performance of daily activities (Figure 3). Three patients could squat fully, climb up and down stairs without any problem and the fourth could squat up to half of the normal, and had to use a railing while climbing stairs.

DISCUSSION

The recommended fixation for comminuted fractures of patella is modified tension band, which can be combined with a cerclage wire or lag screws [5]. Patellectomy is only indicated when anatomical reduction of the displaced bone fragments is not possible. Curtis had shown that the Pyrford method provides better fixation of patellar fracture than the modified tension band method, especially in comminuted type[3]. What differentiates the Pyrford technique from the AO method is use of the tension band wire in figure-of-eight configuration. So far, there has been no formal clinical study published this method to date. In our series of four patients, the initial outcome of this fixation is very encouraging based on the mean score of 92.5 per cent on the Activity of Daily Living Scale, but the number of patients reviewed here is too small to draw any firm conclusions.

The main disadvantage of this method is the need to immobilize the knee for 4 weeks, which may result in stiffness. However, all of the patients achieved full range of motion three months after the surgery. According to reports in the literature, the early complication rate of tension band wiring ranges from 0% to 25% [1]. Common complications include infection, implant failure, loss of reduction, and wire related problems (such as skin impingement, discomfort and pain). In this patient review, none of the patients experienced these problems. Based upon this review, we feel that combination of cerclage and tension band wiring technique can be considered for comminuted fracture of the patella.

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