PATELLECTOMY WITH VASTUS MEDIALIS OBLIQUUS ADVANCEMENT FOR COMMINUTED PATELLAR FRACTURES

A PROSPECTIVE RANDOMISED TRIAL

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We have compared the results of simple patellectomy (group A, n = 16) and patellectomy with advancement of the vastus medialis obliquus (group B, n = 12) in a prospective, randomised trial, with a minimum follow-up of three years.

The results in group B were significantly better (p < 0.001) than those in group A. Although the patella should be preserved if possible, we advocate advancement of the vastus medialis obliquus when patellectomy is necessary.

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The patella is an integral part of the extensor mechanism of the knee and should be preserved whenever possible. Patellectomy may be indicated for several conditions and injuries. These include comminuted fractures, patellofemoral osteoarthritis, anterior knee pain, recurrent dislocation, infection and tumours. Patellectomy may lead to reduction in the strength of knee extension, an increase in tibiofemoral joint loading resulting in osteoarthritis, abrasion of the quadriceps tendon against the femoral condyles causing a tear or a Boutonnière-type deformity, anterior instability, lateral subluxation of the patellar tendon, poor cosmesis and loss of full flexion. Many techniques have been described, but none has been universally accepted and none has given consistently successful results.

The vastus medialis obliquus (VMO) does not contribute to knee extension and has an independent innervation. We have advanced this muscle in association with patellectomy and have shown by mechanical studies that this helps knee extension and improves the loading across the tibiofemoral joint. We now present the results of a prospective, randomised trial evaluating the results at a minimum follow-up of three years.

PATIENTS AND METHODS

The trial had strict criteria for entry. All the patients were skeletally mature and had a comminuted fracture of the patella with at least five fragments seen on the radiographs. They had no other concomitant fractures and none had radiological signs of osteoarthritis of the knee.

The trial was approved by the local ethical committee and every patient gave informed consent. Each was randomly assigned by drawing lots to either simple patellectomy (group A) or patellectomy with VMO advancement (group B). There were 28 patients, 16 in group A and 12 in group B. The groups were well matched for age and gender. Their mean ages were 28.4 and 28.1 years and the male:female ratios were 9:7 and 7:5, respectively. None of the patients was lost to follow-up.

Group A. Treatment was by simple patellectomy through a medial parapatellar incision and longitudinal closure of the defect. On the first postoperative day, partial weight-bearing was allowed while wearing a knee immobiliser and isometric quadriceps exercises were started. Active assisted exercises were begun on the fourth day and the immobiliser discarded. Flexion of the knee to 90° was usually achieved by four weeks after operation.

Group B. Treatment was by patellectomy and VMO advancement through a medial parapatellar incision. After the defect had been closed longitudinally, the muscle was advanced laterally and distally over the sutured defect and the distal 1 cm plicated to increase the angle of insertion in...
the sagittal plane (Fig. 1). The postoperative management was as in group A.

The results were assessed according to the criteria of Levack et al in which three points each were given for no pain, unlimited activity and no loss of quadriceps strength, two for minimal pain during activity, limitation of activities especially in sports and a decrease in quadriceps strength of 30% to 45%, and one point each for constant severe pain at rest, greatly diminished activities and loss of more than 45% of quadriceps power. This may be 20% more on one side compared with the other, but does not necessarily denote dominance and up to 30% difference is not considered significant. The patients were asked to assess their function on a scale of 1 to 100. Three points were given for a score of between 75 and 100, two for 50 to 74 and one for 0 to 49. A total of nine points was considered a good result, six to nine points was a fair result, and less than six points a poor outcome.

Quadriceps strength was measured using a spring dynamometer in flexion and extension (Fig. 2) and the results were expressed as a percentage of that of the normal leg.

Functional assessment of the patients was carried using part of the criteria and the scoring scale described by Marshall, Fetto and Botero for evaluation of recovery after knee ligament injuries. Patients were asked to duckwalk, run on the spot, jump off one leg and squat. Points were scored for each activity; inability to perform scored
zero points. One point was given for each if the patient could squat fully, run on the spot and duck-walk and jump on one leg with discomfort. Two points were given for each if the patient could duck-walk and jump on one leg without discomfort.

Evidence of development of heterotopic ossification in the patellar ligament of osteoarthritis, and the range of motion were also examined. Patients were reviewed at a mean of 4.2 years (3 to 5.5) after the operation by an independent observer.

Statistical analysis used the Student’s *t*-test, the Fisher chi-squared test and the Kolmogorov-Smirnov two-independent samples test, where appropriate. When the outcomes had three categories, the second was combined with the third and the data analysed by Fisher’s exact test.

**Functional assessment.** In group A, 13 patients had minimal pain during activity and the remaining three had no pain. In group B, five had minimal pain during activity, and seven had none. The difference was nearly significant (*p* = 0.08).

**Limitation of activity.** In group A, three patients had unlimited activity, but the remaining 13 had restriction in sport. In group B, two patients had limitation of activities while the other ten had none. The difference between the groups was significant (*p* = 0.002).

**Loss of quadriceps strength.** In group A only one patient had no loss of quadriceps strength. Nine had a decrease of 30% to 45% and six lost more than 45%. In group B, none had no loss of quadriceps. Nine had a decrease of between 30% to 45% and six lost more than 45%. In group B, none of the patients had evidence of loss. Two patients in group B and one in group A had greater quadriceps strength than on the opposite side.

**Subjective functional assessment.** In group A, four patients assessed their functional outcome at between 75 and 100 points, seven at 50 to 74, and five at 0 to 49. One patient in group B assessed the outcome at between 75 and 100 and the remainder at 50 to 74 points. There was a difference between the groups (*p* = 0.09 when scores of 50+ were combined into a single category).

When overall scores were assessed in group A three patients had good results and the remainder fair; in group B all the results were classified as good (*p* < 0.001). No patient in either group had a poor result.

**Functional assessment.** All patients in both groups could perform a duck-walk, but 13 in group A and five in group B had discomfort on this test (*p* < 0.08). All patients in group B could run on the spot but three in group A could not. All patients in group B could jump on one leg but one experienced discomfort; in group A only two could do so without discomfort, ten experienced discomfort and four were unable to perform the test. The difference between the groups was significant (*p* < 0.001 if the last two categories were combined). All patients in both groups could squat fully.

Heterotopic ossification in the patellar tendon or osteoarthritis in the tibiofemoral joint was not seen. All patients in both groups had full range of movement from full extension to at least 125° of flexion. One patient in group A had recurrent lateral subluxation of the patellar tendon. Quadriceps rupture after patellectomy was not seen.

**DISCUSSION**

Lieb and Perry showed that the VMO did not function in extension of the knee. In 1975 Madigan et al. described the technique of advancing it distally and laterally over the patella to prevent recurrent dislocation. Our technique is an adaptation of this procedure.

The main objection to patellectomy is loss of quadriceps strength. Our study suggests that VMO advancement overcomes this problem, probably due to the effect on the lever arm of the quadriceps mechanism.

The technique also appears to give better results as regards pain, limitation of activity, subjective functional assessment and the duck-walk and jump-on-one-leg tests. All patients in both groups had a full range of movement and could perform a full squat, probably because of the longitudinal repair of the defect created by patellectomy.

Lateral subluxation of the patellar tendon was seen in one patient in group A, but not in those in group B. The problem would not be expected in the latter group since the technique was originally introduced to treat lateral subluxation.

Chung and Turnbull and Zariczny have pointed out the poor cosmetic appearance after simple patellectomy. Placement of a mass of muscle anterior to the knee improves this.

We believe that the patella is an important part of the extensor mechanism of the knee and must be preserved if possible. Ficat and Hungerford stated that “a good patellectomy is better than a bad patella” and when the procedure is undertaken it is best combined with VMO advancement.

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**REFERENCES**


