The extensile rectus snip exposure in revision of total knee arthroplasty

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Revision of a total knee arthroplasty may require an extensile approach to permit a satisfactory exposure without compromising the attachment of the patellar tendon. It has been assumed that a rectus snip is a relatively benign form of release, but the effect of using this approach on function, pain and patient satisfaction is not known.

From January 1997 to December 1999, 107 patients who underwent revision of total knee arthroplasty were followed up at a minimum of two years (mean 40.5 months) and assessed by the Oxford Hip Score, the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), the Short-Form (SF)-12 and patient satisfaction. Co-morbidity, surgical exposure, the Hospital for Special Surgery (HSS) knee scores and the range of movement were also used. A standard medial parapatellar approach was used in 57 patients and the rectus snip in 50. The two groups were equivalent for age, sex and co-morbidity scores. The WOMAC function, pain, stiffness and satisfaction scores demonstrated no statistical difference. The use of a rectus snip as an extensile procedure has no effect on outcome.

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Adequate exposure is a prerequisite for revision arthroplasty of the knee. Flexion to 110° is desirable to allow safe delivery of the components. Flexion of less than 90° under general anaesthesia indicates that a simple medial parapatellar approach may be inadequate.¹⁻² To achieve more flexion will require freeing the proximal extensor mechanism or the insertion into the tibial tuberosity. The proximal approach may involve dividing the quadriceps mechanism, the lateral retinaculum, the tendon of vastus lateralis or a combination of the three. Isolated division of the rectus sheath, the 'rectus snip', has been attributed to Insall³ who had been using it since 1988. Various modifications have been subsequently described⁴ which provide excellent exposure of the knee without jeopardising the patellar tendon. Typically at the apical end of the standard medial parapatellar incision, the rectus portion is isolated and divided obliquely, extending superiorly and laterally (Fig. 1).⁵ As this technique maintains the musculotendinous bridge of vastus medialis and vastus lateralis, it allows a relatively easy repair and should allow normal post-operative rehabilitation.

Objective measurement of isokinetic strength demonstrated that knees undergoing a rectus snip are not as strong as normal knees, but do not differ significantly from those which have had a standard medial parapatellar approach.⁵ However, little evidence as to the comparable effects on function, pain and scores for satisfaction has been reported.^{6,7}

Patients and Methods

Between January 1st 1997 and December 31st 1999, 117 patients consecutively underwent revision total knee arthroplasty (TKA). Only three surgeons performed these procedures. The clinical diagnosis was of aseptic loosening in 67 and second-stage reconstruction of infected cases in 50. Co-morbidity was based on recording scores of co-existing conditions and categorizing them as 0, 1, 2, 3+ as based on the Charlson index.⁸ Pre-operative bone loss was assessed in both the tibia and the femur according to Engh's classification and confirmed at removal of each component at the time of operation.⁹

Surgical treatment. All the operations were carried out using the PFC total knee revision systems (DePuy, Warsaw, Indiana). The use of a medial parapatellar, or extensile

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Fig. 1

Illustration of the line of incision for a standard medial parapatellar (MP) and the rectus snip (RS) extension.

Table I. Femoral and tibial bone loss as assessed by the Engh classification

Bone loss	Medial parapatellar approach	Rectus snip approach
Type 1	Femur 11 Tibia 30	12 24
Type 2	Femur 34 Tibia 13	30 20
Type 3	Femur 4 Tibia 6	3 1

Outcome assessment was based on patient responses to questionnaires for the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) for pain, function and stiffness, the Oxford Hip Score¹⁰ and the Short-Form (SF)-12 score¹¹ and a satisfaction questionnaire. Additional assessment of function was by recording the pre- and post-operative range of movement (ROM) and by the Hospital for Special Surgery (HSS) score.

Statistical analysis was carried out using a one-sided *t*-test of the relative risk of poor outcome or poor satisfaction for revision of TKA, with an extensile procedure compared to the standard medial parapatellar incision. Regression analysis was then used to look for factors that were predictive of a poor functional outcome.

Results

rectus snip was recorded. Patients were contacted by letter informing them of the study, followed by a questionnaire two weeks later. If no reply was received a further questionnaire was sent after six weeks, and if there was no response telephone contact was made. Ethical approval was obtained.

There were 57 patients with medial parapatellar approaches, and 50 with rectus snips. Ten had alternative exposures and were excluded. Eight patients who had a medial parapatellar incision failed to complete the questionnaire adequately as did five patients who had a rectus snip. The mean follow-up

Table II. Results using the rectus snip and medial parapatellar approach in revision TKA

	Simple medial parapatellar approach. Mean $\pm$ SD (n = 49)	Rectus snip extensile approach. Mean $\pm$ SD (n = 45)	p value
Post-operative WOMAC function	61.7 (22.9)	62.5 (23.4)	0.890
Post-operative WOMAC pain	70.9 (24.3)	71.1 (25.4)	0.968
Post-operative WOMAC stiffness	64.0 (27.5)	64.8 (23.3)	0.873
Post-operative WOMAC total	64.6 (23.7)	64.4 (23.1)	0.874
Post-operative Oxford score	63.0 (22.0)	60.6 (23.7)	0.619
SF-12 mental component score	50.4 (12.6)	51.5 (14.2)	0.717
SF-12 physical component score	37.2 (13.08)	30.9 (12.5)	0.568
Satisfaction score	64.3 (33.5)	63.4 (36.2)	0.906
Pre-operative HSS	43.7 (13.0)	45.9 (14.6)	0.791
Post-operative HSS	76.2 (14.1)	75.0 (15.6)	0.789
Pre-operative ROM	74.0 (30.8)	79.5 (30.0)	0.473
Post-operative ROM	98.1 (15.9)	94.6 (14.6)	0.476

was 40.5 months. In the medial parapatellar group, 18 were two-stage revisions for infection and 31 one-stage procedures for aseptic loosening. In the rectus group, 25 were two-stage revisions for infection and 20 one-stage procedures for aseptic loosening. There was no correlation with the indication for revision (Fisher exact test, 2-tailed $p = 0.104$). The scores of 0, 1, 2, 3+ for co-morbidity were 51%, 31%, 15% and 3% in the medial parapatellar group and 44%, 35%, 13% and 8% in the rectus group (Fisher exact test, χ^2 statistic 3.17, $p = 0.366$). The Engh classification of bone loss in the two groups is summarised in Table I.

The WOMAC function, pain and stiffness, Oxford, SF-12, HSS and satisfaction scores are recorded in Table II. The principle outcome measure of WOMAC demonstrated no significant difference (61.7 for medial parapatellar *versus* 62 for rectus snip) when controlling for age, sex, co-morbidity, sepsis and the operating surgeon ($R^2 = 0.001$, $F = 0.10$, $p = 0.76$). The power analysis demonstrated a power of 0.803, assuming $\alpha = 0.05$, $\beta = 0.8$, and the minimum effect size of WOMAC function score was 12.

Discussion

When performed with careful attention to release the suprapatellar and medial and lateral gutters, a standard medial arthrotomy gives an excellent exposure in the majority of cases. Isolated division of the rectus sheath tendon was first described as a transverse cut across its proximal portion.⁴ Later modifications included using a 45° oblique incision from distal to lateral in order to protect the superior geniculate artery and facilitate repair, and this was the method favoured in this series in order to allow rehabilitation. The transverse incision is subject to disruptive forces on contraction of the quadriceps.

The advantage of this method of quadriceps snip is that it is technically easy, the post-operative rehabilitation does not have to be modified and it is not associated with an extensor lag. Garvin et al⁵ used the Cybex apparatus to assess the difference in strength following a quadriceps snip or a medial parapatellar approach and found no difference. However, the study was underpowered with only 16 patients. A previous review of 31 revision knee arthroplasties performed with a rectus snip reported equivalent results to a standard

medial parapatellar approaches based on the Knee Society Score.⁶ However, the Oxford, SF-12 and WOMAC scores have been shown to be more accurate in reflecting general functional activity¹²⁻¹⁴ and were not measured. Our study has adequate power and uses valid systems of patient assessment to evaluate post-operative function, pain and stiffness.

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