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The midvastus surgical approach in total knee arthroplasty

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Abstract We report a study of 2 surgical approaches to the knee in 42 consecutive patients undergoing a total arthroplasty. They were divided into 2 groups. In Group 1 (*n*=17) the knee was exposed through classic medial parapatellar arthrotomy and in Group 2 (*n*=25) the knee was approached through the fibers of the medial vastus. Preoperative assessment did not reveal any statistical differences between the groups, and blood loss, operation time, biochemistry values and radiographic evaluation were also similar. However, a higher number of lateral releases, a loss of knee extension and a reduced range of motion were significantly associated with classical parapatellar arthrotomy. As the number of operative or postoperative complications was not increased, we recommend the mid-vastus approach for total knee arthroplasty.

Résumé Nous présentons une étude de 42 arthroplasties totales consécutives de genoux qui ont été divisées en deux groupes. Le groupe 1 (*n*=17) a eu une voie d'abord classique par arthrotomie antéro-interne parapatellaire et le groupe 2 (*n*=25) a eu un abord à travers les fibres du vastus medialis. Entre les deux groupes, il n'y a pas de différence significative entre les données pré-opératoires, la perte sanguine, le temps opératoire et l'état radiographique. Dans le groupe 1, un plus grand nombre de libérations externes a été nécessaire, une perte de la force d'extension a été notée ainsi qu'une diminution de l'amplitude articulaire. Comme le taux de complications opératoires et postopératoires n'a pas été majoré, nous recommandons ce type d'approche à travers les fibres du vastus medialis pour l'arthroplastie totale de genou.

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Introduction

Total knee arthroplasty has been traditionally performed through a classic medial parapatellar approach, either by dividing the fibers of the medial patellar retinaculum a few millimeters away from their patellar insertion, or by detaching it from its insertion on the patella. Both methods also involve a section of the quadriceps tendon in the direction of its fibers.

Several other approaches for primary surgery have been described. Two of these are of special interest: a sub-vastus or "southern" approach in which the medial vastus is split and thus the integrity of the quadriceps tendon is preserved, and a lateral approach, which is indicated for patients with a significant valgus deformity [1,11].

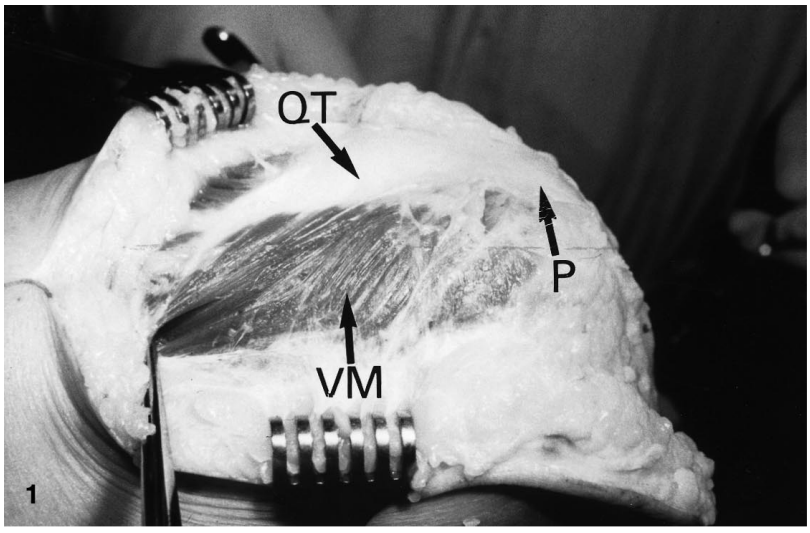
A new approach, called a trans- or mid-vastus approach, has recently been published. It differs as it involves splitting of the medial vastus in the direction of its fibers, which arise from the proximal and medial margin of the patella. This then allows the patella to be "everted" [6,7,8,16].

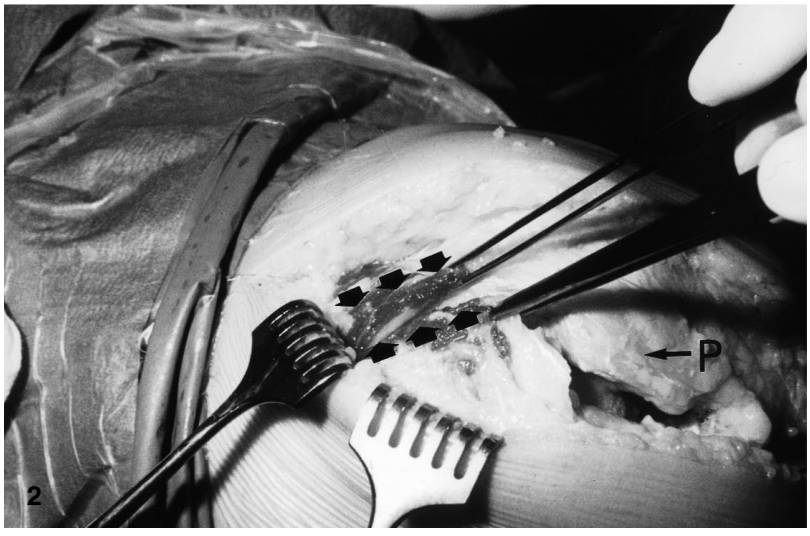
Due to the increase in patellar forces resulting from the body's weight while walking, climbing stairs or squatting, patellar complications arise from defects either in the performance of the surgical technique or from defects in the design of the procedure. These complications may result in an increase in mechanical patellofemoral forces.

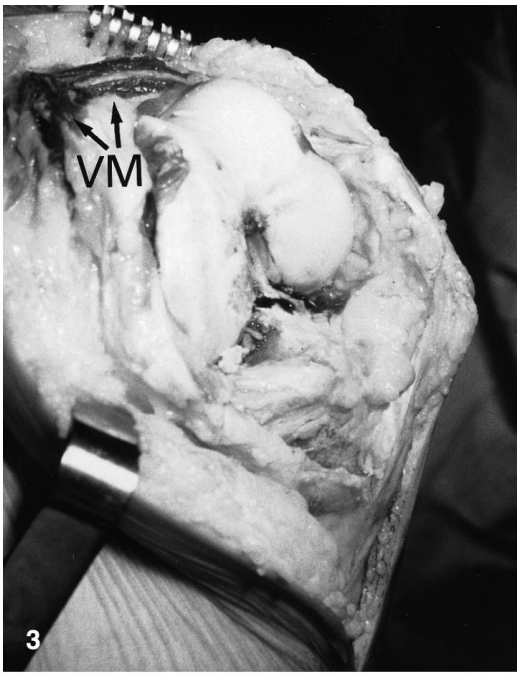
We have made a retrospective study of our total knee arthroplasty patients in whom 2 different approaches to the joint were used.

Materials and methods

Between 1996 and 1997 the same surgical team performed a total of 42 total knee arthroplasties. The same implant and instrumentation was used in all cases (Interax, Howmedica, Rutherford). The posterior cruciate ligament was always preserved and cementation was used for fixation. The mid-vastus approach was employed in 25 patients and the standard medial parapatellar approach in 17 patients.







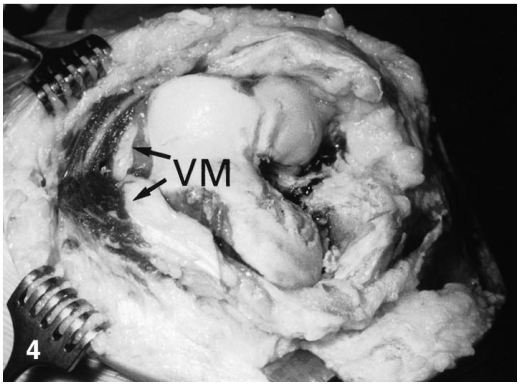


Fig. 1 Left knee view from medial side. Location and separation of fibres of the vastus medialis (*QT* quadriceps tendon, *VM* vastus medialis, *P* patella)

Fig. 2 Left knee view from the top with a section of the medial vastus fibres (*Arrows* ending of the fibers, *P* patella)

Fig. 3 Left knee, superior view after exposing the bone surfaces and approaching the knee between the fibers of the medial vastus (*VM* vastus medialis)

Fig. 4 Same view as Fig. 3 from the medial side, showing separation across the muscular division and knee exposure

With the knee in a flexed position on the operating table, the skin is incised in the mid-line. Scarpa's fascia is exposed on the medial side of the knee as far as the medial patellar retinaculum. The medial vastus is then split 4–5 cm in the direction of its fibers (Fig. 1). The approach is continued distally to the level of the anterior tibial tuberosity by section of the medial patellar retinaculum a few millimeters away from its patellar insertion. The muscular attachments of the medial vastus to the patella are preserved in order to facilitate closure (Fig. 2).

In order to obtain total mobilization of the patella it is important to divide completely the suprapatellar bursa and the femoropatellar ligament. This will allow adequate exposure of the knee joint (Figs. 3, 4).

The knee should be flexed during closure so that sutures can be inserted with the tissues under tension. This will avoid separation when the joint is moved. The muscle fibers should be lightly sutured without tension.

All patients received the same anti-thrombosis and antibiotic prophylaxis, and patients were excluded either as a result of the etiology of their knee problem or because of the presence of any previous pathology. A tourniquet was always used and was released after closure of the incision. Drainage was maintained for 48 h, knee movements were allowed after 24 h and walking with sticks after 2 days. The results were assessed clinically, functionally and radiographically.

Preoperative examination included age, sex, operated side, weight, height, range of motion, varus-valgus deformity or flexion deformity, severity of radiographic changes (Ahlbäck degree), femoro-patellar degeneration, patellar subluxation, preliminary diagnosis, haemoglobin and haematocrit, and clinical scoring according to the American Knee Society scale.

A prospective follow-up protocol was used for each patient and the following data were recorded: intra-operative data (lateral release of external patellar retinaculum), immediate postoperative data (blood loss), haemaglobin and haematocrit on day 3, ability to reach total active extension of the knee by day 5, and the range of knee motion at discharge. Scoring for each patient after 1, 6 and 12 months was recorded according to the American Knee Society clinical evaluation protocol (range of motion, pain at rest or while walking, walking time, ability to stand up from a chair, walk up and down stairs, residual flexion, instability and extension lag).

The degree of alignment for each prosthesis was determined using X-rays of the knee joint while weight-bearing. The alignment angle of the tibial and femoral components in the anteroposterior and lateral plane was studied.

The results were analyzed by means of the χ^2 – test with or without Yates's correction and by Student's *t*-test for quantitative variables. The Epistatcalc computer program was used to correlate the findings.

Results

The preoperative data of the two series had no significant differences ($P>0.05$), as shown in Table 1. Likewise, no statistically significant differences were found ($P>0.05$) after arthroplasties performed through a mid-vastus approach or via the classic medial parapatellar approach. No significant differences were seen 1, 6 or 12 months after operation as regards the range of mobility and the knee scoring (Table 2).

Table 1 Preoperative values (*OA* osteoarthritis, *RA* rheumatoid arthritis)

	Mid-vastus approach	Parapatellar approach
Cases (*n*)	25	17
Sex (male/female)	5/20	2/15
Side (right/left)	16/9	10/7
Age (years)	67.9	71.1
Weight (kg)	74.7	73.7
Range of motion (degrees)	81.2	85.6
Varus deformity (*n*)	20	15
Varus (degrees)	20.7	14.6
Valgus deformity (*n*)	5	2
Valgus (degrees)	14.6	10
Flexion deformity (*n*)	6	5
Flexion deformity (degrees)	12.1	10.6
Ahlback Degree	2.9	2.7
Patelar affectation	14	10
Patellar subluxation	1	0
Hemoglobin	14.2	14.3
Hematocrit	42.8	42.5
Diagnosis OA/RA	23/2	16/1
Scoring	36.6	40.5

Table 2 Postoperative values

	Mid-vastus approach	Parapatellar approach
Patients (*n)*	25	17
Lateral release	1	6
Blood loss (ml)	463	444
Hemoglobin day 3	9.9	10.1
Hematocrit day 3	29.5	30.3
Knee extension day 5	17	6
Anteroposterior angle:		
Femoral component	95.20	95.70
Tibial component	900	89.20
Lateral angle:		
Femoral component	92.40	92.80
Tibial component	88.50	88.40
Range of motion:		
Day of discharge	810	760
1 month	920	880
6 months	990	960
1 year	1010	990
Scoring:		
1 month	79	69.4
6 months	88.5	84.7
1 year	92.9	91.1

In those patients where a mid-vastus approach had been employed however, fewer intra-operative lateral releases were required in order to achieve correct patellar tracking. These patients had a better range of active knee extension by day 5 following operation, and the range of knee motion at discharge was also greater.

Complications included wound dehiscence and cutaneous necrosis in 3 cases where a medial parapetallar approach had been used, and in 1 case where a mid-vastus approach had been used. Two of the parapatellar cases had knee stiffness requiring manipulation under anesthesia. Deep venous thrombosis occurred in 1 case with a parapatellar approach, and in 1 case with a mid-vastus approach.

Discussion

Our results suggest that a mid-vastus surgical approach for total arthroplasty offers a series of advantages over the parapatellar approach and these are mainly seen in the immediate postoperative period. The recovery of knee extension is also better, and this has been previously recorded [11].

The medial vastus approach can be associated with difficulty in swinging or everting the patella where there is a contracture in the external compartment (as in genu valgum). A short stature and obesity make the visualization of the edge or lateral margin of the proximal tibial metaphysis very difficult and therefore complicate selection of the right size, alignment and component location of the prosthesis [6,11]. It also interferes with the parapatellar tendon at its insertion at the tibial tuberosity [9].

Care must be taken to avoid injury to the muscular branches of the crural and saphenous nerves as they innervate the medial vastus and give some sensory supply to the medial aspect of the knee joint. Therefore, dissection should be limited to within 10 cm from the superior medial margin of the patella. A flexed position of the knee makes it easier to identify and then separate the fibers of the medial vastus.

Good stability and better parapatellar movement of the femoral component, based on the advantage of keeping the extensor mechanism intact has been assessed in previous studies of the mid-vastus approach. Where there is no need to make a lateral release [9,11,12,18] no changes in patellar tracking were noted after 3 months from surgery [2].

When there is evidence of an external parapatellar hyper-pressure with subluxing forces, a lateral release has been traditionally recommended, and this improves femoro-patellar dynamics [5,10,14,17,19]. Nevertheless, it results in atrophy and weakness of the quadriceps musculature and also leads to variations in the transmission

of femoro-patellar forces. As a consequence, other problems may arise and these include increasing pain and postoperative inflammation, joint stiffness, and a slower recovery as well as possible interference with the vascular supply of the patella [13,14,20–22].

A medial parapatellar arthrotomy may result in interference of the vascular supply to the patella and that normally originates from the four genicular arteries and from the recurrent branch of the anterior tibial artery. If there is need for latera release we can conclude that there is insufficient vascular supply [15]. For this reason, medial parapatellar arthrotomy along with lateral release can result in a greater poportion of avascular necrosis of the patella, patellar fractures and loosening [3–5].

We believe that it is important to preserve as normal "patellar track" as possible and therefore we recommend a medial mid-vastus approach for total knee arthroplasty as this rarely necessitates a lateral release.

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