The mid-vastus approach: a compromise between the medial parapatellar approach and the minimally invasive approach in total knee arthroplasty

Ahmed Abdel-Badie Abd-Allah, Mohammed S. Moustafa, Ahmed M. Metwally, Adel M. Hamam, Ibrahim I. Rakha

Department of Orthopedic Surgery, Faculty of Medicine, Suez Canal University, Ismailia, Egypt

Correspondence to Mohamed S. Moustafa, Department of Orthopedic Surgery, Faculty of Medicine, Suez Canal University, Ismailia, Egypt
Tel: +20 122 549 9099;
e-mail: msmhh@hotmail.com

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Objectives
The study was conducted to evaluate midvastus approach in total knee arthroplasty.
Background
The medial parapatellar approach, originally described by Von Langenbeck in 1879, remained as the work horse in total knee replacement surgery. The major problems in this technique are reduction of patellar blood flow, extensor mechanism imbalance, and the need for lateral retinacular release in some cases. The vastus medialis approach appeared as an alternative to the traditional medial parapatellar incision, with which to minimize the risks of extensor mechanism imbalance. When using this approach, no special instruments, as in the case of minimally invasive surgery, is needed. The same benefits could be achieved, such as proper visualization during surgery and shorter operative time.
Patients and methods
This is a prospective study of 29 primary knee arthroplasties performed using the midvastus approach without patellar eversion in Suez Canal University Hospital between May 2008 and June 2010. Mobile-bearing cruciate-substituting total knee prosthesis was used in all cases.
Results
Operative data showed no increase in the operative time with no significant increase in the blood loss. No lateral retinacular release was needed. The bone defects can be treated easily through this approach. No serious complications were encountered in patients, except in one case in which infected prosthesis was observed.
Conclusion
The approach is universal and can be recommended for all patients (except for revision cases and in cases of severe deformities). The results are better in this approach compared with the standard approach, with earlier return to start straight leg raising, faster pain relief, and shorter hospital stay.

Keywords:
midvastus, parapatellar approach, total knee arthroplasty

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Introduction

Total knee arthroplasty (TKA) is a very successful treatment for end-stage arthritis of the knee. Long-term results for both pain relief and function are excellent. The approach most commonly used to expose the knee is the medial parapatellar arthrotomy. This approach was first described by Von Langenbeck in 1879, and it has a successful track record with long-term follow-up. However, the incision through the quadriceps tendon and patellar eversion can lead to a long and painful recovery. Eversion of the patella also leads to more splitting of the muscles and stretching of the quadriceps and patellar tendons. It also causes twisting of the patella tendon and nonphysiological stress at the tibial tubercle. In some cases this leads to peeling or avulsion of the tendon [1].

The minimally invasive surgery (MIS) is different from the minimally incision surgery. MIS is determined neither by the length of the incision nor by the cosmetic result. The term 'minimally invasive' should refer to the extent of violation to the anatomic structures about the involved joint. In contrast, the MIS approaches are extensile, permitting conversion to the traditional approach. In the knee, the MIS should neither violate the extensor mechanism nor violate the suprapatellar pouch. MIS should be a capsular approach, and, as such, it should produce less discomfort and faster recovery [2]. Modifications of the MIS technique that extend the arthrotomy into the extensor mechanism, violate the suprapatellar pouch, and evert the patella when using a limited incision are not minimally invasive [3].

The intention of the MIS TKA is to limit surgical dissection without compromising the procedure. The proposed advantages of the less invasive surgery include reduced postoperative morbidity, reduced pain, reduced blood loss, and faster recovery [2].

The vastus medialis approach appeared as an alternative to the problems detected with the traditional medial parapatellar incision. Bramlett [4] was the first orthopedic surgeon to mention the advantages of vastus medialis blunt division, instead of its section, for the extensor mechanism. Engh *et al.* [5] presented a modification of that approach, in which the vastus medialis is divided on the direction of its fibers from the patellar superior pole, thus creating the term 'medial midvastus'.

Patients and methods

Patients

Study design

This study was an interventional prospective study of 29 primary knee arthroplasties.

Study site

The study was conducted in Suez Canal University Hospitals, Ismailia, between May 2008 and June 2010.

Inclusion criteria

Patients with osteoarthritis of the knee joint, indicated for TKA, who could be treated with standard and minimally invasive approaches were eligible for inclusion in this study. Generally, the following patients were included.

(1) Patients with pain caused by severe arthritis, in whom all conservative measures had been exhausted.
(2) Those with no other sources of knee and leg pain, including radicular pain from spinal disease, referred pain from the ipsilateral hip, peripheral vascular disease, and bursitis of the knee.
(3) Patients with correlated radiological findings.
(4) Older patients with a sedentary lifestyle [6].

Exclusion criteria

Patients with a history of sepsis, poor limb perfusion, and severe peripheral vascular disease were not candidates for arthroplasty.

Moreover, patients with varus deformity greater than 15°, valgus deformity greater than 20°, preoperative range of motion less than 90°, and flexion contracture greater than 10° were excluded from this study [7].

Methods

All patients were treated with total knee surface arthroplasty prosthesis (Nex-Gen LPS). All prostheses were mobile-bearing posterior cruciate ligament-substituting. Low molecular weight heparin was started a day before the procedure, along with third generation cephalosporin, and was continued for 2 weeks postoperatively. The midvastus approach without patellar eversion was performed for all cases. The vastus medialis obliquus was cut blunt with the direction of its fibers starting from the superomedial border of the patella. The vastus snip length was 5 cm. Early on the procedure, the osteophytes from the distal femur and the undersurface of the patella were removed to make the patellar retraction easier (Fig. 1).

Tourniquet was used in all cases. It was removed after application of the prosthesis, and hemostasis was performed before closure. Suction drain was used for all patients. Operative time and blood loss were estimated. Postoperative data were recorded, such as time to start straight leg raise, time to start weight bearing, time before removal of the drain, and duration of hospital stay. The American Knee Society Score and radiological assessment were recorded after 1 year.

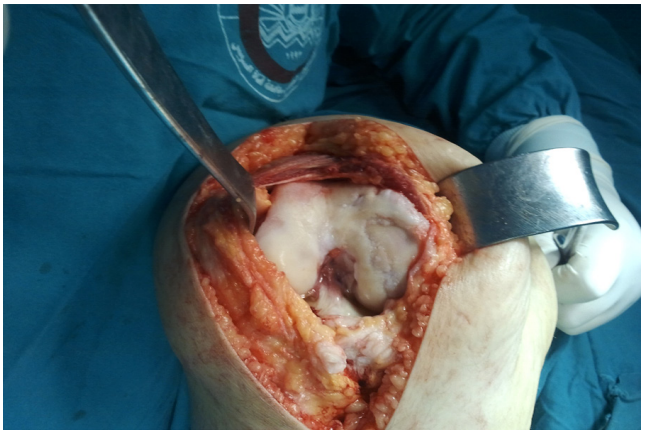
Data management

Analysis of data was performed using statistical program of social sciences, version 16.

Results

The operative findings of this study are summarized in Table 1. The complications encountered in this series were deep infection in one case, femoral notching in two cases, and delayed wound healing in one case. The femoral notching did not affect the functional result, and one of these two patients underwent arthroplasty to the other knee with the same technique later on. The case with delayed healing was the only case in the

Figure 1



Easy patellar retraction after midvastus snip and osteophyte removal.

Table 1 Operative findings in the study group

Operative findings	Mean	SD
Operative time (min)	97.2	±15.2
Lateral release (*n*)	0	–
Blood loss[a] (ml)	803.4	±75.6
Time of weight bearing (days)	1.7	±0.53
Time of SLR (days)	5.65	±4.17
Time of drain removal (days)	1.87	±0.79
Time to discharge (days)	4.3	±3.51

SLR, straight leg raising; [a]Includes both the intraoperative bleeding and blood in suction drain.

series of rheumatoid arthritis; she had her other knee successfully replaced 6 months later (Fig. 2).

As regards the result of the cases, the total American Knee Society Score increased from a mean preoperative score of 47.10 points to a mean postoperative score 86.72 points (maximum 100 points). This was found statistically significant, with a *P*-value of less than 0.001. The mean postoperative range of motion increased to be 115.52° in comparison with a mean of 90.69° preoperatively.

Discussion

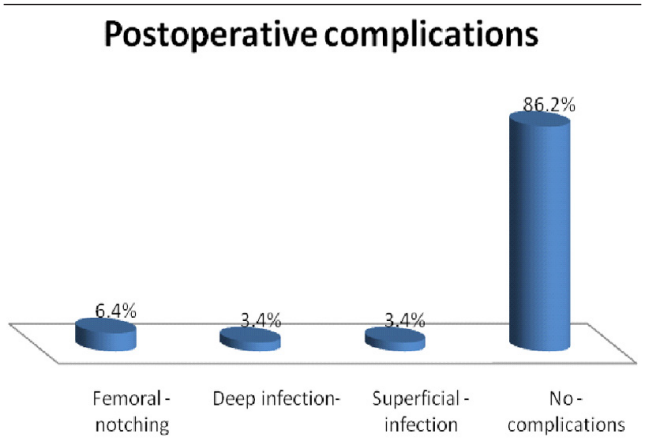
Tourniquet was used in all cases and was deflated before closure for hemostasis. It did not seem that it affected retinacular tension as there was no need for lateral release in our series. Marson and Toklish [8] concluded that tourniquet application alters patellofemoral tracking. Before attempting lateral release, tourniquet deflation and re-evaluation should be considered. Komatsu *et al.* [9] found that lateral retinacular tension was higher after inflation of the tourniquet in the midvastus approach than in the medial parapatellar approach. However, this was not found significant as the need for lateral release was less in the midvastus group [9]. The same finding was reported in our study group, with less or even no lateral retinacular release.

Longer duration of the operative time [10] and delayed wound healing due to excessive retraction needed in the exposure lead to marginal skin necrosis [11]. The operative time in our series was 97.2 min and was significantly neither long as in the minimally invasive approach nor shorter as in the medial parapatellar approach.

Haas *et al.* [1] reported a mean operative time of 93 min (range, 58–137 min) for the midvastus approach and 81 min (range, 65–118 min) with the standard approach.

Blood loss was 803.4 ml on average, in comparison with the 794 ml reported in the study by Cushner and Friedman, who reported longer operative time of

Figure 2



Incidence of the postoperative complications.

140 min on average with the standard approach. They also used a tourniquet in their cases [12].

Our protocol allowed the early discharge of patients after 2 days postoperatively, immediately after suction drain removal. Few complications occurred with this protocol. The overall results show that 86.2% of cases were uncomplicated. Two cases of notching occurred in the beginning of the study, and this complication was avoided in the subsequent cases. More interestingly, one of these cases had the other knee successfully replaced after 1 year.

Deep infection is the most feared complication of the procedure and occurred in one case (3.4% of the study population). The incidence of deep infection is ~1% in cases of TKA, according to a medical registry that included 43 149 cases [13]. This cannot be considered significantly different if we bear in mind the fewer number of the cases enrolled in our series.

In contrast, we did not face any case of deep venous thrombosis or nerve palsy in our study.

In a study conducted on a large cohort (267 patients), the clinical results based on the American Knee Society Score increased from a preoperative value of 48.9 (32–68) to 86.5 (75–100) at 6 weeks postoperatively after the use of the midvastus approach [14]. These results are more or less similar to that reported in our study.

Conclusion

The midvastus approach is a universal one and suitable in most cases, with the ability to retract the patella during surgery. The surgical field is wide and sufficiently adequate to expose both the distal femur and the proximal tibia. It is not lengthy and did not affect the

patellar tracking. Blood loss is average with the standard technique. Complications are few. It matches the short hospitalization regimen. No affection of the alignment or prosthetic placement was found. It is a less invasive approach with the merit of wide exposure and simplicity of the standard approach. It represents a compromise between the standard approach and MIS TKA.

Acknowledgements

Conflicts of interest

There are no conflicts of interest.

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