

ORIGINAL RESEARCH

Comparing the Clinical Outcomes of Arthroplasty Performed Through Medial Parapatellar Approach versus Subvastus with Oblique Cut Approach: An Institutional Based Study

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ABSTRACT

Introduction: The aim of the study is to compare the outcomes of arthroplasty performed through medial parapatellar approach versus subvastus with oblique cut approach.

Materials and Methodology: After obtaining the permission from the institutional ethical committee, the study was carried out in those patients with osteoarthritis. This study was conducted as a prospective comparative study in assessing the factors influencing the total knee replacement surgeries through medial parapatellar and subvastus oblique approach. A total of 150 patients were included in the study and the proposed study period was about 12 months.

Results: A total of 150 patients were included in the study who are all underwent total knee replacement in our study centre and 109 patients were included in group – I that is MP approach (24 males and 85 females) group – II included 41 patients (7 males and 34 females) with the mean age observed at 71.6 ± 6.3 years and 73.3 ± 5.1 years. The pre-operative levels of haemoglobin level was observed to be potent significant risk factor as observed in this study which indicated that for every 1 unit rise in Hb, the probability of deferring the transfusion increases by 2.6 times. This result was in concordance with the results obtained from the earlier studies.

Conclusion: when comparing the subvastus approach with the medial parapatellar surgical approach in managing the total knee arthroplasty patients, early active straight leg raising for up to over 10 days after the surgical procedure had been reported.

Keywords: Total Knee Replacement, Medial Parapatellar, Subvastus.

INTRODUCTION

Knee osteoarthritis is the leading aetiology in causing chronic pain, disability and the overall health care costs more in older adults. The reason that had been attributed in the development of knee osteoarthritis includes those patients who are overweight and obese proved themselves vulnerable to the disease since there is increased mechanical load on the load

bearing joint.¹ The only effective management for those patients affected with end-stage knee osteoarthritis is reported to be total knee arthroplasty which was introduced in the year 1968.² This procedure has proved its efficiency in alleviating the pain and thereby enhancing the functions in patients with advanced arthritis patients.³ Over the past decades, this total knee arthroplasty has been utilised by over more than 3.4 million population.⁴

Von Langenbeck⁵ was the first one to describe the MP approach for Total Knee Arthroplasty in the year 1879. The approach initiates very clear and good exposure and also helps in minimizing the post-operative tibial and femoral complications associated with the surgical procedure. However it influences the major portion of the extensor mechanism and there is increased potential for vascular injury to the patella, with or without a lateral patella release, is relatively uncommon.⁶ Also it has been reported that patellofemoral instability and maltracking can possibly occur after the Medial Parapatellar approach. In an attempt to lessen the complications associated with the earlier technique, few authors have advocated a more anatomic approach through subvastus with minimal cut. This technique was originally been developed by Hofmann in 1991.⁷ He showed that the SV approach preserves the integrity of the extensor mechanism and maintains the vascular supply to the patella. It also preserves the vascularity of the patella by avoiding the articular branch of the descending geniculate artery that lies within the belly of vastus medialis and joins the patellar plexus with the medial superior geniculate artery at the supero-medial corner of the patellar bone.

Subvastus approach also reported to have some disadvantages that include difficulty in everting the patellar bone and contraindicated in patients with obesity, patients with short femur or overweight patients, hypertrophic changes and secondary knee stiffness.⁸ There are still many orthopaedic surgeons who were routinely performing both the procedures on certain knees and there are no observable superior results. Therefore, the aim of the study is to compare the outcomes of arthroplasty performed through medial-parapatellar approach versus subvastus with oblique cut approach.

MATERIALS AND METHODOLOGY

After obtaining the permission from the institutional ethical committee, the study was carried out in those patients with osteoarthritis. This study was conducted as a prospective comparative study in assessing the factors influencing the total knee replacement surgeries through medial parapatellar and subvastus oblique approach. A total of 150 patients were included in the study and the proposed study period was about 12 months. Informed consent was obtained from all the study participants undergone total knee arthroplasty surgery. There were some inclusion criteria that were followed in the study include primary total knee replacement (grade – III & IV) due to primary or secondary osteoarthritis. Patients with inflammatory arthritis were basically excluded from the study.

All the study participants who had undergone total knee replacement were basically divided into two groups based on the approach that were used in the surgery. Group – I consisted of those patients undergone medial parapatellar approach and group – II consisted of those patients where knee replacement was done through subvastus oblique cut approach. Patient's age, body mass index (BMI), stage of osteoarthritis (OA) according to Kellgren-Lawrence classification, prosthesis design (CR, cruciate retaining or PS, posterior stabilizing), duration of surgery, blood loss in the drainage, haemoglobin (Hb) and intra and post-operative complications were recorded. Hb level was measured pre-operatively and on the first post-operative day. Blood loss in the drain was recorded after removal 24 hours post-operatively. Peri-operative complications included partial patellar and popliteus tendon lacerations and excess bleeding after tourniquet release.

Medial parapatellar approach was represented as a straight skin incision through the patellar midline down to the tibial tuberosity is performed, with the incision extended to the knees.

The knee joint is accessed through dissection of the medial patellar retinaculum down to the tibial tuberosity and proximal to the medial third of the quadriceps tendon fibres that are split longitudinally a few millimetres from its insertion to the patella.

The subvastus approach technique is that the skin incision was given as a vertical incision in the middle or slightly medial to the midline of the patella. Fascia layer will be incised with the midline skin incision. To begin with proximal side, the fascia layer will be raised off the perimuscular fascia of the vastus medialis into the insertion site. The inferior edge of the vastus will then be lifted off from the periosteum and intermuscular septum with blunt finger dissection for approximately over 10 cms proximal to the adductor tubercle.

Demographic characteristics are presented as means, standard deviations and percentages. For comparison of categorical variables Pearson's Chi-square test was used and for continuous variables paired and unpaired samples t-test, because data were not skewed. Multiple logistic regression was utilized to find factors associated with transfusion when all variables were considered together. Statistical significance was set at $p < 0.05$.

RESULTS

A total of 150 patients were included in the study who had undergone total knee replacement in our study centre and 109 patients were included in group – I that is MP approach (24 males and 85 females) group – II that is subvastus included 41 patients (7 males and 34 females) with the mean age observed at 71.6 ± 6.3 years and 73.3 ± 5.1 years. There were no significant differences observed between the two groups in terms of gender, age, BMI ($p < 0.05$) and highly significant difference was observed in pre-operative haemoglobin level with SV approach being lower. (Table- 1)

There were no significant differences in Hb level pre and post operatively in the drain volume or transfusion rates between the groups. There were 5 partial patella tendon lacerations and 3 partial popliteus lacerations in the MP group versus four partial patella tendon lacerations in the SV group. Overall perioperative complication rates did not reach statistical significance. The duration of surgery was significantly longer in the MP group, with a mean time of 95.6 minutes versus 89.4 minutes in the SV group.

Table 3 depicting the significant differences between median parapatellar approach and subvastus approach had been noticed in HSS scoring system particularly during the 1st day, 1 week and 6 weeks post-operatively.

Table 1: Demographic characteristics of patients undergoing total knee replacement.

Parameters	MP (n=109)	SV (n=41)	P - value
Gender (M/F) (%)	22.01/77.98	17.07/82.92	0.11
Age (years)	71.6 ± 6.3	73.3 ± 5.1	0.09
BMI (kg/m^2)	31.7 (6.6)	32.1 (8.7)	0.14
Osteoarthritis stage(1/2/3/4)	0.9/1.8/34.7/62.9	-/1.2/35.6/63.2	0.78
Pre-operative Hb	13.61 (1.37)	13.21 (0.75)	0.04

Table 2: Comparisons of peri and post-operative parameters between the two approaches

Parameters	MP (n=109)	SV (n=41)	P – value
Duration of surgery (min)	89.2 (14.5)	95.3 (12.6)	0.02
Drain volume (mL)	380 (280)	350 (236.5)	0.65
Hb difference (g/dL)	2.3 (1.2)	2.61 (1.3)	0.14
Transfusion (%)	10.5	21.5	0.09
Perioperative complications (%)	7.9	3.7	0.61
Straight leg raising (d)	3.2	1.9	0.003

VAS at 24 hrs post-operative	5.5	4.7	0.002
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Table 3: Scoring system (HSS – Hospital for special surgery)

Groups	1 day	1 week	6 weeks	1 year
MP	40.77 ± 5.21	52.33 ± 5,77	80.17 ± 5.38	92.65 ± 2.41
SV	37.93 ± 8.20	42.87 ± 5.19	78.32 ± 6.41	92.32 ± 1.81
P – value	0.0007	<0.0001	0.0007	0.21

DISCUSSION

Based on the experiences of the various orthopaedic surgeons with respect to total knee replacement over the years and the need to reduce the soft tissue damage has led to the pavement of various new approaches other than the traditional medial parapatellar.⁹ In this study, it was not prompt to demonstrate the significant differences among intraoperative complications among patients undergoing medial parapatellar. The subvastus approach has also been reported to have decreased wound complications, a shorter hospital stay, a reduction in analgesia usage and an early return to function when compared to the standard median parapatellar approach.¹⁰ The results obtained from few earlier studies showed that various possible predisposing factors and among them preoperative anaemia, non-obese population, drainage volume and total surgical time are reported to the significant factors.^{11,12} The pre-operative levels of haemoglobin level were observed to be potent significant risk factor as observed in this study which indicated that for every 1 unit rise in Hb, the probability of deferring the transfusion increases by 2.6 times. This result was in concordance with the results obtained from the earlier studies. In the study conducted by *Cao et al* observed that lower pre-operative haemoglobin (12.1 g/dl) and more intra-operative blood loss (130.9 ml) were the two independent risk factors in determining the post-operative anaemia.¹³ In a large retrospective study with 2284 patients undergoing TKR, the authors reported that pre-operative anaemia increased the rate of transfusion by 6.38 and 6.27 times in males and females, respectively.¹⁴

Feczkoet al reported significantly higher blood loss in the subvastus group as compared to the parapatellar group, without indicating the need for blood transfusion.¹⁵ Few other authors reported in contrast to the results obtained from this study. A retrospective study conducted by *Chaiyakit, et al* compared the amount of blood transfusion after TKR to the surgical technique.¹⁶ They found that computer-assisted and minimally invasive surgical techniques had decreased the risk of blood transfusion. This fact is based on the theory that small incisions cause less muscle and soft-tissue damage leading to less blood loss.

Although TKR is relatively safe procedure to be performed that basically alleviates the symptoms of arthritis and thereby enhancing the life quality. Like other surgical procedures, TKR is also not devoid of any complications and the reported the complication rates were recorded to be almost 20% in older individuals.^{6,17} The various complications that were reported commonly in the literature include cardiovascular, respiratory and thromboembolic episodes. The rates of complication might vary from 0.2% to 4.4% which depends on patient factors, the type of implants used and the surgical technique.¹⁸ Among them, the most frequently reported complications in the literature are iatrogenic laceration of the popliteus tendon, fractures and vascular injuries.¹⁹ Moreover the muscle strength have not been quantified in our study. A study conducted by *Faure et al* in comparing the medial parapatellar approach, the muscle strength after the TKR surgery is reportedly stronger than subvastus approach.²⁰ In an another study conducted by *Engh and Parks* have observed that TKA surgery with good clinical outcome was reportedly be seen in midvastus approach.²¹

Considering the scoring system, HSS was significantly improved in the SV group in comparison to the MP group at 1 day, 1 week and 6 weeks, but not at the last follow-up that is 1 year. These observations demonstrated that these differences in clinical outcomes between MP and SV are seen only for a shorter duration of time and are very likely to be disappeared as early as 6 weeks after the surgical procedure.^{22,23}

CONCLUSION

To conclude, when comparing the subvastus approach with the medial parapatellar surgical approach in managing the total knee arthroplasty patients, early active straight leg raising for up to over 10 days after the surgical procedure had been reported. Therefore, it promotes faster rehabilitation and early movements. Hence the modified subvastus approach is totally recommendable in patients with primary total knee arthroplasty.

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