

## Original Article

# MEDIAN PARAPETELLAR VERSUS MIDVASTUS APPROACH ON THE OUTCOMES IN TOTAL KNEE REPLACEMENT

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## ABSTRACT

**Background:** The most common approaches used in Total Knee Replacement surgery are Midvastus, subvastus, median parapetellar, lateral patellar and trivector approach. There is uncertainty as to the best surgical approach to the knee joint for knee replacement. Median parapetellar approach is the standard of practice, but off late quadriceps sparing approaches as like subvastus and midvastus are performed. Subvastus approach has its own limitation of less joint exposure. In our clinical setup, orthopaedic surgeons perform median parapetellar and midvastus approach. The present study has compared outcome of knee function between a standard median parapetellar arthrotomy and mid vastus arthrotomy for patients undergone primary total knee arthroplasty. The post op quadriceps function depend on the type of surgical approach

**Materials and methods:** 30 subjects were recruited who had undergone Total knee arthroplasty with Median parapetellar and Midvastus approach at Sri Ramachandra medical hospital; received standard physiotherapy care. The pre-op and post quadriceps angle were measured and the quadriceps, hamstrings isometric muscle strength and 6 minute walk test of the patients were recorded at the time of discharge and after one month of follow-up, and the data were statistically analyzed.

**Results:** Median parapetellar and Midvastus approach were significant within the groups; with respect to quadriceps angle (QA) ( $p < 0.05$ ), isometric strength of quadriceps (QS) ( $p < 0.05$ ) and 6 minute walk test (WT) ( $p < 0.05$ ). On comparing between the groups at one month follow-up isometric strength of hamstrings (HS) ( $p < 0.01$ ) and 6 minute walk test ( $p < 0.01$ ) were found to be significant.

**Discussion:** Findings show that Mid-vastus approach provides better results in terms of quadriceps angle, isometric strength of quadriceps and 6 minute walk test compared to median parapetellar approach.

**Conclusion:** Study concludes that, the isometric strength of quadriceps and hamstrings has improved at the time of discharge and after one month of follow up (within the group). However no much significant changes seen between the groups.

**KEYWORDS:** Midvastus, Median parapetellar Approach, Total knee replacement, Isometric strength of quadriceps, isometric strength of hamstrings six minute walk test.

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## INTRODUCTION

The most common approaches used in Total Knee Replacement are Midvastus, subvastus, Median parapetellar, lateral patellar and trivector approach. There is uncertainty as to the best surgical approach to the knee joint for knee

replacement. The midvastus approach was developed by with the aim of maintaining the integrity of the extensor mechanism and decreasing the vascular damage of the patella [1].

However, the disadvantages, such as more technical requirements and greater difficulty in knee exposure and patellar eversion, limit the increased use of this technique [2].

The patients whose knee was approached by the mid-vastus method showed 35% and 16% greater quadriceps strength at one week and one month respectively. In addition, the authors highlighted several anatomical advantages. The approach maintains the median parapetellar blood supply and preserves the extensor mechanism. Thus, theoretically, it decreases the likelihood of patellar subluxation, fracture, or patellar avascular necrosis (reported as having an incidence of 17%, 21% and 10% respectively) [3].

The medial parapetellar approach has been used as the most general approach for total knee replacement (TKR) until now and it provides a good surgical view. However, an incision in the vicinity of the patella may cause the impairment of blood supply to the patella. In addition, Avascular necrosis caused by the impairment of blood supply induces patella fracture or anterior knee pain. In addition, if the suture is too loose after the medial parapetellar approach, the problem of the mal-tracking of the patella may be induced [4].

In this context, this study aims to compare the effectiveness and efficiency of a standard medial parapetellar approach versus a Mid-vastus approach in Total knee replacement and to evaluate the functional outcomes care within and between the groups.

## MATERIALS AND METHODS

Informed consent has been obtained from the patients. In this retrospective or prospective study a total of 30 post operative total knee replacement patients who had under gone both the surgical approaches (Midvastus and Median parapetellar approach), with age between 65 to 75years who have been referred for physiotherapy by the orthopedic department of Sri Ramachanda Hospital between September 1<sup>st</sup> 2012 to February 27<sup>th</sup>2013, have participated in the study. The patients with traumatic, Rheumatoid arthritis were excluded.

**The following measurements have been done:**

**Measuring isometric strength of hamstrings:**

Patient was positioned in prone lying, with knee slightly flexed to 30degrees; Hand-held dynamometer was used to measure isometric strength of hamstrings. The torque value displayed on the dynamometer was recorded and the device was re zeroed. Three trials were performed with 10 seconds of rest between trials. The average value from the three trials was recorded.

**Measuring isometric strength of quadriceps:**

Patient was positioned in high sitting; Hand-held dynamometer was used to measure isometric strength of quadriceps. The torque value displayed on the dynamometer was recorded and the device was re zeroed. Three trials were performed with 10 seconds of rest between trials. The average value from the three experimental trials was recorded.

**Six minute walk test:** During the performance of the six minute walk test, patients were instructed to walk between bright colored cones for 6 minutes time frame with opportunity to stop and rest if required. The test was conducted on unobstructed, uncarpeted floor. The distance traveled by each patient was measured by stopwatch.

**Outcome measures:** The baseline measures includes, 6 minute walk test, which has good reliability and self report measure of functional performance [5].

Isometric muscle strength of Quadriceps and Hamstrings, has good reliability and validity in measuring the quadriceps strength [6].

All subjects received standard physiotherapy care. The pre-op and post quadriceps angle(QA) Isometric strength of quadriceps (QS) ,isometric strength of hamstrings(HS) and 6 minute walk test (WT) of the patients were recorded at the time of discharge and one month follow-up, by single reader and the data were analyzed.

The data collection started at baseline comprising of the quadriceps angle, quadriceps strength, hamstring strength and 6 minute walk test. The process of data analysis consisted of baseline comparison between and within the groups.

**Statistical analysis:** The collected data was analysed with SPSS 17.0 version to describe about data, the descriptive statistics; mean and standard deviation was used. To find significance between and within groups paired *t* test and independent *t* test was used. In both the above statistical tools, the probability <0.05 is considered as significant.

**RESULTS AND TABLES**

Table -1 shows that; On comparing between the groups at one month follow-up hamstrings strength (HS) and 6 minute walk test (WT) were found to be significant.

VARIABLES	GROUPS	MEAN	SD	t-VALUE	P-VALUE	SIG
QA	MPP	20.27	2.74	0.526	0.603	NS
	MV	19.8	2.08			
QS	MPP	4.34	1.49	0.682	0.501	NS
	MV	4.75	1.8			
HS	MPP	3.03	1.02	1.254	0.22	NS
	MV	3.67	1.67			
WT	MPP	147.02	90.54	1.844	0.076	NS
	MV	203.59	76.89			
QA1	MPP	14.47	2.95	0.367	0.071	NS
	MV	14.13	1.77			
QS1	MPP	5.25	1.92	1.446	0.159	NS
	MV	6.39	2.37			
HS1	MPP	3.4	1.32	2.223	0.034*	SIG
	MV	4.53	1.47			
WT1	MPP	251.57	91.26	3.098	0.004**	SIG
	MV	350.47	83.41			

**Table 1:** Comparison by independent t-test between MPP & MV.

\*SIG-Significant, HS-Highly Significant & NS-Not Significant

Table-2 indicates; the median parapetellar and midvastus approach were significant within the groups; with respect to quadriceps angle (QA), quadriceps strength (QS) and 6 minute walk test (WT)

**Limitations of the study:**

1. Lesser follow-up
2. Measurements are taken on different days (vary between 2-7days)

MEDIAN PARAPETELLAR					
	AT THE TIME OF DISCHARGE	AFTER ONE MONTH FOLLOWUP	t-VALUE	P-VALUE	SIG
	MEAN±S.D	MEAN±S.D			
QA	20.27±2.738	14.47±2.949	7.999	0.000**	SIG
QS	4.34±1.49	5.24±1.92	2.228	0.043*	SIG
HS	3.03±1.01	3.39±1.32	1.64	0.123	NS
WT	147.02±90.54	251.56±91.25	8.165	0.000**	SIG
MID VASTUS					
QA	19.8±2.07	14.1±1.76	8.239	0.000**	SIG
QS	4.75±1.79	6.38±2.36	3.582	0.003*	SIG
HS	3.61±1.66	4.53±1.47	1.737	0.104	NS
WT	203.8±76.89	350.47±83.40	10.059	0.000**	SIG

**Table 2:** Comparison by Paired t-Test between at the Time of Discharge and One month follow up.

\*SIG-Significant, HS-Highly Significant & NS-Not Significant

**Future scope:** Long term follow-up can be done

## CONCLUSION

The results indicate that, the isometric strength of quadriceps and hamstrings has improved at the time of discharge and after one month of follow up (within the group). However no much significant changes seen between the groups.

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