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Functional Outcome of Patellar Resurfacing using Bony Landmarks in patients undergoing Total Knee Replacement

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Each author of this article has encountered all 04 criterions of authorship:

1. Commencement and design of the study, attainment of data, or analysis and interpretation of information.
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ABSTRACT

Objective: To determine functional outcome after patellar resurfacing using bony landmarks in patients undergoing total knee replacement.

Methodology: After permission from ethical committee and research department, 151 patients fulfilling the inclusion criteria from Institute Of Orthopaedics & Surgery and South City Hospital Karachi, Pakistan were included in this descriptive case series using non – probability purposive sampling technique. These patients were managed by patellar resurfacing using bony landmarks as per hospital protocols. They were followed up every 2 weeks for first two months and then monthly once after that for 6 months. During each follow-up, the patients was examined for both subjective symptoms and objective signs which was recorded and knee mobilization was employed after 3 weeks of procedure. Patients were trained for dynamic exercises (isotonic and isokinetic exercises) of the knee and were advised to follow them for compliance. Functional outcome in term of excellent, good and poor was assessed after 6 months.

Results: This study included 151 patients undergoing total knee replacement, having mean ages 57.36 ± 8.01 years (range; 44 – 70 years). Of these 151 patients, 33.1 % (n = 50) were male and 66.9 % (n = 101) were female patients having mean ages 58.54 ± 5.97 years and 56.71 ± 8.81 years (p = 0.206), respectively. Rural background was noted in 33.1%(n=50) while 66.9% (n=101) were from urban localities. Mean duration of disease was 4.27 ± 2.11 years and 69.5 % (n=105) had duration more than 2.5 years. Diabetes was noted in 31.1 % (n=47), hypertension in 50.3% (n=76) and 22.5% (n=34) were obese (Mean BMI was 26.21± 2.19 kg/m^2). Functional outcome was excellent in 87.4 % (n = 132) while good 12.6% (n=19).

Conclusion: Patellar resurfacing using bony landmarks is safe, reliable effective procedure among patients undergoing total knee replacement as high proportion of functional outcome was excellent in our study, so our study results support the use of patellar resurfacing using bony landmarks to achieve desired outcomes to improve quality of life and physical productivity in our patients. Functional outcome was significantly associated with younger age groups, diabetes and hypertension.

Keywords: Patellar resurfacing, total knee replacement, Functional outcome.

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INTRODUCTION

Historically, around 50 % of total knee arthroplasties failure rates were associated with patella during last two decades of 20th century when dissociation of cementless metal – backed components were the major device related complications encountered in

total knee arthroplasty[1]. However, recent reports have shown that quite lesser arthroplasties fail owing to patellofemoral complications as those traditional designs could not harbor patellofemoral joint. Consequently, higher proportions of patients had symptoms of patellofemoral symptoms ranging from 40 – 58 %[2]. Hence new designs were reported, these designs incorporated anterior flange however these subsequent designs ignored native patella and anatomic motion i.e. range of motion [3]. In Early 1970s, first patellar resurfacing, a polyethylene dome was provided by Insall Burstein total knee replacement [4].

Currently, 3 surgical approaches for patella are adopted globally during total knee arthroplasty; i) Always resurface, ii) No resurfacing, iii) Selective resurfacing which is based upon patient characteristics including articular cartilage condition and patellofemoral congruence, depending upon geographical location and surgical expertise [4,5]. In Northern America, almost all surgeons perform patellar resurfacing while it is not very common in Asian nations and selectively preferred in Europe. North American Surgeons prefer resurfacing owing the facts; it is associated with very less rates of secondary resurfacing and repeat surgeries, significantly decreased pain in resurfacing group and it is hard to ascertain quality of articular cartilage of patella at the time of surgery [6]. Also, there is significant burden of patients who are presenting with patellofemoral arthritis which requires mandatory to resurface patella [7].

In Asian countries, preference for patellar resurfacing varies depending upon institutional facilities and expertise of surgical team as it is highly technique dependent which requires extensive training and skills [8]. Most of the surgeons in Asia don't perform resurfacing due to small stature of patients and thin bones and it is generally performed in patients with rheumatoid arthritis or those having severe cartilage damage [9]. Additionally, there is lack of data in the form of well – designed research trials, no national registries which make it really hard to establish some evidence regarding resurfacing versus non – resurfacing which makes our surgeons hesitant to perform resurfacing of the patella [10, 11].

Owing to these facts, this study was designed to ascertain functional outcome of patellar resurfacing using bony landmarks to ascertain effectiveness in our population may be documented to boost confidence of our surgeon to perform resurfacing in routine to achieve desired outcomes.

METHODOLOGY

After permission from ethical committee and research department, 151 patients fulfilling the inclusion criteria from Institute Of Orthopaedics & Surgery and South City Hospital Karachi, Pakistan were included in this descriptive case series using non – probability purposive sampling technique. Duration of study was 12 months from September 2020 to September 2021. Sample size (n = 151) is calculated by using WHO sample size calculator with following assumptions: Confidence level = 95%, Level of significance= 5% and Least expected proportion= 89 % [12]. Osteoarthritis / rheumatoid arthritis patients undergoing total knee replacement using bony landmarks of either sex aged more than 18 years were included in our study. Recurrent and previously treated patients, patellar fractures, patient not medically fit for the surgery, having any skin disease were excluded from our study.

Patients were explained the objectives and procedure of this study before taking consent of participation. Baseline demographics features like age, gender, duration of disease and BMI were recorded. These patients were managed by patellar resurfacing using bony landmarks as per hospital protocols. They were followed up every 2 weeks for first two months and then monthly once after that for 6 months. During each follow-up, the patients was examined for both subjective symptoms and objective signs which was recorded and knee mobilization was employed after 3 weeks of procedure. Patients were trained for dynamic exercises (isotonic and isokinetic exercises) of the knee and were advised to follow them for compliance. Functional outcome in term of excellent, good and poor was assessed after 6 months.

Functional outcome was

Excellent: No limitation of activities such as; "No loss of flexion. No extensor lag, no subjective complaints, no quadriceps wasting or subsequent reduction in power.

Good: Moderate limitation of activity, Extensor lag of 5-10 degrees, Minimal wasting of quadriceps and power of Grade 4, Some subjective symptoms, Flexion loss not >30 degrees on goniometer.

Poor: Marked limitation of activities with significant, Complaints of pain and weakness, marked quadriceps wasting and power <3, extensor lag >10 degrees, flexion loss > 30 degrees on goniometer".

Data was entered and analyzed with statistical analysis program (IBM-SPSS v.22). Frequencies and percentages was computed for categorical variables like gender, excellent, good and poor. Mean ± SD

was calculated for quantitative variables like age, duration of disease and BMI. Stratification was done with regard to age, gender, duration of disease and obesity to see the effect of these variables on functional outcome. Post stratification chi-square test was applied, p ≤0.05 was considered statistically significant.

RESULTS

This study included 151 patients undergoing total knee replacement, having mean ages 57.36 ± 8.01 years (range; 44 – 70 years). Of these 151 patients, 33.1 % (n = 50) were male and 66.9 % (n = 101) were female patients having mean ages 58.54 ± 5.97 years and 56.71 ± 8.81 years (p = 0.206), respectively. Rural background was noted in 33.1%(n=50) while 66.9% (n=101) were from urban localities. Mean duration of disease was 4.27 ± 2.11 years and 69.5 % (n=105) had duration more than 2.5 years. Diabetes was noted in 31.1 % (n=47), hypertension in 50.3% (n=76) and 22.5% (n=34) were obese (Mean BMI was 26.21± 2.19 kg/m^2). Functional outcome was excellent in 87.4 % (n = 132) while good 12.6% (n=19). Functional outcome of patellar resurfacing has been stratified in Table- 1.

Table 1: Cross – tabulation of functional outcome versus study parameters. (n=151)

Study Variables	Functional Outcome		P value
	Excellent	Good	
Gender			
Male (n= 50)	44	06	**0.999**
Female (n=101)	88	13	
Age groups			
Up to 50 Years (n= 42)	42	00	**0.003**
More than 50 Years (n=109)	90	19	
Residential status			
Rural (n= 50)	43	07	**0.796**
Urban (n=101)	89	12	
Disease duration			
Up to 2.5 Years (n=46)	40	06	**0.999**
More than 2.5 Years (n=105)	92	13	
Diabetes			
Yes (n=47)	28	19	**0.001**
No (n=104)	104	00	
Hypertension			
Yes (n=76)	60	16	**0.002**
No (n=75)	72	03	
Obesity (n=17)			
Yes (n=34)	28	06	**0.377**
No (n=117)	104	13	

DISCUSSION

Patellar resurfacing during total knee arthroplasty largely remains controversial , despite the fact that it has been commonly performed procedure in last 10 years[13]. Although some surgeons prefer patellar resurfacing in order to avoid high incidence of postoperative anterior knee pain, repeat surgeries for secondary patellar resurfacing and an optimal financial practice while many surgeons selectively perform resurfacing due to the anterior knee pain, articular cartilage damage, inflammatory arthritis, patellar subluxation, maltracking and isolated patellofemoral arthritis[14]. During the course of selection of appropriate procedure for patellar resurfacing, anatomy and biomechanics of patellofemoral joints should be kept in mind combined with latest advances in the surgical procedure and prostheses as successful patellar resurfacing outcomes are associated with accurate component implantation[15,16].

This study included 151 patients undergoing total knee replacement, having mean ages 57.36 ± 8.01 years (range; 44 – 70 years). Baloch et al[17] from Karachi also reported ages ranging from 58 – 80 years. Mateen et al [18] from Islamabad has also

reported 60.7 years mean age (range; 45 – 64 years). A Chinese study by Bu et al [19] has also reported 56.5 years mean age. Malhotra et al [20] from India has also reported 55 ± 10.1 years mean age, similar to our results. Rasul et al [21] has also documented mean age in patients undergoing TKA was 63.66 ± 6.58 years.

Of these 151 patients, 33.1 % (n = 50) were male and 66.9 % (n = 101) were female patients having mean ages 58.54 ± 5.97 years and 56.71 ± 8.81 years (p = 0.206), respectively. Baloch et al [17] from Karachi also reported 35.7 % male patients versus 64.3% female patients, similar to our findings. Mateen et al [18] from Islamabad has also reported 70 % female gender predominance in total knee arthroplasty. A Chinese study by Bu et al [19] has also reported 79 % female gender preponderance. Malhotra et al [20] from India has also reported 92 % female gender predominance. Rasul et al [21] has also documented 61.5 % female gender preponderance in patients undergoing TKA, similar to our results.

Rural background was noted in 33.1%(n=50) while 66.9% (n=101) were from urban localities. Mean duration of disease was 4.27 ± 2.11 years and 69.5 % (n=105) had duration more than 2.5 years. A Chinese study by Bu et al [19] has reported quite higher duration 16.8 years.

Diabetes was noted in 31.1 % (n=47), hypertension in 50.3% (n=76) and 22.5% (n=34) were obese (Mean BMI was 26.21± 2.19 kg/m^2). Baloch et al [17] from Karachi also reported similar results. Malhotra et al [20] from India has also reported 26.3 ± 2 kg/m^2 mean BMI. Rasul et al [21] has also reported 33.3 % diabetes in these patients.

Functional outcome was excellent in 87.4 % (n = 132) while good 12.6% (n=19). Migliorini et al [12] has also documented 89 % excellent functional outcome with patellar resurfacing using bony landmarks, similar to our results.

CONCLUSION

Patellar resurfacing using bony landmarks is safe, reliable effective procedure among patients undergoing total knee arthroplasty as high proportion of functional outcome was excellent in our study, so our study results support the use of patellar resurfacing using bony landmarks to achieve desired outcomes to improve quality of life and physical productivity in our patients. Functional outcome was significantly associated with younger age groups, diabetes and hypertension.

Conflict of Interest: None

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REFERENCES

1. Batra S, Malhotra R, Kumar V, Srivastava DN, Backstein D, Pandit H. Superior patient satisfaction in medial pivot as compared to posterior stabilized total knee arthroplasty: a prospective randomized study. Knee Surg Sports Traumatol Arthrosc. 2021 Nov;29(11):3633-3640. doi: 10.1007/s00167-020-06343-4. Epub 2020 Nov 5. PMID: 33155090.
2. Kulshrestha V, Sood M, Kanade S, Kumar S, Datta B, Mittal G. Early Outcomes of Medial Pivot Total Knee Arthroplasty Compared to Posterior-Stabilized Design: A Randomized Controlled Trial. Clin Orthop Surg. 2020 Jun;12(2):178-186. doi: 10.4055/cios19141. Epub 2020 May 6. PMID: 32489539; PMCID: PMC7237261.
3. Lee QJ, Wai Yee EC, Wong YC. No difference in patient preference for medial pivot versus posterior-stabilized design in staged bilateral total knee arthroplasty: a prospective study. Knee Surg Sports Traumatol Arthrosc. 2020 Dec;28(12):3805-3809. doi: 10.1007/s00167-020-05867-z. Epub 2020 Jan 28. PMID: 31993682.
4. Chang JS, Kayani B, Moriarty PD, Tahmassebi JE, Haddad FS. A Prospective Randomized Controlled Trial Comparing Medial-Pivot versus Posterior-Stabilized Total Knee Arthroplasty. J Arthroplasty. 2021 May;36(5):1584-1589.e1. doi: 10.1016/j.arth.2021.01.013. Epub 2021 Jan 12. PMID: 33531176.
5. Wang Z, Zhang YQ, Ding CR, Wang YZ, Xu H. Early Patellofemoral Function of Medial Pivot Prostheses Compared with Posterior-Stabilized Prostheses for Unilateral Total Knee Arthroplasty. Orthop Surg. 2021 Apr;13(2):417-425. doi: 10.1111/os.12895. Epub 2021 Jan 5. PMID: 33403815; PMCID: PMC7957395.
6. Elbardesy H, McLeod A, Gul R, Harty J. Midterm results of modern patellofemoral arthroplasty versus total knee arthroplasty for isolated patellofemoral arthritis: systematic review and meta-analysis of comparative studies. Arch Orthop Trauma Surg. 2021 Apr 7. doi: 10.1007/s00402-021-03882-4. Epub ahead of print. PMID: 33825970.
7. Peng G, Liu M, Guan Z, Hou Y, Liu Q, Sun X, et al. Patellofemoral arthroplasty versus total knee arthroplasty for isolated patellofemoral osteoarthritis: a systematic review and meta-analysis. J Orthop Surg Res. 2021 Apr 15;16(1):264. doi: 10.1186/s13018-021-02414-5. PMID: 33858458; PMCID: PMC8048312.
8. Fredborg C, Odgaard A, Sørensen J. Patellofemoral arthroplasty is cheaper and more effective in the short term than total knee arthroplasty for isolated patellofemoral osteoarthritis: cost-effectiveness analysis based on a randomized trial. Bone Joint J. 2020 Apr;102-B(4):449-457. doi: 10.1302/0301-620X.102B4.BJJ-2018-1580.R3. PMID: 32228074.
9. Lewis PL. Reply to the Letter to the Editor: Short-term Revision Risk of Patellofemoral Arthroplasty is High: An Analysis From Eight Large Arthroplasty Registries. Clin Orthop Relat Res. 2021 Jun 1;479(6):1403. doi: 10.1097/CORR.0000000000001718. PMID: 33835097; PMCID: PMC8133230.
10. Longo UG, Ciuffreda M, Mannering N, D'Andrea V, Cimmino M, Denaro V. Patellar Resurfacing in Total Knee Arthroplasty: Systematic Review and Meta-Analysis. J Arthroplasty. 2018 Feb;33(2):620-632. doi: 10.1016/j.arth.2017.08.041. Epub 2017 Sep 6. PMID: 29032861.

11. Sangoi D, Gokhale N, Kulkarni S, Kodumuri P, Kothari P, Kulkarni S. Does Patellar Resurfacing Matter? Midterm Follow-Up of MRK Total Knee Replacement. Indian J Orthop. 2020 Sep 24;55(Suppl 1):56-61. doi: 10.1007/s43465-020-00258-5. PMID: 34122755; PMCID: PMC8149519.
12. Migliorini F, Eschweiler J, Niewiera M, El Mansy Y, Tingart M, Rath B. Better outcomes with patellar resurfacing during primary total knee arthroplasty: a meta-analysis study. Arch Orthop Trauma Surg. 2019 Oct;139(10):1445-1454. doi: 10.1007/s00402-019-03246-z. Epub 2019 Jul 31. PMID: 31367842.
13. Huang AB, Qi YS, Song CH, Zhang JY, Yang YQ, Yu JK. Novel customized template designing for patellar resurfacing in total knee arthroplasty. J Orthop Res. 2016 Oct;34(10):1798-1803. doi: 10.1002/jor.23200. Epub 2016 Mar 1. PMID: 26895786.
14. Kebbach M, Darowski M, Krueger S, Schilling C, Grupp TM, Bader R, et al. Musculoskeletal Multibody Simulation Analysis on the Impact of Patellar Component Design and Positioning on Joint Dynamics after Unconstrained Total Knee Arthroplasty. Materials (Basel). 2020 May 21;13(10):2365. doi: 10.3390/ma13102365. PMID: 32455672; PMCID: PMC7287668.
15. Benazzo F, Perticarini L, Jannelli E, Ivone A, Ghiara M, Rossi SMP. Controversy: supporting patellar resurfacing in total knee arthroplasty - do it. EFORT Open Rev. 2020 Nov 13;5(11):785-792. doi: 10.1302/2058-5241.5.190075. PMID: 33312705; PMCID: PMC7722947.
16. Bauer L, Woiczinski M, Thorwächter C, Melsheimer O, Weber P, Grupp TM, et al. Secondary Patellar Resurfacing in TKA: A Combined Analysis of Registry Data and Biomechanical Testing. J Clin Med. 2021 Mar 16;10(6):1227. doi: 10.3390/jcm10061227. PMID: 33809605; PMCID: PMC8000328.
17. Baloch NA, Hashmi I. Outcome of total knee replacement in 232 cases Pak J Surg May - Jul 2005;21(1):27-9.
18. Mateen MA, Memon KA, Akhtar A, Shami AM, Rafiq Z.Total Knee Arthroplasty: A clinical trial with Posterior Cruciate Retention in patients with Rheumatoid Arthritis and Osteoarthritis. J Surg Jun 2004;27(1):14-20.
19. Bu Y, Yu J, Zhao X, Zheng D, Zhang T. [Clinical research of posterior cruciate ligament-retained mobile-bearing total knee arthroplasty in treatment of rheumatoid arthritis]. Zhongguo Xiu Fu Chong Jian Wai Ke Za Zhi. 2010 Jun;24(6):696-700. Chinese. PMID: 20632503.
20. Malhotra R, Janardhanan R, Batra S. Total Knee Arthroplasty in Rheumatoid Arthritis patients with a medial stabilized prosthesis - A retrospective analysis. J Clin Orthop Trauma. 2021 Aug 17;21:101566. doi: 10.1016/j.jcot.2021.101566. PMID: 34471601; PMCID: PMC8385158.
21. Rasul A, Ahmed I, Munem HA.Quality of life before and after total knee replacement Rawal Med J. 2014;39(3):289-91.