Outcome of Primary Total Knee Arthroplasty in Morbid Obese Patients.

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Authorship and contribution Declaration:
Each author of this article fulfilled ALL 04 Criteria of Authorship:
1. Conception and design of or acquisition of data or analysis and interpretation of data.
2. Drafting the manuscript or revising it critically for important intellectual content.
3. Final approval of the version for publication.
4. All authors agree to be responsible for all aspects of their research work.

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ABSTRACT

Objective: To determine the clinical and functional outcome of primary total knee arthroplasty in morbid obese patients.

Methodology: This descriptive study was conducted in Liaquat National Hospital Karachi from 25th June 2015 to 25th June 2022.All morbid obese patients (BMI ≥40kg/m^2) who underwent primary TKA were enrolled in this study. Post operative American Knee Society Score (AKSS) was calculated at two year follow up and compared with preoperative score for statistical significance ($p<0.05$ was considered significant)

Results: A total of 186 patients were operated. Bilateral TKA was performed in 182(97.84%) patients and unilateral in 4(2.15%) patients. The mean age of these patients were 62.1±8.2 years. Female patients were 170(92%) and male were 16(8%). Majority (59.6%, n=111) of our patients had BMI in between 40 to 49.9kg/m^2 while 75(40.3%) patients had BMI >50 kg/m^2. At two years follow up the Clinical American Knee society Score (pain, stability, range of motion) improved significantly in all patients ($p<0.05$) while the functional American Knee Society Score (walking distance, climbing and descending stairs) did not improved significantly($p>0.05$).

Conclusion: Primary total knee arthroplasty in morbid obese patients yielded significantly better clinical outcome in terms of pain, stability and range of motion than functional outcome.(walking distance, climbing and descending stairs)

Keywords: American Knee Society Score, Body Mass Index, Morbid Obesity, Total Knee Arthroplasty.

This article may be cited as: Noor SS, Ullah I, Memon N, Chaudhry AM, Chaudhry HA. Outcome of Primary Total Knee Arthroplasty in Morbid Obese Patients. J Pak Orthop Assoc.2023;35(1):4-8.

INTRODUCTION

Primary total knee arthroplasty (TKA) is a challenging surgery even for experienced arthroplasty surgeons especially in patients with severe pre-operative deformity, ligamentous instability or marked bone loss.[1] There is substantial increase in number of patients with complex primary knee deformity especially in developing countries like Pakistan. The reason of this considerable increase of patients with complex primary knee deformity is delayed presentation due to fear of surgery and financial issues.[2] The incidence of advanced knee osteoarthritis (OA) in Asian countries is well documented in the literature and the figure reaches up to 28% in Urban population of Pakistan and with a higher incidence in patients with increased body mass index (BMI).[3] Painful deformed knees badly affects the quality of life. As patients are very they keen to resume their daily activities such as kneeling for prayers.[4] Primary total knee arthroplasty (TKA) is frequently carried out in aging population.[5,6] There are many risk factors for knee osteoarthritis and obesity is one of the risk factor. Compared to non-obese patients obese patients were more susceptible to develop osteoarthritis at an earlier age.[7,8] In United States (US) prevalence of obesity among children and adolescent was 17% while in Pakistan it was reported 15%.[9,10] Therefore it can be presumed that young arthroplasty surgeons will operate more obese patients in their career as the trend has been changed globally. Moreover the increased predicted annual growth of TKA procedures will likely to boost interest in the challenge of managing obese TKA

patients. Obesity is a global problem and a major cause of disability with Asian inhabitant more susceptible than European ones due to multiple reasons.[11] Participants of the International Obesity Committee proposed a cut-off value of BMI for overweight (23-24.9kg/m^2) and obese patients (≥25kg/m^2) for Asian inhabitants. In United Kingdom the percentage of overweight and obese adults increased from 57.6% to 66.6% (for males) and from 48.6% to 57.2% (for women) in between 1993 and 2012.[12]

The objective of our study was to determine the clinical and functional outcome of primary total knee arthroplasty in morbid obese patients.

METHODOLOGY

We conducted this descriptive study was in Liaquat National Hospital Karachi from 25th June 2015 to 25th June 2022.All patients of both gender and all ages with primary osteoarthritis knee and morbid obesity(BMI ≥40kg/m^2) who underwent primary TKA were enrolled in this study. All patients with active infections, fractures around knee and neuromuscular disorders were excluded. The study was approved by the hospital Ethical committee. Liaquat National Hospital, Karachi informed written consent was obtained from all study participants. Complete history was taken. Relevant clinical examination was performed. BMI was calculated for each and every patients. Radiographic and laboratory investigations were performed in all patients. Preoperative clinical and functional assessment was done with the help of American Knee Society Score (AKSS).[13]This score ranges from 0 to 100 with higher the score better the outcome. The AKSS consists of two portions. Portion one is the clinical score and include assessment of pain(50 points),stability(25 points) and range of motion(25 points).The second portion is the functional knee score and assess walking distance(50 points) and climbing and descending stairs(50 points)

Post operative American Knee Society Score (AKSS) was calculated at two year follow up and compared with preoperative score for statistical significance($p<0.05$ was considered significant).

Surgical Technique

All the surgeries were performed under combined spinal epidural (CSE) anaesthesia with tourniquet. Pre-operative antibiotic was given one hour before incision. All surgeries were performed by the same surgical team with the primary surgeon more than 10 years of experience in arthroplasty. A medial para-patellar approach was used in all patients. Incision was planned and marked with knee in extension and it was slightly lateralized relative to tibia tubercle. Incision was made with knee in flexion.Standard distal femur and proximal tibia cuts were made. Aim was to achieve rectangular gap during flexion and extension. Patella was resurfaced in all cases. In some cases multiple drill holes were made especially on tibia side and over patella to remove sclerotic bone in order to improve cement penetration. We used posterior stabilized (PS) design implant in patients with varus or valgus deformity of 20 degrees and fixed flexion deformity (FFD) of 10 degrees. Primary implant with extension stems in tibia used in cases with varus deformity more than 20 degrees. The purpose of stemmed TKA is to improve mechanical stability, maintain alignment and to reduce stress on tibia baseplate. A constrained non-hinged implant was used in cases with instability in coronal plane or inability to achieve a rectangular gap following extensive soft tissue dissection. Closure was performed in layers.

Post-operatively patients were followed at 2 weeks, 6 weeks, 3 months, 6 months and annually thereafter. A uniform supervised physical therapy protocol was adopted in all cases. Radiographs were performed immediate post-operatively, at 6 weeks and quarterly thereafter. The patients were assessed clinically and radiologically at each follow-up visit. Radiographs of the patients were compared to the first radiograph taken after surgery to check for any evidence of aseptic loosening. Other complications that were assessed during follow-up visits were prosthetic joint infection (PJI), peri-prosthetic fractures, extensor mechanism complications, instability and neurovascular injury. If infection occurs at one month following primary TKA then we considered it as early PJI. If it occurs after one month time then we considered it as late PJI. Post operative clinical and functional outcome was assessed at one year and two years with the help of American Knee Society Score (AKSS).

The data was analysed with SPSS version 23.Mean and standard deviation was calculated for quantitative variables whereas frequency and percentage was calculated for qualitative variables. Preoperative AKSS was compared with postoperative AKSS and P value was calculated with paired sample t test.P value <0.05 was considered significant.

RESULTS

We operated 186 patients with TKA. Bilateral TKA was performed in 182(97.84%) patients and unilateral in 4(2.15%) patients. The mean age of

these patients were 62.1±8.2 years. Female patients were 170(92%) and male were 16(8%). Majority(59.6%, n=111) of our patients had BMI in between 40 to 49.9kg/m^2 while 75(40.3%) patients had BMI >50 kg/m^2. The implant design was PS in 12 (6.45%) patients, long stemmed tibia in 161 (95.2%),long stemmed both femur and tibia in 8 (4.73%) and Constrained non-hinged design in 5 (2.6%) patients.Comparison of preoperative and post operative AKSS with body weight is shown in table I.In patients with BMI 40 to 49kg/m^2 the mean preoperative clinical AKSS improved from 48.2±3.41 to 86.8±1.91 post operatively at two years follow up(p=0.000).The functional AKSS however did not show any significant improvement(32.9±2.84 versus 35.3±1.11) in this group. Similarly in patients with BMI>50kg/m^2 clinical AKSS score improved significantly from 62.3±4.38 to 82.9±2.36(p=0.001) but functional outcome did not show significant improvement(47.8±2.28 versus 46.3±1.16)

A total of 28 (15%) patients suffered complications following primary TKA as shown in table II. Out of 28 patients, 9 (8.1%) patients had BMI in between 40-49.9 kg/m^2 whereas 19 (25.3%) patients had BMI >50kg/m^2. Debridement, antibiotics, implant retention (DAIR) procedure was performed for early PJI whereas two stage revision arthroplasty was performed in patients who presented with late PJI. Patients with extensor mechanism injury had patella fracture which was treated with claw plate. Revision surgery was performed for patient who presented with aseptic loosening. Distal femur replacement (DFR) was performed in patients who presented with peri-prosthetic fracture femur.

Table I: Comparison of preoperative and post operative AKSS with body weight.

BMI	AKSS	Preoperative	Post-operative at 1 year follow-up.	Post-operative at 2 years follow-up	*P* value
40-49.9kg/m^2	Clinical score (out of 100)	48.2±3.41	60.3±2.81	86.8±1.91	0.000
	Functional score (out of 100)	32.9±2.84	36.4±1.96	35.3±1.11	1.321
>50kg/m^2	Clinical score (out of 100)	31.3±2.96	62.3±4.38	82.9±2.36	0.001
	Functional score (out of 100)	46.4±3.23	47.8±2.28	46.3±1.16	1.482

Table II: Complications of TKA with respect to BMI:

BMI	Complications	Frequency (%)
40-49.9 Kg/m^2 (n=111)	Aseptic loosening	1 (0.9%)
	Early PJI	4 (3.6%)
	Late PJI	2 (1.8%)
	Peri-prosthetic fracture tibia	2 (1.8%)
>50 kg/m^2 (n=75)	Aseptic loosening	1 (1.3%)
	Early PJI	8 (10.6%)
	Late PJI	4 (5.3%)
	Peri-prosthetic fracture femur	2 (2.6%)
	Peri-prosthetic fracture tibia	-
	Neurovascular injury	2 (1.07%)
		2(1.07%)

DISCUSSION

People who are morbidly obese suffer worse health and financial consequences than patients who are overweight and obese.[14,15] Obstructive sleep apnea syndrome (OSAS), chronic kidney disease (CKD), metabolic associated fatty liver disease (MAFLD), impaired fertility, gastric upset, were the main health consequences linked with morbid obese patients.[16] In UK the medical costs associated with morbid obesity account for 2.3-2.6% of all public health expenditures.[17] The situation is quite different in developing nations like Pakistan where health is not insured and all the expenses must bear by patient.[18] It was previously proposed that a high BMI and a small tibia implant contributed to aseptic loosening

and implant migration. To address this issue in individuals with high BMI extension stems was used with the primary implant that will ultimately increase stiffness and reduce strain on the proximal tibia by 20-60% depending on stem length.[19,20] Another advantage of inserting extension stems with the primary implant is to reduce shear stresses that are transmitted on tibia component, which may be favourable to morbid obese patients who place more strain on tibia baseplate.[21] Many studies can be found in the literature regarding the frequency of aseptic loosening with primary implant among obese patients. It has been reported reported that frequency of aseptic loosening with primary implant among obese patients is more than non-obese patients.[22-24] Out of 186 patients, we used extension stems in 169 (90.8%) patients with extension stem in tibia only in 161 (95.2%) and both femur and tibia in 8 (4.73%) patients. Although we did not measure survivorship of long stemmed TKA among morbid obese patients we noted aseptic loosening in only 2 patients in our series.

Literature revealed inferior results of TKA in obese patients as compared to non-obese patients.[25] Vaishya[26] however noted no difference with respect to functional outcome, implant survivorship and complications among obese and non obese patients followed upto 9 years. groups. Vaishya however suggested that the second TKR in the same patient must be performed with a 6 to 9-month interval in order to provide patient enough time for recovery. In our series of patients, bilateral TKR was performed simultaneously. We divide morbid obese patients into two groups. The first group consists of patients with BMI in between 40 to 49.9 Kg/m^2 whereas the second group consists of patients with BMI $>50kg/m^2$. There was significant improvement of clinical scores among both groups with P value <0.05. On other hand functional scores in both groups worsen with time.

Complication among morbid obese patients following primary TKA are not much uncommon. In our series 28 (15%) patients suffered complications following primary TKA.. The authors revealed that morbid obese patients were at more risk of developing in-hospital complications such as wound breakout and genitourinary related complications. D' Apuzzo and colleague[27] also confirmed that morbid obese patients had high in-hospital death rate than non-obese patients.

Our study had few limitations.The design of ur study was descriptive.Our sample size was small. Our follow up period was short.Further studies are recommended to verify our results.

CONCLUSION

Primary total knee arthroplasty in morbid obese patients yielded significantly better clinical outcome in terms of pain, stability and range of motion than functional outcome. (walking distance, climbing and descending stairs)

Conflict of Interest: None

Grants/Funding: None

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