Etiology of Total Knee Arthroplasty Failure and Functional Outcome of Revision Knee Arthroplasty.

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ABSTRACT

Objective: To determine the aetiology of total knee arthroplasty **(**TKA) failure and assess the functional outcome of patients who underwent revision total knee arthroplasty.

Methods: It was a descriptive study conducted in Orthopaedic department Aga khan university hospital Karachi from 3rd Jan 2010 to 25th December 2020. All patients with primary total knee replacement who underwent revision total knee arthroplasty were included in this study. The indications for revision arthroplasty were documented. Functional outcome of revision total knee arthroplasty was assessed at 6 months with Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) questionnaire. The preoperative and post operative WOMAC score were compared with Student-t test an *P* value calculated. *P* value <0.05 was considered significant

Results: The total number of patients included in this study were 29 with 33 knees. The mean age was 60.60 ±6.78 years. Majority(86.20%,n=25) of our patients were female while males were only 4(13.7%).Unilateral revision arthroplasty was done in 25(86.20%) patients and bilateral in 4(13.79%). The aetiology of revision arthroplasty was Infection in 15(45.45%) knees, aseptic loosening in 14(42.42%) and periprosthetic fractures in 4 knees (12.12%). The pre revision WOMAC pain score was 18.4±3, stiffness score 8.1±7 and function score was 72.5±4.Revision arthroplasty yielded significant improvement in WOMAC score at 6 months with WOMAC pain score of 2.2±1,stiffness 3.4±6 and function 10.4±4(P<0.05).

Conclusion: Infection was the most common cause of revision arthroplasty in our series. Revision arthroplasty yielded acceptable functional outcome in majority of our patients.

Keywords: Aseptic loosening, Infection, Revision arthroplasty, Total knee arthroplasty.

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INTRODUCTION

Surgical replacement of the knee joint also known as total knee arthroplasty (TKA), is one of the most commonly performed orthopedic procedures worldwide. It is the treatment of choice for end stage degenerative osteoarthritis with successful outcome in terms of post-operative pain reduction, restoration of physical activity and patient satisfaction.[1, 2] Since the first successful TKA in 1968, there has been a rapid rise in the number of procedures performed with resulting inevitable rise in failed TKAs.[1, 3, 4] It is estimated that approximately 76,000 TKAs are performed every year in UK with an associated risk of revision in < 5 % after primary total knee arthroplasty at ten years post operatively.[5] In one meta-analysis the rate of revision knee arthroplasty was 3.8% at 4.1 years of follow up.[6] The common causes of TKA failure leading to revisions are infection, aseptic loosening mal-alignment, instability, stiffness, mechanical wear,

rupture of extensor mechanism and persistent pain and stiffness.[7-12] There are many different knee prosthesis currently in use and most of the prosthesis have a definite life and their durability depend on many factors including patient's age, body weight, underlying disease, activity status and life style.[13] However, the overall outcome of revision knee arthroplasty is not as good as primary TKA and revision is a difficult procedure where surgeons often face difficulty in handling bone loss and soft tissue insufficiency.[12]

The objective of our study was to determine the aetiology of total knee arthroplasty **(**TKA) failure and assessment of the functional outcome of patients who underwent revision total knee arthroplasty.

METHODS

We conducted this descriptive study in Orthopaedic department Aga khan university hospital Karachi from 3rd Jan 2010 to 25th December 2020. Patients of either gender and age operated for total knee replacement for osteoarthritis in the last 10 years and presented with complications requiring revision were included in our study. Morbid obese patients and those unwilling for revision surgery were excluded. The study was approved by the ethical committee of our hospital. Informed consent was taken from all the patients for revision surgery and publication of results. In the included subjects complete history, physical examination and relevant investigations were carried out. Revision arthroplasty varied from case to case and depending upon bone loss and ligamentous and soft tissue status rotating hinge, constrained condylar knee prosthesis, augmentation, wedging and augmentation were used in revision.(Fig I-III).For infective cases staged surgeries were performed consisting of removal of primary TKA, debridement or placement of cement spacer till clinical and biochemical parameters ensured eradication of infection. Post operative supervised physiotherapy was advised to all patients. All patients were regularly followed post operatively and functional outcome was assessed at 6th month with Western Ontario and McMaster Universities Osteoarthritis Index(WOMAC) questionnaire.[14] The pre operative and post operative WOMAC scores were compared with Student-t test an *P* value calculated. *P* value <0.05 was considered significant. The data was analysed with SPSS version 24.Frequency and percentage was calculated for categorical variables while mean and standard deviation was calculated for quantitative variables.

RESULTS

We operated 29 patients with 33 knees. The mean age was 60.60 ±6.78 years. Majority(86.20%,n=25) of our patients were female while males were only 4(13.7%).Unilateral revision arthroplasty was done in 25(86.20%) patients and bilateral in 4(13.79%). The aetiology of revision arthroplasty was infection in 15(45.45%) knees, aseptic loosening in 14(42.42%) and periprosthetic fractures in 4 knees (12.12%). The mean interval between the primary total knee arthroplasty and revision surgery was 48±4 months.

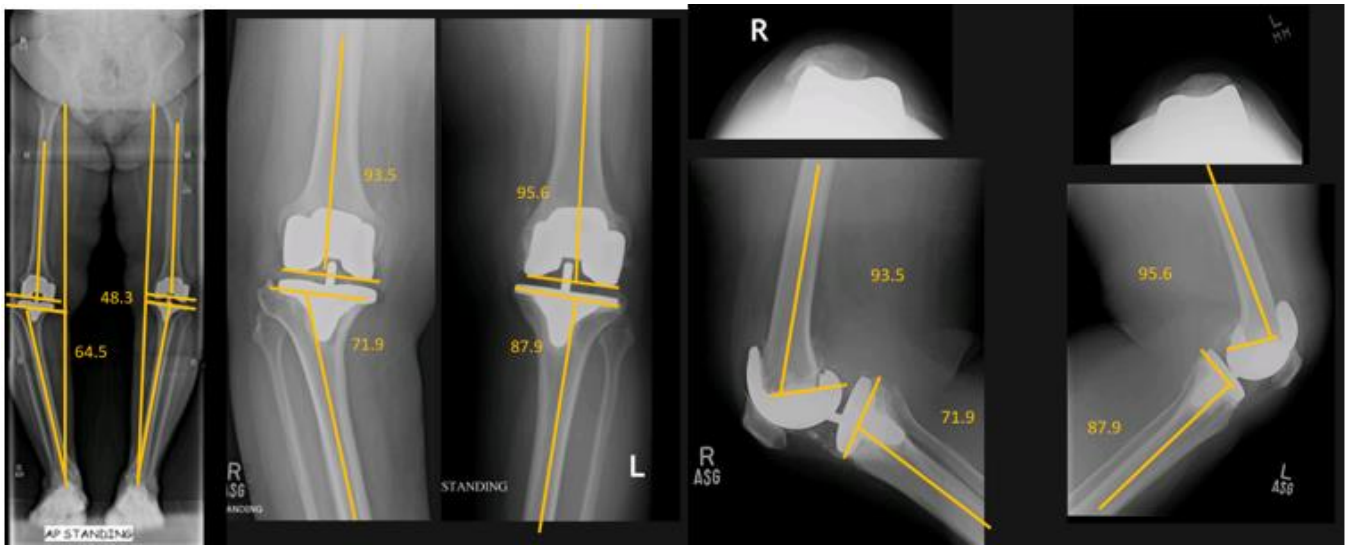

Fig I: Radiographs of bilateral TKA in a 50 years old patient 8 years ago showing osteolysis and mal-alignment of prosthesis.

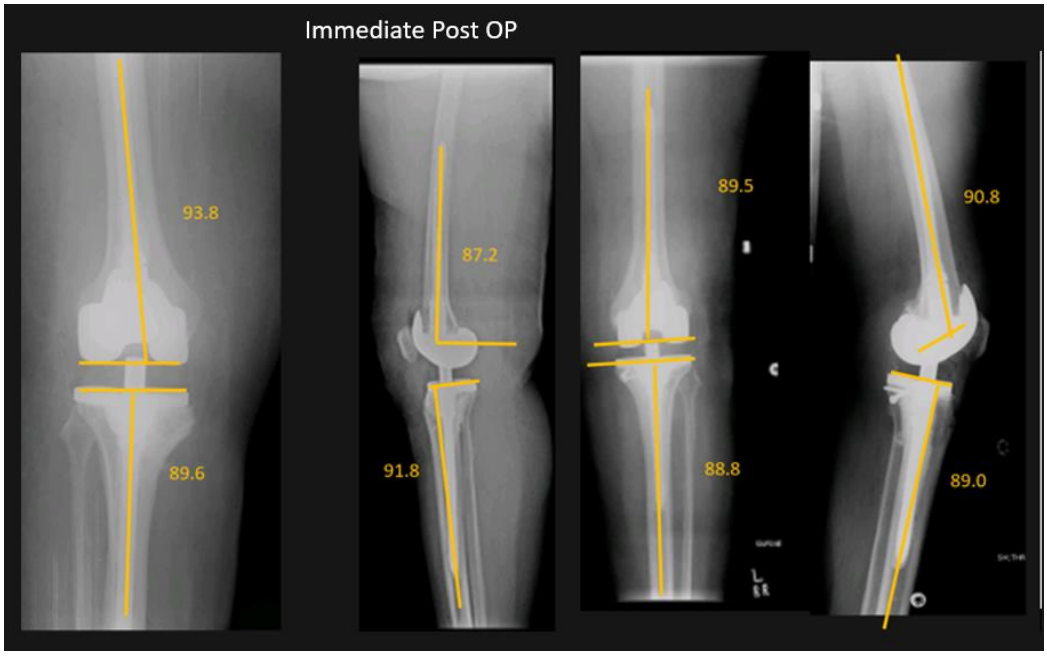

Fig II: Immediate post operative radiographs after revision arthroplasty.

Fig. III: Post operative radiographs one year after revision arthroplasty.

Revision surgery included augmentation in 12(36.36%) knees, constrained condylar knee prosthesis in 11(33.33%) knees, rotating hinge in 8(24.24%), wedging and augmentation in 01(3.03 %) and distal femoral plate along with augmentation in 01(3.03%) knee. The pre revision WOMAC pain score was 18.4±3, stiffness score 8.1±7 and function score was 72.5±4.Revision arthroplasty yielded significant improvement in WOMAC score at 6 months with WOMAC pain score of 2.2±1,stiffness 3.4±6 and

function 10.4±4(P<0.05).No significant difference in WOMAC score was noted when data was stratified for gender, age and side of revision. Patients of aseptic loosening however had significant better overall WOMAC score after revision than others(P<0.05).The overall complication rate in our study was 9.09%(n=3) with extensor mechanism injury in 1(3.03%) knee, lateral collateral ligament injury in 1(3.03%) and femoral condyle fracture in 1(3.03%) knee.

DISCUSSION

In general total knee arthroplasty at younger age is associated with more active life style, functional demand and longer life expectancy of the patients as compared to the older patients. Thus prosthesis are much more likely to fail in their life time in younger patients than in older patients. Kim[2] had shown a failure rate of 7% in patients younger than 55 years age and 2% failure rate in patients who were more than 55 years of age. Laski and O'Flynn[15] reported the survival rate of primary TKA 81 % at ten years follow up. The underlying diseases also play a role in the longevity of the prosthesis. Rheumatoid arthritis patients were reported with prosthesis survival rate of 81 % to 97 % at 10 years of follow up for primary TKA,[16] whereas revision total knee had a failure rate of 19 to 28% in Rheumatoid arthritis.[17]

Morbid obese people with BMI > 40 kg/m2 have greater risk of revision TKAs as compared to non obese (34.5 vs 16.1 %).[18] Furthermore it has been reported that Knee Society Objective Scores (KSOS) and Knee Society Functional Scores (KSFS) after primary TKA were poor in morbid obese patients as compared to non-morbid patients and infection rate was also higher in morbid obese patients.[19]

In our study the aetiology of revision arthroplasty was infection in 15(45.45%) knees, aseptic loosening in 14(42.42%) and periprosthetic fractures in 4 knees (12.12%). Sharkey[20] documented polyethylene wear in 25 %, aseptic loosening in 24.1%, instability in 21.1% and infection in 17.5 %. Fehring[21] reported revision surgery after primary TKAs because of infection in 38%, instability in 27% and osteolysis in 7% patients. Bae DK[22] noted that the most common cause of failure after TKA was polyethylene wear followed by deep infection and aseptic loosening. Kasahara[23] reported that the most common reasons for revision was mechanical loosening in 40%, infection in 24%, osteolysis in 9% and instability in 9%. Kim[2] had noted that revision knee surgery was indicated for polyethylene wear in 44.1 % infection 38.7% and loosening 12.1%. Lee DH[24] noted septic complication in 58.2% cases and aseptic complications in 41.8 % after primary TKA.

We assessed the functional outcome of our revision surgery with WOMAC questionnaire. This scale was used by Mulhall[25] and colleagues for revision total knee arthroplasty and noted a significant improvement at six months follow up. Sheng[26] reported an improvement of knee score after revision from 49 to 84 in a meta analysis of 1356 patients. The main indication for revision in his series was loosening while majority of our revisions were because of infection.

We had documented that patients with aseptic loosening had significant better overall WOMAC score after revision than others(P<0.05).We are supported by Van Kempen[27] who studied 150 revision total knee and noted better patient satisfaction, pain reduction and knee scores in aseptic loosening than in others. Vasso[28] shared his experience of 60 revision total knee arthroplasty and revealed that post revision International Knee Society Knee score was 81 and Function score was 79,Hospital for Special Surgery score was 84 and mean range of motion was 121 degrees.

Our study had a small sample size and short follow up period. We recommend further studies to confirm our results.

CONCLUSION

Infection was the most common cause of revision arthroplasty in our series. Revision arthroplasty yielded acceptable functional outcome in majority of our patients.

Conflict of Interest: None

Grants/Funding: None

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