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A COMPARATIVE ANALYSIS OF THE CLINICAL AND FUNCTIONAL OUTCOME OF HIGH-FLEX AND CONVENTIONAL KNEE PROSTHESIS: AT ONE YEAR, A FOLLOW-UP STUDY

Orthopaedics

Dr. Kishore Raichandani	Senior professor & Head, department of orthopaedics , Dr.S.N. Medical College, Jodhpur
Dr. Prem Manohar Seervi*	Junior resident, Dr. S.N. Medical College, Jodhpur *Corresponding Author
Dr. Hemant Jain	Assistant professor Dr. S.N. Medical College, Jodhpur
Dr. Mohd. Arif	Junior resident, Dr. S.N. Medical College, Jodhpur
Dr. Madhu Sudan Sharma	Senior resident, Dr. S.N. Medical College, Jodhpur
Dr. Ravi Kumar Rana	Junior resident, Dr. S.N. Medical College, Jodhpur

ABSTRACT

Purpose- The aim of this study was to compare the clinical and functional outcome of high flexion knee prosthesis with a conventional prosthesis.
Method- 30 patients who were operated with conventional knee prosthesis kept under group A and group B have 30 patients operated with high flex knee prosthesis. The knee society score and range of motion were assessed periodically. Radiographs were evaluated to identify radiolucent line at bone cement interface, patella tracking, tibiofemoral alignment and implant position
Results- At one year follow up the conventional prosthesis group had mean ROM of 108^0 and high flex group had mean ROM 110^0. No knee had aseptic loosening, deep infection or osteolysis. No significant difference was found in mean knee society score of both groups.
Conclusion- The high flexion prosthesis revealed no significant difference over the conventional prosthesis in terms of KSS and ROM.

KEYWORDS

Total knee arthroplasty, Range of motion(ROM), conventional (Standard knee prosthesis), high flex knee prosthesis, Knee society score(KSS).

Introduction

Total knee arthroplasty (TKA) is the final treatment option provided to patients with unsalvageable, severe arthritic, painful, deformed knee.[1-2]. The goal of TKA is to relive pain and to improve knee function and range of motion (ROM) for activities of daily living .[3,4]

In 1978 Insall et al, introduced posterior stabilized total condylar prosthesis , he used post – cam mechanism to achieve femoral rollback. The average flexion by this prosthesis was $107^0 – 115^0$.

The challenge to improve flexion following TKA has encouraged diverse biomechanics studies that analysed the elimination of the standard knee design to get higher degree of flexion, especially more than 120^0.[5-7]

The ROM after TKA depends on the individual patient, surgical technique, implants and many other factors.[8-11]. To achieve deep flexion, high flex prosthesis were designed with feature of improved posterior condylar offset, improved articular contact area, increased patellar tendon recess and increase posterior femoral translation.[7,11,12]. Theoretically these design modification may lead to better post-operative ROM.

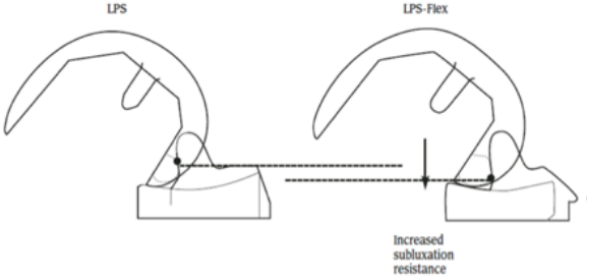


Figure : Diagram of difference in cam height and theoretical increased jump distance in conventional total knee prosthesis vs high flexion prosthesis

Several studies have shown a difference between standard & high flex prosthesis, found better outcome with high flex prosthesis.[13-15]

Consequently controversy remains over design with high flexion modification, thus our aim of this study to compare the functional outcomes of TKA with above those two groups in our institute with 1 year follow up.

Material & method

The study was conducted at tertiary care centre from Jan17 to july18 from records of 60 patients who underwent TKA for primary OA. Clinical records of these patients were reviewed retrospectively by obtaining their bed head tickets from record room and by contacting the patients personally through phone, and calling them for evaluation.

Patients having non-rheumatoid and non-osteoarthritis knee pathology, like bone tumour infection, revision TKA and quadriceps insufficiency were excluded from this study.All patients in study were studied with detailed history, name, age, sex, occupation, X-ray (AP &Lat view).

There were 60 patients who undergone TKA in our institute two group each of 30 patients.

The surgical technique for all the procedure was the classical mid line skin incision, with medial parapatellar arthrotomy, cruciate ligaments were sacrificed in all the patients. The magnitude and angle of bony resection were standardized across treatment groups. The distal femoral resection was made with an intramedullary guide to resect approx 10 mm of bone from most prominent femoral condyle at an angle of 5^0 valgus. The tibial resection was made using an extra medullary guide with the goal of producing a neutral cut in coronal plane and 7^0 of posterior slope in sagittal plane. The anterior, posterior, chamfer cuts referencing guide was 3^0 of external rotation. Posterior condylar osteophytes were resected in all patients. Ligament balancing was aided with use of spacer blocks with the goal of creating symmetric gap of equal magnitude in flexion and extension. All implants were cemented. The capsule was closed in 45^0 of flexion in all

patients.

Preoperatively , The age , gender, the Body mass index (BMI) ,ROM, & Knee society score in both group were taken from tickets.

All patients exhibited normal activity, informed consent of each patients was obtained. The study was approved by the institutional ethical committee of hospital.

Postoperatively, physiotherapy was started from 1st post-op day, quadriceps exercise , knee bending, walk with support and CPM on day 1 and I.V. antibiotics till for 5th post op day(Same protocol for both groups). The knee clinical and functional scores (max 100 in each) and the ROM (especially the maximum passive flexion) using a goniometer were assessed by the surgeon.

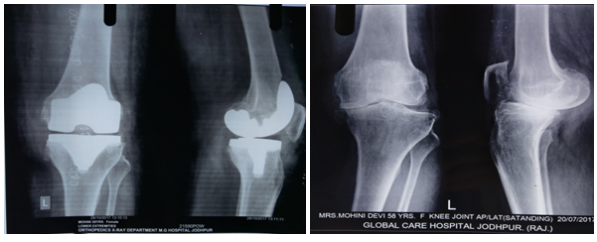
Radiographs (standing AP and Lat view) were evaluated by two independent observer to identify radiolucent line at bone cement interface , tibiofemoral alignment, implant positioning. Data were evaluated by the surgeon to minimise inter observer error. Difference between group were compared using the independent sample t-test , a p value of <0.05 was considered statically significant.

Results - The average follow up was atleast 12 month . The mean age in high flex group 62.8±8.6 years and in standard group 62±9.1 years. Respectively in the high flex and standard knee prosthesis group at one year follow up the mean KSS was 161 & 158 (95 and 89 pre-operative), the mean maximum flexion (ROM) was 112.5^0 and 110^0 (95.2 and 98.6 pre operative) and the mean flexion contracture was 2.5^0 and 1.8^0 (10.5 and 9.7 preoperative). Mean BMI in high flex group was 27.09 and standard group 26.55 kg/m^2 .

TABLE- Patients characteristics and outcomes

Parameter	Standard prosthesis (group A)	High flexion prosthesis (Group B)
Mean(SD) patient age(years)	64.23±7.47	63.33±6.74
Number M:F ratio	12:18	9:21
Mean (SD) BMI	27.26±1.24	27.3±2.23
Mean (SD) KCS Pre-op Final follow-up	42.73±5.53 90.3±4.67	44.6±6.34 89.53±4.25
Mean (SD) KFS Pre-op Final follow-up	39.83±8.03 80±6.43	39.33±5.68 81±5.47
Mean(SD) ROM(degree) Pre-op Final follow up	91.8±7.38^0 108.86±7.14^0	95.06±6.74^0 109.63±7.64^0
Mean (SD) flexion contracture Preop Final followup	10.7^0±6.45^0 2.5^0±3.1^0	9.7^0±6.5^0 1.8^0±5.5^0

Radiographic evaluation – there were no significant difference between the group with regard to the position of femoral and tibial component in the coronal & sagittal plane, or varus /valgus alignment of knee. There were no other finding of radiolucency or bone loss on AP andLat view at 1 year follow up in either group.



Complication-

There was one complication in high-flex group i.e. deep vein thrombosis which was treated with anticoagulant therapy and did well with good functional outcome. In standard group , there were 2 complication one is superficial wound infection treated by wound toileting , iv antibiotics and did well. Second is DVT treated with anticoagulant therapy.

Discussion

TKA success mainly depends on patients profile like BMI, Age, pre op ROM, the surgical technique, and implant design[16-20] . In our study we compared the high flexion design with standard conventional prosthesis and no significant difference were noted for clinical, radiological, in patients satisfaction and in complication rate.

Many article comparing these high flex with conventional design have been published. Minoda et al (2009) analysed range of motion of standard and high flex prosthesis prospectiavely[21]. They had 89 knee with standard & 87 knee with high flex CR total knee prosthesis , difference in preop and post op ROM and knee society score between two group were not statically significantat one year follow up, avg ROM was 112.0±12.6^0 for standard and 115.3±13.4 for high flex CR knee prosthesis. Seon et al [2009] analysed 100 knees with 50knees in each category of Hi-flex and standard total knee prosthesis [22].At the time of the final follow-up, the average maximal non-weight-bearing flexion was 135.3^0 for the knees in the high-flexion group and 134.3 for the knees in the standard group; the difference was not significant.

Bin and Nam [2007] found a significant improvement in knee flexion at one year after operation in patients receiving a high flexion design compared with a standard knee replacement, particularly in patients with a pre-operative range of flexion of less than 90°.[23]

A more recent meta- analysis that was published in 2015 include 16 studies with 2643 knees and reports that high flex prosthesis are better than the conventional at the time of improving ROM, both posterior stabilized prosthesis and prosthesis that keep the posterior cruciate ligament. Nevertheless, there were no significant difference in functional results among design.[24]

Conclusion – The high-flex knee found no significant results over the standard knee prosthesis in term of knee society score and range of motion at one year follow-up in our study.

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