EVALUATION OF EARLY RESULTS OF TOTAL KNEE ARTHROPLASTY USING ROTATING PLATFORM (PS150) HIGH FLEXION KNEE

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ABSTRACT

BACKGROUND

Patients from rural background in India have high demands for flexion at knee because many depend on kneeling and squatting in day to day activities post total knee replacement. We wanted to study the amount of flexion achieved in cases of Total Knee Arthroplasty using Rotating Platform (PS 150) High Flexion Knee.

METHODS

The present study is a prospective analysis of grade III to grade IV osteoarthritis, and rheumatoid arthritis presenting to our hospital from July 2016 to July 2017, and treated with Total Knee Arthroplasty using Rotating Platform (PS 150) High Flexion Knee. The present study included 30 pts. (39 knees) operated with rotating platform high flexion knee, total knee arthroplasty and followed up for a period of 1 year.

RESULTS

As graded with the knee society score, finally, 36 of the total knees (92.31) had excellent outcome, and 2 knees had good outcome. There was one knee which required revision total knee arthroplasty as a two-stage procedure, because of the deep infection.

CONCLUSIONS

Rotating Platform (PS 150) High Flexion Knee is intellectually interesting option in younger and active patients. Hyperflexion is easier in these patients and hence useful in Asian population for social custom.

KEYWORDS

Total Knee Replacement, Rotating Platform 150, High Flexion Knee, Arthroplasty Knee.

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BACKGROUND

Knee is a complex joint and its degeneration is age related. Post traumatic and rheumatoid like arthropathies, give rise to severe disability, severely affecting the overall health and health related quality of life. Total knee replacement is a very rewarding surgery with potential to transform the life of arthritis patients crippled with pain. Total knee arthroplasty (TKA) is common, successful and safe surgery for end-stage knee arthritis.[1] The primary indication of Total Knee Replacement is to relieve pain caused by severe arthritis with or without significant deformity. Rheumatoid arthritis takes the second place after osteoarthritis. It achieves greater than 90% patient satisfaction,[2] and has relatively low morbidity and mortality,[3] The increasing age of the population and improved survivorship enabling arthroplasty in younger more active age groups has seen the number of procedures double in the last decade.[4,5]

Compared to western population the demands of Indian patients are very different. In our centre maximum number of patients are from the lower middle class who live in small towns or villages. In spite of the advice given to them (the precautions and the restrictions that has to be followed after TKR) they try to squat or sit cross-legged. Knee range of motion (ROM) and particularly knee flexion has traditionally been one of the most important factors used to determine success after TKA as many functional activities are dependent upon it. Ascending and descending stairs requires 90-120° of flexion, cultural and religious activities such as squatting, kneeling and cross-legged sitting require up to 165°.[6] Following TKA however knee flexion seldom exceeds 110-115°,[7-9] and while substantial functional improvements do occur postoperatively, they typically remain lower than age-matched population

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norms.[10] Many patients are unable to return to more demanding activities such as kneeling and squatting

Till date an ideal knee prosthesis is not available. Traditional knee replacements have been designed to provide painless range of motion from 0° to about 120° of flexion'. More recently, designs have been introduced to allow up to 155° of flexion, which is necessary and/or helpful for kneeling, squatting, and sitting cross-legged. These high-flexion prostheses include features such as reduced posterior femoral condylar radii with thickened posterior femoral condyles, modifications in tibial and femoral components to accommodate extensor mechanisms with deep flexion and facilitation of physiological posterior femoral rollback.

The purpose of this study is to report the early results of a consecutive series of patients who had undergone primary total knee replacement with rotating platform (PS 150) high flexion knee i.e. RPF. The perception among knee surgeons is that a TKR patient will continue to improve up to 12 months after surgery and their life style differs a lot from normal people for purposes like kneeling down for prayer etc. Various complications that may be seen in this follow up period are also taken into consideration.

METHODS

Total 30 patients (Total 39 Knees)of grade III & grade IV osteoarthritis treated with Total knee Arthroplasty with rotating platform(PS 150) high flexion knee prosthesis.

Data Collection

Data collection is done from the hospital chart &from direct examination of patients and proforma of each and every patient is filed with respective to their knees under treatment. Sample Size is 30 Patients.

Inclusion Criteria

Patient Age- >50 year of Age.
Sex- Both males and females.
Diagnosis- Radiological arthroscopic (Grade III, IV) degenerative arthritis.

Exclusion Criteria

- Medically unfit patients.
- Non ambulatory patients.
- Age <50 yrs.

Preoperative Planning

All these patients are admitted, and following investigations are done

X-ray of the affected knee AP and Lat, Standing views, routine blood investigations, ECG, HIV, HBsAg, Colour Doppler of affected lower limb. Pre-Anaesthetic & medical fitness is done on the basic of above investigation. Amongst all these patients grade III & IV Degenerative arthritis and medically fit for surgery underwent the operative procedure.

Operative Procedures

All patients are given combined spinal + epidural anaesthesia. Cefuroxime 1.5 gm preoperatively given to each patient half hour before operative procedure.

Position supine with knee flexed at 90 and supported with taped sandbags. Pneumatic tourniquet is applied with the cuff pressure 100 mm kg above the systolic blood pressure of the patient at the proximal thigh level. Antiseptic painting & draping with 10% povidone iodine. All patients were operated through medial parapatellar approach.

Postoperative Care

- Drain clamp opened after 6 hours of operation.
- Continuous epidural analgesia pump is started in immediate post op period and maintained in titrated does for first two days of operation & gradually tapered of over next two days.
- Continuous passive motion exercises up to 30º to 60º are given on same days.
- Static quadriceps/static hamstring exercises are given/calf pump ankle ROM given on same days.
- Bedside sitting/knee ROM exercises active /assisted are given on day 1 of surgery.
- Post of HB/PCV is done on 1st day of surgery. If <10 mg/dl then 1 unit blood transfusion.
- Drain removal and 1st dressing is done on 2nd day of operation.
- After removal of drain on day 2, patient is made to stand and walk as tolerable with the supports of walker.
- Knee ROM / active assisted up to 90% active assisted SLR Exercises are given on day 2 of surgery.
- IV antibiotics are given for 3 days total, then after 1st dressing if healthy shifted to oral antibiotics i.e cefuroxime axetil 500 mg BD next seven days.
- Patients made ambulated every day in two session of physiotherapy.
- Toilet training over commode and staircase climbing is given after five to seven days in post-operative period depending upon the recovery and balance.
- Repeat dressing are done every third day till stitch removal.
- Stitch removal is done 12-14th days after surgery.
- Ambulation with walker supports is then shifted to one stick support after 2 weeks depending upon the recovery and balance of the patient.
- Regular follow up is carried out in outpatient clinic for clinical examination at 3 months, 6 months & 1 year.
- X-ray of the operated knee & follow up proforma is filled each time.

RESULTS

The patients were evaluated on the basis of

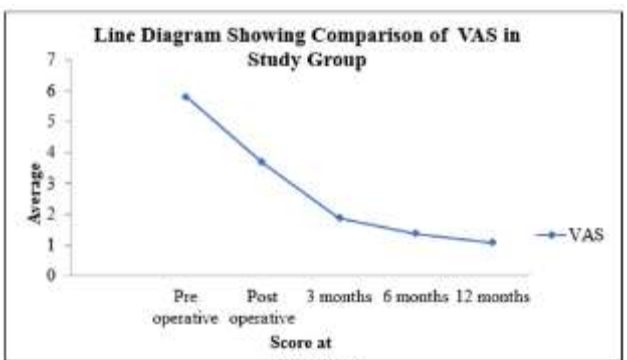
1. Visual analogue scale.
2. Knee society score.
3. Activities of daily living.
4. Flexion achieved both active & passive (with & without weight bearing.)
5. Stability of the knee joint.

The present study included 30 patients (39 knees) operated with rotating platform high flexion knee, total knee arthroplasty and followed up for a period of 1 year the result are as follows-

Visual Analogue Scale (VAS)- Visual analogue scale represent the subjective pain in our study. studying the pattern of pain in our study, we found that the pain has significantly decreased in the postoperative period at around 12th day of operation, and continued decreasing in each follow up period at 3 months, 6 months and at 12 months.

Score at	VAS Mean ± SD(n=39)	T Value	p Value
Preoperative	5.82 ± 1.50	-	-
Postoperative	3.69 ± 0.69	9.63	<0.0001
3 months	1.87 ± 0.57	18.18	<0.0001
6 months	1.38 ± 1.16	15.12	<0.0001
12 months	1.08 ± 0.27	19.25	<0.001

Table 1. Comparison of Visual Analogue Scale (VAS) in Study Group



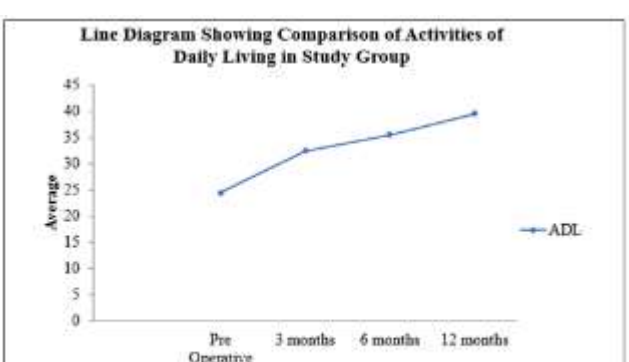
Graph 1

Activities of Daily Living

As compared to preoperative period, Activities of Daily living have improved significantly in postoperative period (p Value<0.001)

Score at	ADL Mean ± SD(n=39)	T Value	p Value
Preoperative	24.44 ± 11.02	-	-
3 months	32.41 ± 8.28	3.62	<0.001
6 months	35.54 ± 9.37	5.01	<0.0001
12 months	39.55 ± 5.19	6.34	<0.0001

Table 2. Comparison of Activities of Daily Living (ADL) in Study Group



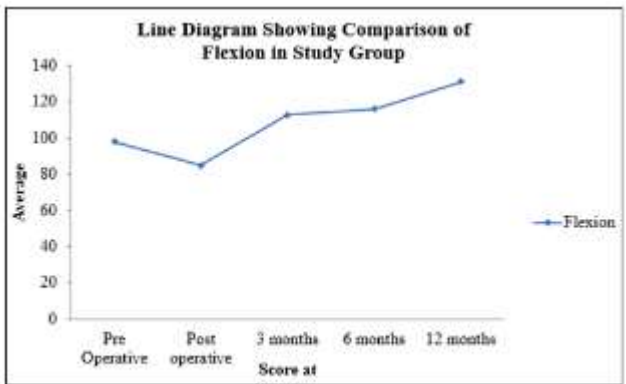
Graph 2

Flexion

In our study, mean preoperative flexion was 97 degrees which has decreased to 84 in early postoperative period but Increased to a mean of 112 degrees at first 3 months, then at 6 & 12 months, with a mean of 115 degrees and 130 degrees respectively.

Score at	Flexion Mean ± SD(n=39)	T Value	p Value
Preoperative	97.95 ± 12.76	-	-
Postoperative	84.87 ± 9.14	5.09	<0.0001
3 months	112.69 ± 10.87	7.91	<0.0001
6 months	115.77 ± 18.26	5.56	<0.0001
12 months	130.92 ± 11.02	5.07	<0.0001

Table 3. Comparison of Flexion in Study Group



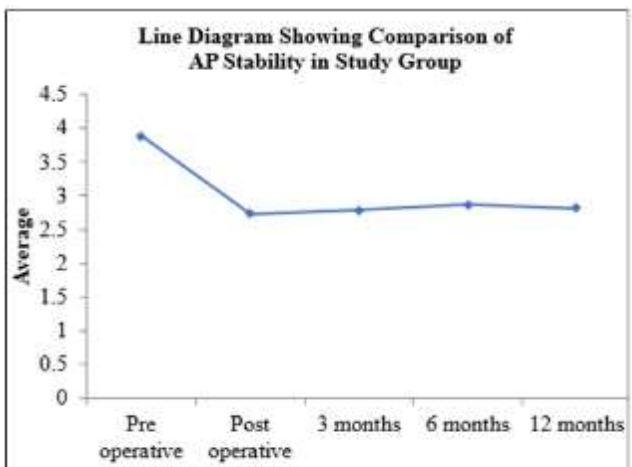
Graph 3

Stability

Both anteroposterior and mediolateral stability is improved in postoperative period and then no much difference found in the further follow up period**.**

Score at	AP Stability Mean ± SD(n=39)	T Value	p Value
Preoperative	3.89 ± 1.89	-	-
Postoperative	2.74 ± 1.16	4.07	<0.0001
3 months	2.79 ± 1.10	3.88	<0.001
6 months	2.87 ± 1.15	3.65	<0.001
12 months	2.82 ± 1.11	3.88	<0.001

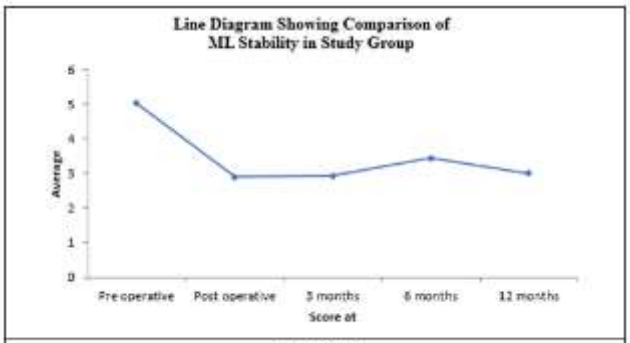
Table 4. Comparison of Anteroposterior Stability in Study Group



Graph 4

Score at	ML Stability Mean ± SD(n=39)	T Value	p Value
Preoperative	5.03 ± 2.83	-	-
Postoperative	2.89 ± 1.14	5.08	<0.0001
3 months	2.92 ± 1.11	5.04	<0.0001
6 months	3.44 ± 2.94	2.39	<0.05
12 months	3 ± 1.12	5.04	<0.0001

Table 5. Comparison of Medial Lateral Stability in Study Group



Graph 5

Series 1

Figure 1. Preoperative Radiographs A-P & Lateral Views

Figure 2. Postoperative Radiographs A-P & Lateral Views

Figure 3. Follow Up Radiograph AP-Lateral Views (3 Months)

Figure 4. Follow up Radiograph AP-Lateral Views (6 Months)

Figure 5. Follow up Radiograph Lateral Flexion View (12 Months)

Figure 6. Functional Outcome (12 Months)

Series 2

Figure 1. Preoperative Radiographs A-P & Lateral Views

Figure 2. Postoperative Radiographs A-P & Lateral Views

Figure 3. Follow up Radiograph AP-Lateral Views (3 Months)

Figure 4. Follow up Radiograph AP-Lateral Views (6 Months)

Figure 5. Follow up Radiograph Lateral Flexion View (12 Months)

Figure 6. Functional Outcome (12 Months)

Figure 7

DISCUSSION

Total knee replacement is the most technologically advanced solution for arthritic pain, however a search for a better functional and durable prosthesis still continues. The success of total knee arthroplasty is influenced by a complex interaction between the geometry of an implant design and the active and passive soft tissue structures that surround the articulation. This interaction, in turn, determines the stability, range of motion and interface stresses that develop.

Flexion

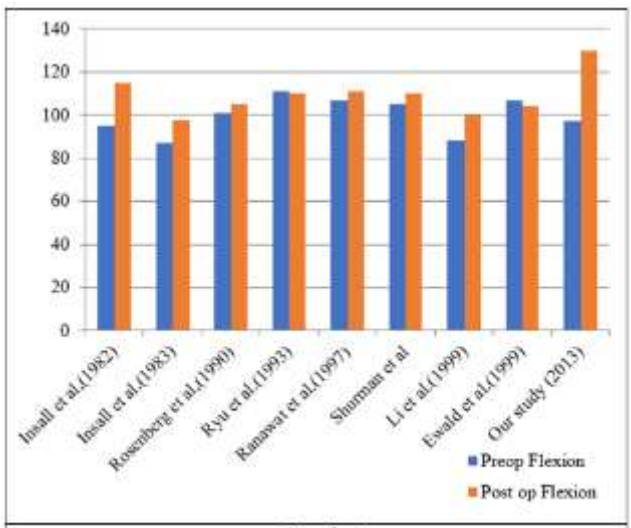
Range of motion is an important measure of outcome of total knee arthroplasty (TKA) and is an important part of most

knee scoring systems. It has been demonstrated that 67º of knee flexion is need for the swing phase of the gait, 83º to climb stairs, 90º to descend stairs, and 93º to rise from a chair.[11,12] The minimum flexion of the knee necessary for usual daily living is generally agreed to be 90^0. Even though this may be enough for most of the daily activities in the western world, Asians and particularly Indians require higher flexion for most of their daily social habits and customs.[6]

Flexion achieved after TKR depends upon several factors like preoperative range of motion, underlying disease-causing arthritis, type of prosthesis being used, surgical technique, postoperative rehabilitation, and motivation of the patients.

In our study, the preoperative flexion was mean 97 degrees (85-110 degrees), all the cases ware of the osteoarthritis knee, and in all cases, we have used high flexion rotating platform knee prosthesis. In post-operative period at 1 year follow up, mean flexion was 130 degrees (119-140 degrees).

Comparison of the results of flexion achieved with the other studies using fixed bearing knees, we found significant difference of flexion achieved at the 1 year follow up in our study.



Graph 6

We used rotation platform high flexion knee prosthesis in our study and the preoperative flexion was mean 97 degrees (85-110 degrees), and amount of flexion in postoperative period at 1 year follow up, mean 130 degrees (119-140 degrees). We noted the maximum amount of flexion on non-weight bearing and weight bearing whichever is highest, as final flexion achieved.

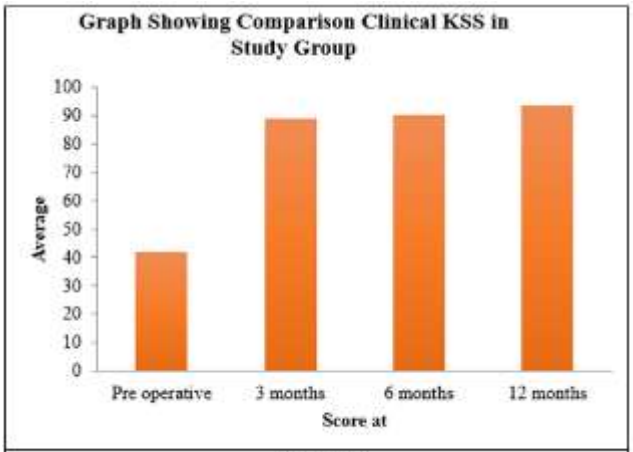
Knee Society Score

We studied the results of our study by using knee society score. It consists of two parts, clinical and functional. Clinical score represent findings of the clinician on examination and the functional score represents the functional performance of the patient.

In our study, knee society score(clinical) was 42 (mean) preoperatively, which significantly improved after operation when assessed in follow up visits at 3 months (mean 89.05), 6 months(mean 90.44)and at 12 months (mean 93.39).

Score at	Clinical KSS Mean ±SD(n=39)	t Value	p Value
Preoperative	42 ± 14.98	-	-
3 months	89.05 ± 6.66	20.29	<0.0001
6 months	90.44 ± 14.39	15.59	<0.0001
12 months	93.39 ± 5.41	14.39	<0.0001

Table 6. Comparison of Clinical Knee Society Score (KSS) in Study Group

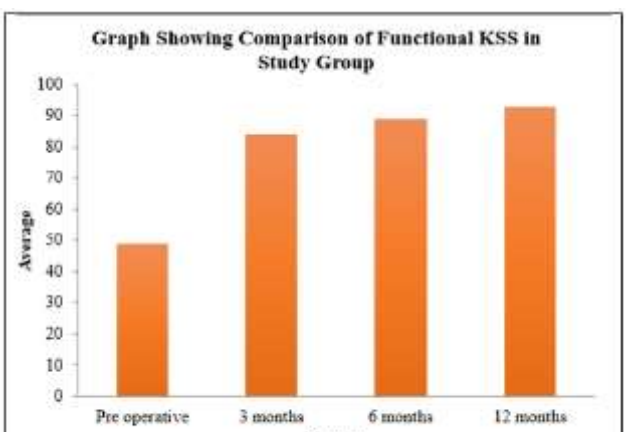


Graph 7

Functional knee society score also improved significantly from a mean of 48.85 in preoperative period to a mean of 83.97 at 3 months, 88.72 at 6 months and 92.76 at 12 months postoperatively.

Score at	Functional KSS Mean ±SD(n=39)	t Value	p Value
Preoperative	48.85 ± 19.35	-	-
3 months	83.97 ± 11.48	11.38	<0.0001
6 months	88.72 ± 17.42	9.99	<0.0001
12 months	92.76 ± 6.85	10.07	<0.0001

Table 7. Comparison of Functional Knee Society Score (KSS) in Study Group



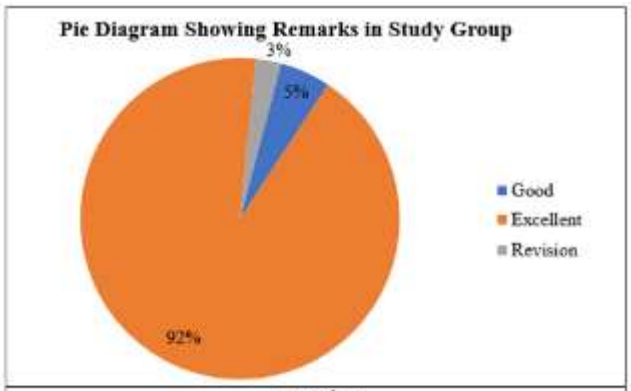
Graph 8

As graded with the knee society score, finally 36 of the total knees (92.31) had excellent outcome, and 2 knees had good outcome. There was one knee which required revision

total knee arthroplasty as a two-stage procedure, because of the deep infection.

Remark	No of Knee	Percentage
Good	2	5.13
Excellent	36	92.31
Revision	1	2.56
Total	39	100

Table 8. Remark in Study Group



Graph 9

In the present series, we studied 30 patients (total 39 knees) of osteoarthritis knee, all were undergone total knee arthroplasty using Rotating platform (PS 150) high flexion knee prosthesis, and followed up for a period of 1 year.

Mean age of the pt was 64 mean, female to male ratio was 2:1; 18 right and 21 were left knees. Majority of the pts (13,43.33%) are of normal BMI, 10 patients are overweight (33.33%), and 7 patients (23.33%) are obese. 25 cases(64%) were grade 4 osteoarthritis, and 14 cases (35.9%) of grade 3 osteoarthritis.

We evaluated all cases with visual analogue scale (VAS), activities of daily living (ADL), knee society score, flexion and stability of the knee, in preoperative period, postoperatively and 3 months, 6 months and at 12 months follow up. X-rays are taken at each follow up.

VAS continuously improved in each follow up, and at the end of 1 year only 3 patients had mild pain, other were painless. ($p<0.0001$).

Knee society score (clinical) was mean 42 ± 14.98, preoperatively which improved to 93.39 ± 5.41 at the final follow up at 1 year. ($p<0.0001$). Functional knee society score was mean 48.85 ± 19.35 preoperative then improved to 92.76 ± 6.85 at 1 year follow up. ($p<0.0001$)

As compared to preoperative period, activities of daily living (ADL) have improved significantly in post-operative period from mean of 24.44 ± 11.02 to 39.55 ± 5.19 at 1 year follow up. ($p<0.0001$)

Flexion was mean 97 degrees preoperatively which has decreased to 84 in early post-operative period but increased to a mean of 112 degrees at first 3 months, then at 6&12 months, with a mean of 115 degrees and 130 degrees respectively. ($p<0.0001$)

Both anteroposterior and mediolateral stability is improved in post-operative period and then no much difference found in the further follow up period.

There were 2 cases of superficial infection which was managed on intravenous antibiotics for extended period of 1wk and 3 weeks, and the infection was settled.

Two other cases got swelling over the operation site on the lateral aspect of the knee which was related to extensive lateral patellar retinacular release. In both patients the swelling decreased with local ice fomentation and cryo cuff application.

One patient had deep infection after 6 months of the operation, and septic loosening was present on X-ray at medial tibial condyle, which required two staged procedure, implant removal and antibiotic impregnated cement spacer then revision total knee arthroplasty.

No patient had platform dislocation, periprosthetic osteolysis from backside wear of the bearing surface, aseptic loosening, periprosthetic fractures in our series.

The limitation of our series was the follow up period is very small, and all the results needs further long term follow up.

CONCLUSIONS

Rotating Platform (PS 150) High Flexion Knee is intellectually interesting option in younger and active patients. Hyperflexion is easier in these patients and hence useful in Asian population for social custom.

Recommendations

- As total knee arthroplasty with rotating platform high flexion knee is a technically very demanding surgery, it requires precise ligament balancing of flexion and extension gap.
- Tibial slope should mimic natural slope of Tibia.
- Pre-operative flexion less than 110º is contraindicated.
- Not to be indicated in patients with more than 15º FFD.
- Younger & active patients can be considered for RPF.

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