www.jmscr.igmpublication.org
Impact Factor 5.244
Index Copernicus Value: 83.27
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: http://dx.doi.org/10.18535/jmscr/v4i9.75

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Functional Outcomes of Total Knee Arthroplasty in Primary Osteoarthrits Knee Using HSS Scoring System

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INTRODUCTION

Knee pain is one of the most common complaints that brings a patient to the doctor. Knee pain is caused by a wide spectrum of disorders, ranging from traumatic injuries to the soft tissue, disruption of ligaments or menisci, infections, rheumatoid arthritis, and degenerative conditions of the joint. Patients (often athletes) with traumatic injuries present in the acute setting, often with a history of antecedent trauma to the extremity, resulting in damage to ligaments, menisci, and bones. Occasionally, rheumatoid arthritis starts in the knee as a chronic mono-articular synovitis. Sooner or later, however, other joints become involved. Osteoarthritis is a chronic joint disorder in which there is progressive softening and disintegration of articular cartilage accompanied by new growth of a bone at the joint margins & capsular fibrosis. It differs from simple wear &tear in several ways: is asymmetrically distributed & often localized to one part of a joint & is related to abnormal loading rather than frictional wear[1]. Osteoarthritis is the result of mechanical & biological events that destabilize the normal process of degradation & synthesis of articular cartilage chondrocytes, extracellular matrix & subchondral bone. Osteoarthritis is classified as primary (idiopathic) and secondary. Primary is generally polyarticular degenerative arthritis of unknown origin & rarely occurs before 35yrs of age. Progression is slow & prognosis is better. It is especially seen in weight bearing joints & is more common in obese patients older than 50yrs. Secondary osteoarthritis is usually monoarticular in which the reaction of a joint to some condition has produced incongruity in its surfaces. Mechanical derangement, pyogenic infections, congenital anomaly, physeal separation, fracture into a joint & ligament instability are among common causes of secondary osteoarthritis. It has rapid progression & worse prognosis than primary osteoarthritis. The end result of both types is same. [2]Knee being a weight bearing joint is severely affected by degenerative changes & is the most commonly affected joint in osteoarthritis.[3] Knee joint is involved in osteoarthritis because not only is it a weight bearing joint but also of the reason that its highly mobile joint with lack of intrinsic stability & the latter factors subject the knee joint to eccentric distribution of normal stresses.Patient with osteoarthritis of knee presents after middle age. Symptoms center on one or two of the weight bearing joints (hip or knee). Pain is usual presenting symptom, other symptoms include swelling, stiffness, deformity, lossOf function & muscle wasting. Typically the symptoms of osteoarthritis follow an intermittent course with

periods of remission sometimes lasting for months. [1] Pain in early stages of Osteoarthritis can be managed by conservative means e.g. rest, modifying daily activities (avoiding stairs, using a cane), isometric knee exercises, weight reduction in obese, moist heat & non-steroidal analgesics. Intra articular injections change the biomechanical characteristics of articular cartilage. [3]

Osteoarthritis knee can also be managed surgically, by excision of loose bodies, arthroscopic joint debridement & replacement arthroplasty. All of these procedures have their merits & demerits. Removal of loose bodies and arthroscopic debridement gives only symptomatic relief with the disease process remaining undisturbed and there is recurrence. Total knee arthroplasty is the definitive treatment modality with early ambulation, weight bearing and long lasting results.

AIMS AND OBJECTIVES

To evaluate functional results of Total Knee Arthroplasty in symptomatic patients of primary osteoarthritis knee, with posterior cruciate ligament substituting implantusing hospital for special surgery scoring system

MATERIALS AND METHODS

The study was conducted at the Postgraduate Department of Orthopaedics; Government Medical College, Srinagar. After obtaining approval from Hospital Ethics Committee, a written informed consent was taken from the patients for participation in this study. The present prospective study consisted of a total of 25 cases of total knee replacement for symptomatic patients with primary osteoarthritis knee using posterior cruciate ligament substituting implant.

Patient Inclusion Criteria

- Age >55
- Either sex
- Primary osteoarthritis
- Grade 3, 4 Kellgren & Lawrence.[4]

Patient Exclusion Criteria

- Age <55 years
- Grade 1, 2 Kellgren & Lawrence
- H/o knee infection
- Extensor mechanism dysfunction
- Secondary osteoarthritis
- Neurological disorders

Preoperative Planning

All patients were admitted in the hospital, the procedure was explained to them, & written consent was taken. A detailed history was taken. Special attention was directed towards the assessment of, range of motion of knee, ligamentous stability & alignment.Complete systemic & local examination was done. Routine investigations (CBC, ESR, CRP, KFT, Electro-lytes, BT/CT, Blood sugar, Serology for viral antigens/antibodies, urine examination) were also performed. Standard AP weight bearing view was taken to look for medial and lateral joint compartments, the patella, presence of any osteophytes and subchondral bony changes at the joint Lateral view was taken to look for any osteophytes, patella and calculation of posterior proximal tibial angle and posterior distal femoral angle Skyline view was taken to look for patellofemoral joint Scan gram of lower limbs was taken to look for alignment of tibia and femur, anatomical and mechanical axes and calculation of lateral distal femoral angle and medial proximal tibial angle Chest X-ray and ECG were also done. Various scores including WOMAC score [Western Ontario MacMallister], Hospital for Special Surgery score and Knee Society Score have been used in total knee arthroplastyWe have used Hospital for Special Surgery Score in our study.

The HSS Score [5]

Pain	**30**
No pain on walking	15
Mild pain on walking	10
Moderate pain on walking	5
Severe pain on walking	0
No pain at rest	15
Mild pain at rest	10
Moderate pain at rest	5
Severe pain at rest	0
Function	**22**
Walking and standing unlimited	12
Walking distance of 5 to 10 blocksand standing ability intermittent (<30 minutes)	10
Walking 1 to 5 blocks and standing ability up to 30 minutes	8
Walking less than 1 block	4
Cannot walk	0
Climbing stairs	5
Climbing stairs with support	2
Transfer activity	5
Transfer activity with support	2
Range of movement	*18*
each 8° of arc motion	1
Muscle strength	**10**
Excellent: cannot break the quadriceps power	10
Good: can break the quadriceps power	8
Fair: moves through the arc of motion	4
Poor: cannot move through the arc of motion	0
Instability	**10**
None	10
Mild: 0 to 5°	8
Moderate: 5° to 15°	5
Severe: more than 15°	0
Fixed deformity	**10**
No deformity	10
Less than 5°	8
5° to 10°	5
More than 10°	0
Subtraction	**0**
One cane	1
One crutch	2
Two crutches	3
Extension lag of 5°	2
Extension lag of 10°	3
Extension lag of 15°	5
Each 5° of varus	1
Each 5° of valgus	1
Final score	**100**
Score 85 to 100	Excellent
70 to 84	Good
60 to 69	Fair
<60	Poor

Operative Procedure [6,7,8,9,10,11,12]

- Surgery was done under epidural/spinal or combined anesthesia, under tourniquet.IV antibiotic was given before inflating tourniquet The patient was kept in supine position and carefully prepared and draped. standard midline skin incision measuring about 12-15 cm was made with the knee in flexion.The standard medial Para patellar approach was used. The patella was everted.Knee joint was completely exposed. Anterior Fat pad removed. Medially soft tissue sleeve was dissected from tibial metaphysis up to midline.The ACL, PCL, medial and lateral menisci were excised .With flexion, external rotation and anterior displacement tibia was subluxed forwards Tibia was cut perpendicular to its mechanical axis using extra medullary alignment device with posterior slope, and approximately 6 to 8 mm of the proximal tibia was removed as measured from the intact compartment. Medullary canal of femur was entered about 1cm above origin of PCL and few mm medial to the true centre of intercondylar notch .Distal femoral cut was made at a valgus angle (usually 5 to 7 degrees) perpendicular to the predetermi-ned mechanical axis of the femur. The amount of bone removed generally was the same as that to be replaced by the femoral component. The sizing of femoral component was done by attaching A/P Sizing Guide, flat onto the smoothly cut distal femur The guide was applied so that the flat surface of the A/P Sizing Guide was flush against the resected surface of the distal femur and the feet of the A/P Sizing Guide were flush against the posterior condyles.Femoral finishing guide was attached to distal femur after sizing Anterior and posterior cuts were made Chamfer and box cuts were made after this.The prepared distal femur was again checked for any osteophytes. With knee in 90 degrees of flexion, and extension spacers were placed between finished femur and proximal tibial cut surfaces. Any residual discrepancies in the flexion and extension gaps was corrected .Patella was inspected and any osteophytes if present were removed Circumcision of patella was done using cautery. Femoral canal entry was plugged with a bony piece. Trial components (both tibia and femur) were placed, the knee was moved in flexion and extension to check patellar tracking. Alignment was checked When ligamentous balancing was satisfactory, and the extensor cleaned with a thorough normal saline wash and surfaces were dried with clean sponge .The trial tibial tray along with alignment handle was put on cut surface and fixed with two pins. Appropriate sized modular punch guide with drill bushing on drill was applied on tibial tray The drilled area was widenedAppropriate sized modular tray keel punch was subsequently positioned through guide and impacted with hammer until shoulder of the punch was in contact with guideTibia was cemented first.The tibial tray was gently hammered at its place.Excess cement was removed from the periphery of the component.After the tibial component was completely seated, the knee was flexed, to expose the distal femur.The femoral component was placed after completely cementing the distal prepared femur and the implant. The femoral component was gently hammered to its place. The knee was extended carefully with a trial tibial spacer in place to ensure complete seating of the femoral prosthesis.Search for any bone or cement debris was done, and removed, if found. Thorough joint lavage was given with normal saline to remove any bony or cement debris present inside the joint.The

joint was once again inspected before closure.Wound closure was done over suction drain ASD applied Compression bandage applied Tourniquet was removed Knee brace applied

Postoperative Care [13,14,15,16,17,18]

- Fluid & electrolyte balance. Monitoring Vitals. I.V antibiotics. Pain relief. Bowel& bladder care. Patient was admitted for 3-4 days & received I.V antibiotics and anticoagulant. A standard AP & lateral view of knee with proximal tibia & distal femur was taken on first post-operative day to look for sizing, alignment and cementing. Static quadriceps exercise & ROM of ankle/ ankle pumps were started on first post-operative day. Suction drain was removed after 24 hoursActive and passive ROM of knee were started on 1st post-operative day and toe touch to partial weight bearing was allowed as per tolerance starting the 2nd post-operative day with knee brace.Patient was discharged on 3rd to 5th post-operative day with the instructions to do weight bearing as tolerated.IV antibiotics were continued for another 4 days followed by oral antibiotics till first follow-up.

1st F/U 2 Weeks; -

- Assessment of following parameters was done *Severity of pain* ROM of knee Swelling, inflammation DVT, infection, or any other complication Distal neurovas-cular status removal of stitches/staples.

2nd follow up: - 4 week

- Severity of pain was assessedROM of knee, ankle Other complications were checked for.

3rd follow up at 6-Weeks: -

- Severity of pain was assessed. The incision site was inspected for any swelling/ infection. Rom exercises of knee and ankle were encouraged. The patient was advised continuous ROM of knee, ankle and muscle strengthening exercises

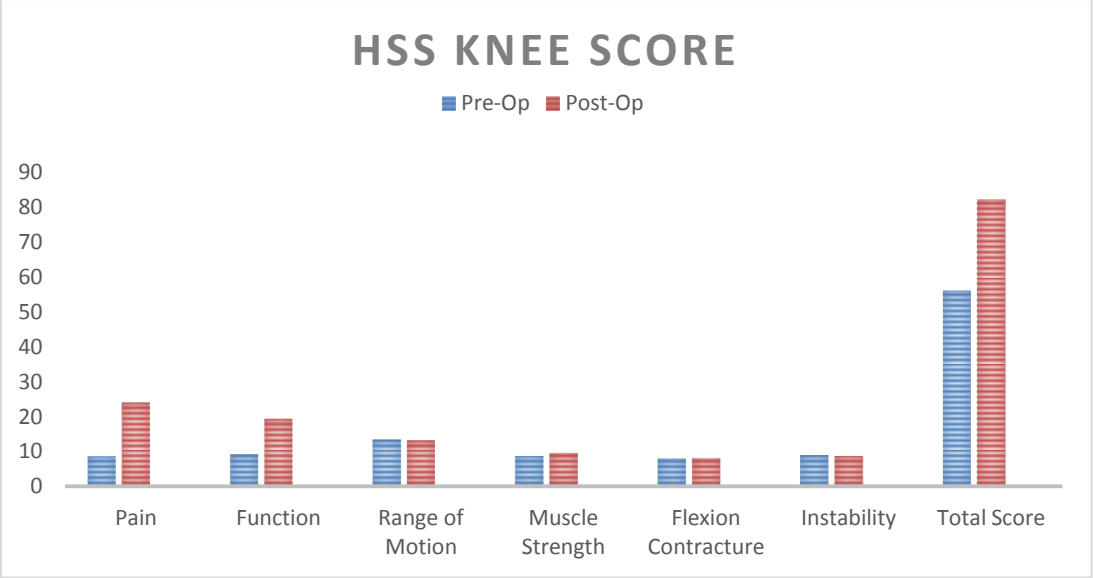
Final Follow Up Was Done at 6 Months

- Functional assessment was done using HSS knee scoreRadiological assessment was done by calculating lateral distal femoral angle and medial proximal tibial angle for coronal alignment and posterior distal femoral angle and posterior proximal tibial angle for sagittal alignment 0n anteroposterior and lateral views respectively between the anatomical axis of femur and tibia with the line tangent to components at joint The axis of femur was determined by connecting a point midway between medial and lateral cortices as far proximally as image allows to a similar point 10 cm proximal to the joint line The axis of tibia was determined by connecting a point midway between medial and lateral cortices as far distally as image allows to a similar point 10 cm distal to the joint line.

OBSERVATIONS AND RESULTS

TABLE 6 PRE- AND POST-OPERATIVE SCORES ACCORDING TO VARIOUS PARAMETERS OF HSS KNEE SCORE

		N	Mean	Std. Deviation	Min	Max	'p' value
Pain	Pre	25	8.6	3.68	0	15	0.000
	Post	25	24	5.20	5	30	
Function	Pre	25	9.28	2.37	0	12	0.000
	Post	25	19.36	3.13	6	22	
Range of Motion	Pre	25	13.48	1.19	11	16	0.381
	Post	25	13.2	1.29	11	16	
Muscle Strength	Pre	25	8.64	1.11	6	10	0.005
	Post	25	9.52	1.32	4	10	
Flexion Contracture	Pre	25	8.04	0.84	5	10	0.664
	Post	25	8.12	0.93	0	10	
Instability	Pre	25	8.96	1.02	8	10	0.417
	Post	25	8.72	0.98	8	10	
Total Score	Pre	25	56.00	6.76	33	66	0.000
	Post	25	82.12	11.88	35	96	



N represents the total number of patients included in the study. A p value of less than 0.05 indicates statistical significance. For the total score, and each of the parameters, higher score implies lesser disability. The mean pre-operative score was 56.00, the maximum score being 66, and the minimum being 33. The mean post-operative score was 82.12, the maximum being 96, and the minimum being 35.With regards to different parameters in the scoring system i.e. Pain, Function, Range of motion, Muscle strength, Flexion contracture, and Instability; there was a statistically significant improvement in the post-operative total score as compared to the pre-operative score.

DISCUSSION

Study		Cem Coskun et al (2013)[19]	Hernández-Vaquero D et al(2006)[20]	P. L. S. Li, et al (1998)[21]	Julian A Feller, et al (1996)[22]	Present Study
Hospital for Special Surgery Score	Pre-Op	58.60	53.43	31.00	61.6	56.92
	Post-Op	90.20	85.57	79.00	88.6	82.72

Disabling pain, leading to significant functional impairment was one of the most common indications for performing total knee arthroplasty in our study.In our study of 25 patients, pain and function were the two parameters that showed marked improvement following our intervention. However, there was little difference with regards to range of motion, instability, and flexion contracture. The total HSS score improved from 56.92 to 82.72A study on total knee arthroplasty incorporating the standard technique, conducted by Cem Coskun et al, showed an improvement of the HSS score to 90.20 from a mean pre-op score of 58.60. The mean follow-up duration of the patients in this study was 29 months.Another study comparing the results of total knee arthroplasty between patients younger than 75 and patients older than 75 years showed an improvement of the HSS score from a mean of 53.43 to 85.57. This study was conducted by Vaquero et al, and the follow-up duration in this study was 2 years.A yet another study by Feller et al, comparing patellar resurfacing versus retention showed an improvement of the HSS score from a mean pre-op of 61.6 to a mean post-op of 88.6 (between the patellar retention group).

The present study, with its mean HSS score improving from a mean of 56.92, to a mean post-operative score of 82.72, is comparable to the above mentioned studies that have been conducted in the past.

SUMMARY AND CONCLUSION

Total knee arthroplasty is a surgical procedure done primarily to relieve pain and improve functional ability of the patients. This was a prospective study carried out in 25 patients with primary osteoarthritis of the knee, who underwent total knee arthroplasty and were available for follow up.The mean age of patients was 65.72, with a range of 58 to 78 years. There were 11 males and 14 females. 48% patients had right sided involvement, and 52 % had left sided involvement. The average duration of surgery in our study was 110.8 minutes; the maximum being 130 minutes. The mean blood loss in our study was 806mL.The mean duration of hospital stay in our study was 6.68 days. Complications were superficial wound infection in one, and knee stiffness in two cases. Minimum follow up was 30 weeks, and maximum was 72 weeks. The mean HSS score improved from a preoperative mean score of 56.00 to a postoperative mean score of 82.12.We had 1 poor result, 14 good results, and 10 excellent results. The success of total knee arthroplasty, as observed in our study, lies in its ability to relieve the patients' symptoms mainly pain, and enhance their quality of living by increasing function of the knee joint; all at the risk of minimal complications arising out of the procedure

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