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RESEARCH ARTICLE

RETROSPECTIVE ANALYSIS OF FUNCTIONAL OUTCOME OF TOTAL KNEE REPLACEMENT IN RURAL TEACHING SETUP

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Abstract

Background: Indian population is mainly residing in two areas- urban and rural. The literature has shown consistent results following knee joint replacement surgeries, however these studies have been done in highly efficient and equipped hospitals in urban areas.

Aim: The aim of this study was to compare outcome at a rural set-up with those at a high-end teaching or corporate hospital in urban set-up from published literature. **Materials and Methods:** This study was an observational and retrospective analysis. Observation data was collected from January, 2020 and April, 2021. This study included follow-up of 60 total knee joint replacements.

Results: In our study of total knee joint replacement surgeries in rural teaching set-up, we achieved 95.39% results (excellent) while the remaining 4.61% results were good.

Conclusion: This study confirmed that results of total knee replacement are comparable to any other highly well equipped urban center, if all basic surgical principles including aseptic precautions are stringently followed-up. Further the clinical outcomes in our cases was more surgeon dependent rather than technology dependent as all surgeries were performed by one single surgeon.

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Introduction:-

Total replacement of knee took approximately three and a half decades to evolve to its present form. Improvement in knee joint functioning by modification of articular joint surfaces has been a subject of attention since 19th century. Earliest example of this was in year, 1860 when Verneuil had suggested inter-position of soft tissues for reconstruction of articular surfaces by utilizing substances such as - pig bladder, nylon, fascia lata, pre-patellar bursa. However, these materials yielded poor result. Ferguson 1860 performed resection of complete knee joint that caused in mobilization of newly formed sub-chondral surfaces.¹

Hinged prosthesis were first advocated by Walldius (1957) and Shiers (1965).^{2,3} The designs for these prosthesis were non-cemented.³ Later advancement was in form of "Guepar hinged prosthesis, a cemented model with posteriorly placed axis of rotation. However, major drawbacks of these hinged designs were their loosening as well as infection. MacIntosh (1966) described a type of hemi-arthroplasty.⁴ Sir John Charnley's work (1958) on total replacement of hip joint with low-friction arthroplasty had generated interest in application of similar concept to knee joint. Gunston and Charnley (1971) designed a polycentric knee.⁵ Coventry et al (1972) developed Geometric

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knee which provided joint stabilization with preservation of cruciate ligaments.⁶ Marmor (1973) designed modular knee for uni- & bi-compartment replacement.⁷

Total Condylar Prosthesis which was designed by Insall et al (1973) marked beginning of modern era of total knee arthroplasty. This design bears similarity to original total condylar design which makes use of sagittal plane concavity or dishing for controlling antero-posterior stabilization. Stabilization of knee joint is complex issue and results in involvement of ligaments on medial and lateral sides. Thus, a correct positioning of all components and adequate soft-tissue balance are important steps in a successful total knee arthroplasty.⁸ Total knee prosthesis which is implanted “too tightly” may result in a limited range of motions and also, can severely compromise patient satisfaction. On the other hand, total knee replacement which is implanted “too loosely” may be unstable.⁹ Thus, medial-lateral instability is most common type of instability which results from incompetent collateral ligaments, incomplete correction of pre-operative deformity or incorrect bone cuts.¹⁰ Instability has been identified as a major cause of early clinical failure of primary total knee replacement that may result in revision surgery within a span three to five years.^{11, 12}

Presently, computer-assisted surgery is newer approach for total knee replacement wherein a patient's anatomy is simulated and displayed on computer screen which gives real-time information to surgeon who provides assistance with bone cuts as well as alignment of parts. Thus, based on existing literature evidence, the aim and objectives of present study were- a) To critically evaluate the clinical outcome of the total knee joint replacement surgeries; b) To compare both clinical and functional outcomes of total knee joint replacement surgeries with performed at present set-up with similar published data; c) to analyze any complications and to assess causes and solutions and d) To evaluate the outcome of total knee joint replacements keeping in mind the necessary alterations made in standard surgical protocol.

Materials And Methods:-

This retrospective cross-sectional study was conducted in a rural teaching set-up between January, 2020 and April, 2021. Total of 60 patients were operated by a single Orthopedic surgeon along with a changing surgical team for total knee replacement. The inclusion criteria for the study were- a) those patients who were willing to participate in this study and b) All cases of total knee replacement surgery irrespective of age and medical condition. Exclusion criteria included- a) Patients who were unwilling for participation in current study and b) Cases with short term follow-up i.e., lesser than six months.

All patients included in this study were firstly examined in Out-Patient Department. Patient related information such as - name, age, gender, hospital registration number, occupation, pain with detailed characteristics, presence or absence of limp, duration of symptoms, progression of symptoms, associated deformity, if support was required for walking, any history of trauma and history of any other joint pain.

Pre-operative medical evaluation of patients was performed to assess any patients' capability to withstand anesthesia and peri-operative loss of blood. Routine chest X-ray, ECG, CBC and ESR, anti- HIV, anti-HbsAg, CRP levels, RA factor, LFT, RFT, Random Blood Sugar levels, 2-D echocardiography and serum electrolytes investigations were done. Patients who were diagnosed with any systemic disease such as- hypertension and diabetes mellitus were treated following the advice of a physician.

For radiographic assessment of knee joints, Antero-Posterior view while standing, lateral view, sky-line view and long leg roentgenogram were performed. Clinical evaluation was performed by assessing a patient using the Knee Society Score criteria.

Pre-operative surgery planning and template designing was done for choosing the correct model and proper size of a prosthesis and for correct positioning.

Combined spinal and epidural anesthesia were given to most of the patients. Use of epidural anesthesia allowed usage of indwelling catheter for a post-operative duration of 48 to 72 hours for pain control. Preoperatively, broad-spectrum antibiotics- injectable Cefoperazone in combination with Sulbactam (1.5 gm) was given to the patient half an hour before performing surgery. Post-operative asepsis was maintained, no one was allowed to meet till 24 hours and physiotherapy was done. Following surgery, patient knee was immobilised in Jones compressive bandage

immediately. All patients were prescribed I.V. antibiotics followed by changing of dressing and progressive physiotherapeutic mobilization.

The collected data was analyzed using appropriate statistical tools- SPSS and EPI software analysis. "P" values equal to or less than 0.05 was considered as statistically significant.

Results And Observations:-

In current study on analyzing age distribution, patients were aged between 61 to 70 years (table 1). On analyzing gender distribution in present study, there were 30 female and 30 male subjects (table 2). Of 60, total knee replacements done in our study, 47 were on right side and 13 on left side.

2 cases of superficial infections were observed which recovered at the end of two weeks. None of the cases had infection at final follow up. In our study, the average knee clinical score preoperatively was found to be 40.35 while the average post-operative score was 90.88 while the average knee functional score was 35.99 pre-operatively which increased to an average score of 95.11 post-operatively. Present study demonstrated excellent post-operative results in 95.39% cases while 4.61% cases showed good result.

Discussion:-

Total Knee Arthroplasty is mostly an effective procedure and is associated with return of good functional improvement. Older patients having difficulty with mobility due to degenerative arthritis reported good symptomatic relief in joint pain, increase in mobility, correction of deformity and improvement in quality of life following this procedure.

Total knee joint replacement surgeries have shown an exponential increase over past decade due to increase in longevity of life thus, a rising aging population. However, most of patients who have undergone this surgery belong majorly to urban population. However, owing to economic development and availability of insurance facilitates in rural areas along with an increase in longevity of life, there is also an increase in incidence of total knee joint replacement surgeries in rural population as well.

However there are certain short-comings in rural areas such as lack of advanced technology in hospitals and lack of expertise. Hence, these knee joint replacement surgeries are limited to urban corporate hospitals due to which patients are required to travel to urban areas for availing these surgeries. This results in infrequent and inadequate follow-up due to greater distance for travelling and expense that are involved for making visit to any urban centre.

Therefore, this study was done to analyze outcomes of total knee joint replacement surgeries in a rural set-up. In present study, patient's age who underwent total knee joint replacement surgery was found to range between 61-70 years. Our findings are supported by Ranawat et al, who reported mean age of 70 years which clearly indicated an earlier age of onset of osteoarthritis in Indian population as compared to western population. This may be attributed to habit of squatting and sitting cross-legged traditionally which results in an early onset of osteoarthritis of knees in Indian population.¹³

In current study, 50% of study subjects were males while 50% were females. Thus, in our study equal preponderance in knee osteoarthritis was noted. In present total knee replacement series, 47 on right side and 13 on left side.

In our series of total knee joint replacement surgeries, we had minimum follow-up duration of 6 months and maximum 18 months which is short to medium-term follow-up for any joint replacement surgery. In this study, all 60 cases underwent cemented total knee replacement surgery of which two patients had suffered from superficial infection, one of which had undergone bilateral replacement while the other patient had undergone unilateral knee replacement. Both the patients had fully recovered at end of two weeks.

There are chances of development of deep vein thrombosis around 40-80% without any form of mechanical or pharmacological prophylaxis.¹³ However, in our study, this could be prevented due to early mobilization and ankle pump exercises. In case series of Dennis et al, 1.7% cases of superficial infection were noted.¹⁴

As far as the indications are concerned, most of the patients in this study were suffering from advanced primary tri-compartmental osteoarthritis. This is comparable to studies performed by Barrack which showed primary osteoarthritis of knee as a most common cause.¹⁵ Only six patients had other causes, two of them had bilateral rheumatoid arthritis, one had tuberculosis and one had post-traumatic arthritis.

The “Knee Society” Scoring system distinguishes between findings in operated knees with findings in patient functioning. This scoring system has been sub-divided into- i) knee clinical score which demonstrates only the knee joint and ii) knee functional score which rates a patient’s ability for walking and climbing stairs. The knee clinical score is not affected by co-morbid conditions. The scoring system combines a relatively objective knee clinical score which is based up on various clinical parameters and knee functional score which is based on patient perception of knee functioning with specific activities.

In our study, a significant improvement in Knee Clinical and Knee Functional Scores were noted following Total Knee Arthroplasty. The average knee clinical score pre-operatively was observed to be 40.35 while the average post-operative clinical score was found to be 90.88 while the average knee functional score was found to be 35.99 pre-operatively which increased to an average score of 95.11, post-operatively. Our findings were comparable to similar series published by Ranawat et al¹⁶ and Insall JN et al¹⁷. We achieved 95.39% result in our series of total knee replacement at our rural teaching setup which is an excellent outcome.

Conclusion:-

In our retrospective study of critical analysis of total knee joint replacement surgeries performed at tertiary teaching medical set-up situated in rural area, with constrained set-up, we concluded that clinical and functional results of total knee joint replacement surgeries that are usually performed in a high-end urban set-up suited with latest facilities can also be achieved in tertiary teaching rural medical set-up, if there is an availability of experienced senior surgeons and adequate man-power. Results in a tertiary set-up in rural area may be achieved with strict adherence and following of code of conduct in all steps of operative procedure which included pre-operative, intra-operative and post-operative period.

Table 1:- Table illustrating age distribution.

Age Group (years)	No. of total knee replacement
51-60	25
61-70	12
71-80	12
>80	11
Total	60

Table 2:- Table illustrating gender distribution.

Sex	No. of total knee replacement
Male	30
Female	30
Total	60

Table 3:- Table illustrating laterality.

Side	No. of total knee replacement
Right	47
Left	13
Total	60

Table 4:- Knee Society Score – Clinical.

CLINICAL SCORE	PRE-OP	POST-OP
0-10	06	00
11-20	00	00
21-30	07	00
31-40	17	00

41-50	08	00
51-60	22	00
61-70	00	00
71-80	00	00
81-90	00	38
91-100	00	22

Table 5:- Knee Society Score – Functional.

FUNCTION SCORE	PRE-OP	POST-OP
0-10	05	00
11-20	04	00
21-30	13	00
31-40	23	00
41-50	06	00
51-60	09	00
61-70	00	02
71-80	00	01
81-90	00	14
91-100	00	43

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