

# Outcome of Total Knee Arthroplasty with Insall Burstein-II Prosthesis

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## ABSTRACT

**Introduction:** Patients with severe degenerative knee joint disease often require knee arthroplasty to reduce pain, improve stability and restore function. Insall Burstein II prosthesis is posteriorly stabilized condylar prosthesis, which provide posterior cruciate ligament substitution. It was designed to improve range of motion, stair climbing ability and to prevent posterior subluxation. **Objectives:** Evaluate the functional outcome of total knee arthroplasty with IB II prosthesis and Evaluate the alignment of prosthetic components by radiological parameters and its correlation with functional outcome. **Study Design:** It was a case series descriptive study. **Setting:** Department of Orthopaedic Surgery at Shaikh Zayed Hospital, Lahore. **Duration of the Study:** It was carried out in 3 years form 1st September 2003 to 31<sup>st</sup> August 2006. **Subject and Methods:** Sixty knees of sixty patients were replaced by using Insall Burstein II prosthesis. Postoperative radiographs were evaluated for alignment of knee and prosthetic components by criteria selected from knee society roentgenographic evaluation system. Functional outcome was evaluated by rationale of knee society knee rating system. **Results:** Prosthetic component was aligned in 93% and mal-alignment in 7% of the cases. There was significant improvement in function score from mean score  $33.83 \pm 15.5$  to  $59.5 \pm 7.7$  and knee score from  $37 \pm 12.5$  to  $76.4 \pm 2.2$ . Postoperative functional score was found correlated with alignment significantly. **Conclusion:** Total knee arthroplasty with I-B-II prosthesis is a safe durable and predictable procedure with proper surgical technique and expertise good alignment and satisfactory functional out come can be achieved.

**Key Words:** Total Knee Arthroplasty, Osteoarthritis and Rheumatoid Arthritis.

## INTRODUCTION

Knee pain is the common presenting complaint in the middle age and elderly patients, interfering with and limiting the activities of daily living. Pain free and mobile knee joint is essential for good quality of life.<sup>1</sup>

Knee osteoarthritis is common cause of severe pain and functional limitations, affecting approximately 6% of adult population; this percentage increases in people who are more than fifty-five years old.<sup>2</sup>

Rheumatoid arthritis is another disabling disease affecting the knee joint along with other joints involvement. Females are affected more commonly than males, in a ratio of 2.5:1.<sup>3</sup>

The primary management of the knee pain is

with analgesics, change of life style, physiotherapy, intra articular steroids or hyaluronic acid injections.<sup>4,5,6</sup> However, after failure of this conservative management, options left for treatment include arthroscopic joint lavage and debridement, open debridement, high tibial osteotomy for medial or lateral uni-compartmental osteoarthritis, hemi or total knee arthroplasty<sup>1</sup> and arthrodesis.<sup>7,8</sup>

The posterior stabilized condylar knee (Insall Burstein-II) is an improvement of the total condylar design evolved in 1987. It was designed to provide posterior cruciate ligament substitution by means of a central post in tibial component, which articulates against a transverse cam on the femoral component. It was designed specifically to improve range of motion, stair climbing ability and to prevent posterior subluxation.<sup>9</sup> This prosthesis has excellent

knee score and pain free range of motion up to 120 degree with stability<sup>10,11</sup>. Also demonstrated excellent survivorship of the prosthesis 96% over 10 years.<sup>12,13</sup>

Alignment refers to relationship of each prosthetic component to the relevant bone as well as over all alignment of the limb. Incorrect alignment can lead to decrease functional score, abnormal wear, premature loosening and need for revision.<sup>14,15</sup>

## OBJECTIVES

The objectives of this study was:

1. Evaluate the functional outcome of total knee arthroplasty with IB II prosthesis.
2. Evaluate the alignment of prosthetic components by radiological parameters and its correlation with functional outcome.

## MATERIALS AND METHODS

### Study design

It was a case series descriptive study.

### Place of study

This study was carried out at the Department of Orthopaedic Surgery Federal Postgraduate Medical Institute, Shaikh Zayed Hospital, Lahore.

### Duration of study

This study was carried out in three years from 1<sup>st</sup> September 2003 to 31<sup>st</sup> August 2006.

### Sample size

Sixty cases of primary total knee replacement with IB-II prosthesis were selected on convenient bases.

All patients were operated by single surgeon.

Follow up was done at two weeks for examination of wound and after one month, three month, six month and one year for the complete clinical examination of the patient to evaluate the functional status of the patient and status of the knee. All patients who lost from follow up excluded from the study.

### Data collection

Postoperative radiographs were evaluated for

alignment of prosthetic components and over all alignment of the knee by using criterias (tibiofemoral angle on Anteroposterior view, femoral flexion and tibial angle on both Anteroposterior and lateral views) selected from knee society roentgenographic evaluation and scoring system.<sup>16</sup>

After the mean follow up of 1 year range from 6 months to 2 years. Results were assessed by the Rationale of the Knee Society clinical rating system.<sup>17</sup> Final rating of the results was compiled as excellent (score 85-100), good (70-84), fair (55-69) and poor (<55).

## RESULTS

During this study 60 knees of 60 patients were replaced by using Insall Burstein II prosthesis. Mean age of the patients was 60.47±6.12 years, range 46-75 years.

Male to female ratio 1:2 males were 33.7% and females 67.3%.

Patients of the primary osteoarthritis were (90%) and rheumatoid arthritis were (10%).

Evaluation of the preoperative radiographs revealed mean tibiofemoral angle of 6.7±3.9 degrees varus range from 0-12 degree varus.

On the evaluation of anteroposterior postoperative radiographs mean tibiofemoral angle was (5±0.53) degree range from 4-6 degrees. Mean femoral flexion angle was (96±1.88) degree range from 94-102. Mean tibial angle was (89.7±1.72) degrees with range from 84-92.

On lateral radiographs mean femoral flexion angle was (10.83±1.49) degrees and range from 10-16 degrees. And mean tibial angle was (89.9±1.24) range from 85 to 92 degree.

No tibiofemoral mal-alignment was found. Alignment of prosthetic component was accurate in 56 total knee arthroplasties (94%) and in 4 arthroplasties (6%), prosthetic components was not properly aligned.

Pain in the knee joint was significantly relieved ( $p < 0.05$ ) and pain score was improved from mean preoperative 14.3 to 39.5 postoperatively, 80% patients had no pain or mild pain on stairs climbing 17% had mild pain on walking 3% patients had continuous moderate pain

in the knee postoperatively.

Range of motion was also significantly improved from (Mean  $85 \pm 1.7$ ) range 75-100 degree preoperatively to (Mean  $104 \pm 1.9$ ) range 85-120 degree after total knee replacement.

Preoperative flexion contracture of the knee joint was also improved from knee ( $4.5 \pm 6.06$ ) degree to ( $2.0 \pm 0.45$ ) degree after the total knee arthroplasty

Knee score was also significantly improved ( $p < 0.05$ ) from mean preoperative ( $36.63 \pm 12.5$ ) to ( $76.4 \pm 2.2$ ) postoperatively. Postoperative knee score was excellent in 30%, good in 47%, fair in 20%, poor in 3% of the cases.

Functional score of the patients improved significantly ( $p < 0.05$ ) from the mean score of ( $33.83 \pm 15.52$ ) to ( $59.53 \pm 17.7$ ) range 15-80 score postoperatively. Postoperative function score was excellent in 0 %, good in 40%, fair in 37%, poor in 23%. Details are given in (Fig. 1).

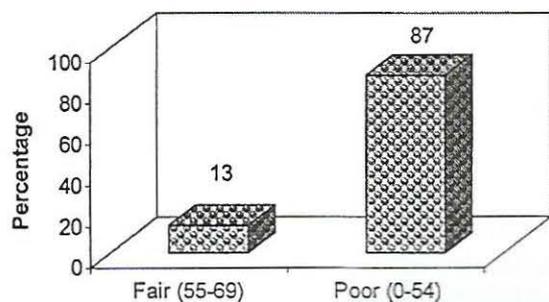


Figure 1: Preoperative Function Score

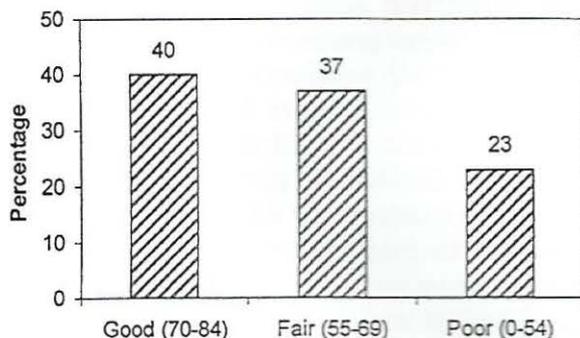


Figure 2: Postoperative Function Score

There was no joint instability in any case. Mediolateral laxity was less than 5 degree in 90% cases, 6 to 9 degree in 10% of the cases. There was

no wound infection or delayed wound healing. No clinical finding of deep vein thrombosis, pulmonary embolism or fat embolism was observed in any case.

During follow up one patient was diagnosed as postoperative patellar subluxation and three patients reported moderate retropatellar pain. The prosthetic components were found mal-aligned on the radiographs of these patients.

Patients with already replaced other knee had better function score and knee score as compared to patients having other knee symptomatic ( $P < 0.05$ ). Both postoperative knee score and functional score was also correlated with preoperative knee score and functional score.

Correlation of the knee score and functional score with alignment of prosthetic components was also noted significantly (Chi-square test revealed  $p < 0.05$ .) Both the patients in which prosthetic components was not aligned had poor knee score and function score (Table 2).

Table 1: Correlation of Alignment of Prosthetic Components and Postoperative Function Score

Functional Score	Mal-alignment (n=4)	Alignment (n=56)
Excellent	-	-
Good	-	24 (43%)
Fair	-	22 (39%)
Poor	4 (100%)	10 (18%)

Table 2: Correlation of Condition of other Limb and Postoperative Function Score

Functional Score	Other Knee Replaced (n=32)	Other Knee Symptomatic (n=28)
Excellent	-	-
Good	22 (69%)	2 (7%)
Fair	8 (25%)	14 (50%)
Poor	2 (6%)	12 (43%)

## DISCUSSION

Total knee arthroplasty is now the accepted management for the patients with severe degenerative joint disease to relieve pain, improve

stability and restore function.<sup>1</sup>

Pain relief is the single most important determinant of long term outcome after total knee arthroplasty following by deformity.<sup>18</sup> Pain after knee replacement resolve quickly. Significant pain after six months of total knee replacement (TKR) may be indicative of abnormal pain.<sup>19</sup>

In the present study all patients had the significant improvement in the severity of pain and 97% patients had no pain or mild pain only during walking and climbing stairs. Continuous moderate pain was recorded in only 3% of the patients.

Range of motion after total knee arthroplasty is an important variable in determining clinical outcome. Motion beyond 90 degree of flexion is beneficial for many activities like walking and going up-stairs, 103 degree of flexion is required for rising out of chair.<sup>20</sup>

Insall et al reported on the Posterior stabilized Total condylar prosthesis that range of motion improved from a mean of 95 degree pre-operatively to 115 degree post-operatively. There was great controversy in literature and high degree of disagreement among various authors on whether the cruciate sacrificing or a cruciate retaining knee replacement give better improvement in post-operative range of motion, as the clinical results using various designs have been essentially the same.<sup>21,22</sup> This controversy is been resolved with the development of posterior cruciate substituting prosthesis "The Insall - Burstein Posterior Stabilized Prosthesis. This design is intended to increase the motion of knee and provide additional stability. Range of motion was increased to an average of 107 degrees with this design as compared to average range of motion of 90 degrees in their previous series in which total condylar prosthesis was used. However, pre-operative range of motion has been found to affect the amount of motion that is regained after any type of knee replacement. In our study range of motion was improved to an average of 105 degree.

Correct positioning of the components and adequate soft tissue balancing are critical steps in successful knee arthroplasty. Optimal alignment of the prosthetic components is fundamental to the achievement of long-term survival of total knee arthroplasty. Incorrect alignment can lead to

decrease survival and patellofemoral problems. There is little margin of error.<sup>14,15</sup> Relation of radiological parameters of the alignment with clinical outcome of TKA is controversial.<sup>23</sup>

In our study correlation of the knee score and functional score with alignment of prosthetic components was noted significantly. Alignment of the components and overall alignment of the knee mainly effects the long-term survival of total knee arthroplasties. Our study period was too short to comment on the survival of the total knee arthroplasties for which a study is required with long term follow up.

Several studies using conventional intra medullary and extra medullary rods reported 10-20% failure to achieve ideal positioning of the components. Many studies suggested that computer assisted knee arthroplasties have improved alignment and have low complications rate and less surgical exposure.<sup>24,25,26</sup>

In our study Alignment of prosthetic component was accurate in 93% of the cases and all the angles are consistent with these studies.<sup>27</sup>

The knee score increased significantly and stayed on a constant level from 2 years on, whereas the function score reached a maximum at 2 years and declined subsequently. The function score is influenced significantly by the walking distance, age, body mass index, and patient category correlating moderately. The knee score is not affected by any of these factors.<sup>28</sup>

Insall et al reported in his study 88% excellent 9% good or fair and 3% poor results with TKA using IB-II prosthesis. Knee score increased from 50 points preoperatively to 90 points post operatively. Shah and Pervaiz also reported good to excellent function score in 90% of the patients and mal-alignment in 10% of total knee arthroplasties with Insall Burstein II prosthesis. Results of our study are consistent with these studies 77% patients had good to excellent and 20% fair knee score. Function score was good in 40% and fair in 37%.<sup>29</sup>

Patients with other knee already replaced had good functional out come as compared to the patients with knee not replaced and symptomatic. In our study the improvement in knee score was (77% good to excellent post operative) was much more than improvement in function score (40% good post

operative). The reason of less improvement in function score was half of the patients had other knee symptomatic which compromised the patient ability to walk and climb stairs. Other reasons were short-term follow up, poor compliance of the patients for physiotherapy and psychological apprehension to the new joint. Even then most of the patients were able to perform their daily activities with little modification because of increased pain free range of motion.

### CONCLUSION

Total condylar knee arthroplasty with Insall Burstein II prosthesis is a safe, durable and predictable procedure. With proper surgical technique and expertise, it is possible to restore the mechanical axis of the knee with stability and 100 degree or more pain free range of motion. Satisfactory functional outcome can be achieved by using IB-II prosthesis.

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