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The posterior stabilized condylar prosthesis : An experience in fifty knees.

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Itiravivong P, Kunnataraporn N. The posterior stabilized condylar prosthesis : An experience in fifty knees. Chula Med J 1988 Dec; 32 (12) : 1061-1067

Posterior stabilized condylar total knee replacement was performed in fourty-six patients, three having seropositive rheumatoid arthritis and fourty three having severe osteoarthritis. Of a total of fifty arthroplasties, pre-operatively, the average varus and valgus angulations measured 20 and 13 degrees respectively. The post-operative reontgenographic measurements showed that seventy two percent of the arthroplastic knees had obtained an ideal alignment of less than five degree valgus angulation. The follow up period was between two and eight years. Clinical results revealed that all patients gained significant relief of pain, an increase in walking ability and a decrease in the necessity for walking aid and analgesics. The majority of complications were related to problems with soft tissue healing and there were two cases of dislocations of patellar prosthesis.

Reprint request : Itiravivong P, Department of Orthopaedics & Rehabilitation Medicine, Faculty of Medicine, Chulalongkorn University.
Received for publication. November 15, 1988.

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พิบูลย์ อิทธิระวิวงศ์, นำชัย คุณธาราภรณ์. หัวเข่าเทียม "โพสทีเรีย สเตบิไลซด์ คอนไดลาร์ พรอสทีสิส" : ประสบการณ์ผ่าตัดใน 50 หัวเข่า. จุฬาลงกรณ์เวชสาร 2531 ธันวาคม; 32(12): 1061-1067

หัวเข่าเทียมทั้งชุดชนิด posterior stabilized condylar prosthesis ได้ถูกใช้ผ่าตัดในผู้ป่วยจำนวน 46 ราย ซึ่งมีข้อบ่งชี้ในการผ่าตัด คือ กระดูกข้อหัวเข่าเสื่อมรุนแรง 43 ราย และโรคกระดูกหัวเข่ารูมาตอยด์ 3 ราย ในจำนวนข้อหัวเข่าผ่าตัดทั้งหมด 50 ข้อ ภาพเอ็กซเรย์การวัดมุมผิดปกติ varus และ valgus ของหัวเข่าก่อนผ่าตัด ได้ถัวเฉลี่ย 20 และ 13 องศา ตามลำดับ หลังผ่าตัดได้มุมหัวเข่าที่เป็นปกติ (ideal) 72 เปอร์เซนต์ การติดตามผลผ่าตัดนานจากสองถึงแปดปี ผลการผ่าตัดปรากฏว่า ผู้ป่วยทั้งหมดมีอาการปวดหัวเข่าลดลงมากทุกราย และทุกรายผู้ป่วยสามารถเดินได้ดีขึ้นโดยไม่ต้องใช้ไม้เท้าหรือยาแก้ปวด โรคแทรกซ้อนหลังผ่าตัดมีน้อยมากพบมีแผลอักเสบไม่รุนแรงในบางราย และมี 2 รายที่พบมีสะบ้าเทียมหลุด

The primary indications[1-10] for total knee arthroplasty are the presence of pain and deformity resulting from ostoearthritis and rheumatoid arthritis. Pain is the constant criterion. In the absence of pain, a severe fixed deformity as well as total lack of mobility are relative indications, but both must be considered cautiously.

Total knee arthroplasty with prosthetic device has been a popular procedure for fifteen year.[6,8] During this period, several hundred prosthetic designs have been conceived and of these a large number have been implanted. Because the knee is more architecturally complex, in contrast to the hip where a simple ball-and-socket configuration is sufficient, many design concepts have proved to be inadequate in best of all testing devices, the human body.[6] However, some design concepts have demonstrated durability and more than adequate function.

This is a prospective study of fifty total knee arthroplasties, employing the design concept of posterior stabilized condylar knee prosthesis as advocated by Insall and Burstein.[1-11]

The goals of this study are to assess the results of this design arthroplasty in terms of pain relief. correction of deforimities and functional performances.

Material and Methods

The study included fourty six patients of whom five were male patients. Fourty three patients were diagnosed as having severe osteoarthritic knees, of which almost all had bicompartmental involvement. There were three patients with seropositive rheumatoid arthritis. All these patients were disabled owing to their painful arthritic knees. The average age was fifty nine years with a range of thirty eight to seventy four years. The youngest was a crippled rheumatoid patient. Most of these patients were apparently much overweight. The indications for total knee arthroplasty were unstable, deformed and activity restricted knees. Of a total of fifty knee replacements, four patients underwent bilateral procedures in one setting.

Operative technique[1,2]

Incision : A long midline, 10 to 12 inches, passing over the patella. The knee joint was exposed through medial parapatellar approach and the patella dislocated laterally.

Ligamentous release : Any ligamentous imbalance, either from varus or valgus deformities, must be corrected by performing appropriate soft tissue release.

Instrumentation : Stage I. Basic bone cuts. (a) Creating the flexion gap. The tibia is a always cut at the same level. The correct size template should remove approximately equal amounts of bone from the anterior and posterior porticus of the femur. (b) Creating the extension gap. This gap is created by resecting bone from the distal femur; the exact amount depends upon the thickness of the spacer chosen to fill the flexion gap. Alignment of the distal femoral resection determines the overall varus-valgus alignment of the knee, and the spacer previously used to size the flexion gap should also fit precisely the extension gap with the limb lying in the mechanical axis (centre of hip, centre of knee, centre of ankle).

Stage II. Sculpting bone for the prosthesis. This stage is devoted to trimming of femoral and tibial bone ends to accept the particular prosthesis. The size of both femoral and tibial components have already been selected in the process of making the stage I cuts. The patella is also prepared by cutting sufficient portion of its articular surface.

Trial reduction : Several things are assessed during the trial fit. (a) The components should fit the bones accurately with minimal gap and a good press fit. (b) In 90 degrees of flexion, the knee must not sublux posteriorly. (c) The knee must come into full extension and have satisfactory mediolateral stability against varus and valgus stress. (d) The patella must track centrally.

Post-operative care : The preferable method is to have a continuous passive motor machine beginning a few days post-operatively after pain subsides. At the time of discharge from the hospital, the patient should be able to walk with a cane, ascend and descend stairs and arise from a chair without help.

All patients were operated upon by the authors who personally evaluated them pre-operatively and post-operatively using a standardized rating system.[12] Criteria for assessment included anatomical results and functional performances. Anatomical results were evaluated in terms of correction of deformity and arc of motion. Functional performances were evaluated in terms of pain relief, both at rest and on walking, walking ability, stair climbing activity and use of walking aid. The Good Result group are those who had obtained ideal alignment of operated knees with over 90 degrees of flexion arc, had very mild or no pain at rest and on walking, and the capacity to walk 5-10 blocks, climbing stairs, use no walking aids. The fair group consisted of those having near ideal alignment of knee, between 5-10 degrees varus or 6-10 degrees valgus deformity only, and with 60-90 degrees range of knee movement, requiring analgesics occassionally, walking 1-5 blocks, climbing stairs and using cane. The poor group consisted of those having more than 10 degrees of varus or valgus deformity with less than 60 degrees are of flexion, constant need for analgesics, house bound or not walking and requiring walking aids.

The follow-up period was from two to eight

years. Pre-operatively, fourty two knees were in varus alignment and eight knees in valgus, as measured on weight bearing roentgenograms. A summary of the angular deformity and arc of motion was given in table I.

TABLE 1 Summary of analysis of anatomic results in 46 patients with 50 knee replacements.

ANGULAR DEFORMITY	PRE-OPERATIVE (No. OF KNEES)	POST-OPERATIVE (No. OF KNEES)
VARUS DEFORMITY		
0 - 5 degrees	-	12
6 - 10 degrees	2	-
11 - 15 degrees	25	-
> 15 degrees	15	-
VALGUS DEFORMITY		
0 - 5 degrees	3	36
6 - 10 degrees	3	2
> 10 degrees	2	-
TOTAL ARC OF PASSIVE MOTION		
60 degrees	9	2
60 - 75 degrees	9	2
75 - 90 degrees	30	8
> 90° degrees	2	38

Results

Roentgenographs were taken post-operatively, at three months and at each follow up visit. The valgus and varus alignments of the operated prosthetic knees were measured. (Fig. 1,2) Seventy two per cent of the knees had the ideal alignment of between zero and five degrees of valgus angulation (Fig.,3,4). Four per cent of the knees had a valgus of 19 degrees. There were twenty four per cent of the knees that had a mild varus angulation (TABLE I.) The relationship of tibial implant to the longitudinal axis of the tibia was also measured, and in fourty knees it was within a few degrees of the ideal neutral position. The remaining ten knees all had the tibial plateau tilted slightly either anteriorly or posteriorly.

Clinical tests of passive varus and valgus of the extended knees to determine the post-operative degree of laxity were also performed. It was noted that ten per cent of cases showed more than 5 degrees of laxity, sixty five per cent had less than 5 degrees of laxity and the remaining twenty five per cent showed no laxity. Good range of motion was seen in most of the prosthetic knees. All knees had full extension. Seventy six per cent demonstrated more than 90 degrees flexion, of which most had over 100° flexion. There were only two knees which had less than 60 degrees flexion and these were in the two rheumatoid patients who had had marked flexion contracture of knees pre-operatively (TABLE 1).

Post-operative functional data were tested in TABLE 2. Overall there was a marked relief of pain, an increase in walking ability and a decrease in the necessity for walking aids and analgesics. By employing the assessment criterion, mentioned priorly, there were thirty five patients falling into the good categatory, thirteen into the fair categatory and two with poor results.

Complications

There were no subfascial infection. Eight knees showed superficial wound infection that healed without the necessity for further surgery and none recurred.

There were two cases of dislocations of patellar prosthesis. This happened in the one patient who was markedly obese. The dislocations occurred at two and two and a half years on the left and right knees respectively. She was re-operated upon with patellar prosthetic replacement as soon as the diagnosis was made.

Eighty per cent of the knees showed radiolucencies at the bone cement interface of the tibial stem of about one millimeter in width. The radiolucency was not progressive on follow up roentgenograhs. No revision of implant was done in any of these patients.

Discussion

Soft tissue balancing for the correction of fixed varus and valgus deformities was the essential step of total

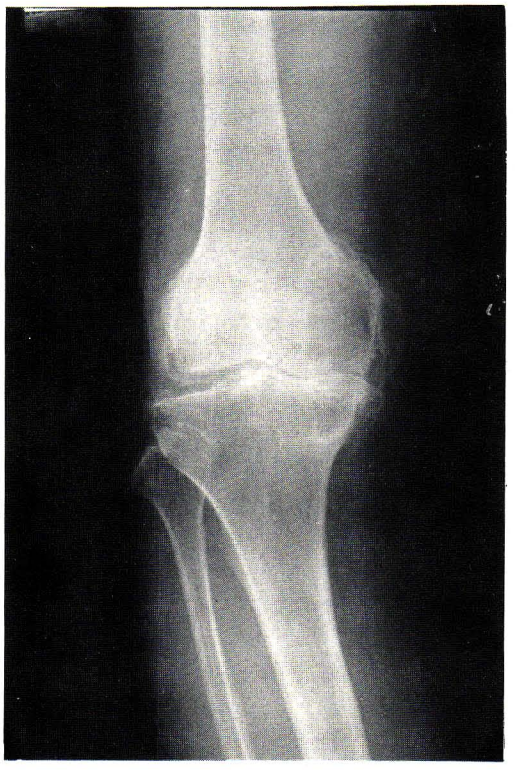

Figure 1. X-Rays-AP. Right knee showing marked varus deformity.

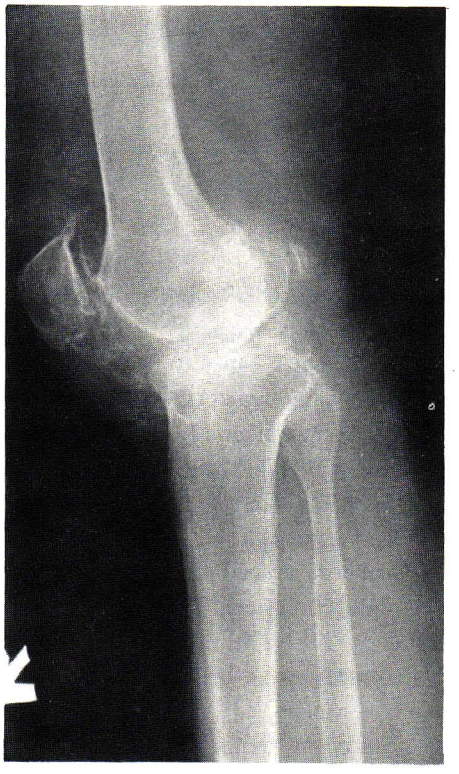

Figure 2. X-Rays. Lateral view right knee.

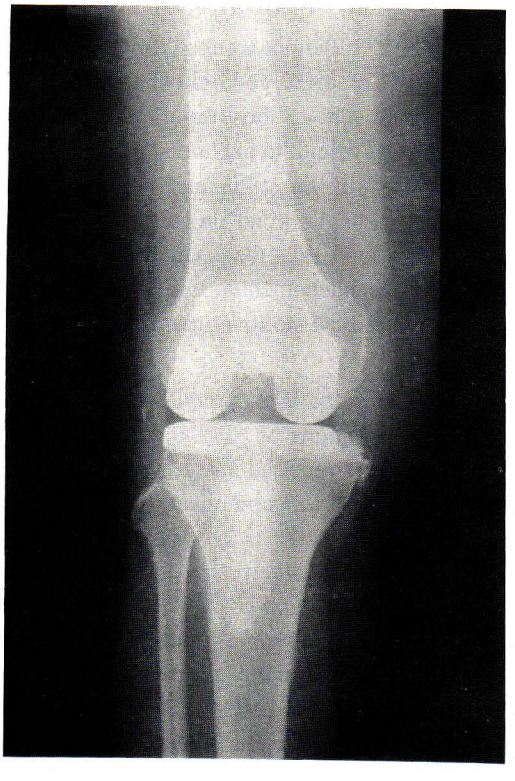

Figure 3. AP. view post total knee replacement.

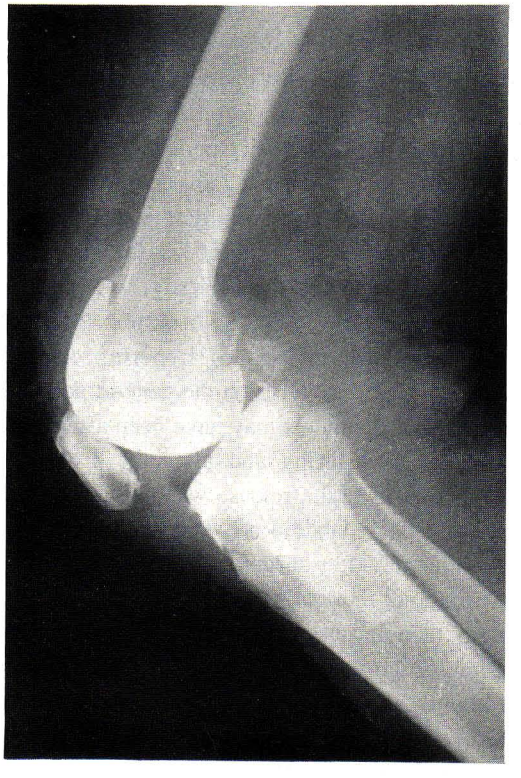

Figure 4. Lateral view post total knee replacement.

TABLE 2 Summary of analysis of function in 46 patients with fifty knee replacements.

	PRE-OPERATIVE	POST-OPERATIVE
PAIN (No. OF KNEES)		
Severe on walking	45	-
At rest	5	2
WALKING (No. OF PATIENTS)		
5 - 10 block capacity	10	35
1 - 5 block capacity	20	10
Housebound walkers	15	1
Non-walker	1	-
STAIR-CLIMBING ABILITY (No. OF PATIENTS)		
One-step at a time	42	44
Unable to ascend stair	4	2
REQUIREMENT FOR PAIN RELIEF (No. OF PATIENTS)		
No medication, occassional aspirin	-	44
Aspirin on routine basis	46	2
WALKING AIDS USED (No. OF PATIENTS)		
No walking aid	34	41
One cane	11	5
Non-ambulatory	1	-

knee arthroplasty[1,11] Whether this procedure of soft tissue release caused the post-operative laxity of the knee joints was not clearly understood. As noted from the results of this study, seventy five per cent of arthroplastic knees showed a mild degree of joint laxity, even though the proper prosthesis were carefully implanted. This also occurred in the series of Laskin (66%).[12] There may be two reasons to explain this. Firstly, the degree of preoperative joint laxity differed in each patient. Many patients had all the criteria of hypermobile joints, considered a normal minority in the general population. The elasticity of ligaments may have been affected after soft tissue release during and after the arthroplasty. Secondly, the soft tissue release was perhaps overdone and the loose ligaments did not contract to their proper tension with time after surgery.

Radiolucency at the bone-cement interface of the tibial stem, though caused no alarming clinical problems, was striking. Eighty per cent of cses in this series showed such radiolucency. The figure was higher than those reported by Insall et al, 21%[11,13] and by Laskin, 65%[12]. Radiolucency in the total hip replacement procedures was generally considered a bad prognostic sign of loosening.[14,15] It did not seem so for the knees. Insall and Laskin[12,13] reported good clinical results on long term follow up in spite of these findings, and so was in our series. It was difficult to explain. The porosity of the metaphyseal area of the tibia and the configuration between the stem of the tibial prosthesis and the upper tibial configuration and the cementation might be responsible for this phenomenon. Experimental study and perhaps longer period of following up study might prove the cause.

Concerning patellar complications, there were two cases of dislocations of patellar prosthesis (4%) in our series. Laskin[12] reported in his series of 117 patients of having only 1% of this complication. There were no fracture of patellar prosthesis in our series, but Insall et al[13] reported 11% in their 118 knee arthroplasties. According to Insall et al and Laskin[12,13] these complications were usually asymptomatic, but in our series mild knee discomfort, though the patient still managed to ambulate well, was noticeable. The cause of these complications might be due to the position of knee flexion and quadriceps load[13]. At position of knee flexion of more than 95 degrees the patellar compression force was

greater, due to additive effect of quadriceps force on the patellar tendon force. Then the greater range of motion might subject the patellar to more severe loading. It was suggested that, in order to prevent patellar complications[13], very careful attention must be paid to patellar tracking at operation and when necessary a lateral release or even proximal realignment must be done.

Summary

Fifty posterior stabilized condylar knee prostheses were implanted, according to the technique of Insall and Burstein, in fourty-six patients. The indications for surgery were bicompartmental osteoarthritis (43 patients) and severe rheumatoid arthritis (3 patients). Preoperatively, the average roentgenographic measurements of varus and valgus deformities were 20 and 13 degrees respectively. Post-operatively, 72 per cent of the arthroplastic knees obtained an ideal alignment of less than 5 degree valgus angulation. Clinical evaluation, after a follow up period of two to eight years, showed good functional results in all patients. Few complications, including superficial wound infection (8 knees) and dislocation of patellar prostheses (2 knees), were encountered.

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