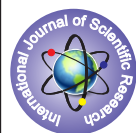


To study the outcome of Autograft reconstructions for Medial Tibial bone defects in primary total knee replacement in 80 cases of severe varus knees.



Orthopaedic

KEYWORDS: Total knee replacement, Medial tibial defect. Bone graft, Femoral condyle, varus knee, osteoarthritis knee

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ABSTRACT

In Primary total knee arthroplasty the defects are usually secondary to severe malalignment and are associated with destructive changes in articular cartilage, bone and surrounding soft tissues. Various classifications have been described for medial tibial defect. Anderson Orthopaedic research institute [1] classifies the defect into three types.

Type 1- minor defect that does not compromise the stability.

Type 2: Loss of cancellous bone requiring reconstruction, A- one condyle, B- both condyles.

Type 3: Bone loss that compromises the major portion of the condyle.

The treatment of the tibial defect in primary total knee arthroplasty depends on whether it is a contained or uncontained defect and the size of the defect. Based on the size of defect it is divided into small (5mm). It is essential to have good quality X-ray for proper preoperative planning as well as to classify the defect. The various methods to treat tibial defects are; translation of the component away from the defect, lower tibial resection, polymethylmethacrylate cement filling +/- screws, autograft, metallic wedge augments or using custom implants.

Large posteromedial asymmetrical osseous defects are often seen in proximal tibia while performing a primary total knee arthroplasty (TKA) in severe varus knees. Majority of these are peripheral uncontained defects. Depending upon the size of the defect, these can be treated with cementoplasty, cement with screw augmentation or metal wedges that constitute an integral part of modern knee systems [2]. The use of autografts is a viable alternative for the treatment of massive bone loss [3]. To achieve axial implantation of the prosthesis and stable fixation of the components, we performed osseous reconstruction of the medial tibial condyle defect using autologous bone grafts obtained from the cut proximal tibia or posterior femoral condyle cut. Our aim was to obtain firm seating of the tibial tray on a rim of viable bone, along with rigid press fixation of the medullary stem. Our study describes the outcome of management of medial tibial defect treated by using autograft for reconstructing large medial tibial defects (>5mm) using Sculco's technique. The minimum followed up period was 03 year.

Materials and Methods:

This was a retrospective analysis of the outcome of bone grafting for severe varus knees ($>15^\circ$ central axis). The total 200 cases of primary total knee replacements (TKRs) performed at our center between 2010 to 2013 in which 80 knee in 80 patients had medial tibial defect which was managed by Autologous bone grafting was included the study. Clearance from the internal review board was taken. Only those patients with severe varus, osteoarthritis and defects >5 mm in the cut proximal tibia condyle were included. Severe medial bone loss, valgus knees, Rheumatoid arthritis knees, Ankylosing spondylitis knee and knees with defects <5 mm were excluded. All 80 patients (age range 58-81 years) had advanced osteoarthritis. Among 80 patients 41 were female and 39 were male. All had body mass index between 22 kg/m² and 45 kg/m². The mean varus alignment was 25° (range $24^\circ - 40^\circ$). All the patients were operated by the same team. Informed consent was taken from all the patients.

Operative procedure

All 80 patients (80 knees) those were included the study underwent pre anaesthetic checkup and accepted in ASA Gd 1-3. During surgery the defects were measured after the proximal tibial cut was taken. We took conservative tibial cut in all our these 80 patients where medial tibial defect was present (8 mm from the lateral tibial plateau (Pic 1)). Defect dimensions of length, width and depth were measured using a sterile metallic scale. The width of the proximal (cut) tibia was also measured. The ratio of defect to proximal tibial cut surface was measured.

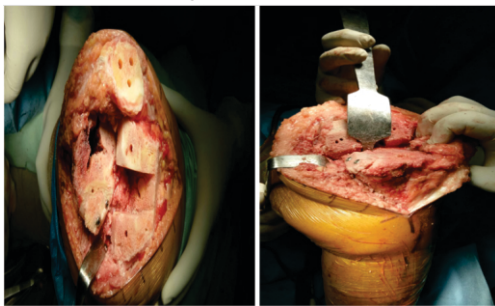
Posteromedial defects involving 25-40% of the tibial condyle cut surface and measuring more than 5 mm in depth (range 5-25 mm) were bone grafted using structural grafts [pic 2]. Structural bone grafts were used in all 80 knees and autogenous impaction bone grafting contained with a wire mesh was done in six patients. The overlying cartilage was removed using blade and surface was made rough. The graft was initially fixed with K-wires and then fixed with

3.5 mm cortical screw 25-30 cm screws length. The defect was fashioned using a saw. The base of the defect was made raw by drilling with a 2.5 mm drill bit. Cartilage was removed from the bone cuts. Structural bone grafts originating from proximal tibial cut or distal femur cut were fixed with screws by using a technique described by Windsor et al [3].

Fig 1 Clinical and Radiological picture



Pic: 2 Medial Tibial bone defect

Pic 3 A: Graft initially fixed with K wires and later on by screws**Pic 3 B: Final Graft fixating with screws****Pic 4: X-Ray post op****Pic 6: 12 month post operative with complete graft union****Results:**

The average follow up was 03 years (range 3-6 years). All 80 patients were available for follow up. 73 out of 80 patients had complete incorporation of the grafts (structural and impaction) in average 4.5 months (range 3-6 months). There were 03 failures due to graft absorption. In these 03 cases in which infection took place after 3 wks post operative. Nonunion of the graft, collapse, stress fractures or loosening was not seen in any of the cases. In our study no patient reported pain on the medial side of the joint and proximal tibia. We observed an average postoperative increase in the Knee Society Score from 40 (28-52) to 90 (85-93) points. There was improvement in WOMAC scores from an average of 70 (range 50-90) to 41.2 (range 26.2-50) in terms of pain, stiffness and function during activities of daily living. The postoperative alignment was measured and ranged from 0° to 3° varus. The average range of motion achieved was 5 degree to 120 degree of flexion (ROM 5-120). Loosening of the screws used to fix the structural graft was not seen secondary to battery effect.

Discussion:

In country like India a developing country people report very late for knee replacement. By the time they reached to decide for TKA their knee went into very much varus deformity which resulted from

medial tibial defect over the period of time. Large posteromedial bone defects are commonly encountered in proximal tibia while performing a primary TKR. Removing bone to the level of the defect is not recommended as the computed tomography (CT) scans have shown that >1 cm below the joint line, the quality and quantity of the supporting cancellous bone diminishes.

Equally important, the attachments of pes anserinus, iliotibial band, patellar ligament and Posterior cruciate ligament can be compromised [4]. Problem of asymmetrical bone loss can be addressed using cement with screws, bone grafting, custom implants or metal wedges or simply by cementoplasty [5].

Reinforcement of the proximal tibia with autogenic bone grafts preserves an area of subchondral bone essential for optimal thickness of the cement and fixation of the implants. Bone grafts reduce the need for custom implants and prevent implant failure. Autologous bone grafts is the best can be successfully used for reconstruction of large osseous defects. They are available on the operating table and are biological compatible and no cost involvement. Our aim was to reconstruct the defect with host bone (graft was made from posterior Femoral condyle cut), which was followed by primary TKR. There are many reports in literature on bone grafting for defects in primary TKA. Our study is a prospective study of 80 patients managed with bone graft for bone defects and outcome after structural and incorporation of graft in primary TKA in Indian patients with severe varus deformity of knees.

As mentioned in literature and used by many surgeon earlier regarding various methods are available for the reconstruction of the tibial plateau like Polymethacrylate, cementfiller, lower tibial resection, metallic wedge augments, autograft and custom implants. Polymethylmethacrylate cement can be used as a filler for very small defects with or without screws. These are ideal when the defect is less than 5mm after completing the tibial cuts. The lower limit of Tibial resection is till the level of Iliotibial band i.e about 10mm. Excessive tibial resection of tibia may lead to altered patella-femoral kinematics, poor quality cancellous bone and sizing problems and joint line shift.

The use of structural allograft has various disadvantages like donor availability, late reabsorption of graft, infection, non-union, re-fracture and risk of disease transmission. The use of metallic augments and custom made implants allows selective filling of the bone deficiencies in tibia. They are indicated in some cases only. These are used when the tibial defect fails to support more than 25% of the tibial base plate. They allow immediate weight bearing and long term stability. Disadvantages of using wedges are that they are expensive, cement fatigues with time, screws produce metallic by-products and wedges does not restore the bone stock. All the above mentioned limitations and disadvantages can be overcome by using autograft either from distal femoral cut or posterior condyle cut. In our study the medial Tibial defect after Tibial cuts was measuring between 2.3 to 3.4cm. The surface of bone defect was made roughened and multiple bone drill was made using 2mm drill and then contoured bone graft was made from posterior Femoral condylar cut and placed over tibial defect and was fixed. We could sometime reconstruct the defect using the bone cuts taken from the distal femur if posterior Femoral condylar cut was not sufficient for grafting. Autograft can be then stabilized temporarily with k wires and after final Tibial base plate is fixed the graft can be stabilized with cancellous screws avoiding the Tibial prosthesis [3-4]. The advantages of using autograft is that it is inexpensive, available from the site of surgery, helps in graft incorporation, no risk of non union, infection or disease transmission. There was no screw loosening, graft failure or infection in our study.

Conclusion:

Sculco's technique of medial Tibial defect reconstruction in primary total knee replacement using autograft is a very simple procedure which does not add any special technique or any financial burden of

total knee replacement. More over it overcomes the other complications associated with other methods of reconstruction mentioned above. With our series of study we come to the conclusion that the medial Tibial defect upto 03 cm in the preoperative X-ray can be well managed by Sculco's technique of oblique osteotomy and graft fixation using 3.5 mm cancellous screws or K-wires in some cases.

References:

1. Engh G.A classification of bone defects in revision total knee arthroplasty. Presented at the Knee Society Interim Meeting, Philadelphia, Pennsylvania 1992
2. Altchek D, Sculco TP, Rawlins B. Autogenous bone grafting for severe angular deformity in total knee arthroplasty. J Arthroplasty 1989; 4(2):151-55
3. Windsor RE, Insall JN, Sculco TP. Bone grafting of the tibial defects in primary and revision total knee arthroplasty. Clin Orthop 1986;205:132-7
4. Dorr LD, Ranawat CS, Sculco TP, McKaskill B, Oriesek BS. Bone grafting for tibial defects in total knee arthroplasty. Clin Orthop 1986;205:153-65
5. Pagnano MW, Trousdale RT, Rand JA. Tibial wedge augmentation for bone deficiency in total knee arthroplasty. A follow up study. Clin Orthop Relat Res. 1995;321:151-5. [PubMed: 7497661]