Case Report

Posterior Cruciate Retaining (CR) Surgery for Treatment of Severe Valgus Knee Deformity with Bone Defects in Tibial Plateau

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Abstract

Reason for the research: valgus knee deviations >20° has been think as grade III severe deformity. We regular performer PS to rectify this deformity. Patient history: A 69-years-old women with Rheumatoid has keen Swelling and pain for 10 years and the symptoms has been aggressived 1 week. But the disorder of flextion and extension present only 3 month before the operation. Surgery: we perform Bilateral Total Knee Arthroplasty (TKA) for treatment of this valgus knee deformity and using Cruciate-Retaining (CR) obtain a axial correction and stabilization of the joint. Autologous bone graft was performed for Posterior defect of lateral tibial plateau. Result: The function of knee has been improved after surgery 3 month and specifically American the knee society knee score(KSS) increased. Conclusion: Valgus knee which classified grade III deformity is usually rectified using posterior-stabilized total knee arthroplasty (PS).but in some particular case, Cruciate-Retaining (CR) total knee arthroplasty also have possibility for serious valgus keen deformity.

Keywords: Cruciate-retaining; Total knee arthroplasty; Valgus knee

Abbreviations: TKA: Total Knee Arthroplasty; KSS: American The Knee Society Knee Score; CR: Cruciate-Retaining; PS: Posterior-Stabilized Total Knee Arthroplasty

Introduction

Valgus knee, different from Varus knee which has Defects of the medial tibial plateau and medial condyle, is opposite to Varus knee to involve degenerate of lateral femoral condyle and lateral tibial plateau [1]. Reason for the rarity of Valgus knee, correction of Varus knee is easier than valgus knee, and valgus deviations >20° is still a challenge for surgeons [2-5]. Valgus knee deformity has been classified into 3 grade [6]. Grade I deformity of deviation is less than 10° and specifically Medial Collateral Ligament (MCL) not suffered elongation keeping a stable joint balance. Axial deviation rang 10 to 20° has been classified grade II and with elongated MCL but still functional. Grade III deformity has over 20° deviations and MCL elongated without function.

The debating about using CR or PS for treatment of Valgus knee is still going on. CR TKA is different to PS TKA for it’s no resection of the Posterior Cruciate Ligament (PCL) and the retained PCL furthermore have possibility to stabilizes the knee joint at the anterior–posterior level. First of all, Using CR TKA as much possible as decreasing bone deficit in TKA surgery. Second proprioception involved in PCL have been saved to acquire a better feeling in up-down stairs. Third, retained PCL possess stress transmission function avoiding risk of bad shear to induce Prosthesis wear. Fouth CR imitate natural joint structure as much as possible to resemble natural state before surgery [7-9].

As we all know, Obtain a balance between extension and flexion gap is essential for successful TKA operation. The stable joint of knee include following soft tissue structure:1.the Lateral Collateral Ligament (LCL); 2.the popliteus tendon(POP); 3.the Posterolateral Capsule (PLC); 4. the iliotibial band (ITB); 5.the posterior cruciate ligament(PCL) [10]. The valgus deformity always company soft tissue contraction or elongation [11]. The aim of this operation is acquire a balance between Medial and lateral compartments of the knee joint, so that how to counterpoise...
bilateral soft tissue is significant for the surgery. In this case report, we present a CR TKA for Valgus knee (valgus deviations >20°), but the deformity has a functional soft tissue. We suppose that CR TKA could be performed in some case which has serious deviations but soft tissue still functional. We have agreement from this patient and her family to publicate this article.

Case Report

The patient is 70 years old lady and suffered Rheumatoid 10 years. Joint pain have occurred 6 years and disorder of knee happened 3 months (Figure 1). CR image of knee shows severe valgus deviations and degeneration of lateral femoral condyle and defect of lateral tibial plateau (Figure 2). The symptom of knees is that left one have more serious than right and valgus deviations 30°. Except Medial and lateral balance of the knee joint, the left knee can be straightened and flexed and valgus deviations decrease when the joint flexed. Physical examinations show valgus knee extension reached 180°, and the flexion reached 110°. KSS score was assessed to be 20. At the beginning of this operation, we have done sufficient assessments. We assessed PCL using MR image and find PCL is still functional. Medial and lateral collateral ligaments usually degenerate as long as deformity occurred for a long time and this result directly induce imbalance for bilateral of knee to increasing problem to the surgery. Softer tissue are assessed through physical examinations and DR/MIR image. Through these series of assessment, we conclude PCL and Posterior knee joint capsule is still functional. Base on these result, we decide that using a CR TKA for this valgus knee at beginning and PS TKA and rotating hinge knee prosthesis is preparation if CR TKA fail. These prosthesis are provided by JUST company.

Figure 1: Patient have severe valgus knee and deviations >20° before operation.

Figure 2: DR radiography show valgus knee and bone defects in the left Lateral posterior tibial plateau.
We could perform CR TKA surgery whether Medial or lateral parapatellar approach. But lateral parapatellar approach are more appropriate for valgus knee including ligament balancing and preservation of the medial retinaculum and the medial neurovascular structures for patella supplying [12]. “Z” shape cut was performed for biceps femoris releasing to achieve a satisfactory patellar trajectory and a reasonable coverage gap of fibula side of joint after the operation [13]. The surgical incision was along the lateral edge of the rectus femoris muscle to the tibial tubercle. We placed the patella on the side and performed Patella resurfacing and Osteophytes removing for a good prognosis [14]. we performed osteotomy to obtain a Joint space in the extended and bended position. Because of ligaments included Medial Collateral Ligament (MCL) functional, we performed ligament loosening to get a medial and lateral gap balance. Valgus deformity accounted for defect of tibial plateau and autologous bone graft was adopted for the defect repair [15] (Figure 3). Stable of tibial plateau was considered, as reasonable Mechanical conduction transmit has obtained. So that Tibia extension rod (size:13*18) have been chosen. Finally we got a stable knee joint in flexion and extension position (Figure 4). One week after the operation, the movements of the knee ranged from 0° to 110°. The DR image showed the prosthesis position (Figure 5). we perform a successful operation for the patient while CR prosthesis is stable in action of Flexion and extension (Figure 6). we regular give patient Cefuroxime sodium, flurbiprofen axetil, tranexamic acid for management patient after operation. Given the soft tissue has been Surgical release and bone autograft, patient rest on bed 2month companying rational physical training for recovery of Muscle strength and joint range of motion. After 3 months recovery, the patient show improvement of physical function and KSS assessment improved to 75.

**Figure 3:** Bone defects in the left Lateral posterior tibial plateau and repair of defects with autologous bone grafts.

**Figure 4:** Physical examinations show joint stable in action of flexion (A) and extension.

**Figure 5:** DR examinations show prosthesis position and stable fixation of prosthesis.
Discussion

This patient suffered Osteoarthritis induced by Rheumatoid nearly 10 years and the pain couldn’t be hamper through medicine taken. Psychical examinations show the left knee joint has valgus deviations >20°. Advantages of CR TKA has been presented in this paper. CR or PS are eligible for the joint replacement of grade I or grade II valgus deformity [16]. In this case, we don’t choice PS TKA or rotating hinge knee instrument but CR TKA at first time according to the patient history that deviations happened only 3 month ago and soft tissue still functional. So that this represents a challenge for our orthopedic surgeons [17]. Given the requirement of surgery filed exposure, the medial parapatellar approach was not suitable to gain adequate exposure and lateral parapatellar approach was chosen because of ligament balancing and preservation of the medial retinaculum and the medial neurovascular structures for patella supplying. “Z” shape cut used for completely correct the patella trajectory. Patella resurfacing subject to opposition. Some studies show that there are no difference between resurfacing and not-resurfacing the patella. According to study of long term following experiments, resurfaced patella superior non-resurfacing in patients with osteoarthritis observed for over 5 years [14,18]. CR and PS TKA are eligible for grade I and II Valgus deformity and no difference was find between them [11]. PS designs lead to higher degrees of fexion and a superior femoral rollback compared with CR designs [9]. CR designs have advantages and depicted in front of this paper. Replacement and retention of PCL is essential to decide choosing prosthesis CR or PS. We assess function of PCL at the same time and PCL still functional, so that we in favour of CR design to acquire a balance joint but PS. We have pay attention to injury in the nerve, but we suppose the valgus deformity deviations is not enough to influence tension of peroneal nerve. We don’t expose peroneal nerve during the operation and we regular tell the patient to keep her knee in a flexed position after operation [19].

Autologous bone graft have been used for repairing bone deficit. A amount study suppose that Autologous bone grafting is a Small financial burden for patient, non - time consuming, and effective method to reduce blood loss [20]. However some study show that Autologous bone grafting method have negative influence of failure of prosthesis fixation because of Graft Resorption [21]. so that many surgeon support bone cement but autologous bone graft.

In summary, we perform a surgery using CR TKA for a patient who got valgus deformity associated defect of Posterolateral tibial plateau and in the final the patient present satisfaction for the result. The characteristics of the case that valgus deviations occurred only 3 month and Physical examination showed soft tissue still functional means CR TKA shouldn’t be excluded. And the result of the operation confirmed our hypothesis and acquired a stable joint. We use autologous bone graft not bone cement for defect of posterolateral tibial plateau, because of anti-immune response for immune rejection decreasing. But the disadvantage is resorption of autologous bone induced disappearance of mechanical support. So that we adopt tibia extension rod for Maintain the mechanical conduction of the platform. However, although we got a stable knee joint using CR TKA, we still face the failure of prosthesis. So that Reasonable functional exercise and Post-operative education is necessary. We still need to conduct long-term follow-ups of the case.

Reference


