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ORIGINAL RESEARCH ARTICLE

ARTHROSCOPY ASSISTED ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION USING BONE PATELLA TENDON GRAFT; OUR EXPERIENCES

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ABSTRACT

Nine cases of complete anterior cruciate ligament (ACL) deficient knees were operated for arthroscopic reconstruction using bone patella tendon bone (BPTB). Among them 8 were male and one was female. Average age was 24 years. 6 injury occurred in road traffic crash. 4 cases had medial meniscus injury and 2 had medial collateral ligament grade I injury. Clinically Lachman test and anterior drawer test were positive and radiological findings were also positive in all patients, All patients recovered their activities of daily living within one month and 2 patients had knee contracture. The use of autologous BPTB graft with interference screw to reconstruct ACL is well established and allow early aggressive rehabilitation and has lowest failure rate.

Keywords: *Anterior cruciate ligament, arthroscopy, bone patella tendon bone graft, reconstruction, single bundle*

INTRODUCTION

Anterior cruciate ligament (ACL) reconstruction technique has advanced over the past decades. More consistent results were achieved with minimally invasive arthroscopically assisted single bundle ACL reconstruction techniques. Success rate of 90% were reported in regards to restoration of knee stability, patient satisfaction and return to full activity. Some controversy remains about the rotational stability after anteromedial bundle reconstruction so new techniques are evoilving to reconstruct both bundles of ACL to address the problem of rotational stability[1].

The use of autograft bone patella tendon bone (BPTB) with interference screw to reconstruct ACL has been widely studied by many different authors over many years. It is a reproducible and reliable procedure. Bony interference screw fixation is excellent and allows for early aggressive rehabilitation. The technique has also been shown to have the least measurable laxity, the fastest graft incorporation and the lowest failure rate. So, BPTB-ACL reconstruction remains the gold standard[1].

The purpose of this study was to report the outcome of 9 arthroscopically assisted ACL reconstructions with BPTB and interference screw in our centre with short term follow up.

PATIENTS AND METHODS

This study included eight male and one female. The right knee involved in three cases and the left in six cases. The average age at the time of surgery was 24 years (range 21-45 years). Five injuries occurred during the road traffic crash and three during activities of daily living. The interval between injury and surgery averaged three and half month (range 1-9 months).

Preoperatively, all knees had positive Lachman test and anterior drawer sign. Concomitant injuries were medial meniscus injury in four cases and grade one medial collateral ligament injury in two cases. Magnetic resonance imaging were done in all cases to confirm the lesion radiographically (fig. 1).

Fig 1: MRI of ACL deficient knee

The surgical technique is similar to that developed at the Hospital for Special Surgery in New York. The details of the operation have already been reported[2]. At arthroscopy the medial meniscus was found torn in four knees. Partial meniscectomy was performed in them. Chondromalacia of the medial compartment (femoral condyle and tibial plateau) was seen in eight knees.

The roof and lateral wall of the notch were routinely enlarged until the dimensions of the notch were deemed sufficient to accept the graft. A k wire was inserted in the femur using a front entry guide. The femoral insertion point was selected approximately 5 mm anterior to the over the top position and at 10 o,clock for the right knee and 2 o, clock for left knee. A second K wire was drilled into the tibia 5 mm anterior and medial to the center of the ACL insertion area using the tibia guide. A cannulated 7-9 mm reamer was used to drill the tibial tunnel. The central third (8-10mm) of the patellar tendon was removed with bone blocks at each end. The graft was introduced in the femoral tunnel through the tibial tunnel. The graft was tensioned manually with knee at 20-30 degree flexion. Fixation on both sides was achieved with kurosaka type interference screw.

Post operatively, early motion was encouraged. The patient was discharged when range of motion of 10 to 90 degree achieved usually by the 7th post operative day. Partial weight bearing was allowed as tolerable from the 3rd post operative day and progressed to full weight bearing by the end of 4th post operative day. Knee brace was applied during gait exercises for 3 weeks.

RESULTS

The follow up was 6 months to 3 years. Two patients were interviewed by telephone. They have already started their activities of daily living. There was no complain of anterior knee pain, givingway, click catching etc. But 4 patient did not achieve full flexion, causing difficulty in squatting of knee and cross leg sitting. Physical therapy was advised to them for range of motion exercises.

Radiographic analysis showed satisfactory fixation (fig.2). All patients recovered their occupation and able to achieve satisfactory ADL during their last visits.

Fig. 2: X-ray image of knee after ACL reconstruction using bone patella tendon bone

DISCUSSION

In recent years, there are rapid advances regarding knowledge of biomechanics of knee and its ligament anatomy. Accordingly several techniques of ligament reconstruction have been evolved and many types of fixation devices invented. Nevertheless reconstruction of sound anterior stability is obviously the main goal of a reconstruction procedure.

In under-developed country like Nepal, road traffic accidents and fall injuries are main cause of knee ligament injury. Many cases are complicated with poly trauma. Economic status of patient is also poor. However enthusiastic orthopaedic surgeon in Nepal has started performing arthroscopy of the knee and ligament reconstruction surgery. Arthroscopically assisted ACL reconstruction using an autologous patellar tendon graft followed by an early range of motion program has gained wide acceptance[3]. So, we have started treating ACL deficient knee with autologous BPTB graft in this series.

The graft harvest techniques and tunnel positioning anatomy are almost established. Several studies have shown that a posterior and proximal placement of the intra-articular exit of the femoral tunnel is advisable[4,5,6,7,8,9]. Tibial tunnels within the anatomic ACL insertion are compatible[5,6]. However a tibial tunnel in the anterior half of the anatomic tibial insertion are cause of roof impingement in extension[10,11,12,13].

Anatomic land marks which can be used to place the guide wire in correct position include the posterior border of the anterior horn of the lateral meniscus[14] or the anterior margin of the PCL with the knee at 90 degree of flexion[15].

Despite good to excellent results with the majority of ACL reconstruction, there remains a subset of patients who have residual instability. It would seem that antero-posterior translation is largely resolved with a well done singlebundle (anteromedial) autograft ACL reconstruction. For those patients with residual instability despite an excellent Lachman examination there may be a component of rotational instability. Because the posterolateral bundle of the ACL is incompletely addressed with the current singlebundle techniques, it may be one of the reasons for residual instability.

The anteromedial and posterolateral bundles of the ACL act in coordination to limit anterior tibial translation and tibial rotation.Biomechanical investigations have demonstrated that the ACL bundles are not isometric throughout knee flexion and extension. Therefore, both bundles are important to the stability of the knee at different angles of flexion. In regard to anterior translation, the anteromedial bundle is an important stabilizer of the knee in flexion whereas the posterolateral bundle is an important stabilizer in extension. In regard to combined rotator loads, both bundles contribute to knee stability.

To address this residual rotational instability, some surgeons have attempted to change their femoral tunnel to get lower on the clock. The ideal position of the femoral tunnel for single-bundle ACL reconstruction remains unknown. A review of recent literature reveals a growing body of evidence that suggests that a more horizontal femoral tunnel (closer to 2 o'clock or 10 o'clock) may improve the overall clinical results of single bundle ACL reconstruction. This may be accomplished by creating an anteromedial arthroscopy

portal versus a far medial tibial tunnel. Recent studies have shown that the anteromedial portal more reliably reaches the 10 o'clock femoral position. Additionally, the length of the femoral tunnel decreases as the tunnel placement becomes more horizontal[16].This may affect graft fixation and incorporation as there is less graft in the tunnel. Recent biomechanical tudies have revealed a higher degree of AP and rotational knee stability with double bundle reconstructions when compared with the single bundle technique. Clinical results lag behind. Short term results favor an improvement in anterior tibial translation stability compared with the single bundle technique. It is unclear if rotational stability is restored with this technique as grading of rotational instability is complicated and poorly quantified. Long term functional results have yet to be reported. Theoretical risks associated with double bundle ACL reconstruction include fracture, osteonecrosis of the lateral femoral condyle, graft impingement, and technically challenging revisions[17].

In conclusion, the restoration of a good objective stability is the main goal of the ACL reconstruction. In this case studies satisfactory anterior stability is achieved.

REFERENCES

1. Maj Steven J, Mark D. Miller. Controversies in ACL Reconstruction: Bone-patellar Tendon-bone Anterior Cruciate Ligament Reconstruction Remains the Gold Standard; Sports Med Arthrose Rev. 2009; 17:224-247

2. Robert AM, Joseph PD, Kurt PS. Bone-patellar tendon-bone autograft anterior cruciate ligament reconstruction. Ln: WN Scott eds. Insall & Scott, Surgery of the knee 5th ed.NY. Churchill Livingstone, 2012; 385-392.

3. P. Aglietti, Buzzi, Giron, J.V. Simeone, Zaccherotti. Arthoscopic=assisted anterior cruciate ligament reconstruction with the central third patellar tendon; Knee Surg, Sports Tranumatol. Arthosc. 1997; 5:138-144.

4. Bradley J, Fitzpatrick D, Daniel D, Et al Orientation of the cruciate ligament in the sagittal plane: a method of predicting its length-change with flexion. J Bone Joint Surg [Br]. 1988; 70: 94-99.

5. Hefzy Ms, Grood ES, Noyes FR Factor affecting the region of most isometric femoral attachments. II. The anterior cruciate ligament. Am J Sports Med. 1989; 17:208-216.

6. Hoogland T, Hillen B Intraarticular reconstruction of the anterior cruciate ligament: reconstructions. Clin Orthop 1984; 185:197-202

7. Penner DA, Daniel DM, Wood P, et al An in vivo study of anterior crucicate ligament and a rationale for recruciate ligament and a rational for reconstruction. Am J Sports Med. 1988; 19:21-25

8. Sapega AA, Moyer RA, Schneck C. Testing for isometry during reconstruction of the anterior cruciate ligament. J Bone Joint Surg [Am]. 1990; 72:259-267.

9. Sidles J, Larson R, Garbini J, et al. Ligament length relationships in the moving knee. J Orthop Res. 1988 6:593-610

10. Howell SM, Clark JA. Tibial tunnel placement in anterior cruciate ligament reconstructions and graft impingement. Clin Orthop. 1992; 283: 187-195.

11. Howell SM, Clark JA, Farley TE. Serial magnetic resonance study assessing the effects of impingent on the MR image of the patellar tendon graft. Arthoscopy 1992; 8:350-358

12. Romano VM, Graf BK, Keene JS. Anterior cruciate ligament reconstruction. The effect of tibial tunnel placement on range of motion. Am J Sports Med 1993; 21:415-418.

13. Stabuli Hum Rauschning W. Tibial attachment are of the anterior cruciate ligament in the extended knee position. Anatomy and cryosections in vitro complemented by magnetic resonance arthrography in vivo. Knee Surg Sport Traumatol Arthrose. 1994; 2:138-146.

14. Jackson DW, Gasser SI. Tibial tunnel placement in ACL reconstruction. Arthoscopy. 1994; 10:124-131.

15. Morgan CD, Kalman VR, Grawl DM. Definitive andmarks for reproducibile tibial tunnel placement in anterior cruciate ligament reconstruction Anthroscopy. 1995; II: 275-288

16. Golish Sr, Baumfeld JA, Schoderbek RJ, et al. The effect of femoral tunnel of femoral tunnel starting position on tunnel length in anterior cruciate ligament reconstruction: a cadaveric study. Arthoscopy. 2007; 13:1187-1192.

17. Zelle BA, Vidal AF, Brucker PU, et al. Double-bundle reconstruction of the antenor cruciate ligament; anatomic and biomechanical rationale. J am Acad Ortho Surg. 2007;15:97-96.