ARTHROSCOPIC ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION USING FOUR-STRAND HAMSTRING GRAFT – A PROSPECTIVE MEDIUM TERM STUDY+

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Background: In this study, we analyzed the clinical outcomes at two years following reconstruction of the anterior cruciate ligament with use of a four-strand hamstring tendon autograft in patients who had presented with a symptomatic torn anterior cruciate ligament.

Methods: Twenty four consecutive patients who had an isolated, symptomatic anterior tibial subluxation associated with rupture of the anterior cruciate ligament were treated with reconstruction of the anterior cruciate ligament with a four-strand autologous semitendinosus-gracilis tendon graft. One surgeon performed all of the operations. Prior to surgery and at the follow-up examination, physical findings and functional scores were recorded and knee radiographs were analyzed. Following surgery, a six-month rehabilitation regimen was implemented. Results: Of the 41 patients operated 24 were available for follow-up. Twenty three of the patients had stable pain free knee negative Lachman and pivot shift tests. The mean IKDC score improved from an average preoperative from 38.62 point to average at final follow up 89.11 points at the time of follow-up ($p < 0.01$). One patient (5.5%) had a positive Lachmann’s test at final follow up. One patient had a traumatic rupture of the graft, occurring at a 16 months postoperatively. Conclusions: Reconstruction of the anterior cruciate ligament with use of a four-strand hamstring tendon autograft eliminated anterior tibial subluxation in 94.5% of patients who were examined at a minimum of two years postoperatively. The functional knee scores were significantly increased at the time of follow-up. Objective: A prospective study of 24 patients of Arthroscopic ACL reconstruction, all operated on by a Single Surgeon followed up for 24 months. All the patients were operated between January and December 2005. Of the 41 patients operated, 24 were available for regular followup till 2 years. The study assessed the Clinical outcome at various intervals during the study period.

Key words: Anterior cruciate ligament reconstruction, Hamstring tendon autograft.

INTRODUCTION

In patients with symptomatic ACL deficient knees, ligament reconstruction is the means of stabilizing and restoring high level function of the knee joint. The ‘ideal’ graft for use in ACL reconstruction is still a matter of debate. Both BPTB graft and Hamstring graft have comparable results in terms of stabilizing the knee and provide 90-95% good to excellent results functionally as well as on clinical and KT-1000 instrumented testing.

Recent surge of interest in Quadrupled Hamstring tendon graft is due partly to (i) considerable improvements in soft tissue graft fixation techniques (especially the endobutton and transcondylar fixation devices) that have resulted in reliable fixation with pull out strengths averaging 1345 N vs 710 N for BPTB graft fixed with interference screws, (ii) increased concerns with anterior knee pain and problems with knee extensor mechanism with Patellar tendon graft.

Ultimately the choice of graft in ACL reconstruction depends on the Surgeons experience and preference. Tissue availability, patient preference and activity level, prior surgeries and presence of chronic patello femoral pain influence the choice in some patients. In this study we analyzed the clinical outcomes of Arthroscopic ACL reconstruction with Four strand Hamstring graft (Quadrupled Semitendinosus and Gracilis) in symptomatic, post traumatic, isolated ACL deficient knees at a two year follow up (all patients with positive Lachmann and Pivot shift tests).

METHOD OF STUDY

All twenty four patients in the age group 18-40 years with symptomatic ACL rupture treated by Arthroscopic ACL reconstruction with Four strand Hamstring graft, and available for regular followup till 24 months were included in the study. All patients falling within the inclusion criteria were evaluated by a detailed history and clinical examination. Preoperative assessment included...
assessment of Duration of injury; Mechanism of injury; Clinical examination of knee; International Knee Documentation committee 2000 (IKDC) Subjective Knee Evaluation Score. IKDC Score is a reliable and reproducible indicator of knee function and correlates well with the KT-1000 Arthrometric testing. It is scored by summing the responses to 18 factors assessing knee function and activity and transforming the score to a scale of 0-100. Arthroscopy was done on all patients to treat associated meniscal injury and confirm the diagnosis, followed by Quadriceps and Hamstring strengthening exercises and ACL Reconstruction after 4-6 weeks.

The surgical procedures are listed below:

1. Positioning and graft harvesting (Fig. 1) through a 2 cm incision.
2. Whip suturing the graft to make it into a four-strand graft.
3. Arthroscopic preparation of femoral and tibial (Figs. 2-4) graft fixation sites.
4. Arthroscopic placement of tibial tunnel.
5. Femoral tunnel placement and drilling using guide for arthroscopic tunnel placement.
6. Drilling for Endobutton.
7. Graft passage (Fig. 5) through both tunnels.
8. Femoral fixation using Endobutton (Fig. 6) and tibial fixation using interference screw.
9. Post operative AP and lateral radiographs are shown in Fig. 7.

Post operative protocol

1. Full weight bearing mobilisation on day 1.
2. Graduated exercise programme progressing to level III – IV at 12 weeks.
3. Full ROM at 6 weeks.
4. Return to unrestricted activity/sports after 5-6 months.

Post operative evaluation

(a) IKDC scores at 3 wks, 6 wks, 12 wks, 6 months, 12 months and 2 yrs
(b) Range of motion
(c) Quadriceps power and extension deficit
(d) Laxity
(e) Anterior knee pain.

RESULTS

The mode of injury in the patients was: vehicular injuries - 50%; sports-46%; others-4%. Associated meniscal injury was found in 60% of patients (Medical meniscus - 40%; Lat. Meniscus-15%; both-5%). The preoperative IKDC scores were: Mean Score-38.62%; Range-16.09 to 51.72. The mean score were: pre-operative 38.62; 3 months 65.67; 1 year 84.30; 2 years 89.11. Flexion deficit of 5-10 deg. in 2 patients (9%) was found at 1 yr follow up. No extension deficit was detected in any patient.

Laxity. One patient (5.5%) had a significant positive lachman test at final follow up. One patient had post traumatic rupture of ACL graft at 16 months post op. 89% patients had a stable, pain free, functional knee joint. No patient had anterior knee pain at 3 months follow up. Diameter of Graft Harvested in patients was: 8 mm-85% and 9 mm-15%.

Fig. 1 Hamstring graft harvested with tendin stripper; The photo shows the tendons (Semitendonosis & Gracilis) attached to their tibial insertion at Pes Anserinus.

Fig. 2 Arthroscopic view of tibial guide wire.
Problems with graft harvesting

Difficulty in harvesting Hamstring graft was encountered in 2 patients (8%), graft harvested from C/L thigh in one patient, and superficial infection in one patient, which responded well to early exploration, debridement and antibiotics. No patient had deep or knee joint infection.

DISCUSSION

Successful clinical outcomes following anterior cruciate reconstruction with a hamstring graft have been reported by many authors [1-14]. In our study, anterior cruciate reconstruction with a four-strand hamstring graft resulted in a successful clinical outcome in 94.5% of patients who were available for follow-up. Marder, et al.
utilized a two-bundle semitendinosus construct and two femoral Endobuttons in sixty-two patients and reported improved anterior cruciate stability compared with that in patient who had been treated with a single semitendinosus bundle [5]. Hoffmann, et al. reported in the results sixty-five patients of anterior cruciate reconstruction with a doubled-semitendinosus-and-Endo-button construct that was augmented with an extra-articular lateral repair [15].

Nebelung, et al. reviewed the results of twenty-nine anterior cruciate reconstructions with a doubled autogenous semitendinosus tendon and a femoral Endobutton [9]. They graded 66% of the results as normal or nearly normal using the criteria of the International Knee Documentation Committee. In the present study, we analyzed the effectiveness of a double-loop (four-strand) semitendinosus-gracilis graft in eliminating symptomatic anterior tibial subluxation caused by a torn anterior cruciate ligament. Anterior tibial subluxation was eliminated in 94.5% of the patients who were examined at a mean of 2 years postoperatively. The remaining 5.5% of the patients had a positive lachmanns and pivot shift at the follow-up examination. Bach et al. reported a reoperation rate of 15% in a series of 103 patients evaluated two years after anterior cruciate reconstruction with a patellar tendon autograft [16].

With the rehabilitation protocol used in our study, the majority of patients returned to a high functional status in six months. No motion deficits or clinically important knee pain was noted at the follow-up examination. Other authors have reported success with similar rehabilitation protocols following anterior cruciate reconstruction [7,17-19]. We allow full weight-bearing with the knee in terminal extension in a brace in the immediate limited active and employ immediate passive range of motion following the reconstruction.

In their study of 2500 consecutive arthroscopically assisted anterior cruciate reconstructions performed Williams, et al. reported an infection rate of 0.03% [20]. One patient had a superficial infection of the knee following the anterior cruciate reconstruction. The patients who had a postoperative infection in our study were treated effectively by a combination of parenteral and oral antibiotics for a total of six weeks.

Clinically relevant patellofemoral pain or loss of knee motion has been reported following anterior cruciate reconstruction with the patellar tendon [16,20,21], but neither was observed in our study. The elimination of knee instability and the functional scores in our series were consistently good, but the rate of traumatic rupture of the graft (5.5%) may be a cause for concern. The prevalence of traumatic rupture of bone-patellar tendon bone grafts used for anterior cruciate reconstruction has been reported to be 0% to 2% [16,21,22] where as those for Hamstring graft is about 5%.

We did not observe any clinically relevant knee pain or motion loss at the time of follow-up. The absence of such morbid findings following anterior cruciate reconstruction with a hamstring graft may make this method of reconstruction more desirable for certain patients (i.e., those with chronic patellofemoral pain or patellofemoral cartilage disorder) over the BPTB graft.

CONCLUSION

We found that a four-strand semitendinosus-gracilis autograft with a torn anterior cruciate ligament in 94.5% of the patients who were available for follow-up. Significant improvements in functional scores were noted. Four strand hamstring graft is an effective treatment option for patients with symptomatic ACL tears without any concerns regarding knee extensor mechanisms or anterior knee pain.

REFERENCES

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