



Day case anterior cruciate ligament reconstruction : A study of 51 consecutive patients

Sumedh TALWALKAR, Sri KAMBHAMPATI, Dennis DE VILLIERS, Rosemary BOOTH, Andrew LANG STEVENSON

From The Oldchurch Hospital, Romford, United Kingdom

We prospectively assessed 51 arthroscopy assisted anterior cruciate reconstructions done over two years as day cases. We looked at the clinical results, postoperative pain control and patient satisfaction. There were 45 males and 6 females, with ages ranging from 18 to 52 years. A hamstring graft was used in 38 patients while 13 patients had reconstructions using the patellar tendon. Forty-nine patients were successfully discharged on the same day while 2 patients had to be admitted due to excessive drainage. Six patients had additional procedures at the time of surgery. The mean time interval from injury to surgery was 27 months (range : 2 to 180). Forty-six patients had an excellent to good outcome as regards satisfaction with one poor result. Pain control was not a major issue with any of the other patients included in the study. Our study demonstrates that day case arthroscopic ACL reconstruction is a safe procedure with minimal to absent morbidity.

INTRODUCTION

Anterior cruciate ligament reconstructions using a hamstring graft or the central third of the patellar tendon have been traditionally performed on an inpatient basis with a 1-2 day postoperative stay (12). There have been many improvements in anaesthetic techniques and postoperative pain management over the years. Advances have occurred in operative technique and instrumentation as well,

thus major procedures like anterior cruciate ligament reconstruction are now increasingly performed as day cases. This practice although widely prevalent in the United States (2, 7, 9, 12) is not as widespread in the United Kingdom and Europe where published studies have been smaller (4, 8) and at times with extended stay (6). As more experience is gained in performing these procedures, pain control becomes the limiting factor.

We prospectively assessed our first 51 consecutive day case anterior cruciate ligament reconstructions with the purpose of looking at the clinical results, post operative pain control and patient satisfaction.

■ Sumedh Talwalkar, MD, Upper Limb Fellow.
Wrightington Hospital, Wigan WN6 9EP, United Kingdom.

■ Sri Kambhampati, MD, Research Fellow.
RNOH, Brockley Hill, Stanmore, Middlesex, HA7 4LP, United Kingdom.

■ Dennis De Villiers, MD, Consultant Anaesthetist.

■ Rosemary Booth, MD, Lead for COPE.

■ Andrew Lang Stevenson, MD, Formerly Consultant Orthopaedic Surgeon,
Oldchurch Hospital Waterloo Road Romford Essex RM7 0BE, United Kingdom.

Correspondence : Sumedh C Talwalkar, 508 Imperial Point,
The Quays, Manchester M50 3RA, United Kingdom.

E-mail : stalwalkar@aol.com.

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Table I. — Age range

No of Patients	Age (years)
5	< 20
21	20-30
16	30-40
8	40-50
1	> 50

PATIENTS AND METHODS

Patient selection

From February 2001 to February 2003, we prospectively assessed 51 patients with arthroscopically confirmed ACL rupture who underwent arthroscopically assisted ACL reconstructions with autograft. All patients were initially seen in a pre-operative assessment clinic by either the senior author (ALS) or a trainee (SCT) for the purpose of explaining the surgical procedure and for obtaining an informed consent. Subsequently at a similar interview they were seen by a physical therapist and a member of the outreach team to discuss and review the rehabilitation protocol. Patients were instructed on range of motion exercises in order to maintain quadriceps strength. They were also taught crutch training and the use of the CPM machine and the cryo-cuff. Patients were measured for a removable above knee light weight delta cast with Velcro straps to assist with ambulation on discharge from the day unit.

Demographics

There were 45 males and 6 females with a mean age of 31 years (range : 17 to 51). The age distribution is shown in table I. We had 24 (47%) patients in the 30-50 age group. All patients were medically fit with an American Society of Anesthesiologists (ASA) grading of 1. The majority of patients had sedentary occupations (49%).

The 4-stranded hamstring construct was used in 38 patients while 13 patients had a patellar tendon autograft. During arthroscopic reconstruction 45 (88%) patients did not have any additional procedures done. Nine (18%) patients had concurrent knee pathology. In 6 (12%) of these patients additional procedures had to be performed during the reconstruction (table II).

The mean time between injury and ligament reconstruction was found to be 27 months (range : 2 to 180). Average operating time was 119 minutes (range : 70 to

Table II. — Associated co-morbidity

No of Patients	Procedure/Pathology
1	Partial Lateral Meniscectomy
2	Partial Medial Meniscectomy
1	Subtotal Lateral Meniscectomy for Bucket Handle Tear
1	Subtotal Medial Meniscectomy for Bucket Handle Tear
1	Drilling of Osteochondral Defect of Medial Femoral Condyle
1	Early Medial Compartment OA
1	Psoriasis
1	Patellar Fibrillation

155). Time spent in recovery was 27 minutes on an average with a range of 15-45 minutes. The average time spent in the hospital was 506 min (range : 320 to 720). The average drainage was 270 ml (range : 80 to 460) and the drain was removed in 6 patients (hamstring autograft) prior to discharge due to the absence of drainage.

Surgical technique

All the surgeries were performed by the senior author (ALS) or under his supervision by a senior trainee (SCT). The graft was harvested with an oblique incision over the pes anserinus using the hamstring method, while a pre-patellar midline vertical incision was used for patellar tendon graft harvest. The remainder of the procedure including any concomitant meniscectomies or meniscal repairs was performed arthroscopically. Notch preparation involved a notchplasty if appropriate and the graft was positioned isometrically using the Acufex jig. Graft fixation was done using the Rigidfix and Intrafix instrumentation (Mitek) for the hamstring graft while the patellar tendon graft was fixed using interference screws.

The subcutaneous tissue and skin were closed with undyed vicryl 2/0 and 3/0 respectively. A suction drain was used in all cases through the superolateral arthroscopic portal. This was removed on the next day by the community nurse. A tourniquet was used during the arthroscopic procedure while the graft harvest was done with infiltration with 10 ml of 0.5% Bupivacaine.

Anaesthetic technique

Patients were admitted to the day surgery unit an hour prior to surgery where they were seen by both the anaesthetist and surgeon.

Premedication consisted of Cyclizine 50 mg, Cocodamol 2 tabs, and Diclofenac 100 mg all given orally. Anaesthetic induction was by way of Ketamine 1 mg/kg, Propofol 2-3 mg/kg and Ondansetron 4 mg all given intravenously. An intravenous infusion of Ringer's lactate was commenced. Once positioned, a 3 in 1 block containing 40 ml of 0.5% Bupivacaine with 1:200,000 adrenaline was placed on the appropriate side.

Anaesthesia was maintained with a laryngeal mask and nitrous oxide, oxygen and sevoflurane via either an ADE circuit or a circle system with absorber. The patient was allowed to breathe spontaneously throughout the procedure. An antibiotic (Cefuroxime 1.5 g i.v.) was given as well as a single dose of 20 mg Clexane (subcutaneously). Once the graft has been harvested, a further 20 ml of 0.5% Bupivacaine with adrenaline was injected along the path of the harvested tendons using a 20 G spinal needle. At the completion of surgery, a final 20 ml of 0.5% bupivacaine with adrenaline was injected into the arthroscopic ports and into the knee cavity. A pneumatic cryo-cuff was used as routine immediately after the procedure to reduce swelling and for pain control. All patients were discharged with the custom made removable delta cast brace with Velcro straps. Discharge medication consisted of Cocodamol 2 tabs every 4-6 hours, Diclofenac 50 mg three times a day and Cefuroxime 500 mg for one week.

Pain assessment

All patients were instructed prior to surgery on the use of an 11 point numerical rating scale (NRS) scale. The patient was scored according to the NRS, from 0 to 10 in recovery and prior to discharge.

The NRS-11 consists of asking the patient to rate his or her perceived level of pain intensity on a numerical scale from 0 to 10, with 0 representing one extreme (e.g., 'no pain'), and 10 representing the other extreme (e.g. 'Pain as bad as it could be'). The number stated by the patient as representing his or her level of pain intensity is the basic datum for the NRS-11. We chose the NRS in this study due to its increased sensitivity to the Visual Analogue Scale (VAS) which has been related to the fact that more cognitive skills are required to transform a perceived pain sensation to a line length than to a number, making VAS more difficult to use for some individuals (3).

Physiotherapy

The aftercare was managed by a funded nursing and physiotherapy team called as the "Community Project in

Essex" or the "COPE" team. This project was originally started to reduce inpatient stay following joint replacement surgeries.

Each patient was visited by a physiotherapist on the first postoperative day when the drain was removed and on days 3 and 6. Passive knee motion and a programme of closed chain exercises were commenced when swelling and pain permitted. The patients also had the use of a cryo-cuff machine, as cold therapy has been found to be beneficial after injury or operation by slowing pain signal transmission, and by reducing tissue metabolism via decreasing enzyme function, and local vasoconstriction.

Patient assessment

All patients were assessed at a 2 week follow-up visit where the surgical site was examined and patients were asked to rate their degree of satisfaction with the management of their pain and the quality of advice and support given. They were also asked whether, if the procedure were to be performed again, they would want it to be performed as a day case procedure.

RESULTS

Pain control and patient satisfaction

The average NRS grade in the recovery was 2.9 (range : 0 to 9), in the ward 3.2 (range : 0 to 7) and at discharge 1.8 (range : 0 to 5). Three (6%) patients had severe pain (> 5) in the immediate postoperative period and this was well controlled with intravenous cyclimorph.

The NRS grade was compared between patients greater and less than 30 years of age. The mean NRS grade in recovery in patients less than 30 (N = 26) was 3.17 while in the older age group (N = 25) the average NRS grade was 2.8. Similarly we compared the NRS grades of the patients between the under 30s and over 30s : on discharge these were 1.95 and 1.72 respectively. Using Students t-test no significant difference ($p > 0.005$) was found in the NRS grades of these age groups either in the recovery room or on discharge.

Patient satisfaction (table III) with surgery and the outreach services was excellent in 25 (49%), good in 21 (21%), satisfactory in 3 (5.9%) and unsatisfactory in 2 (3.9%) patients.

Table III. — Patient satisfaction

Outcome	N° of Patients	%
Excellent	25	49
Good	21	41
Satisfactory	3	5.9
Unsatisfactory	2	3.9

Of the two patients who expressed dissatisfaction with the surgery one patient was an asthmatic and could not take painkillers. He felt that he should have been kept in overnight. However in his questionnaire his pain was well controlled in the postoperative stage (NRS = 0 in recovery and 3 at discharge). He found the COPE visits valuable and felt that his problems were satisfactorily dealt with when they arose. The other patient was an out of region referral and did not fall in the catchment's area of our outreach services and hence did not get the full benefit of our rehabilitation and community services.

When asked if they would have the procedure done again as a day case, 49 patients said yes, one patient said no due to excessive pain (6-7/10). This patient had contralateral hamstring graft harvest. Inadvertently the graft site was not blocked with local anaesthetic resulting in severe postoperative pain. One patient preferred overnight stay. This patient was an out of region referral as mentioned above.

Community assessment

The first consecutive 26 patients were audited by the community outreach team and detailed data for call outs was maintained.

In the first postoperative night 22 patients were comfortable (NRS Score 0-5) with Cocodamol and Diclofenac while 3 patients had significant pain (NRS Score 6-10). Two of these patients did not take NSAIDS as instructed while one patient required increased analgesia.

Post-operative visits for these patients were recorded. These are detailed in table III. The patient requiring 9 visits had a patellar tendon autograft. His drain did not work in the immediate postopera-

Table IV. — Complications

N° of Patients	Complication
1	Severe Pain (> 6)
2	Calf Tenderness (No DVT)
1	Haemarthrosis
1	Stitch Abscess
2	Excessive Drainage (Overnight Admission)

tive period and was removed before discharge, resulting in a swollen knee and an oozing wound that needed aspiration after the first week.

Patients were able to reduce pain killers from the 4th day on an average (range : 1 to 8 days) and received physiotherapy on average on the 7th post operative day (range : 6-10 days).

Complications

Two patients representing our early admission rate (4%) had to be admitted for overnight stay due to excessive bleeding from the drain site. In both patients we found that the drain tube had been left very long. The patellar tendon autograft was used in both cases and due to the excessive graft length we had to use bone staples to secure the distal tibial portion of the graft to the tibia.

We had no patients re-admitted after discharge from the day unit (late admission rate = 0%). Other postoperative complications (table IV) included calf tenderness in 1 patient, major pain (6-7/10) in 1 and a stitch abscess in 1 patient. One patient developed a haemarthrosis that had to be aspirated at the 1 week stage due to an oozing wound.

DISCUSSION

With spiralling healthcare costs there is a growing trend towards the use of ambulatory care services. The Department of Health 2000/2001 figures for the percentage of elective operations performed as day surgery was 68%, while the NHS Plan in the UK predicts that 75% of all elective operations will be carried out as day care setting (8).

Our study confirms that day case anterior cruciate ligament surgery is feasible. The role of proper patient counselling and selection preoperatively

cannot be overemphasised. The surgeon and the physiotherapist play an important role in discussing with the patient the goals of surgery and rehabilitation, and a plan should be in place pre-operatively to help the patient meet these goals in the postoperative stage. A good support network needs to be set up to help the patient feel comfortable after surgery. Patient suitability for such a procedure is crucial for success. They should be well motivated and aware of the potential problems that can occur in the rehabilitation period.

Adequacy of postoperative analgesia is another prerequisite for a successful outcome (1). The value of a bupivacaine and adrenaline injection in reducing post-operative medication consumption has been discussed by Furia and Zambetti (5) as well as Aronowitz and Kleinbart (1). We found this to be true in our series as well. One of our unsatisfactory results was due to inadequate blockade of the contralateral graft site.

The two cases that had to be admitted had several similarities. Both had patellar tendon reconstructions with staple fixation for the distal tibial pegs and in both patients the drain tube had been left long. In the absence of any other differences in technique, one of the possibilities for excessive drainage could be due to bleeding from the raw cancellous bone of the tibia tunnel exacerbated by a long drain tube lying adjacent to the intra-articular opening of the tibial tunnel in the region of the intercondylar notch. The drainage across the series varied from 10-40 ml (average : 28 ml) when the drainage due to these two patients was excluded from the study. Nausea, vomiting and uncontrolled pain although reported as a common cause of hospital admission from a day case unit did not appear to be a significant problem in our study. This underscores the use of a good triple block and the role of good anti-emetic medication like Ondansetron (4 mg) in preventing avoidable admissions (11).

Some of the studies from the United Kingdom and Europe have looked at the feasibility of performing ACL day case surgery. Mogens *et al* (10) had eight admissions due to inadequate pain control while three patients had re-surgery for haematoma and scar rupture. They had an overall

complication rate of 20% with a surgical complication rate of 9%. These figures although consistent with some other published studies are considerably higher than our rates of complication.

Kumar *et al* (8) have discussed the role of day surgery in a small prospective study of 20 patients. They had a 0% admission rate and reported a 100% success rate in terms of patient satisfaction. This study was conducted in a University Hospital while we have examined a similar scenario in a District General Hospital setting with a larger number of patients.

A number of studies (2, 6, 9, 11) have looked upon a younger age as an important criterion for success in day case surgery. In our study the younger patients (< 30 years, n = 26) had a higher mean NRS score in the recovery room as well as on discharge when compared to the older age group (> 30 years, n = 25). Statistically however using Students t-test ($p > 0.005$) there was no difference between these groups either in recovery or on discharge. This may imply that age alone may not be the only factor in deciding suitability for day case surgery. Patient motivation, general health, fitness and the availability of adequate outpatient support are probably more important for a successful outcome.

We have demonstrated that outpatient ACL surgery is a safe and practical procedure. A large majority of the patients included in the trial expressed satisfaction with having the procedure done on an outpatient basis and stated that they would choose this procedure again in the future if it were necessary. Our rate of early admission in both cases was due to the drain being left too long. This problem has been identified and subsequent cases had the drain tube trimmed in order to prevent similar complications.

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