

# Surgeon case volume and anterior cruciate ligament reconstruction: Can low volume surgeons achieve acceptable results?

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## Abstract

**Introduction:** Arthroscopic anterior cruciate ligament reconstruction is an effective, but technically demanding procedure. There is abundant evidence within surgery and orthopaedics that surgeon volume can be correlated with outcome. The effect of surgeon volume on anterior cruciate ligament reconstruction specifically has not previously been investigated. **Methods:** We evaluated outcome in 35 patients operated on by a surgeon who carries out approximately 10 reconstructions per year. Subjective International Knee Documentation Centre score, instrumented laxity and one-legged hop were measured. **Results:** Mean International Knee Documentation Committee score was 70.69 (40-99). Mean side-to-side laxity difference was 2.91. One graft failure requiring revision was identified. **Discussion:** A low volume surgeon can achieve acceptable results with anterior cruciate ligament reconstruction. Case volume is a poor surrogate for patient outcome on an individual level.

Site of study: Heatherwood and Wexham Park NHS Trust.

## INTRODUCTION

Anterior cruciate ligament (ACL) injuries account for approximately 20% of sports injuries to the knee<sup>(21)</sup>. Arthroscopic ACL reconstruction is the treatment of choice for symptomatic instability, but debate continues over the most appropriate graft material<sup>(3,7)</sup>. Arthroscopic ACL reconstruction using hamstring (Semitendinosus and Gracilis) tendons is a well established technique which can produce excellent results by specialist surgeons<sup>(4)</sup>. It has, however, been shown that correct tunnel placement in ACL reconstruction is a technically demanding procedure which takes time to learn<sup>(13)</sup>.

Since the seminal research of Luft and colleagues, published more than 20 years ago<sup>(19,20)</sup>, it has been hypothesised that surgical outcome, may be directly related to the volume of procedure-specific experience. Since this time, data has been generated both for (e.g. <sup>(23)</sup>), and against (e.g. <sup>(9,16)</sup>) this hypothesis. Within orthopaedics, both hospital case volume<sup>(24)</sup>, and surgeon experience for upper and lower limb arthroplasty, have been shown to impact on outcome; in terms of post-operative complications, hospital costs and length of stay<sup>(8,12,14,18)</sup>. The majority of this data is derived from US Medicare information, and its applicability to the

UK setting is debatable. Some Canadian studies for both hip<sup>(16)</sup> and knee<sup>(15)</sup> arthroplasty find no correlation between surgeon volume and outcome. For hemiarthroplasty in hip fracture evidence both supports<sup>(17)</sup>, and refutes<sup>(9)</sup> the effect of surgeon volume on outcome. The controversy continues.

On this basis, it has been suggested that the technically demanding procedure of ACL reconstruction should only be carried out by specialist knee surgeons who perform many cases per year, and as such have a greater volume of procedure-specific experience. The purpose of this retrospective study was to identify whether a single low volume surgeon, in a UK district general hospital, could attain comparable outcomes to surgeons who specialise in soft tissue knee reconstructions.

## MATERIALS AND METHODS

Arthroscopic ACL reconstructions carried out by the senior author (an established orthopaedic surgeon and foot and ankle specialist) in the NHS setting over the last 5 years were reviewed. Approximately 25% of the senior authors caseload is knee surgery, and a total of 46 ACL reconstructions were carried out in the NHS between 2001 and 2005. This represents fewer than 10 cases per year. The 46 patients were contacted by post, inviting them to take part in the study. Non-responders received a second letter and

were contacted by telephone.

## **SURGICAL PROCEDURE**

All patients had undergone arthroscopic ACL reconstruction using 4-strand ipsilateral hamstring autograft. Endobutton suspensory fixation was used proximally, and titanium interference screw fixation distally. A single staple was used to augment tibial fixation in cases where the interference screw had sub-optimal hold. All patients entered the same standardized rehabilitation regimen, with progressive mobilization and weight bearing from postoperative day 1 to return to sport at between 6 and 9 months.

## **EVALUATION**

The subjective component of the International Knee Documentation Committee 2000 form (IKDC 2000) <sup>(1)</sup> was sent out. Patients were asked to attend a research clinic for examination run by independent observers. Antero-posterior laxity was measured using the Westminster Crucimeter (University College, London, United Kingdom) applying a force of 89 N to the knee in 20 degrees of flexion <sup>(6)</sup>. This is a validated instrument that has been shown to have an excellent correlation with the KT-2000 cruciometer <sup>(25)</sup>. Instrumented AP laxity was measured in the normal knee and the reconstructed knee, the side-to-side difference, reconstructed knee minus normal knee, was recorded. The one-legged hop test was used as a general measure of knee function. Each patient executed a single hop, as far as they could, from stationary. The best of three attempts from the operated leg, and the non-operated leg was measured and difference recorded as a percentage of the operated side relative to the non-operated side.

## **RESULTS**

Five patients moved away from the area and left no forwarding address. Of the 41 remaining patients, 35 agreed to participate. Age ranged from 20 to 49 years with a mean of 32.8. Patients came from a variety of activity levels from retired sedentary individuals to semi-professional athletes. The mean interval from injury to surgery was 23 months (2-131) - as dictated by NHS waiting times. The indication for surgery was symptomatic instability in the presence of a confirmed ACL rupture. Patients were not excluded on the basis of concurrent knee pathology and 19 patients (54%) were found to have additional intra articular pathology at initial arthroscopy (15 had meniscal tears, 3 had Outerbridge grade 3 or 4 chondral damage and one had a significant lateral collateral ligament injury).

The mean IKDC subjective score was 70.69 (40 to 99). Side to side laxity difference was between -1mm and 2mm (IKDC grade A) in 18 patients (51.43%), between 3mm and 5mm (IKDC grade B) in 13 patients (37.14%) and 6mm and 10mm (IKDC grade C) in 4 patients (11.43%). No patients had a side-to-side laxity difference of greater than 10mm (IKDC grade D). The mean side-to-side laxity was 2.91mm (sd=2.33).

In the one-legged hop test 15 patients (42.86% of the group) achieved 90% or more (IKDC grade A). In 13 patients (37.14%) the distance was between 89% and 76% (IKDC grade B). The remaining 7 (20%) patients could only attain between 75% and 50% (IKDC grade C). No one achieved less than 50% (IKDC grade D).

One patient, of the 41 who were contacted, declined to take part because of graft rupture following a further twisting injury. Revision surgery had been carried out elsewhere. None of the other 41 patients contacted reported graft rupture. This represents a graft failure rate of 2.4%.

## **DISCUSSION**

Due to its very nature, this retrospective observational study involved a small number of patients. Our findings are limited in that we could only recruit 35 of the 46 patients who underwent surgery. The outcome measures used in this study were up to date indices that may readily be achieved in the outpatient clinic. They have, however, limited our ability to make comparison with some of the historical data (which quote older iterations of the IKDC, or the Lysholm and Tengner scores), and some more specialist studies.

The mean interval between injury and surgery for this group was long at 23 months. The majority of these case represented chronic injuries. This reflects what was typically attained in the District General Hospital setting, between 2001 and 2006 within the British NHS, however many specialist surgeons and units internationally can expect to operate on their patients much sooner. The effect of delayed (12-24 months) versus sub acute ACL reconstruction (2-12 weeks) was investigated by Karlsson et al in athletes <sup>(11)</sup>. They showed that delayed surgery led to a decreased activity level at 2-5.5 years, and a higher incidence of meniscal injury.

Due to the retrospective nature of this study, and lack of exclusion criteria, there are additional factors, which may have led to impaired outcome: Smoking has been shown to

have an adverse effect on the outcome of ACL reconstruction (<sub>10</sub>), and our patient group included a mix of smokers and non smokers. Also we did not exclude patients with concurrent knee injuries from the study, whereas some published data has excluded patients on the basis of cartilage injury (<sub>4,5</sub>). In our study 54% of patients were noted to have concurrent pathology at the time of ACL reconstruction, which may be expected to reduce the IKDC score.

Despite these factors our results are comparable to those of specialist groups. In a specialist setting in the UK, Karim et al reported a mean subjective IKDC score of 60.8 (16.0 to 97.8) in smokers and 70.1 (17.8 to 98.8) in non smokers (<sub>10</sub>). Combining this data for 304 patients gave a mean subjective IKDC of 68.08.

With regards to graft rupture, an accurate rupture rate cannot be inferred from such a small sample size, however our rate of 2.4% compares favorably with the published literature. Salmon et al (<sub>22</sub>) reported a graft rupture rate of 6.4% at 5 year follow up, in a sample which included both hamstring tendon and bone - patellar tendon - bone grafts. Interestingly they demonstrated a similar rate of contra lateral ACL rupture (5.7%), and no statistically significant difference between graft types.

To the authors knowledge there is very little work regarding the effect of surgical volume on outcome in ACL reconstruction. The correlation between surgical experience (total number of cases) and radiological measured bone tunnel placement was investigated by Behrend et al (<sub>2</sub>). They found no significant correlation between surgeon experience and correct tunnel placement. No published data regarding surgeon case volume and outcome in ACL reconstruction has been identified. A prospective study, with shorter intervals between injury and surgery, but the same low case volume, is now underway in order to try to address this question further.

## CONCLUSION

This study suggests that it is possible for a non-specialist surgeon, with a low case volume, to achieve acceptable results with ACL reconstruction. We feel case volume per se is a poor surrogate measure for surgical outcome. It is overly simplistic to suggest that low volume equates to poor outcome and high volume equates to good outcome. Subjective and objective outcome measures should be used if decisions are to be made over whom should be carrying out specific surgical procedures.

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