Bilateral anterior cruciate ligament reconstruction as a single procedure: evaluation of cost and early functional results

Larson C M, Fischer D A, Smith J P, Boyd J L

Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
The study compared bilateral anterior cruciate ligament (ACL) reconstruction performed under one anaesthesia and at a single setting with unilateral ACL reconstruction.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients presenting with bilateral ACL deficiency.

Setting
The study setting was secondary care. The economic study was carried out in Minneapolis, USA.

Dates to which data relate
The effectiveness and resource use data were gathered between 1993 and 2001. The price year was 2001.

Source of effectiveness data
The effectiveness data were derived from a single study.

Link between effectiveness and cost data
The costing was undertaken retrospectively on the same patient sample as that used in the effectiveness study.

Study sample
No sample size was determined in the planning phase of the study. In addition, no retrospective power calculations were reported. A retrospective analysis was performed of 11 consecutive patients (22 knees) who underwent bilateral ACL reconstructions as a single procedure from 1993 to 2001 at the authors’ institution. Seven of these 11 patients were male, and the mean age for the group was 37.9 (+/- 10.5) years. The control group comprised patients undergoing unilateral ACL reconstruction during the time period (1999) that the majority of the bilateral ACL reconstructions (9 out of 11 patients) were performed. The control group was matched for surgeon and graft choice. After attempting to contact 39 patients, a control group consisting of 33 patients (35 knees) was obtained. Nineteen of these 33 patients were male, and the mean age for the group was 34.5 (+/- 10.1) years.
Study design
The study was a retrospective cohort study that was undertaken in a single centre. All patients underwent telephone interviews and filled out International Knee Documentation Committee (IKDC) knee score forms at a mean follow-up of 3.1 years. The mean objective follow-up (physical examination and KT-1000 arthrometry) was 3.1 years for the bilateral group and 1.0 year for the unilateral group. The authors did not report any loss to follow-up.

Analysis of effectiveness
All the patients included in the study appear to have been accounted for in the analysis. The outcomes used were:

time to full activity,

objective laxity (KT-1000 arthrometry, pivot shift, and Lachman tests), and

functional knee scoring (Lysholm and IKDC subjective scores).

Intraoperative and postoperative complications (e.g. wound complications, graft failures, operative management or arthrofibrosis) and unexpected inpatient stay were also recorded. There were no significant differences between the bilateral and unilateral ACL groups in terms of age, gender, or graft choice.

Effectiveness results
Both groups returned to full unrestricted activity at a mean period of 6.5 months postoperatively.

At a mean follow-up of 3.1 years, the mean IKDC knee score was 91.8 for the bilateral group and 92.0 for the unilateral group, (p=0.95).

At the latest follow-up, the mean Lysholm score was 95.4 for the bilateral group and 94.2 for the unilateral group, (p=0.47).

All knees in the bilateral group and 25 knees in the unilateral group had KT-1000 arthrometry measurements documented at the latest follow-up. There were no significant differences in KT-1000 arthrometry measures between groups at the latest follow-up.

There was one graft failure in each group. Two patients in each group required an unexpected inpatient stay as a result of postoperative nausea and vomiting.

There was no significant difference between the groups at the latest follow-up in terms of complication rates.

Clinical conclusions
For patients presenting with bilateral ACL deficient knees, reconstruction of both knees at a single setting was safe and did not compromise early functional results.

Measure of benefits used in the economic analysis
The authors did not derive a measure of health benefit. The study was, in effect, a cost-consequences analysis.

Direct costs
The resource use and costs were not reported separately. The direct costs included in the analysis were those to the hospital. These were for the hospital operating room, ancillary costs, anaesthesiologists and surgeons, allografts, equipment and rehabilitation. Anaesthesiologist fees were calculated according to a time-based graduated fee scale provided by the billing office. Current, mean surgeon fee reimbursements for ACL reconstruction were obtained from the orthopaedic billing office. Information about operative, preoperative and anaesthesia time, as well as other services and equipment provided, was obtained from the medical records of each patient. Intraoperative and perioperative
charges were obtained from the hospital billing department. The authors did not discount the costs. However, since it was unclear whether the costs were accrued over the mean follow-up period of 3.1 years, or over a shorter period, it is unclear if discounting was necessary. The authors reported marginal costs. The price year was 2001.

**Statistical analysis of costs**
The costs were treated stochastically. Statistical analyses (t-tests) were used to test for statistical significance. The criterion for statistical significance was p<0.05.

**Indirect Costs**
The indirect costs were not included in the analysis.

**Currency**
US dollars ($).

**Sensitivity analysis**
No sensitivity analyses were undertaken.

**Estimated benefits used in the economic analysis**
See the 'Effectiveness Results' section.

**Cost results**
The cost analysis revealed that there was a mean total cost-saving of $3,751.59 per knee, or $7,503.18 per patient, when performing bilateral ACL reconstruction at a single setting compared with doing two knees at two separate settings, (p=0.0001).

**Synthesis of costs and benefits**
The costs and benefits were not combined.

**Authors' conclusions**
For patients presenting with bilateral anterior cruciate ligament (ACL) deficient knees, reconstruction of both knees at a single setting is safe, cost-effective and does not appear to compromise early functional results.

**CRD COMMENTARY - Selection of comparators**
A justification was given for the comparator used. It represented current practice in the authors' setting. You should decide if this is a widely used health intervention in your own setting.

**Validity of estimate of measure of effectiveness**
The analysis was based on a retrospective cohort study. This was appropriate for the study question, as it allowed the authors to identify patients who had undergone the two procedures quickly and at little cost. However, it would have been more appropriate if a randomised controlled trial or prospective cohort study with concurrent controls had been undertaken, as these studies, if well conducted, are considered to be the 'gold'-standard study design when comparing health interventions since they are less prone to bias. The study sample appears to have been representative of the study population, although the authors provided very little information about the population under study. The patient groups were shown to be comparable at analysis. To increase comparability between the two patient groups, the authors matched the controls in terms of surgeon and graft choice. However, the study sample was very small and, therefore,
the study was insufficiently powered to detect any statistical differences in the outcomes or baseline characteristics of the two groups.

**Validity of estimate of measure of benefit**
The authors did not derive a measure of health benefit. The study was, in effect, a cost-consequences analysis. The reader is therefore referred to the comments in the 'Validity of estimate of measure of effectiveness' field (above).

**Validity of estimate of costs**
Though the perspective adopted was not stated clearly, it appears to have been that of the hospital. Hence, all the categories of cost relevant to the hospital perspective were included in the analysis, as were all the relevant costs for each category. The costs and the quantities were not reported separately, which will hamper the generalisability of the results of the economic analysis. Resource use was derived from the study, while the unit costs were derived from fee schedules and from hospital charges. Appropriate statistical tests were undertaken to test the statistical significance of costs between the two groups. It is unclear whether discounting was necessary, as the authors did not report the time period during which the costs were incurred. Charges were used to proxy prices and were not adjusted to reflect actual costs. The price year was reported, which will aid any possible inflation exercises.

**Other issues**
The authors compared their results with the only study reporting results of bilateral ACL reconstruction during one period of anaesthesia (Jari et al., see Other Publications of Related Interest). This study also concluded that ACL reconstruction was safe and cost-effective. The issue of generalisability to other settings was not addressed. The authors do not appear to have presented their results selectively and their conclusions reflected the scope of the analysis. The authors reported one limitation to their study. The retrospective nature of their study meant than no detailed data were available on postoperative pain or return of motion, strength, or return to work.

**Implications of the study**
Although the authors made no explicit recommendations based on the results of their study, they appear to imply that bilateral ACL reconstructions at a single setting should become current practice as they were cost-effective and as safe as unilateral ACL reconstructions.

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None stated.

**Bibliographic details**

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**Other publications of related interest**


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