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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.

CRD summary
The aim was to assess the preliminary cost-effectiveness of double-bundle reconstruction of the anterior cruciate ligament. The authors concluded that their preliminary analysis suggested that double-bundle anterior cruciate ligament was cost-effective and the results should be used to guide future research. The methods were adequate and the authors’ conclusions appear to be appropriate for the scope of their analysis.

Type of economic evaluation
Cost-utility analysis

Study objective
The aim was to assess the preliminary cost-effectiveness of double-bundle reconstruction of the anterior cruciate ligament.

Interventions
Two sports medicine procedures were compared: double-bundle reconstruction techniques for anterior cruciate ligament versus single-bundle autograft reconstruction techniques.

Location/setting
USA/in-patient secondary care.

Methods
Analytical approach:
A decision tree model was constructed to assess the cost-effectiveness of double-bundle anterior cruciate ligament reconstruction compared with single-bundle, in an otherwise-healthy young person with a reconstructed anterior cruciate ligament tear, over the 12 years after operation. The authors stated that a societal perspective was used.

Effectiveness data:
The clinical and effectiveness data were derived from published data or estimated by the authors, where published data were not available. The was reviewed to derive the estimates for probabilities of anterior cruciate ligament reconstruction failure (revision rates), which was the main measure of effectiveness. For double-bundle reconstruction, failure rates at four years were from a synthesis of 11 randomised controlled trials for single-bundle reconstruction identified by a review and considered to be the most unbiased level I studies of single-bundle anterior cruciate ligament reconstruction. For single-bundle reconstruction, failure rates were from two studies, with long-term follow-up. The percentages of patients with postoperative International Knee Documentation Committee (IKDC) outcomes were identified by a literature search.

Monetary benefit and utility valuations:
The utility values were derived, using a rating scale method, from a published survey of college student athletes and non-athletes. Expert opinion was used to correlate the states reported in the study with the IKDC grades A, B, C, and D (A was the best outcome).

Measure of benefit:
The measure of benefit was quality-adjusted life-years (QALYs) and these were discounted at an annual rate of 3%.
Cost data:
The direct health care costs included acute care hospitalisation, out-patient care, surgeon and anaesthesia fees, physical therapy, and durable medical equipment. All costs were from published studies. The indirect costs, such as productivity losses, were not included as they were assumed to be captured in the QALY outcome. All costs were reported in US dollars ($) for the year 2009 and discounted at an annual rate of 3%.

Analysis of uncertainty:
One-way and multivariate sensitivity analyses were undertaken for model variables that included the cost of single-bundle repair, the marginal cost of a double-bundle repair, the utilities, the failure rates, the percentage of patients who experienced different IKDC grade outcomes, the discount rate, and the cost and outcomes of revision surgery. The results of the multivariate sensitivity analyses were presented graphically as the net monetary benefit for a willingness-to-pay threshold of $50,000 per QALY gained.

Results
Compared with single-bundle, double-bundle reconstruction had an incremental cost of $3,362 per patient and an incremental QALY gain of 0.52 per patient.

The incremental cost per QALY gained for double-bundle was $6,416. The incremental cost per QALY of double-bundle reconstruction exceeded $50,000 QALY for threshold values that included a marginal cost for the double-bundle technique of $24,500, an IKDC grade A utility value of 0.58, and a 52% double-bundle IKDC grade A outcome.

The results were most sensitive to the proportion of IKDC grade A outcomes and the utility values assigned to IKDC grades A and B outcomes, but less sensitive to the marginal cost of performing double-bundle compared with single-bundle reconstruction.

Authors’ conclusions
The authors concluded that their preliminary analysis suggested that double-bundle anterior cruciate ligament reconstruction was cost-effective.

CRD commentary
Interventions:
The interventions were clearly reported. Single-bundle reconstruction appears to have been an appropriate comparator.

Effectiveness/benefits:
The authors stated that they reviewed the literature to identify relevant studies, but they did not state whether this was performed systematically and it is unclear whether or not all the best available information was analysed. The estimates of double-bundle failure rates were assumed to be the same as the four-year rates for single-bundle anterior cruciate ligament; the authors provided no evidence and no rationale to support this assumption. The data were from randomised controlled trials which were potentially of high quality, but few details were reported. Further details on the calculation of the IKDC outcome percentages were provided in an online appendix. A time horizon based on the literature was chosen, but no estimates of benefit over a longer time horizon (such as lifetime) were assessed.

Costs:
The authors stated that a societal perspective was adopted, but the analysis included only the health care costs. The indirect costs were not included as they were assumed to be captured in the QALY outcome. This assumption might not have been appropriate as work-related productivity losses were not assessed. It appears that all the important and relevant health care costs were included. These were derived from published studies, but the resource-use quantities were not presented separately from the costs. Some studies were more than a decade old and although these costs were inflated, changes in medical practice could have rendered them obsolete. The time horizon and discount rate were reported.

Analysis and results:
The analytic approach was appropriate. The modelling assumptions were described. A diagram of the model structure was provided. The uncertainty was evaluated using extensive one-way and multivariate sensitivity analyses. A more
comprehensive probabilistic sensitivity analysis would have captured the full impact of overall parameter uncertainty on the results. The authors reported the limitations of their study, which included very limited long-term information on the effectiveness of double-bundle anterior cruciate ligament reconstruction and robust utility data. They viewed their results as preliminary and for guiding future research.

Concluding remarks:
The methods were adequate. The analysis was described as preliminary and should be used to guide future research because of the lack of long-term information. The authors’ conclusions appear to be appropriate for the scope of the analysis.

Funding
Not stated.

Bibliographic details

PubMedID
20829416

DOI
10.1177/0363546510375545

Original Paper URL
http://ajs.sagepub.com/content/38/12/2417.abstract

Subject indexing assigned by NLM
MeSH
Anterior Cruciate Ligament /injuries /surgery; Athletic Injuries /economics /surgery; Cost-Benefit Analysis; Decision Support Techniques; Health Care Costs; Humans; Knee Joint /pathology /surgery; Missouri; Multivariate Analysis; Orthopedic Procedures /economics /methods; Quality-Adjusted Life Years; Reconstructive Surgical Procedures /economics /methods; Treatment Outcome

AccessionNumber
22011000797

Date bibliographic record published
08/06/2011

Date abstract record published
24/08/2011