A cost-effectiveness analysis comparing 3 anterior cruciate ligament graft types: bone – patellar tendon – bone autograft, hamstring autograft, and allograft

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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 evaluate the cost-effectiveness of the three most common types of graft, for anterior cruciate ligament reconstruction. The authors concluded that quadrupled hamstring tendon autograft appeared to be the most cost-effective method. There were a few limitations to the study methods and reporting, so the authors’ conclusions should be considered with caution.

Type of economic evaluation
Cost-effectiveness analysis, cost-utility analysis

Study objective
The objective was to evaluate the cost-effectiveness of the three most common types of graft, for anterior cruciate ligament reconstruction.

Interventions
The interventions were bone to patellar tendon to bone autografts, quadrupled hamstring tendon autografts, or allografts.

Location/setting
USA/secondary care.

Methods
Analytical approach:
The authors developed a decision tree to synthesise data from a range of sources, to simulate the outcomes of a cohort of hypothetical patients requiring anterior cruciate ligament surgery. The time horizon was one year and the authors stated that societal costs were considered.

Effectiveness data:
The clinical evidence came from published studies and assumptions made by the authors. The main clinical estimates were the probabilities of success, infection, pain, a need for revision, stiffness, and instability, following anterior cruciate ligament surgery. The quality of the evidence for these estimates was reported, and the evidence was mostly from case-control and cohort studies.

Monetary benefit and utility valuations:
The source for the utility values was a direct elicitation study, conducted by the authors, with patients in a sports medicine clinic, using time trade-off methods. The authors assumed full health (a utility value of 1.0) for patients who were ‘well’ in the model.

Measure of benefit:
Quality-adjusted life-years (QALYs) were the summary benefit measure.

Cost data:
The cost categories included each procedure, treatment of infection, revision procedures, and treatment of stiffness or fracture following the procedure. The resource use and prices were from published literature (surgery and treatment of...
infection), the US National Transportation Safety Board (fracture of the femur), unpublished data (physiotherapy for stiffness), and published estimates from an academic medical centre (revision). All costs were reported in US $.

Analysis of uncertainty:
One- and two-way sensitivity analysis were performed, with the results reported in tables or graphs.

Results
Quadrupled hamstring tendon autografts were expected to result in 0.912 QALYs, compared with 0.906 QALYs for bone to patellar tendon to bone autografts (an incremental loss of 0.006 QALYs), and 0.904 QALYs for allograft (an incremental loss of 0.008 QALYs).

The cost of hamstring autograft was expected to be $5,373, compared with $5,580 for patellar tendon autograft (an additional $207) and $6,958 for allograft (an additional $1,585).

Patellar tendon autograft and allograft were dominated, as they were more costly and less effective than hamstring autograft. Patellar tendon autograft was cost-effective in some scenarios in the sensitivity analysis, using an incremental cost-effectiveness ratio threshold of $50,000 per QALY.

Authors' conclusions
The authors concluded that quadrupled hamstring tendon autograft appeared to be the most cost-effective method for most patients requiring anterior cruciate ligament construction.

CRD commentary
Interventions:
The interventions were adequately reported. The selection of the comparators was appropriate, and it included the most common methods of surgery. These interventions should be generalisable to other settings. The hypothetical population was not described, making it difficult to assess the validity of some assumptions and the generalisability of the results.

Effectiveness/benefits:
The references for the sources and the estimates used in model, as well as the level of evidence for each source, were reported. The sources were case-control and cohort studies, and the authors stated that there was no level one (randomised trial) data. The databases searched and methods used to select the evidence were not reported, so it is unclear whether the best available evidence was used. A time horizon of one year might have been insufficient to capture the full difference in effectiveness, and its impact on patient health, between options. The utilities were estimated using appropriate methods, but the values of patients in a sports medicine clinic, might not fully represent the clinical population. The authors assumed that patients who were ‘well’ had full health, or a utility of one, which could overestimate the benefits of surgery, particularly as utility estimates may decrease with age and comorbidity.

Costs:
The authors reported most details of the costs in the text and a table, but some details, such as the methods used to identify and select the estimates from published literature, were omitted, making it difficult to assess whether the best available estimates were used. They did not state the price year, nor whether any adjustments were made to the cost data. Discounting was not necessary for the one-year time horizon, but one year might not have been sufficient to capture all the differences in the costs, between the three techniques. Only the direct operative costs, additional direct postoperative rehabilitation, indirect societal costs, and patient costs were included. These were consistent with the stated societal perspective, but some costs might have been omitted, such as those of lost productivity.

Analysis and results:
An incremental approach was appropriate to assess the relative cost-effectiveness of the three surgical options. The impact of uncertainty was assessed in a sensitivity analysis, but an assessment of the joint parameter uncertainty, in probabilistic sensitivity analysis, would have been useful. The authors reported some of the limitations of their analysis.

Concluding remarks:
There were a few limitations to the study methods and reporting, so the authors’ conclusions should be considered with caution.
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