Cost-effectiveness analysis of autologous chondrocyte implantation: a comparison of periosteal patch versus type I/III collagen membrane

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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
This study examined the cost-effectiveness of autologous chondrocyte implantation, using either a periosteal patch or a type I or III collagen membrane, as a cover for the transplanted chondrocytes. The authors concluded that either procedure was cost-effective. Over 10 years, the collagen membrane was slightly more cost-effective than the periosteal patch, but this depended on the model assumptions. The authors’ conclusions seem valid, but variations in the utility values had a big impact on the model outcomes.

Type of economic evaluation
Cost-utility analysis

Study objective
This study examined the cost-effectiveness of autologous chondrocyte implantation, using either a periosteal patch or a type I or III collagen membrane, as a cover for the transplanted chondrocytes, for otherwise healthy patients with a focal chondral injury of the medial or lateral femoral condyle that satisfied the indications for repair using autologous chondrocyte implantation.

Interventions
Autologous chondrocyte implantation, using a periosteal patch, was compared with implantation, using a collagen membrane.

Location/setting
USA/hospital (orthopaedic unit).

Methods
Analytical approach:
The analysis was based on a decision model, with a 10-year time horizon. The perspective was not explicitly stated.

Effectiveness data:
The clinical inputs were from high-quality studies, identified by a published Cochrane database review and published systematic reviews, where possible. These studies provided the short-term treatment effect and the rate of graft hypertrophy, with the periosteal patch and the collagen membrane. The long-term data were from observational studies and authors’ assumptions. Treatment failure rates were the primary input for the model.

Monetary benefit and utility valuations:
The utility values were from studies that assessed the quality of life of patients with conditions similar to a focal chondral injury, such as osteoarthritis. Some assumptions were required, and Lysholm scores were used to estimate some utility values.

Measure of benefit:
Quality-adjusted life-years (QALYs) were the summary benefit measure, and they were discounted at annual rate of 3%.

Cost data:
The economic analysis included the costs of the procedures, such as initial consultation fees; all hospital surgeon and anaesthesia fees; physical therapy; postoperative out-patient care; and durable medical equipment. The cost of autologous chondrocyte implantation included cell shipping and processing. The cost of the type I or III collagen membrane was added and a lower operating time was assumed, for the collagen membrane. Most of the economic data were from a local orthopaedic specialty hospital. The costs were in US $, and a 3% annual discount rate was applied.

Analysis of uncertainty:
Threshold analysis was carried out to investigate how robust the model outcomes were to variations in: the additional cost of the type I or III collagen membrane, the rate of graft hypertrophy following each procedure, the utility values, and the discount rate.

Results
Compared with the periosteal patch, the collagen membrane led to a gain of 0.07 QALYs and saved $941, so it was dominant. The average cost per QALY gained was $9,466 with the periosteal patch, and $9,243 with the collagen membrane.

The results of the main analysis were robust to variations in the selected inputs, except for the utility values. For example, the periosteal patch became cost-effective if the utility value for patients doing well after autologous chondrocyte implantation, using a periosteal patch, increased slightly from 0.85 to 0.86, or the utility after using the collagen membrane, decreased from 0.85 to 0.84.

Authors’ conclusions
The authors concluded that autologous chondrocyte implantation, with either procedure, was cost-effective. Over 10 years, the collagen membrane was slightly more cost-effective than the periosteal patch, but this depended on the model assumptions.

CRD commentary
Interventions:
The authors justified their selection of the comparators, which appear to have been the available autologous chondrocyte implantation procedures for the patient population. The collagen membrane was used, without approval, in the USA, and it was licensed for use in most European countries.

Effectiveness/benefits:
The authors stated that the best available evidence (high-quality studies identified by systematic reviews) was used for the short-term treatment effect. The long-term data were from low-quality evidence, as there was a lack of high-quality studies. No further details on the sources were provided. Only a few parameters were varied in the sensitivity analysis. QALYs were a relevant outcome measure, given the impact of the procedures on the patients' quality of life. There were no available utility weights for the patient population considered, so these values were from patients with diseases with a similar impact on quality of life.

Costs:
The perspective was not explicitly stated, but only those costs paid by the hospital appear to have been considered. The costs were presented as category totals, and were not broken down to individual items. The price year was not reported. The costs were from a local specialty hospital, and their generalisability to other health care settings was not clear. The impact of variations in the economic inputs was not tested in the sensitivity analyses, except for the cost of the type I or III collagen membrane.

Analysis and results:
The results of the main analysis and the sensitivity analyses were reported. A deterministic approach was used to assess uncertainty and this focused on a few parameters; the exclusion of the other inputs was not discussed. A description of the model pathways was given. The authors acknowledged some limitations to their analysis, and these mainly related to the lack of high-quality data for the long-term treatment effect, and the need for some assumptions for the utility values. The findings were specific to the USA and do not appear to be transferable to other settings.

Concluding remarks:
The authors’ conclusions appear to be valid, but the sensitivity analysis highlighted the impact of variations in the estimated utility values on the model outcomes.

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