A cost-utility analysis of laser-assisted angioplasty for peripheral arterial occlusions
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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.

Health technology
Laser-assisted angioplasty for peripheral arterial occlusions.

Type of intervention
Treatment.

Economic study type
Cost-utility analysis.

Study population
Patients with peripheral vascular disease.

Setting
Hospital. The economic study was conducted in the UK.

Dates to which data relate
The effectiveness data were largely based on a single trial published in 1992. The price year used was 1993/94.

Source of effectiveness data
Effectiveness data were derived from a review of previously published studies.

Modelling
A decision analytic model was used in the analysis, consisting of two elements. The first element was a decision tree that described the short-term effectiveness of conventional angioplasty and laser assisted angioplasty in recanalising occlusions. The second element was an eight-state Markov model that extrapolated from short-term trial data to estimate the cost and benefit implications of the initial recanalisation process over a 25 year period.

Outcomes assessed in the review
Primary and secondary recanalisation rates, and the probability of operative mortality during angioplasty, bypass surgery and amputation. Unsuccessful primary recanalisations were classified either as patients with claudications (sub-analysis I) or those with rest pain or ulceration (sub-analysis II).

Study designs and other criteria for inclusion in the review
The majority of the effectiveness data was based on the results of a prospective randomised controlled trial undertaken by Lammer (1992). Other studies were also used to estimate probabilities, although the study designs were not stated.
No clear criteria for inclusion in the review were stated.

**Sources searched to identify primary studies**
Not stated.

**Criteria used to ensure the validity of primary studies**
Not stated.

**Methods used to judge relevance and validity, and for extracting data**
Not stated.

**Number of primary studies included**
One randomised controlled trial, plus approximately 9 other studies of unknown design.

**Methods of combining primary studies**
The primary studies do not appear to have been combined. It is not clear how the primary studies were used to produce probabilities, or what those probabilities were.

**Investigation of differences between primary studies**
Sensitivity analyses were performed on the variability of primary data.

**Results of the review**
The main focus of the trial was the evaluation of excimer laser versus conventional angioplasty versus Nd/YAG laser assisted angioplasty for primary recanalisation. However, this model used data relating to the use of Nd/YAG in a secondary role to cross only those occlusions that the conventional guidewire could not recanalise. Based on a total of 7 patients, the laser's secondary recanalisation was 57% (4/7). Other published studies concluded that at least 50% of lesions that could not be crossed by guidewire could be recanalised by the laser.

**Methods used to derive estimates of effectiveness**
Where data was not available from the literature, an audit of patients’ notes and expert opinion were used to estimate probabilities for the model.

**Estimates of effectiveness and key assumptions**
It was not stated where such methods were used in practice.

**Measure of benefits used in the economic analysis**
Quality-adjusted life years (QALYs) gained were estimated using a decision tree to estimate expected life years and a Markov model to extrapolate the short term recanalisation results over a 25 year period. The time trade-off and Euroqol visual analogue scales were used to estimate utilities from 36 health care professionals (100% response) and 36 members of the general public (3 of whom refused). Participants were interviewed by a trained research nurse who asked them to value 4 health states using the above mentioned techniques.

**Direct costs**
Direct health services costs were considered in terms of: initial recanalisation costs (unit costs for the angioplasty
procedure including inpatient and outpatient care, drug use etc.), transition costs (repeat angioplasty, bypass surgery, or amputation), and state-dependent costs (monthly costs of care for the different states - unoperated asymptomatic, unoperated claudicant, unoperated rest pain/ulceration, operated asymptomatic, operated claudicant, operated rest pain/ulceration, amputee, dead). The unit costs were based largely on financial information obtained from the Nuffield Department of Surgery at the John Radcliffe Hospital and were expressed in 1993-1994 prices.

Indirect Costs
Not considered.

Currency
UK pounds sterling ( 드).  

Sensitivity analysis
One-way sensitivity analyses were performed for the three areas of uncertainty, together with some threshold analyses. The areas of uncertainty were: generalisability (e.g. utilisation of the laser, average age and case mix of the cohort, length of inpatient stay associated with the laser, average cost of inpatient stay and the discount rate); analytical methods (health state valuation method and discount rate for benefits); and variability of data (e.g. secondary recanalisation rate, symptom outcomes, five year patency rates, etc.)

Estimated benefits used in the economic analysis
The base-case results of the model over a 25 year period were as follows.

Sub-analysis I (claudicants):

Expected number of life years: Conventional angioplasty, 6.78; Secondary laser, 6.79.

Expected number of QALYs: Conventional angioplasty, 5.78; Secondary laser, 5.87.

Sub-analysis II (rest pain/ulceration):

Expected number of life years: Conventional angioplasty, 5.44; Secondary laser, 5.46.

Expected number of QALYs: Conventional angioplasty, 4.40; Secondary laser, 4.46.

Cost results
Sub-analysis I (claudicants):

Expected cost per patient: Conventional angioplasty, 3,669; Secondary laser, 3,929.

Sub-analysis II (rest pain/ulceration):

Conventional angioplasty, 8,716; Secondary laser, 8,823

Synthesis of costs and benefits
The incremental cost per additional QALY for sub-analysis I (claudicants) was 3,040 and for sub-analysis II (rest pain/ulceration) was 1,810. The model was sensitive to various factors including the proportion of patients who become asymptomatic following secondary recanalisation and the secondary recanalisation rate achievable by the laser.

Authors' conclusions
The best available data indicate a cost-effective role for the laser, but important areas of uncertainty exist. These include the laser's secondary recanalisation rate, which has been estimated on the basis of limited numbers of patients. This uncertainty suggests that further research is required before widespread diffusion of the laser for use in this clinical context.

**CRD COMMENTARY - Selection of comparators**
The selection of comparator for the review was appropriate.

**Validity of estimate of measure of effectiveness**
The method used to estimate effectiveness may not be valid. The study relies heavily on secondary results from a trial examining primary canalisation and the data used for the model were based on an extremely small sample of patients ($n=7$). There was no mention of any literature search to identify relevant literature, and very little detail is provided regarding the other studies used, or what they were used for.

**Validity of estimate of costs**
Extensive costing was conducted for the model, and the costs used seem entirely appropriate and reliable.

**Other issues**
Given the limitations of the available effectiveness data the authors' conclusions regarding the need for further research are entirely justified.

**Implications of the study**
Further research is required before widespread diffusion of the laser for use in this clinical context.

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Funded by the UK Department of Health.

**Bibliographic details**

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8690551

**Other publications of related interest**

**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
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