Incremental cost-effectiveness of laser therapy for visual loss secondary to branch retinal vein occlusion


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 use of laser photocoagulation therapy for macular oedema associated with branch retinal vein obstruction.

Type of intervention
Treatment.

Economic study type
Cost-utility analysis.

Study population
The study population comprised patients with branch retinal vein occlusion. Eligible eyes had a visual acuity ranging from 20/40 to 20/200, mainly due to the branch vein occlusion.

Setting
The setting was a hospital. The economic study was conducted in the USA.

Dates to which data relate
The effectiveness and resource use data were derived from studies published between 1984 and 1999. The price year was 2000.

Source of effectiveness data
The effectiveness data were obtained from several published studies, supported by authors' assumptions.

Modelling
A decision tree model, based on a Markov process, was constructed to assess the outcomes of the laser therapy in comparison with no treatment. The Markov model was used to account for the recurrent risk of developing a retinal vein occlusion in the second eye. Details of the model were reported elsewhere (see Other Publications of Related Interest).

Outcomes assessed in the review
The health outcomes assessed were the patients' mean age, life expectancy, mean follow-up, mean initial vision in affected eye and its utility value, and mean vision after treatment and its utility value.

Study designs and other criteria for inclusion in the review
One of the primary studies was a randomised controlled trial that was carried out with a large sample of patients. Effectiveness data were also obtained from official statistics of the US Department of Health and Human Services. Details on the design of the remaining studies were not reported.

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
Four primary studies were used to assess the effectiveness evidence.

Methods of combining primary studies
Narrative methods were used to combine the studies.

Investigation of differences between primary studies
Not carried out.

Results of the review
The mean age of the patients was 66 years.

Life expectancy was 16.5 years.

The mean follow-up was 37 months.

The mean initial vision in the affected eye was 20/70 (utility value 0.74).

The mean vision after treatment was 10/45 (utility value 0.785).

Methods used to derive estimates of effectiveness
The authors made some assumptions, which were derived from the literature, to support the effectiveness data used in the decision model.

Estimates of effectiveness and key assumptions
The authors assumed the following:

the treatment had no effect on mortality, thus the mortality in the study patients was the same as that in the age-matched US general population;

7% of the patients had worse vision in the fellow eye than in the treated eye at the time of treatment;

3% of the patients would develop a retinal venous obstruction in the fellow eye after the initial diagnosis;
the patients who developed a retinal venous obstruction in the fellow eye would have vision in the fellow eye that was
equal or poorer than that in the initial eye;

the beneficial effects of laser treatment would last for the remainder of the patients’ lives;

in the better seeing eye for untreated and laser treated patients, the utility values were 0.92 for those with visual acuity
20/20, 0.785 for those with visual acuity 20/45, and 0.74 for those with visual acuity 20/70; and

a 3% recurrent annual risk of contralateral vascular obstruction.

Measure of benefits used in the economic analysis
Quality-adjusted life-years (QALYs) were used as the benefit measures in the economic analysis. The utility values
were derived from a published study. The method used to elicit the patients’ preferences was the time-trade off
approach. QALYs were discounted at an annual rate of 3% for 16.5 years (mean life expectancy of the cohort under
study).

Direct costs
A 3% discount rate was used as the time horizon of the study was 16.5 years. The unit costs and the quantities of
resources were reported separately. The cost analysis included only the costs of laser therapy and repeat fluorescein
angiographies. The costs of initial consultations, initial fluorescein angiographies, and follow-up examinations were not
included in the analysis, as only the extra costs of laser therapy were analysed. The cost/resource boundary adopted in
the analysis appears to have been that of the third-party payer, as reimbursement rates were used as a source of cost
data in the economic evaluation. The quantities of resources were estimated from one of the published studies used in
the effectiveness analysis (the randomised controlled trial) and from some assumptions regarding the number of repeat
fluorescein angiographies. The cost data were obtained from the average Medicare Fee Schedule without geographical
adjustments. The total costs of the laser therapy were obtained using modelling. The price year was 2000.

Statistical analysis of costs
The costs were treated deterministically in the base-case.

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

Currency
US dollars ($).

Sensitivity analysis
A two-way sensitivity analysis was conducted. This varied both the discount rate for the costs (0, 1, 3, 5 and 10%) and
the annual recurrent risk of contralateral vascular obstruction (1, 2, 3 and 5%).

Estimated benefits used in the economic analysis
The extra number of discounted QALYs gained with the laser therapy over no treatment was 0.230.

Cost results
The discounted incremental costs of laser therapy over no treatment were $1,056.50.
Synthesis of costs and benefits
An incremental analysis was performed to combine the costs and benefits of the intervention. The extra cost per QALY gained with laser over no treatment was $4,439. The sensitivity analysis showed that even in the most unfavourable scenario, the cost per QALY did not reach $20,000.

Authors' conclusions
The incremental cost-effectiveness of laser photocoagulation therapy for macular oedema associated with branch retinal vein obstruction was well below the common threshold of cost per QALY used in the economic evaluation of health interventions.

CRD COMMENTARY - Selection of comparators
The rationale for the choice of the comparator was clear. No treatment was selected, as the main aim of the study was to assess the active value of laser therapy. You should decide whether it represents a valid comparator in your own setting.

Validity of estimate of measure of effectiveness
The effectiveness data were derived from published studies, but a formal review of the literature was not undertaken. The authors did not evaluate the impact of differences among the primary studies when assessing the effectiveness outcomes. Also, the data from the primary studies were combined using narrative methods. Several assumptions were made to support the decision model, but only the impact of risk of branch vein occlusion was tested in the sensitivity analyses.

Validity of estimate of measure of benefit
The benefit measure used in the economic analysis was the QALY, which was appropriately modelled and discounted. The utility values and the method used to derive the QALYs were reported. The use of QALYs enhances the comparison of the benefits of the treatment under study with those of other interventions funded in the health care system.

Validity of estimate of costs
The analysis of the costs was, presumably, conducted from the perspective of the third-party payer. The authors stated that only the incremental costs related to laser therapy were included in the analysis. The sources of the cost and resource data were reported. Appropriate discounting was performed. However, the costs were treated deterministically, sensitivity analyses were performed only on the discount rate, and the cost estimates were somewhat specific to the US setting. Good features were that the price year was indicated, and the unit costs were reported separately from the quantities of resources. This enhanced transparency and facilitated the application of the results to other settings.

Other issues
The authors did not compare their findings with those from other studies. Also, they did not address the issue of the generalisability of the study results to other settings, and only one sensitivity analysis was carried out. However, the study referred to patients requiring laser therapy and this was reflected in the conclusions of the analysis. The authors discussed the use of assumptions in the decision model, and acknowledged that some of them may represent a potential limitation of the analysis. The authors did not present their results selectively.

Implications of the study
The main implication of the study was that laser therapy used for macular oedema associated with branch retinal vein obstruction represents a cost-effective treatment, although this depends on the cost and benefit of other treatments that might be displaced to fund the laser therapy. The authors noted that their model offered wide applicability beyond...
ophthalmology.

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**Other publications of related interest**


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