Cost-benefit comparison: holmium laser versus electrocautery in arthroscopic acromioplasty

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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
Holmium yttrium-aluminum garnet (YAG) laser compared with conventional electrocautery in arthroscopic shoulder decompression. The glenohumeral joint was first evaluated and any concomitant pathological condition addressed. An arthroscope was then placed into the subacromial space and a decompression was performed. A full-radius shaver and either a laser or cautery were used to remove the bursa and maintain haemostasis. The acromial attachment of the coracoacromial ligament was then detached with the laser or cautery. Anterior acromioplasty was performed with a high-speed bur. The holmium YAG laser was set at 20W for all laser cases. Secondary procedures included acromioclavicular joint resection, glenohumeral joint debridement, debridement for partial tears of the rotator cuff, and manipulation under anaesthesia.

Type of intervention
Treatment.

Economic study type
Although the authors describe this study as a cost-benefit comparison, it is in fact a cost-consequences study.

Study population
In order to be included, patients had to satisfy the following criteria: diagnosis of stage II impingement (persistent fibrosis and tendinitis); no improvement of symptoms despite a course of physical therapy; chronic symptoms of at least four months duration; no previous decompression surgery on the affected shoulder; good pain relief from a subacromial injection of lidocaine (to confirm the diagnosis); and provision of informed consent.

Setting
Forty-six of the total of 49 procedures, including all the laser cases, were conducted at two separate institutions. The other three procedures were performed at three different hospitals. The health institutions were not named. The study was conducted in the USA.

Dates to which data relate
For the trial of clinical effectiveness, patients were enrolled between September 1993 and December 1994. The price year for the cost data was not stated.

Source of effectiveness data
The evidence for clinical effectiveness was derived from a single study.

Link between effectiveness and cost data
Costing was undertaken on the same patient sample as that used in the clinical effectiveness study. The study was conducted prospectively.
Study sample
The authors state that participants were randomly allocated to treatment groups, and that allocation was blind. However, the method of randomisation used is unclear. Overall, 49 shoulders in 48 patients were treated. Twenty-five shoulders were treated in the cautery group and 24 in the laser group. The selected study sample appears to be appropriate to the study question. There was no mention of the use of a power calculation for sample size. The numbers of excluded patients or those refusing to participate were not reported.

The following baseline characteristics were reported for the cautery and laser groups respectively:

- mean (SD) age 46 (11) and 49 (13) years;
- males per group 17/25 and 13/24;
- dominant arm affected 16/25 and 16/24;
- mean (SD) duration of symptoms 27 (41) and 20 (19) months;
- mean (SD) duration of conservative treatment 12 (10) and 14 (11) months;
- number receiving worker's compensation 12/25 and 7/24.

Study design
This was a multi-centre randomised controlled trial (five sites in total), but the majority of the procedures were performed at two sites. It is unclear whether patients or shoulders were the unit of randomisation. All patients were followed up for at least one year after surgery; the mean follow-up period was 14 months. There appeared to be no loss to follow-up. The use of blind outcome assessment was not mentioned.

Analysis of effectiveness
There did not appear to be any loss to follow-up. Therefore it is likely that the analysis was conducted on an intention to treat basis. Shoulders were evaluated with two scoring systems during each patient visit (at one week, one month, two months, three months, six months, and one year post-operatively). The University of California-Los Angeles (UCLA) shoulder system measures pain, function, range of movement, strength, and satisfaction. The maximum score is 35 points (see other publications of related interest). The American Shoulder and Elbow Surgeons (ASES) score is derived from a pain score determined with a visual analogue scale (50%) and a cumulative 'activities of daily living' function score (50%). The maximum score is 100 points (see other publications of related interest). In addition, surgery time, and peri- and post-operative complications were assessed, including peri-operative blood loss graded subjectively by surgeon at the end of each case. The two treatment groups were comparable at baseline for age, gender distribution, involvement of dominant arm, duration of symptoms, duration of conservative treatment, receipt of worker's compensation, secondary operative procedures, and ASES score. The cautery group had a higher UCLA score at baseline (mean (SD) 20 (4) versus 18 (3), p=0.006). There was no mention of an attempt to adjust for this baseline imbalance in the analysis.

Effectiveness results
The mean (SD) UCLA scores were initially significantly different between groups (cautery 21 (4) versus laser 18 (4) at one week, p=0.04). However, results from one month to one year showed no statistically significant differences between treatment groups (cautery 30 (5) versus laser 32 (4) at one year). Scores improved for both groups from baseline to end of follow-up. The UCLA subscores for patient satisfaction were 92% for cautery and 100% for laser at the last follow-up (non-significant difference). There were no statistically significant differences between groups for ASES scores at any time point (cautery 85 (16) versus laser 88 (16) at one year). Scores improved for both groups from baseline to the end of follow-up. The mean (SD) surgery time was 122 (20) minutes for the cautery group and 124 (29) minutes for the laser group (non-significant difference). The numbers of patients with mild/moderate/severe blood loss were 12/10/3 in the cautery group and 13/10/1 in the laser group (non-significant difference). There were no other
intraoperative complications. In terms of post-operative complications, reflex sympathetic dystrophy developed in one patient in the laser group after operation.

**Clinical conclusions**
There is no medical advantage in laser assistance for arthroscopic shoulder decompression.

**Measure of benefits used in the economic analysis**
No summary benefit measure was used in the economic analysis. A cost-consequences, cost-minimisation approach was adopted as no differences in clinical outcomes were observed.

**Direct costs**
Discounting was not undertaken, but this is justified due to the short duration of follow-up (less than two years). It is unclear whether costs and quantities were considered separately. Costs were reported from the perspective of the hospital. The estimation of quantities was based on data from the clinical trial (patients recruited 1993-1994). No price years for cost data were given.

**Statistical analysis of costs**
A t test was used to test the statistical significance of the between-group difference for average hospital charges per patient.

**Indirect Costs**
Indirect costs were not included in the analysis.

**Currency**
US dollars ($).

**Sensitivity analysis**
A sensitivity analysis was not reported.

**Estimated benefits used in the economic analysis**
Not applicable due to the cost-consequences approach. The reader is referred to the effectiveness results reported earlier.

**Cost results**
The mean (SD) cost per patient for surgery using conventional electrocautery was $5,039 ($1,273), and for laser assisted surgery was $6,166 ($1,270). The laser group averaged $1,127 more than the cautery group. (p=0.003). The total hospital charge was 23% higher for patients treated with lasers than for patients treated with cautery.

**Synthesis of costs and benefits**
No synthesis of costs and benefits was reported. Conventional electrocautery emerged as the dominant strategy in terms of costs.

**Authors' conclusions**
These data show no medical advantage in laser assistance for arthroscopic shoulder decompression. Considering the
lack of measurable benefit in conjunction with the significantly higher costs identified, laser assistance in arthroscopic shoulder decompression is not recommended.

CRD COMMENTARY - Selection of comparators
The choice of comparator (i.e. conventional electrocautery) is appropriate.

Validity of estimate of measure of benefit
The patient selection criteria and outcome measures used were clearly stated and were appropriate to the purpose of the study. The authors stated that all patients were followed up for at least one year, therefore there were no withdrawals. However, this was a small trial which may have lacked sufficient statistical power to detect true treatment effects. The methods used for randomisation and allocation concealment were not described explicitly. The use of blind outcome assessment was not mentioned. It is unclear whether the trial was single-blind or double-blind. It is therefore impossible to exclude the impact of bias on the results of the study. The benefits were represented as separate clinical outcomes and no summary measure was employed in the economic analysis.

Validity of estimate of costs
Since very little information was given about costs (source, separate consideration of costs and quantities, price year) it is difficult to comment on validity.

Other issues
It is difficult to draw conclusions about the generalisability of the results of this study, as it is likely to be underpowered. The authors compare their results to those of a similar study, which found significantly greater clinical improvement in the laser group. However, the study was non-randomised, recruited patients with more severe disease, used different outcome measures, and was also a small study. The findings should, therefore, be treated with a degree of caution.

Implications of the study
The results, taking into account the caveats described above, suggest that the use of laser-assisted arthroscopic subacromial decompression is not warranted on either clinical or economic criteria.

Source of funding
None stated.

Bibliographic details

PubMedID
10389086

Other publications of related interest

Subject indexing assigned by NLM

MeSH
Adult; Arthroscopy /economics /methods; Cost-Benefit Analysis; Decompression, Surgical /economics /methods; Female; Hospital Costs; Humans; Laser Therapy /economics /methods; Male; Middle Aged; Prospective Studies; Shoulder Impingement Syndrome /surgery; Shoulder Joint /pathology /surgery

AccessionNumber
21999001250

Date bibliographic record published
28/02/2001

Date abstract record published
28/02/2001