Cost advantages of two-level anterior cervical fusion with rigid internal fixation for radiculopathy and degenerative disease

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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
Two-level allograft anterior cervical discectomy and fusion for radiculopathy and degenerative disease.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Population of patients treated with ACDF who did not undergo RIF.

Setting
Hospital setting. This study was carried out at the St. Francis and Mercer Medical Centers, Trenton, New Jersey, USA.

Dates to which data relate
The effectiveness data were collected between 1989 and 1994. The price year was 1995.

Source of effectiveness data
Effectiveness data were derived from a single study.

Link between effectiveness and cost data
The costing was undertaken on the same patient sample as that used in the effectiveness study. The costing was carried out prospectively alongside the effectiveness study.

Study sample
The study sample comprised 64 patients treated with ACDF who did not undergo RIF. All patients had clinical evidence of cervical radiculopathy unresponsive to medical therapy with magnetic resonance imaging confirmation of the appropriate nerve root impingement. Two patients in the RIF group and one patient in the ACDF group also had signs of mild myelopathy. The ACDF group consisted of 25 patients (selected between 1989 and 1991), while the RIF group was made up of 39 patients (selected between 1991 and 1994). No power calculations were reported. Patients with single and three- or four-level disease were excluded.

Study design
This was a retrospective cohort study. Follow-up was 6 months to 4 years (mean: 31 months). No patients were lost to follow-up.

**Analysis of effectiveness**
The analysis of the clinical study was based on intention to treat. The primary health outcomes studied included health outcomes, complication rates, return to light activity, return to driving, return to unrestricted work, and external immobilisation rates. At analysis, the age and gender distributions were similar in both groups. The labour distribution showed a higher number of heavy and moderate labourers in the RIF group compared with the ACDF group.

**Effectiveness results**
The mean duration of symptoms was 3.5 years in the RIF group compared with 2 years in the ACDF group. 23 patients in the ACDF group and 36 patients in the RIF group achieved excellent or good outcomes using ODOM criteria. Patients who underwent RIF returned to light activities sooner than ACDF patients (mean 17 versus 28 days), although this was not statistically significant (p=0.08). RIF patients returned to driving (28 versus 57 days), and unrestricted work (66 versus 136 days) sooner than ACDF patients (p<0.05). No RIF patient was given external immobilisation. There were six complications in each group. In the RIF group there was 1 plate migration, 1 epidural haematoma, 2 misplaced screws, and 1 screw migration. In the ACDF group, there was 1 graft migration, 1 hemiparesis, 1 wound infection, 2 asymptomatic graft migrations, and 2 wound infections. Mean operating room time was 9 minutes longer in the RIF group and estimated blood loss was not significantly different between the two groups.

**Clinical conclusions**
Two-level allograft anterior cervical discectomy and fusion with RIF for radiculopathy is safe, effective, provides shorter convalescence, a shorter time to return to unrestricted work and hence a reduction in short-term disability compared with conventional anterior cervical discectomy and fusion.

**Modelling**
No modelling was undertaken.

**Measure of benefits used in the economic analysis**
The benefit measures used included time to return to driving, to return to normal activities and to return to work.

**Direct costs**
Direct costs included costs associated with the length of hospitalisation, SOME brace, operating room and anaesthesia time, instrumentation, and complications requiring intervention. Costs were not discounted. Quantities and costs were not reported separately. The quantity/cost boundary adopted was that of the hospital. The estimation of quantities and costs was based on actual data. The cost analysis was conducted using 1995 current procedural terminology codes as well as standard hospital charges to patients. No adjustments were made for the fact that charges, rather than real cost data, were used.

**Statistical analysis of costs**
Cost differences between the two groups were compared using a two-tailed, paired Student's t-test.

**Indirect Costs**
No indirect costs were included.
US dollars ($).

**Sensitivity analysis**
No sensitivity analysis was conducted.

**Estimated benefits used in the economic analysis**
Patients who underwent RIF returned to light activities sooner than ACDF patients (mean 17 versus 28 days), although this was not statistically significant (p=0.08). RIF patients returned to driving (28 versus 57 days), and unrestricted work (66 versus 136 days) sooner than ACDF patients (p<0.05).

**Cost results**
Mean length of stay charges to patients were $581 in the RIF group and $1,084 in the ACDF group (p=0.003). Mean operating room charges were $1,456 in the RIF group compared with $1,301 in the ACDF group (p=0.05). Mean anaesthesia charges were $505 in the RIF group and $488 in the ACDF group. Mean complication charges were $447 in the RIF group against $335 in the ACDF group. The overall mean charge was $13,098 in the RIF group and $10,624 in the ACDF group (p<0.05). To minimise bias and to account for recent changes in practice patterns, length of stay costs were equalised between the two groups. This brought charges for the ACDF group down to $9,701.

**Synthesis of costs and benefits**
The incremental cost-effectiveness ratios were calculated as $86 per day for driving, $213 per day for returning to normal activities, and $31 per day to return to work sooner. With equalised length of stay, the incremental cost-effectiveness of RIF was $293, $118, $42 for return to activities, driving, and unrestricted work, respectively.

**Authors’ conclusions**
Two-level allograft anterior cervical discectomy and fusion with RIF for radiculopathy is safe, effective, provides shorter convalescence and shorter time to return to unrestricted work. RIF may provide cost advantages to patients and insurance disability providers. The authors concluded that the increased cost of RIF treatment was more than offset by the benefits of earlier mobilisation.

**CRD COMMENTARY - Selection of comparators**
The rationale for the choice of the comparator was clear.

**Validity of estimate of measure of benefit**
The most relevant benefit measures seem to have been included. Outcome measures were only assessed by the patients themselves, and not, for instance, by the treating surgeon. Psychological and other effects on families and friends could also have been measured.

**Validity of estimate of costs**
Charges, as opposed to real opportunity costs, were used, however, no indication was given of whether this would lead to an over- or underestimation of true costs. Only costs which fell to the hospital were included. Indirect costs associated with the time to return to work and unrestricted activities could have been measured. The costing could have been more extensively reported. On the basis of the existing report, it is not possible to assess the robustness and generalisability of the results to other settings or countries.

**Other issues**
The reporting of the statistical results was sometimes incomplete. The study was retrospective and non-randomised,
which limits its usefulness. It also suffered from a small sample size and limited follow-up of the patients. The authors acknowledged that the study suffered from three limitations: (1) changing practice patterns during the study period, (2) the automatic immobilisation of patients using external orthosis, (3) physician-defined activity restrictions. The outcomes of the procedure were influenced by the expertise of the surgeon. Since all patients were treated by the same surgeon, this confounding effect was not taken into account.

**Implications of the study**

These results should be confirmed by a randomised controlled trial in which the procedures are carried out by a number of different surgeons. Any future study in this area should also include a more formal and extensive cost analysis.

**Source of funding**

None stated.

**Bibliographic details**


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**Other publications of related interest**


**Indexing Status**

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**MeSH**

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