Use of Tisseel fibrin sealant in neurosurgical procedures: incidence of cerebrospinal fluid leaks and cost-benefit analysis in a retrospective study

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 the fibrin sealant (FS) Tisseel (Baxter Healthcare Corp.). This was administered after surgery when the surgeons considered the patient to be at increased risk for postoperative cerebrospinal fluid (CSF) leaks because of the nature of the procedure, or the quality of the dural closure.

Type of intervention
Primary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients with intracranial pathological lesions undergoing surgical procedures using anterior cranial, infratemporal or retromastoid craniectomy (RMC) approaches.

Setting
The setting was secondary care. The economic study was carried out in the USA.

Dates to which data relate
The effectiveness evidence related to 1998 to 2000. No date for the resource evidence was given, but it was likely to have been 2000. No price year was given.

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

Link between effectiveness and cost data
The costing was carried out retrospectively on the same patients who provided the effectiveness evidence.

Study sample
No power calculations to determine the sample size were reported. All 72 patients treated with Tisseel FS between May 2000 and September 2000 at a single institution were included (FS group). These patients were matched in a 3:1 ratio with 181 historical controls treated by the same surgeons between July 1998 and June 2000 (control group). Apart from the use of Tisseel, no other differences in surgical techniques between the two patient groups could be detected.
Study design
This was a single-centre retrospective study with matched historical controls. The length of follow-up was unclear, but it was likely to have been 5 months for the intervention group and 1 year for the control group.

Analysis of effectiveness
The basis of the analysis was treatment completers only. The primary health outcomes used in the analysis were the incidence rates of CSF leaks and tension pneumocranium. The demographic characteristics were similar in the two groups. However, the surgical approach differed between the two groups, with a higher incidence of RMC in the control group (80.7%) than in the FS group (55.5%). Also, the pathological conditions were different in the two groups. In the FS group, there was a higher incidence of tumours (40.3% versus 22.7%) and a lower incidence of vascular conditions (50.0% versus 75.7%).

Effectiveness results
There were no CSF leaks in the FS group (0.0%) and 10 in the control group (5.5%), (p=0.067). Of these 10 CSF leaks, 4 occurred in patients undergoing anterior cranial base procedures (16% of these patients) and 6 occurred in patients undergoing RMC procedures (4.1% of these patients).

No patients experienced tension pneumocranium in the FS group, whereas there were 2 cases (1.1%) in the control group, (p>0.1). Both patients had undergone anterior cranial base procedures for tumour resection.

Clinical conclusions
The use of Tisseel FS reduced the incidences of postoperative CSF leaks and tension pneumocranium.

Measure of benefits used in the economic analysis
No summary measure of benefit was used. The authors adopted a cost-consequences approach.

Direct costs
No discounting was carried out since the costs were incurred during less than 2 years. The costs and the quantities were not analysed separately. The costs measured were for using Tisseel FS, 5 days' lumbar drainage, and 5 days' lumbar drainage followed by surgical repair. The costs were obtained from the authors' setting. No price year was given.

Statistical analysis of costs
No statistical analysis of the costs was carried out.

Indirect Costs
No indirect costs were calculated.

Currency
US dollars ($).

Sensitivity analysis
No sensitivity analysis was carried out.

Estimated benefits used in the economic analysis
See the 'Effectiveness Results' section.

**Cost results**
The cost of treating the CSF leaks was $245,068.

If all the control group had been treated with Tisseel FS it would have cost $90,500. Tisseel FS would therefore have been cost-saving.

**Synthesis of costs and benefits**
Not relevant.

**Authors' conclusions**
The use of the fibrin sealant (FS) Tisseel reduced the costs and improved the outcomes. It was a dominant strategy.

**CRD COMMENTARY - Selection of comparators**
The implicit justification for the comparator (no FS) was that, in the past, it represented current practice in the authors' setting. You should decide if the comparator represents current practice in your own setting.

**Validity of estimate of measure of effectiveness**
The effectiveness data were derived from a single study. The study design was based on a retrospective study of patients with matched historical controls. It cannot be stated with certainty that a randomised controlled trial, in which the treatment of both patient groups takes place simultaneously, would not produce different results. The patient groups were not comparable in terms of their reason for surgery and the exact surgical approach taken. This difference may have affected the results. However, the authors did not adjust for the disparities.

**Validity of estimate of measure of benefit**
The authors did not derive a summary measure of health benefit. Therefore, the benefits were those associated with the effectiveness outcomes.

**Validity of estimate of costs**
It appears that the authors only examined the costs from the hospital perspective. They only looked at the costs specifically associated with applying FS, and with lumbar drainage and surgical repair resulting from a CSF leak. No details on the cost components were provided. The total costs incurred by patients undergoing the two kinds of treatments were not examined. There was some breakdown of the costs into prices and quantities. The resource use quantities were taken from the study, whereas the prices were taken from the authors' setting. Statistical and sensitivity analyses of the prices were not carried out.

**Other issues**
The authors made some comparisons of their work with other studies. The issue of the generalisability to other settings was not addressed. The authors were aware that a randomised controlled trial would be the best method of assessing Tisseel FS. Also, that the retrospective nature of the current study and the lack of comparability of the two patient groups limited its usefulness. The authors did not discuss the lack of follow-up in the costs or effectiveness data after hospital discharge. They also did not discuss the limited cost data and how it limited the generalisability of the cost information to other settings.

**Implications of the study**
The study suggested that the use of Tisseel FS after neurosurgical procedures reduces the incidence of CSF leaks and tension pneumocranium when compared with a policy of treating such problems when they occur after surgery. This was most marked for anterior cranial base and RMC procedures. The authors recommended a randomised controlled trial to verify their results.

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