Percutaneous dilation tracheotomy versus surgical tracheotomy: our experience

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 percutaneous dilation tracheotomy (PDT) and surgical tracheotomy (ST) was examined.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients undergoing tracheotomy for prolonged mechanical ventilation. Only patients who did not have contraindications for the procedure were considered.

Setting
The setting was a hospital. The economic study was conducted in Israel.

Dates to which data relate
The collection of the effectiveness and resource use data started in November 1999. No closing date was reported. The price year was not reported.

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

Link between effectiveness and cost data
The costing was conducted on the same sample of patients as that used in the effectiveness study. It was carried out prospectively in the PDT group and retrospectively in the ST group.

Study sample
Power calculations were not reported. All eligible patients identified at the authors’ institution were considered in the study. An overall sample of 150 patients was included in the analysis, 75 in each group. The patients in the ST group had a mean age of 58.2 (+/- 16.4) years (age range: 27 - 85) and 27 were women. The patients in the PDT group had a mean age of 56.4 (+/- 14.8) years (age range: 25 - 90) and 30 were women. Seven patients were unsuitable for PDT because they had a large diffuse goiter that obscured the trachea (4), were hematologic patients with severe thrombocytopenia (2), or were morbidly obese and the trachea could not be palpated (1). These patients were therefore excluded from the analysis.
Study design
This was a prospective cohort study with historical controls, which was conducted at a single centre (the Rambam Medical Center, Haifa, Israel). The same surgeon conducted all procedures. The length of follow-up was not reported. No loss to follow-up was observed.

Analysis of effectiveness
It appears that all the patients included in the initial study sample have been accounted for in the analysis of effectiveness. The outcome measures used were the numbers of intraoperative and postoperative complications, and the rate of deaths. Actual procedural time and waiting time from the request of surgery to its performance were also reported. The baseline comparability of the study groups was not discussed and only age and gender were reported.

Effectiveness results
There were no deaths and intraoperative complications in the study groups.

In terms of postoperative complications, there were 3 cases of haemorrhage in the ST group. In the PDT group, there were 2 cases of haemorrhage, 1 case of stomal cellulites, and 1 case of subcutaneous emphysema.

The waiting time from the request of surgery to its performance was 2 to 5 days in the PDT group and 1 to 24 hours in the ST group.

Actual procedural time was 5 minutes or less for PDT and approximately 20 minutes for ST.

Clinical conclusions
The effectiveness study showed that PDT was as safe as ST for the performance of tracheotomy in critically ill patients. No deaths were observed with either technique. The procedural times were far shorter with PDT.

Measure of benefits used in the economic analysis
The health outcomes were left disaggregated and no summary benefit measure was used in the economic analysis. In effect, a cost-consequences analysis was conducted.

Direct costs
Discounting was not relevant since the costs were incurred during a short time. The unit costs were not presented separately from the quantities of resources used. The health services included in the economic evaluation were operating room services (e.g. nursing staff, assistants, equipment, and upkeep), anaesthesiology team, surgeon, and tracheotomy equipment. The cost/resource boundary of the study was not stated. The source of the costs was not reported, but it appears to have been the hospital where the study was conducted. The resource use data were presumably derived from the sample of patients who were included in the effectiveness study. The price year was not reported.

Statistical analysis of costs
The costs were treated deterministically.

Indirect Costs
The indirect costs were not included.

Currency
US dollars ($).
Sensitivity analysis
Sensitivity analyses were not conducted.

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

Cost results
The total costs per patient were $565 with ST and $274 with PDT.

The main cost-driver was operating room service ($366) for the ST group and tracheotomy equipment ($171) for the PDT group.

Synthesis of costs and benefits
A synthesis of the costs and benefits was not relevant since a cost-consequences analysis was conducted.

Authors' conclusions
Percutaneous dilation tracheotomy (PDT) was easy to perform, safe, and cheaper than standard surgical tracheotomy (ST) for the management of critically ill patients requiring tracheotomy.

CRD COMMENTARY - Selection of comparators
The rationale for the choice of the comparators was clear. ST was selected because it represented the standard approach for patients requiring tracheotomy. You should decide whether this is a valid comparator in your own setting.

Validity of estimate of measure of effectiveness
The analysis of effectiveness was based on a cohort study, which was partly prospective (PDT patients) and partly retrospective (ST patients). The two groups of patients were identified in two different timeframes, which could have introduced some time-related bias. The patients' demographics were reported, but the authors did not discuss the baseline comparability of the two groups. All eligible patients were identified but the method of selecting them was unclear. Details of the follow-up and outcome assessment were not provided. The evidence came from a single centre. It was unclear whether the sample size was appropriate for the study question since power calculations were not conducted. These issues tend to reduce the internal validity of the analysis.

Validity of estimate of measure of benefit
No summary benefit measure was used in the analysis because a cost-consequences analysis was conducted.

Validity of estimate of costs
The authors did not state explicitly which perspective was adopted in the study. The unit costs were not presented separately from the quantities of resources used and the price year was not reported. This reduces the possibility of replicating the study and conducting reflation exercises in other settings. No statistical tests on the costs were conducted and all estimates were specific to the study setting. The source of the economic data was not reported. A breakdown of the items was not presented and the costs were presented as macro-categories.

Other issues
The authors made extensive comparisons of their findings with those from other studies with clearly reported results, particularly the clinical results of the two procedures. The authors also noted that some studies showed the existence of
a learning curve for PDT, which affected the success of the procedure. However, the issue of the generalisability of the study results was not addressed and no sensitivity analyses were conducted. This affected the external validity of the analysis. The study referred to critically ill patients requiring tracheotomy and this was reflected in the authors' conclusions.

**Implications of the study**
The authors suggested that PDT is a good alternative to ST and should be added to the otolaryngologists' range of available surgical procedures for the management of prolonged mechanical ventilation. Although performed bedside, only a surgeon trained to treat potentially serious complications should perform PDT.

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