Percutaneous or surgical tracheostomy: a meta-analysis

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Authors' objectives
To compare percutaneous with surgical tracheostomy.

Searching
The authors searched the MEDLINE electronic database (1960 to 1996) with a Boolean combination of 'tracheostomy' or 'tracheotomy' and 'complications'. To locate recent publications, Current Contents was searched through the last 3 months of 1996. The authors also searched the bibliographies of retrieved articles for additional relevant studies. The search was limited to English language publications.

Study selection
Study designs of evaluations included in the review
Studies with at least 5 participants. Studies limited to specific tracheostomy complications (such as tracheal stenosis and tracheoinnominate fistula) or containing insufficient details were excluded.

Specific interventions included in the review
Percutaneous (PcT) and surgical (SgT) tracheostomy.

Participants included in the review
Adult intubated patients undergoing elective tracheostomies. Studies of children and emergency procedures were excluded from the review.

Outcomes assessed in the review
Peri- and post-operative complications of percutaneous and surgical tracheostomies.

How were decisions on the relevance of primary studies made?
Two authors independently selected the publications.

Assessment of study quality
No formal assessment of quality was undertaken.

Data extraction
The articles were extracted by three reviewers independently and discrepancies were resolved by discussion and data re-examination. Complications were divided into peri- and postoperative groups and further subclassified into severe, intermediate, and minor groups. Since most studies were published after 1985, surgical tracheostomy studies were divided into two periods: 1960-1984 and 1985-1996.

Methods of synthesis
How were the studies combined?
Complication rates were summed across publications for each study group divided by the total number of patients in each study group, and expressed as events per 10,000 procedures. Complication rates per study group were compared using the Fisher's exact test (two-sided).

The authors also computed totals of complications in each of six sub-groups (serious, intermediate and minor, both peri- and postoperative) and a weighted average was obtained by taking into account the number of patients in each publication (subjects at risk).
How were differences between studies investigated?
To examine the heterogeneity between studies within each group (PcT, SgT (1960-1984) and SgT (1985-1996)) the authors compared study-specific complication rates using a Fisher's exact test.

A subgroup analysis of PcT studies was performed to investigate the influence of the particular PcT 'set' used (of those using the progressive dilation technique, those using the same progressive dilation technique and performing the procedure under endoscopic control, and those using other tracheostomy 'sets').

Results of the review
Sixty-five studies were included in the review. Seventeen SgT studies (1960-1984) were included with 4,188 participants. Twenty-one SgT studies (1985-1996) were included with 3,512 participants. Twenty-seven PcT studies (1985-1996) were included with 1,817 participants.

Earlier surgical tracheostomy studies have the highest rates of both peri- (8.5%) and postoperative (33%) complications.

Comparison of recent surgical and percutaneous tracheostomy trials show that perioperative complications are more frequent with the percutaneous technique (10% versus 3%), whereas postoperative complications occur more often with surgical tracheotomy (10% versus 7%).

The bulk of the differences are in minor complications, except perioperative death (0.44% versus 0.03%) and serious cardiorespiratory events (0.33% versus 0.06%), which were higher with the percutaneous technique.

Heterogeneity was higher in the older and surgical trials.

Authors' conclusions
The authors state that the available data suggest the following:

a. Percutaneous tracheostomy is not clearly superior to SgT when recent studies are compared.

b. Percutaneous tracheostomy is associated with more perioperative complications than SgT in the published article, and especially, perioperative deaths and cardiorespiratory arrests.

c. PcT compares favourably with SgT in terms of postoperative problems.

However, these conclusions should be accepted with caution because of the heterogeneity of the published studies and because of the difficulty in detecting real differences when the prevalence of complications is low.

CRD commentary
The authors have clearly stated their research question and some inclusion and exclusion criteria. The literature search appears thorough but does not mention the inclusion of unpublished data and is limited to English language publications. The quality of the included studies was not formally assessed however the authors have reported on how the articles were selected, and on how many of the reviewers were involved in the data extraction.

The data extraction is reported in tables and text. The studies were pooled in a statistical analysis and there were tests for heterogeneity. Further subgroup analyses were performed and the authors have discussed some of the methodological and data limitations in the review. The authors' conclusions appear to follow from their results, but as stated by the authors, these should be viewed with caution.

Implications of the review for practice and research
Practice: The authors state that the choice of tracheostomy technique should be based on personal experience, until compelling evidence favouring one technique becomes available.
Research: The authors do not state any implications for further research.

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