Is sensorineural hearing loss a possible side effect of nasopharyngeal and parotid irradiation: a systematic review of the literature

Raaijmakers E, Engelen A M

Authors' objectives
The authors appear to study the effects of radiotherapy on permanent hearing loss.

Searching
MEDLINE was searched from January 1980 to July 2001 for English language publications; a list of search terms was provided. The authors also searched for relevant references cited in review papers.

Study selection
Study designs of evaluations included in the review
The authors did not specify any inclusion criteria regarding the study design, but did exclude case studies. Studies with a follow-up period of longer than one year were included in the review. Prospective and retrospective studies with and without a control were included.

Specific interventions included in the review
Radiotherapy was the intervention of interest. The papers included in the review examined nasopharyngeal and parotid irradiation. The authors described radiotherapy techniques in the review.

Participants included in the review
The authors did not explicitly state any inclusion criteria regarding the participants. Participants who underwent radiotherapy for nasopharyngeal carcinoma or parotid gland tumours were included in the review. Participants who also received cisplatinum were excluded from the review.

Outcomes assessed in the review
Hearing loss (dB) was assessed in the review. Studies were only included if they presented data on the frequency-dependent pure tone audiogram. They were excluded if they reported on otitis media only.

How were decisions on the relevance of primary studies made?
The authors did not state how the papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
The authors assessed validity using a scoring system that they developed. It was based on criteria involving participants, study design, follow-up, radiotherapy, audiometry and results. Studies were excluded if they scored less than 20 points when using this system. The authors did not state how the validity assessment was performed.

Data extraction
The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction.

For retrospective studies, the median follow-up time (if reported) was used as the follow-up period. The incidence of hearing loss was calculated for each study, along with a 95% confidence interval (CI) and standard error (SE).

Methods of synthesis
How were the studies combined?
Where possible, the authors pooled incidence data from the studies and calculated a 95% CI (presented as SE).
How were differences between studies investigated?
The studies used different cut-off levels to determine the clinically relevant hearing loss. Thus, the authors reported the pooled incidence at different cut-off levels (10, 15 and 20 dB). The pooled incidence (of 10 dB or more) was also presented according to tumour site (nasopharynx and parotid gland).

Results of the review
Nine studies (number of participants unclear) were included in the analysis. Four of these studies were prospective and five were retrospective.

When data from eight studies (n=248) were pooled, 42% (SE=0.03) of the participants experienced a hearing loss of 10 dB or more at 4 kHz.

When the data were presented according to tumour site, the pooled incidence was 44% (SE=0.04) for the nasopharynx (n=135), and 36% (SE=0.05) for the parotid gland (n=113).

Authors' conclusions
Radiotherapy has a significant effect on hearing. The dose to the inner ear should receive more attention, particularly in dose escalation studies and inverse planning.

CRD commentary
The authors did not clearly define all of their inclusion criteria. They only included English language studies and made no attempt to identify unpublished studies, which could have introduced publication or language bias into the review. The authors assessed validity using their own scoring system; the use of additional criteria to more rigorously evaluate the internal validity of each study would have been helpful. The authors did not report the results of the validity assessment for each of the included studies.

Since the study included mostly observational studies, further details (e.g. participants, radiotherapy techniques) presented in tabular format would have enabled a more thorough assessment of clinical heterogeneity. The authors pooled incidence data and then discussed reasons for heterogeneity. However, given the heterogeneity between the studies, a pooled incidence (particularly without weighting the data) is unlikely to be meaningful. While the data appear to show a trend of hearing damage due to radiotherapy, the quality of the included studies, the inappropriately pooled results, and hence the conclusions, are unlikely to be reliable.

Implications of the review for practice and research
Practice: The authors suggested that hearing is tested before radiotherapy and during follow-up. They also suggested that, in inverse planning, a penalty should be put on irradiation of the inner ear.

Research: The authors stated that further research, using large multicentre prospective trials, is needed.

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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.