A systematic review of radiofrequency ablation for lung tumors

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CRD summary
The authors concluded that radiofrequency ablation appeared safe for lung tumours and may have a role in treatment of non-resectable lung tumours, but at the time of the review there was insufficient evidence to determine its therapeutic value. In view of the lack of controlled or long-term evidence, the authors' conclusions about the safety of radiofrequency ablation may not be reliable.

Authors' objectives
To determine the efficacy and safety of radiofrequency ablation (RFA) for primary and secondary lung tumours.

Searching
MEDLINE via PubMed, EMBASE, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews and DARE were searched from inception to November 2006. Search terms were reported. The reference lists of articles retrieved were handsearched. The search was restricted to published peer-reviewed articles in English. Articles published only in abstract form were excluded.

Study selection
Studies of radiofrequency ablation for patients with primary or secondary lung tumours were eligible for inclusion, regardless of whether patients concurrently received chemotherapy or had previous unsuccessful lung resection and chemotherapy. Studies were required to include at least 10 participants and to report rates of procedure-related morbidity and mortality, complete tumour ablation, local recurrence and/or overall survival. Studies of radiofrequency ablation combined with radiation therapy or immediate surgical resection were excluded.

Participants in the review differed widely both within and across studies with respect to demographics, tumour characteristics, prior management and use of concurrent additional therapies (where described). Most studies included both primary and secondary tumours. A mean of one to 2.8 tumours per patient were treated. Mean lesion size ranged from 1.7cm to 5.2cm. Most studies used local anaesthesia with conscious sedation. A wide variety of radiofrequency ablation systems were used, in all cases via a percutaneous approach and in most cases guided by computed tomography (CT) or CT fluoroscopy. Follow-up protocols and measures of treatment response varied widely and were frequently poorly described. Most studies used contrast-enhanced CT for follow-up review, with or without additional imaging and/or percutaneous biopsy. Quality of life and cost-effectiveness data were sought in the review, but were not reported in the primary studies. All studies had relatively short follow-up times and few reported two or three year survival rates.

The authors stated neither how the papers were selected for the review nor how many reviewers performed the selection.

Assessment of study quality
Two reviewers independently classified studies by the quality of their design according to published criteria about levels of evidence (Oxford 2001). The authors did not state that other aspects of study validity were assessed. Disagreements were resolved in discussion with a third reviewer.

Data extraction
Event rates (medians and ranges) were extracted from primary studies and reported as percentages. Two reviewers independently extracted the data using a predefined format, with disagreements resolved in discussion with a third reviewer.

Methods of synthesis
Studies were combined in a narrative synthesis, grouped by outcome.
Results of the review
The review included 16 studies, all case series (n=652, range 12 to 142).

Mortality and morbidity (16 studies): The overall median procedural mortality and morbidity rates were 0% (range 0% to 5.6%; 16 studies) for mortality and 35.7% (range 15.2% to 55.6%; 16 studies) for morbidity. The most frequent complications were pneumothorax (median rate 28%, range 4.5% to 61.1%; eight studies) and pleural effusion (median 13.4%, range 1.3% to 60%; 10 studies). Other complications included pneumonia, pulmonary abscess, haemothorax, intrapulmonary bleeding, haemoptysis, pleural chest pain, cough and fever. The common complications were either self-limiting or easily managed. Median hospital stay was 1.3 days (range one to six days; nine studies).

Local disease control (12 studies): The median rate of complete tumour necrosis associated with radiofrequency ablation was 90% (range 38% to 97%; nine studies). Median rate of local recurrence in the radiofrequency ablation site was 11.2% (range 3% to 38.1%; eight studies) and median progression-free interval was 21 months (range 15 to 26.7; four studies).

Survival: Seven studies reported median survival duration after lung radiofrequency ablation, which ranged from 8.6 to 33 months (median 23 months). One-, two- and three-year survival rates were 63% to 85% (seven studies), 55% to 65% (four studies) and 15% to 46% (three studies).

Authors' conclusions
Radiofrequency ablation appeared safe for lung tumours and may have a role in treatment of non-resectable lung tumours. However, there was insufficient evidence at the time of the review to determine its therapeutic value.

CRD commentary
The objectives and inclusion criteria for the review were clear and relevant sources were searched for studies, although the restriction to published studies in English meant that the review was subject to publication and language biases. The potential for publication bias was not assessed. Steps were taken to minimise the risk of bias and error in validity assessment and data extraction by having more than one reviewer make decisions independently, but it was unclear whether this applied to study selection. The criteria used to assess study validity addressed study design only and no information was reported about the quality of individual case series (such as whether cases were consecutive). The decision to combine the studies by narrative synthesis was appropriate, given the lack of controlled data and heterogeneity between the studies. The potential for bias associated with poor study design, clinical heterogeneity and cointerventions was well addressed in the text. In view of the lack of controlled or long-term evidence, the authors' conclusions about the safety of radiofrequency ablation may not be reliable.

Implications of the review for practice and research
Practice: The authors stated that (wherever possible) surgical resection should remain the standard of care for patients with lung tumours.

Research: The authors stated that a randomised controlled trial that compared systemic chemotherapy alone versus chemotherapy with radiofrequency ablation would be useful. Clear patient selection criteria for radiofrequency ablation needed to be established.

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Record Status
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.