CRD summary
This review concluded that the addition of postoperative radiotherapy did not affect recurrence rates after complete resection of stage II and/or III thymic epithelial tumours. The authors' conclusions reflected the evidence presented, but the extent to which this is reliable is unclear due to the nature of the primary research, a small retrospective sample and the poorly reported review processes.

Authors' objectives
To evaluate the effects of adjuvant radiotherapy on recurrence rates after complete resection of stage II and stage III thymic epithelial tumours.

Searching
MEDLINE, EMBASE and the Cochrane Library were searched from 1981 to May 2008. Search terms were reported. References of included studies and review articles were handsearched. Abstract titles from the American Society of Clinical Oncology and the American Association of Thoracic Surgery were searched. Only papers published in English were considered for inclusion.

Study selection
Studies that included two cohorts of patients (one received complete resection and the other received complete resection with adjuvant radiotherapy) were eligible if they were diagnosed with thymic carcinoma and the studies reported on stage II or stage III thymic epithelial tumours. Studies that did not report Masaoka stage, but which provided sufficient details for the stage to be assigned were also included. Studies that combined adjuvant radiotherapy with chemotherapy were excluded.

All of the included studies were retrospective cohort design. Where reported, most studies used a range of radiation doses. No further details were reported.

The authors did not state how many reviewers carried out study selection.

Assessment of study quality
Methodological quality was assessed using a modified version of a validated scale (Newcastle-Ottowa) designed for non-randomised studies. The scale assessed criteria that included patient selection, comparability between cohorts and outcome measurement. Each reviewer independently scored the included studies before these were discussed as a group to arrive at a consensus score. The lowest possible score was zero. There was no set maximum score.

Data extraction
Recurrence rates for cohorts of patients who received complete resection versus complete resection plus adjuvant radiotherapy were extracted as odds ratios (OR). An associated Masaoka stage was extracted. Summary data or individual data or both were extracted, depending on availability. Recurrence was defined as any recurrence: local, regional and distant. Data were also extracted on recurrence patterns, survival and dosage of radiotherapy.

The authors did not state how many reviewers carried out the data extraction.

Methods of synthesis
A mixture of random-effects and fixed-effect meta-analyses were used to pool primary data and give odds ratios and associated 95% confidence intervals (CI). Data were analysed for all stage II and III patients, then separately by Masaoka stage. Heterogeneity was tested using the $X^2$ statistic; where this was statistically significant a random-effects model was used. A funnel plot was used to assess publication bias and tested using an adjusted rank correlation test.
Results of the review
A total of 22 studies met the inclusion criteria, but only 13 reported sufficient data be included in the meta-analysis (n=592). Of these 592, 342 patients received complete resection alone and 250 received complete resection plus adjuvant radiotherapy. Quality scores ranged from 0 to 14; three of the four highest ranked studies reported exclusively on stage II patients. Significant statistical heterogeneity was noted only for the stage III analysis and a random-effects model was used.

The pooled odds ratios that comparing complete resection with complete resection plus adjuvant radiotherapy in all thymic epithelial tumours stage II and III patients indicated there was no significant difference in rate of recurrence (OR 1.05, 95% CI 0.63 to 1.75, p=0.840). Analysis by stage did not significantly alter this result.

Ten studies compared survival rates for complete resection and reported the data according to stage, but meta-analysis was not possible due to poor reporting of the primary data. Eight of these 10 studies reported no difference between groups, one found a significant increase in survival for those patients receiving adjuvant radiotherapy and one reported significant benefit for the complete resection within radiotherapy patients.

The test for publication bias was not statistically significant (p=0.669).

Authors' conclusions
The addition of postoperative radiotherapy did not affect recurrence rates after complete resection of stage II and/or III thymic epithelial tumours.

CRD commentary
This review addressed a clear clinical question with appropriate inclusion criteria. The searches covered three key databases, but did not address the wider research literature or grey literature. The date restrictions were justifiable given the focus on accurate staging of thymic epithelial tumours. A publication bias test suggested it was unlikely to be present in the review. Only English-language publications were included, which potentially introduced language bias. The review process was fully described only for the quality assessment and details were poorly reported for study selection and data extraction, which made it difficult to rule out reviewer error or bias. The meta-analysis and narrative syntheses appeared to have been appropriate, although it was difficult to judge the clinical heterogeneity of the primary studies as few study characteristics were presented. The authors’ conclusions reflected the evidence presented, but the extent to which this was reliable is unclear due to the nature of the primary research, a small retrospective sample and the poorly reported review processes.

Implications of the review for practice and research
Practice: The authors stated that an argument could be made that adjuvant radiotherapy should not be routinely administered after complete resection of stage II or III thymic epithelial tumours, thus radiotherapy could be reserved as a treatment for later use.

Research: The authors highlighted ongoing research and emphasised that given the scarcity of available data, prospective clinical trials were needed.

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