Radiotracer-guided thoracoscopic resection is a cost-effective technique for the evaluation of subcentimeter pulmonary nodules

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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.

CRD summary
The aim was to determine whether radiotracer-guided thoracoscopic resection (RGTR) was cost-effective compared with thoracotomy in patients with highly suspicious intraparenchymal pulmonary nodules of less than one centimetre (5 to 10mm) and not easily removed by traditional thoracoscopic procedures. The authors concluded that RGTR was cost-effective for evaluating these highly suspicious solitary pulmonary nodules. There were a few limitations to the study and the authors’ conclusions should be considered with caution.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The objective was to determine whether radiotracer-guided thoracoscopic resection (RGTR) was cost-effective compared with thoracotomy in patients with highly suspicious intraparenchymal pulmonary nodules of less than a centimetre (5 to 10mm) and not easily removed by traditional thoracoscopic procedures.

Interventions
RGTR using a technetium 99m (a metastable nuclear isomer)-labelled microalbumin aggregate was compared against thoracotomy.

Location/setting
USA/secondary care.

Methods
Analytical approach:
A decision tree was used to combine the effectiveness data from multiple sources. Patients received either RGTR or a thoracotomy. In patients for whom the RGTR was unsuccessful, a thoracotomy was performed. Patients with lung cancer, at or not at stage IA (good prognosis), received a lobectomy. The authors stated that the analysis was carried out from an institutional perspective.

Effectiveness data:
The success of RGTR and the probability that the diagnosis was lung cancer at stage IA or other stages, a neoplasm other than lung cancer, or benign were based on an analysis of a 40-patient cohort from a single centre. All patients received RGTR, followed by thoracotomy, with lobectomy for patients with non-small cell lung cancer. The Society of Thoracic Surgeons Database (available at http://www.sts.org/sections/tnationaldatabase/ accessed March, 2010) was used to estimate the perioperative mortality after thoracoscopy and thoracotomy. The life expectancy of patients with non-small cell lung cancer with nodules of one centimetre or less was obtained from published sources and the life expectancies of patients with neoplasms other than lung cancer and with benign disease were obtained from standard sources.

Monetary benefit and utility valuations:
Not relevant.

Measure of benefit:
The primary measure of benefit was the probability of five-year survival.

**Cost data:**
The cost categories included RGTR alone, RGTR followed by thoracotomy, and unsuccessful RGTR followed by thoracotomy. The costs were based on total charges for the cohort of 40 patients treated in the single centre. The costs of thoracotomy were calculated by subtracting the estimated cost of RGTR from the total charges for patients with unsuccessful RGTR followed by thoracotomy. These costs were presented in a table and were reported in US dollars ($).

**Analysis of uncertainty:**
One-way sensitivity analysis was conducted and the probabilities were varied, within clinically plausible ranges, to assess their effects on the estimated cost-effectiveness ratio and to identify whether any thresholds existed at which the best treatment option would change. Two-way sensitivity analysis was also conducted by varying the cost of RGTR and the cost of thoracotomy.

**Results**
The probability of five-year survival was 0.8785 for patients who received RGTR compared with 0.8696 for thoracotomy. The cost per patient was $27,887 for RGTR and $32,271 for thoracotomy. RGTR was dominant as it had both lower costs and greater effectiveness than thoracotomy.

The one-way sensitivity analysis demonstrated that thoracotomy was less costly if the cost of RGTR increased by 33% or more, or the cost of thoracotomy decreased by 14% or more. Thoracotomy became the most cost-effective strategy when the diagnostic success rate of RGTR fell below 44%, the probability of perioperative death with RGTR increased to above 27%, or the probability of a lung cancer diagnosis increased to above 65%.

**Authors’ conclusions**
The authors concluded that RGTR was cost-effective for evaluating highly suspicious solitary pulmonary nodules of 5mm to 10mm.

**CRD commentary**
**Interventions:**
The interventions were well described and were relevant to the secondary health care setting.

**Effectiveness/benefits:**
The effectiveness of RGTR was well reported, but it was based on a small, non-randomised cohort of patients, from a single centre, with no control data. It was not clear whether a systematic review was conducted to identify any other sources for the estimates of the effectiveness of RGTR. The success of RGTR, the probability that the diagnosis was lung cancer (stage IA or other stages), a neoplasm other than lung cancer, or benign, and the probability of perioperative death, were explored in the analysis of uncertainty. The authors did not state whether any discounting was performed.

**Costs:**
The costs were relevant to the perspective taken, but the ongoing costs of the treatment of non-small cell lung cancer after the initial diagnosis were not considered. The unit costs were well reported in a table. The authors did not state whether discounting was performed and did not report the price year.

**Analysis and results:**
The use of a decision tree, which was presented in a diagram, was appropriate for the disease and the methodology was well reported. The authors conducted an incremental analysis and the reporting of the results in terms of five-year survival was appropriate and should be generalisable to other settings. The results and the uncertainty analysis were well reported enhancing the generalisability of the findings.

**Concluding remarks:**
The methods and results were generally well reported, but there were a few limitations to the study and the authors' conclusions should be considered with caution.
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