Utility of preoperative radionuclide scanning for primary hyperparathyroidism

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.

Health technology
Preoperative radionuclide to scan for primary hyperparathyroidism.

Type of intervention
Diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
Patients who underwent parathyroid exploration surgery for primary hyperparathyroidism.

Setting
The practice setting was three institutions, one tertiary care and two community hospitals. The study was undertaken in the USA.

Dates to which data relate
Effectiveness and resource data were collected between 1990 and 1994. No price dates were specified.

Source of effectiveness data
The utility of preoperative radionuclide scanning in patients with primary hyperparathyroidism was derived from a single study.

Link between effectiveness and cost data
Costing was undertaken retrospectively in the effectiveness study.

Study sample
60 patients (12 males, 48 females) were included in the study. Their ages ranged from 15 to 82 years.

Study design
The study was a retrospective case review. All patients included in the study underwent parathyroid exploration for primary hyperparathyroidism. Diagnosis was based on elevated serum total or ionised calcium and elevated parathyroid hormone. Images were obtained 10 to 20 minutes after injection of the tracer and 2 to 3 hours after injection to allow for dissipation of tracer from the thyroid.
Analysis of effectiveness
The analysis of the clinical study was based on intention to treat. The primary health outcomes used were the sensitivity in detecting adenoma and ability to localize adenomatous glands, the analysis from radionuclide scanning and the surgical success rates between scanned and unscanned cases.

Effectiveness results
Of the 60 patients included in the study, 54 were ultimately diagnosed with adenoma and 6 with hyperplasia. 21 patients underwent sestamibi scanning and 19 of these had solitary adenoma and 2 had hyperplasia. 10 patients underwent thallium scanning and 8 were diagnosed with adenoma and 2, with hyperplasia. Hypercalcemia was resolved in 100% of scanned patients and in 96.6% of unscanned patients at 3 months. 5 patients experienced transient postoperative hypercalcemia that required supplementation. An additional 4 patients were permanently hypocalcemic and required long-term medical therapy. The sestamibi scan demonstrated 89.5% sensitivity (95% CI: 65.5% - 98.2%) for adenoma. Scanning localized the adenoma exactly in 68.4% (95% CI: 43.5% - 86.4%) of cases scanned with sestamibi. The sensitivity for the thallium scan was 62.5% (95% CI: 25.9% - 89.8%), and the accuracy in localising the gland exactly was 62.5% (95% CI: 25.9% - 89.7%). The difference in sensitivity and accuracy between the sestamibi and thallium scans was not statistically significant. Statistical analysis of mean operative times was performed with the Mann-Whitney U test. Operative times were not statistically different.

Clinical conclusions
The data from this study indicated that preoperative radionuclide scanning does not have a significant effect on the surgeon’s ability to locate hyper-functioning parathyroid glands in primary hyper-parathyroidism.

Measure of benefits used in the economic analysis
The measure of benefits used were operative time savings from radionuclide scanning and the surgical success rates between scanned and unscanned cases.

Direct costs
In the analysis of treatment cost, the average time of exploration by the senior author in cases of adenoma without the benefit of an accurate scan was compared with that of unilateral exploration by the same surgeon. The cost of operative time was based on hospital charges for operative services exclusive of anaesthesia fees.

Statistical analysis of costs
P-values and a 95% confidence interval were used in the statistical significance of the tests.

Currency
US dollars ($).

Sensitivity analysis
Sensitivity analyses were carried out on the surgical success rates between scanned and unscanned cases.

Estimated benefits used in the economic analysis
Hypercalcemia was resolved in 100% of scanned patients and in 96.6% of unscanned patients at 3 months. The only measured variable that was statistically influential was the experience level of the attending surgeon (P=0.0005).
Cost results
The costs of sestamibi and thallium scans were the same. The 20 minutes of time savings did not outweigh the approximately $660 cost of a scan. The cost of the scan was about $360 more than the cost of the 25 minutes of operative time at the most costly of the three institutions where the surgery was performed.

Synthesis of costs and benefits
Costs and benefits were not combined.

Authors' conclusions
Preoperative radionuclide scanning can be helpful although it is not cost-effective for the initial exploration of patients with primary hyperparathyroidism and is insufficiently sensitive to make routine unilateral neck exploration for adenoma consistently effective. However, greater experience in the operating surgeon does decrease operative time. Even if one were to perform unilateral explorations routinely, the cost of scanning may outweigh the benefit of time savings.

CRD COMMENTARY - Selection of comparators
The reason for the choice of comparator was clear. Thallium 201/Tc99m-pertechnetate dual scanning has been the standard method of localising hyperfunctioning parathyroid glands until recently.

Validity of estimate of measure of benefit
The estimate of the benefits may not be internally valid because of the disparity in samples associated with each group. However, statistical analysis was performed on the results.

Validity of estimate of costs
The cost of operative time was based on hospital charges for operative services exclusive of anaesthesia fees. No other description of the cost methodology was described and there was no mention of prices used.

Other issues
The study seemed to determine the use of preoperative radionuclide scanning in patients, but the methodology outlining the cost of the scans and of the time saved was rather limited. The authors could have specified the costing methodology in more detail and carried out a more elaborate cost analysis. The issue of generalisability was not addressed although comparisons to other studies were made. Fewer cases (10 vs. 21) may have resulted in internal validity problems and weakness of study design.

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