Magnetic resonance angiography for the nonpalpable testis: a cost and cancer risk analysis

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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.

Health technology
The use of magnetic resonance angiography (MRA) for unilateral nonpalpable cryptorchid testes in children. Two alternative MRA strategies were considered. One was MRA with subsequent removal of testicular nubbin tissue (MRA-removal), while the other was MRA with observation of testicular nubbin tissue (MRA-observation). Management after MRA consisted of observation for an abdominal vanishing testis, orchiopexy for inguinal or abdominal testes, and either the removal or observation of inguinal nubbins.

Type of intervention
Diagnosis and treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised a hypothetical series of 1,000 children with nonpalpable testicles.

Setting
The setting appears to have been secondary care. The economic study was carried out in the USA.

Dates to which data relate
The effectiveness data were collected from studies published between 1982 and 2002. No dates for resource use were provided, since these were based on three management protocols. The costs related to data from the years 2002 and 2004. The price year was not stated.

Source of effectiveness data
The effectiveness data were derived from a review of English medical literature.

Modelling
A model comparing the overall costs of treatment was developed (TreeAge Software). This was based on a published model (Lorenzo et al. 2004, see 'Other Publications of Related Interest' below for bibliographic details). No other details were reported. A risk model was also developed to estimate the risk of cancer developing or death from cancer when using the "MRA with observation of nubbin" protocol.

Outcomes assessed in the review
The main outcomes estimated from the literature were:
the diagnostic accuracy of MRA and location of nonpalpable testes (both for historical series and MRA series);
the percentage of patients for whom testicular nubbin tissue would be left in situ (i.e. therefore being theoretically at risk of developing cancer);
the estimated risk of having testicular tissue in a nubbin;
the estimated risk of cancer occurring in an undescended testicle; and
the risk of dying of cancer in patients with an uncorrected cryptorchid testis.

Study designs and other criteria for inclusion in the review
Not stated.

Sources searched to identify primary studies
Not stated.

Criteria used to ensure the validity of primary studies
Not stated.

Methods used to judge relevance and validity, and for extracting data
Not stated.

Number of primary studies included
Nine studies appear to have been included in the review.

Methods of combining primary studies
The authors performed a meta-analysis based on two studies published in 1999 and 2001. They applied the results to a hypothetical series of patients using historical testicular localisation data (1992 - 1996). Data obtained from the other studies were presented in a narrative fashion.

Investigation of differences between primary studies
Not stated.

Results of the review
The meta-analysis of the two studies revealed that MRA was accurate in 98.5% of the patients (1.5% incorrect diagnosis), compared with 100% accuracy for laparoscopy.

The accuracy of MRA for nonpalpable testes varied depending on their location. Accuracy was 100% for abdominal, inguinal, inguinal nubbin and scrotal locations, and 0% for abdominal vanishing location.

The percentage of patients for whom testicular nubbin tissue would be left in situ would be 0% with the MRA-removal strategy, 29.1% with the MRA-observation strategy, and 0% with laparoscopy.

The estimated risk of having testicular tissue in a nubbin was 0 to 11%.

The estimated risk of cancer occurring in an undescended testicle was 3 to 10%.
The risk of cancer in a testicular nubbin was 0 to 1.1%.

The risk of dying of cancer in patients with an uncorrected cryptorchid testis 5.9%.

**Measure of benefits used in the economic analysis**
The summary measure of health benefit appears to have been the number of children at risk of developing cancer or dying from cancer. The authors reported that this measure was estimated from data collected in the review by means of a "risk analysis".

**Direct costs**
The direct costs considered in the economic analysis appear to have been those of the hospital. The main resource use categories were hospital-related (operating room, surgical supplies, room and board, medications, intravenous fluids, radiographic studies and professional fees). The overall cost of each proposed treatment protocol algorithm was compared using data from a large paediatric hospital (Children's Medical Center Dallas) for a patient undergoing an uncomplicated surgery. In addition, actual data provided by the same institution, a published study (Lorenzo et al. 2004) and the 2002 Texas Medicare reimbursement rates were consulted for the estimation of costs. Discounting was not relevant since the costs were probably incurred during a short period of time, although this was not explicitly reported. The unit costs were reported, but the price year was not explicit.

**Statistical analysis of costs**
The costs were treated deterministically. No statistical analysis of the costs was reported in the paper.

**Indirect Costs**
The indirect costs were not considered in the economic study.

**Currency**
US dollars ($).

**Sensitivity analysis**
One-way sensitivity analyses were conducted to evaluate the effect of varying individual probabilities and costs. Two-way sensitivity analyses were performed to evaluate the costs of care while varying operating room time and equipment costs. Neither the ranges nor the method of selecting the parameters and ranges were reported.

**Estimated benefits used in the economic analysis**
The highest estimated risk of cancer associated with the MRA-observation strategy was 1 in 300 children (0.32%). The highest associated risk of dying of cancer was 1 in 5,300 children (0.019%).

It could be inferred from the paper that with MRA-removal and laparoscopy there was an associated risk of cancer and of dying from cancer since no testicular nubbin tissue would be left in situ with these strategies.

**Cost results**
The average costs per child were:

- $5,925 for a protocol of MRA with removal of nubbin tissue,
- $5,118 for a protocol of MRA with observation of nubbin tissue, and
$5,051 for the standard laparoscopic protocol.

No incremental costs were reported.

**Synthesis of costs and benefits**
The costs and benefits were not combined.

**Authors' conclusions**
The use of magnetic resonance angiography (MRA) with observation of testicular nubbin tissue would result in 29% of patients avoiding surgery at a similar cost to standard care, without any significant increased risk of developing cancer of the testes. MRA followed by the removal of inguinal nubbins would dramatically reduce the number of operative interventions, but at increased costs.

**CRD COMMENTARY - Selection of comparators**
The reason for the choice of the comparator was clear, as diagnostic laparoscopy represents standard care. You should decide whether this represents standard care in your own setting.

**Validity of estimate of measure of effectiveness**
The analysis of effectiveness was based on data derived from the literature. The authors do not appear to have conducted a systematic review of the literature, and no details of the methods or conduct of the search and data extraction were provided. The authors did not report any information on the primary studies that provided the evidence. This point is important as if more studies had been included, the authors would have been able to conduct a receiver operating curve analysis to estimate the correlation between MRA sensitivity and specificity. The authors reported that the results of the review might have been affected by selection bias.

**Validity of estimate of measure of benefit**
The main benefit measure used in the economic analysis was the number of children at risk of developing cancer or dying from cancer. However, the results for MRA-removal and for laparoscopy were not explicitly reported and appear to have been based on assumptions. The authors did not report a generic measure of health benefit, such as quality-adjusted life-years, which would have enabled the study results to be compared with those for other interventions.

**Validity of estimate of costs**
The authors did not explicitly state the perspective adopted in the study, although it appears to have been that of a hospital. Most of the relevant resource use categories seem to have been included in the analysis. However, as the authors reported, some relevant costs (such as pathology expenses, disposable laparoscopic instrumentation and parental time off work following surgery) were not included. A rationale for the exclusion of the indirect costs was not provided. Although the overall cost of each proposed treatment protocol algorithm was compared using data from a large paediatric hospital, it was compared for a patient undergoing an uncomplicated surgery. This factor may explain why there is no measure of uncertainty around the cost estimates, and why no breakdown of the costs per management strategy was provided. Some of the resources used were reported separately from the unit costs. Discounting was appropriately not performed. The price year was not reported. The cost analysis was mainly based on cost data from one US paediatric hospital, which would limit the validity of the study results to other settings. However, some limited sensitivity analyses were performed to assess uncertainty.

**Other issues**
The authors did not compare their findings with those from other studies. They also did not address the issue of the generalisability of the study results to other settings.
Implications of the study
The study results suggest that MRA is a safe and reliable imaging technique for the evaluation of nonpalpable cryptorchid testes. As a specific recommendation for further research, the authors proposed a prospective trial assessing the accuracy of MRA for the evaluation of children with nonpalpable testis.

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None stated.

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Other publications of related interest

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