Magnetic resonance imaging for investigation of the knee joint: a clinical and economic evaluation

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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 imaging (MRI) for the diagnosis of chronic knee problems.

Type of intervention

Diagnosis.

Economic study type

Cost-effectiveness analysis.

Study population

The study population comprised patients with a persistent knee problem. The inclusion criteria were:

diagnostic or therapeutic arthroscopy was being considered (in the absence of MRI);

there had been no major surgery, such as knee replacement, in the injured knee (prior arthroscopy and partial meniscectomy did not represent an exclusion criterion);

there was no pre-existing chronic knee pathology;

there was no serious condition requiring immediate attention;

there was no history or recurrent experience of recurrent locking of the knee;

the patients were aged between 16 and 55 years; and

anterior knee pain was not the main clinical indication.

Setting

The setting was a hospital. The economic study was carried out in the UK.

Dates to which data relate

The period during which the effectiveness and resource use data were gathered was not reported. The price year was 1998.

Source of effectiveness data

The effectiveness evidence was derived from a single study.

Link between effectiveness and cost data
The costing was carried out prospectively on the same sample of patients as that used in the effectiveness study.

Study sample
Power calculations were based on published observational data and assumptions. A total sample size of 100 patients was required to detect a difference of at least 28% in the rate of patients in whom arthroscopy could be avoided (power 80%; alpha <0.05). Eligible patients were recruited from the routine orthopaedic clinic after referral, either from the general practitioner (GP) or from the emergency department. A total of 118 patients was identified and included in the analysis. There were 59 patients in each group. However, 9 patients in the MRI group and 3 patients in the arthroscopy group did not receive the scheduled intervention. The mean age was 36 years (range: 16 - 55) in the MRI group and 36 years (range: 17 - 54) in the arthroscopy group.

Study design
This was a prospective, open-label, randomised clinical trial that was performed at a single centre, the Kent and Canterbury Hospital in the UK. Randomisation was achieved using randomly ordered, opaque sealed envelopes. Patients in the MRI group were booked for an MRI scan and then placed immediately on the arthroscopy waiting-list. Patients in the arthroscopy group were placed directly on the arthroscopy waiting-list. Clinical follow-up continued until full knee recovery. The overall follow-up lasted 12 months. Final clinical data were available for 40 patients in the MRI group and 29 patients in the arthroscopy group. Blinding was not feasible.

Analysis of effectiveness
The analysis of the clinical study was conducted on an intention to treat basis). The primary outcome measures were the diagnostic or therapeutic impact of knee MRI and quality of life. Quality of life was estimated using two instruments, the SF-36 and the EuroQol EQ-5D, at baseline, and 6 and 12 months. Waiting times were also reported. The study groups were comparable at baseline in terms of age, gender distribution, source of referral, injured leg, duration of knee problems, and quality of life scores. Regression analyses were performed to take the potential impact of confounding factors into consideration.

Effectiveness results
The proportion of patients receiving surgery was 0.41 in the MRI group and 0.71 in the arthroscopy group, (p=0.001).

The time interval from randomisation to surgery was 173 (+/- 119) days in the MRI group versus 152 (+/- 106) days in the arthroscopy group, (p=0.47). The mean time from randomisation to receiving an MRI scan was 42 (+/- 35) days (range: 7 - 141).

The overall response rates to quality of life questionnaires were 67.8% at 6 months and 58.5% at 12 months. A significantly higher response rate at the 12-month assessment was obtained with MRI patients than with arthroscopy patients. At 12 months, nonresponders were significantly younger and had had their knee problems for a significant shorter period of time.

No statistically significant differences were observed between the groups for quality of life measures at any of the assessment points. However, there was a non significant trend towards better outcomes in the arthroscopy group. The data suggested that for many patients, problems remained in terms of bodily pain, performing daily work, or other activities. These results were confirmed in regression analyses that took potential confounding factors into consideration.

Clinical conclusions
The effectiveness analysis showed that MRI scan avoided surgery in a significant proportion of patients, but did not result in improvements in quality of life.

Measure of benefits used in the economic analysis
The health outcomes were left disaggregated and no summary benefit measure was used in the economic analysis. In effect, a cost-consequences analysis was carried out.

Direct costs
Discounting was not relevant because the costs were incurred during a short time. The unit costs were presented separately from the quantities of resources used. The NHS health services included in the economic evaluation were MRI scan, arthroscopy, other surgical and diagnostic procedures (including anterior cruciate ligament repair and knee X-ray), outpatient visits, GP visits and physiotherapy sessions. The costs relevant to the patients were travel, time, and other expenses associated with attending diagnostic and treatment procedures. The perspectives of the NHS and the patient were used. Resource use was derived from patient-level data, which came from the sample of patients included in the clinical trial. The NHS costs came from three main sources, a survey of 10 NHS Trusts, the University Hospital Birmingham, and Personnel Social Services Research Units. The source of the patient unit costs was not reported. The price year was 1998.

Statistical analysis of costs
The non-parametric approach of bootstrapping was used to determine confidence intervals (CIs) around the mean costs, and to examine the statistical significance of differences in the estimated costs.

Indirect Costs
The indirect costs do not appear to have been considered in the economic evaluation.

Currency
UK pounds sterling ().

Sensitivity analysis
Sensitivity analyses were not performed.

Estimated benefits used in the economic analysis
See the 'Effectiveness Results' section.

Cost results
A similar pattern of resource consumption was observed in the two arms of the trial. The NHS costs per patient were 756 (+/- 809) (95% CI: 609 - 1,121) with MRI and 708 (+/- 607) (95% CI: 594 - 926) with arthroscopy.

The difference was 48.12 (95% CI: -181.41 - 335.49).

The patient costs per patient were 141 (+/- 100) (95% CI: 117 - 170) with MRI and 137 (+/-90) (95% CI: 114 - 161) with arthroscopy.

The difference was 3.76 (95% CI: -28.93 - 40.94).

The total NHS and patient costs per patient were 897 (+/- 886) (95% CI: 730 - 1,227) with MRI and 845 (+/- 678) (95% CI: 707 - 1,077) with arthroscopy.

The difference was 51.88 (95% CI: -197.53 - 369.98).

Synthesis of costs and benefits
A synthesis of the costs and benefits was not relevant as the study was, in effect, a cost-consequences analysis.

Authors' conclusions
The use of magnetic resonance imaging (MRI) in patients with chronic knee problems avoided surgery in a large proportion of patients, without increasing costs to the National Health Service (NHS) and to the patient, and was not associated with worse outcomes.

CRD COMMENTARY - Selection of comparators
The authors justified the selection of the comparators. Arthroscopy represented the usual pattern of care, while MRI was an emerging diagnostic approach. You should decide whether they are valid comparators in your own setting.

Validity of estimate of measure of effectiveness
The effectiveness evidence came from a clinical trial, which was appropriate for the study question. The method of randomisation was reported. The study groups were comparable at baseline and the analysis of the clinical study was conducted on an intention to treat basis. These aspects of the study enhanced the robustness of the comparison. Power calculations were carried out to justify the size of the sample. The length of follow-up was appropriate. The study sample was likely to have been representative of the patient population. These issues tend to increase the internal validity of the analysis. However, the statistical analysis revealed that nonresponders were significantly different from those who provided complete follow-up data. Blinding was not feasible and was not performed. The authors noted that data were censored at the 12-month assessment point. This represented a weakness of the study because some patients had received arthroscopy towards the end of the follow-up period. However, the impact of using a longer follow-up was unclear.

Validity of estimate of measure of benefit
No summary benefit measure was used in the analysis because a cost-consequences analysis was conducted. Please refer to the comments in the 'Validity of estimate of measure of effectiveness' field (above).

Validity of estimate of costs
The authors reported explicitly the perspectives adopted in the study. All the relevant categories of costs were included in the analysis. The indirect costs (i.e. productivity losses) were not included in the analysis. The authors mentioned the costs of patient time, but such a category of costs was not clearly specified. The source of the data was reported only for the NHS costs. In general, the information on the patient costs was less clear. Details on the unit costs and resources used were clearly presented, and the price year was reported. These factors increase the possibility of replicating the study and reflating the results of the analysis in other settings. Statistical tests of the costs were carried out, owing to the skewed distribution of economic data.

Other issues
The authors stated that the results of the current study confirmed those of prior research. The issue of the generalisability of the study results to other settings was not addressed and sensitivity analyses were not performed. This reduces the external validity of the analysis. The authors discussed the potential explanations for the low response rates observed at the two follow-up points. The study referred to patients with chronic knee problems and this was reflected in the authors' conclusions.

Implications of the study
The study results supported the use of MRI as a diagnostic tool for patients referred for chronic knee problems. The authors noted that further research should be carried out to corroborate the results of the current study.

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Bibliographic details
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Other publications of related interest
Warwick DJ, Cavanagh P, Bell M, Marsh CH. Influence of magnetic resonance imaging on a knee arthroscopy waiting list. Injury 1993;24:380-2.

Hollingworth W, Mackenzie R, Todd CJ, Dixon AK. Measuring changes in quality of life following magnetic resonance imaging of the knee: SF-36, EuroQol or Rosser index? Quality of Life Research 1995;4:325-34.

Indexing Status
Subject indexing assigned by NLM

MeSH
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