

The Incidence of Pathology Detected by Magnetic Resonance Imaging of the Knee: Differences Based on the Specialty of the Requesting Physician

Joseph Bernstein, MS, MD*†

Eric L. Cain, MD, MBA*

J. Bruce Kneeland, MD‡

Murray K. Dalinka, MD‡

Abstract

The usage patterns of magnetic resonance imaging (MRI) by orthopedic and nonorthopedic surgeons were studied. A sample consisting of the radiologist reports from all knee MRIs in a single year at our institution were reviewed. Studies to evaluate tumors or infections were excluded. Reports were classified as normal or demonstrating degenerative joint disease, meniscal tears, cruciate ligament pathology, collateral ligament pathology, focal chondral defects, chondromalacia patella, cysts, extensor mechanism dysfunction, intraosseous edema, or fractures. Six hundred eighteen reports were reviewed.

The combined incidence of a normal study or one that found only degenerative joint disease was 45% for nonorthopedic surgeons and 27.6% for orthopedic surgeons ($P < .00001$). Given the higher incidence of normal findings in studies ordered by nonorthopedic surgeons, these physicians probably use MRI more for screening whereas orthopedic surgeons are more apt to use it for confirmation. Therefore, if clinical guidelines for using MRI are to be established, differences in use as a function of specialty must be acknowledged.

Magnetic resonance imaging (MRI) is a highly accurate means of detecting intra-articular knee pathology.¹⁻³ Moreover, because MRI provides diagnostic information noninvasively and without using ionizing radiation, this test is believed to be clinically safe.

Increased usage of MRI is troubling to some.⁴ One belief is that the growth of MRI represents a corresponding decrease in the importance of and reliance on history and physical examination. Others note that MRI is expensive. In response to this perceived

excess use, some third-party payers have imposed certification procedures to ensure that MRI is medically indicated.⁵

Creating guidelines for cost-effective use of MRI may be difficult beyond the usual limitations. The unique obstacle is that MRIs of the knee are obtained by two groups of doctors: orthopedic and nonorthopedic surgeons. If the use patterns of these physicians are different, broad guidelines applied to both groups will be inappropriate.

A difference in MRI usage between the two groups of physicians can result from different diagnostic strategy, the prevalence of pathology in the patient population, or both. Unique rates of positive findings will be seen if the test is used by one group for screening and for confirmation by the second group.⁶

Similarly, if the prevalence of disease were markedly lower in the nonorthopedic group, more normal studies would be present in this group even if its rules for invoking MRI were the same as the other group's rules. These differences manifest as a variance in the incidence rate of pathology seen on tests ordered by each group.

This article presents the results of knee MRIs obtained by orthopedic and nonorthopedic surgeons over the course of 1 year at our institution. Incidence and type of pathology were measured as a function of the specialty of the ordering physician.

MATERIALS AND METHODS

A computer search of the database of the department of radiology was performed for a single calendar year. A list

From the *Department of Orthopedic Surgery, †Leonard Davis Institute of Health Economics, and the ‡Department of Radiology, University of Pennsylvania, Philadelphia, Pa.

Reprint requests: Joseph Bernstein, MS, MD, 424 Stemmler Hall, University of Pennsylvania, Philadelphia, PA 19104-6081.

TABLE
**Pathology Detected on Magnetic Resonance Imaging,
 Tabulated by the Specialty of the Ordering Physician**

	Nonorthopedic Surgeon	Orthopedic Surgeon	P value
Total no. scans reviewed	266	352	
Normal study (%)	67 (25.2)	50 (14.2)	.0006
Degenerative joint disease (%)	94 (35.3)	97 (27.6)	.04
Degenerative joint disease as only finding (%)	53 (19.9)	47 (13.4)	.03
Meniscal tears (%)	86 (32.3)	150 (42.6)	.009
Meniscal tears, no degenerative joint disease noted (%)	49 (18.4)	103 (29.3)	.002
Cruciate ligament pathology (%)	29 (10.9)	47 (13.4)	NS
Osteochondral defect (%)	9 (3.4)	16 (4.5)	NS
Chondromalacia patella (%)	12 (4.5)	20 (5.7)	NS
Collateral ligament pathology (%)	3 (1.1)	17 (4.4)	.01
Tendon pathology (%)	4 (1.5)	6 (1.7)	NS
Fracture (%)	2 (0.8)	9 (2.6)	NS
Cysts (%)	3 (1.1)	2 (0.6)	NS
Intraosseous edema (%)	8 (3)	14 (4)	NS
Miscellaneous (%)	1 (0.3)	1 (0.2)	NS

Abbreviation: NS=not significant ($P>.05$).
 Note: Because some studies found more than one type of pathology, the percentages listed equal >100.

of MRIs of the knee was created, and the narrative reports of each study were obtained. These reports contained the patient identification number and age, the name of the ordering physician, and a running text describing the findings.

All studies obtained to evaluate tumors, vascular disease, or infections were excluded. Six hundred eighteen MRI reports were the basis of further analysis. For each, patient age and the specialty of the ordering physician were recorded.

The radiologist's report was reviewed for each study. Studies were classified as normal or demonstrating one or more conditions (Table). To determine the incidence of significant findings, the incidence of meniscal tears in the absence of degenerative joint disease, and the incidence of degenerative joint disease as the lone finding were reported distinctly, as well as part of their respective groups. Statistical significance was ascertained using the chi-square test.

RESULTS

Of the 618 studies, 266 were ordered by nonorthopedic surgeons and 352 by

orthopedic surgeons. Average patient age in both groups was 41 years. The incidence of normal studies was 25.2% for nonorthopedic surgeons and 14.2% for orthopedic surgeons ($P=.0006$). The incidence of degenerative joint disease was 19.9% for nonorthopedic surgeons and 13.4% for orthopedic surgeons ($P=.03$). The combined incidence of a normal study or one that found only degenerative joint disease was 45% for nonorthopedic surgeons and 27.6% for orthopedic surgeons ($P<.00001$). The incidence of other forms of pathology are shown in the Table.

An MRI evaluating a painful knee replacement in the nonorthopedic group (which was technically marred by metallic artifact and therefore not readable) and an MRI in the orthopedic group finding pigmented villonodular synovitis were the only miscellaneous results found. The distribution of findings by specialty is shown in the Figure.

DISCUSSION

The incidence of pathology detected on MRI of the knee is a function of the specialty of the physician who ordered the test. Strictly normal studies (25.2%

versus 14.2%) as well as those that were normal or showed degenerative changes alone (45% versus 27.6%) were more common in the nonorthopedic surgeon group. The high rate of negative studies in this group implies a lower threshold for using the test (ie, screening use) or a lower prevalence of pathology in the underlying population, or both. Conversely, the incidence of meniscal tears without degenerative joint disease present, the prototypical surgical lesion of the knee, was higher in the orthopedic surgeon group (29.3% versus 18.4%).

Several limitations are present in this study. This review was based on the written reports of several radiologists and not an explicit re-examination of the MRIs. Accordingly, the standards for reporting these films are not uniform. It is also possible that the radiologists have differing sensitivities and specifics for reporting intra-articular lesions. A similar issue is the absence of a gold standard validation of any of these reports. However, these potential biases can be assumed to be uniformly distributed across the two groups, and therefore of limited relevance.

Another limitation is that this review of MRI use can make no statement about appropriate usage.⁷ A test is indicated only if the next step in management depends on the result of the test, and the information needed to determine whether that rule was followed cannot be garnered from the data collected. Furthermore, a low incidence rate of pathology is not necessarily a sign of excessive use. It may be that the immediate benefits of a negative test (eg, rapid return to work or avoidance of further testing and consultation) justifies its cost. Likewise, a high incidence of pathology does not prove apt usage, as the "discovery" of pathology on MRI may be redundant. For example, a given finding on MRI could have been noted on physical examination, from the history, or from other imaging studies. Therefore, the incidence rate alone is not enough to determine the appropriateness of usage.

Another limitation to the study was the inability to determine whether a given patient had prior plain radiographs at our institution or elsewhere. In clinical practice, many patients present for an orthopedic evaluation with radiographs obtained elsewhere. This limitation compromises our ability to make a strong statement about the high rate of degenerative joint disease as the lone finding in the nonorthopedic surgeon group. Many of these MRIs could possibly have been omitted if weight-bearing radiographs were obtained prior to MRI.

The findings of this study superficially disagree with the results reported by Uppal et al.⁸ In their study, using similar methodology, it was shown that the incidence of pathology detected on MRI of the knee did not differ based on the specialty of the physician who ordered the scan. In their study, however, the overall incidence of pathology was considerably higher than what was found in the current study. Specifically, the incidence of meniscal tears was 45% in their study versus 38% in our study ($P=.02$); cruciate tears were found in 20% of MRIs versus 12% in our study ($P<.01$); incidence of fractures was 4% versus our 2% ($P=.01$); and the incidence of collateral ligament pathology was 7% versus our 3% ($P<.01$). Furthermore, in the study by Uppal et al,⁸ a higher percentage of MRIs were ordered by orthopedic surgeons (75% versus 57% in the current study). These two findings suggest that, overall, it is likely that the process by which nonorthopedic surgeons obtain an MRI is more stringent than in the orthopedic surgeon community; or, that for unknown reasons, the prevalence of pathology is different. It is unclear which study population more closely approximates the national norms.

Since the rate of surgical pathology in our study was low among nonorthopedic surgeons, efforts to decrease MRI in this group might be directed at using better initial screening tests. Perhaps a requirement to obtain plain

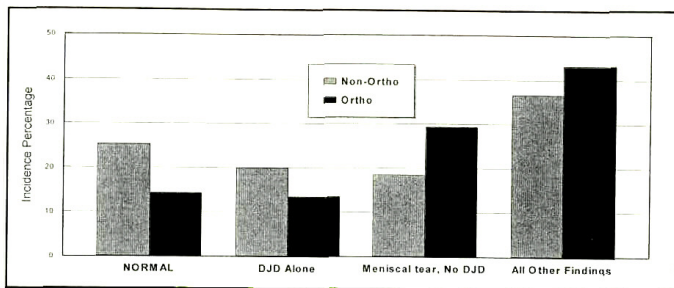


Figure: Graph depicting the comparative incidence of pathology by specialty. (Abbreviation: DJD=degenerative joint disease.)

radiographs to detect degenerative joint disease or a physical examination performed by a specialist would decrease usage. The relative price and accuracy of these other diagnostic methods determines whether this is cost-effective. Programs to decrease usage among orthopedic surgeons (whose patients may have a higher rate of pathology) might include encouraging empirical treatment without MRI. In both groups, of course, it would be wise for the ordering physician to explicitly consider the pretest probability of disease, the threshold at which a new plan would be chosen, and the likelihood that the MRI results will influence the next step in clinical management.

It is not clear which usage pattern of MRI is truly optimal. As MRI becomes less expensive and more accurate, the arguments against using it weaken.⁹ Should the cost value and accuracy of MRI surpass that of plain radiographs, even infrequent detection of pathology could reflect appropriate use. Moreover, given the financial and opportunity costs associated with unnecessary surgery (ie, a purely diagnostic arthroscopy), MRI may also have merit as a screening test even at a relatively high price. Given that context, it may be the case that MRI is not used enough.

Determining apt use requires articulation of the relative benefits of detecting or excluding the presence of disease. To perform a cost-effectiveness analysis, one must measure (or assign) utility

values to all possible outcomes and the probabilities of those outcomes. The current study made no such attempt. It showed merely that MRI is used differently by orthopedic surgeons and nonorthopedic surgeons. As a result, one set of practice guidelines for both physicians is probably not appropriate.

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