

# Radiographic examination of the lumbar spine in a community hospital: an audit of current practice

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## Abstract

**Objective**—To assess general practitioners' decisions to request lumbar spine radiographs according to the guidelines of the Royal College of Radiologists.

**Design**—Prospective questionnaire survey of outpatients attending for lumbar spine radiography.

**Setting**—London community hospital.

**Subjects**—100 consecutive adult outpatients attending for lumbar spine radiography at their general practitioner's request.

**Main outcome measures**—Patient's history and clinical signs; radiological diagnosis; change in management of patients with significant radiological abnormality in response to the radiologist's report.

**Results**—60 patients were aged between 18 and 45, 27 (45%) of whom were women. Five patients were fully examined by their doctor before radiographs were requested, 76 were partially examined, and 19 were not examined. In 37 patients the examinations showed radiologically normal findings; 30 had radiologically significant disc or degenerative disease. Pain score and radiological diagnosis was not correlated (6.43 (range 1-10) for patients with significant disease *v* 6.14 (range 1-10) for those without,  $p > 0.05$ ). There were no cases of malignancy or infection. One patient with radiologically significant disease was referred to a hospital specialist, and the management of only two such patients was altered by the report. 52 of the examinations should not have been requested if the guidelines had been strictly applied.

**Conclusions**—There is a need to inform doctors of the efficacy of radiological examinations. An awareness of the college's guidelines among general practitioners should be actively promoted by radiologists.

## Introduction

Radiographic examinations of the lumbar spine remain a large part of the workload in community radiology departments, and in this hospital comprise 15% of all outpatient examinations. Although they are apparently innocuous tests, there is a statistical probability of 19 deaths each year nationwide as a result of radiation absorbed during the examination.<sup>1-3</sup>

One of the recommendations of the Royal College of Radiologists, which outline the most effective use of diagnostic radiology, is that lumbar spine radiographs are likely to be useful in a limited number of clinical settings—that is, when pain is worsening or not resolving, when there is a history of trauma, or when abnormal neurological signs are evident on clinical examination.<sup>4</sup>

This study was inaugurated as part of our radiological audit. Its aim was to collect and interpret data on the referral patterns of our local general practitioners, and subsequently to make available to them the findings and a copy of the college guidelines, to try to reduce the number of unnecessary examinations.

## Patients and methods

We asked 100 consecutive consenting adult outpatients attending our radiology department for lumbar

spine radiographs between March and June 1990 to complete a questionnaire designed to determine whether the request form complied with the royal college's guidelines. They were therefore asked their age, sex, symptoms, and length of history and to grade any pain on a scale of 1 to 10. The questionnaire also established which components of a neurological examination had been carried out by their doctor: whether he had examined their back, gait, reflexes, sensation, and so forth. The general practitioners were not advised that the study was taking place so as not to bias their referral pattern.

The radiographs were assessed by at least two of us (any disagreement being settled by the third), and the patients were placed into the following diagnostic groups: normal findings; minor degenerative changes (assessed as sclerosis at facet joints or minimal osteophytic lipping at intervertebral discs); appreciable degenerative changes (more marked osteophytes at disc or facet joints, +/- resultant abnormal vertebral movement); minor disc lesion (loss of less than a third of the anticipated disc space at any or several levels); and significant disc lesion (loss of more than a third of the anticipated disc space). Combinations of these findings were noted, as were any other abnormal radiological findings.

The general practitioners of those patients with significant radiological abnormalities were contacted, and the number of patients referred to a hospital specialist as a result of the examination was recorded. The general practitioners were also asked if they were aware of the college's guidelines and whether they were interested in learning more about them.

The *t* test was used for statistical evaluation.

## Results

Table I shows the characteristics of the study population by age and sex. Sixty were aged between 18 and 45, of whom 27 were women. Table II shows the number of patients examined by their doctor and the number who were partially or completely examined. Assuming that a full examination is defined as one which includes examination of the back, the gait, straight leg raising, knee and ankle reflexes, and tests of sensation, then only five of our patients were fully examined; 19 were not examined at all and 76 were partially examined. In 15 their ankle jerks were assessed (although four patients did not answer this question); 17 had tests of sensation performed.

Table III shows the radiological findings in the group as a whole. In 37 the findings were normal and 30 had radiologically significant disc or degenerative disease, or both. There was one case of grade 1 spondylolisthesis, two of scoliosis, and one incidental finding of Paget's disease affecting an iliac wing. There were no cases of malignancy or of other serious disease.

The mean pain score of patients with radiologically significant disease compared with that of those with normal radiological findings was not significantly different (6.34 (range 1-10) *v* 6.14 (range 1-10,  $p > 0.05$ ). Only one of the patients with a significant radiological abnormality was referred to a hospital specialist.

According to the indications for lumbar spine

TABLE I—Age and sex of 100 patients presenting for radiography of lumbar spine

| Age (years) | Men | Women | Total |
|-------------|-----|-------|-------|
| <30         | 12  | 10    | 22    |
| 30-45       | 21  | 17    | 38    |
| 46-60       | 10  | 15    | 25    |
| 61-70       | 3   | 5     | 8     |
| >70         | 3   | 4     | 7     |
| Total       | 49  | 51    | 100   |

TABLE II—Extent of physical examination by general practitioners before referral for radiography

|                           | No of patients |
|---------------------------|----------------|
| Partial                   | 76             |
| Back alone                | 21             |
| Straight leg raising test | 48             |
| Knee jerk tested          | 25             |
| Ankle jerk tested         | 15             |
| Cutaneous sensation tests | 17             |
| Strength test             | 36             |
| Full                      | 5              |
| None                      | 19             |

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TABLE III—Radiological findings in 100 patients

|  | No of patients |
|--|----------------|
| Normal   | 37             |
| Minor disc lesion                                | 8              |
| Minor degenerative changes                       | 25             |
| Minor disc lesion and degenerative changes       | 3              |
| Appreciable disc lesion                          | 11             |
| Appreciable degenerative changes                 | 9              |
| Appreciable disc lesion and degenerative changes | 10             |
| Other  | 4              |

radiography in the college's guidelines, 52 of the examinations should not have been requested, although this was unclear in a further six patients. Of the patients wrongly referred, 23 were aged under 45, 20 had had pain for less than one month, 17 had a pain score of <3, and nine had pain which was resolving spontaneously.

When the general practitioners of the 30 patients with appreciable disease were contacted we ascertained that the radiological report had positively altered the medical management in two of them. However, most of the doctors said that the report had been useful in excluding serious disease. In one case the report had been used to obtain early retirement for a patient with chronic low back pain. Three general practitioners of the 26 contacted had heard of the college guidelines, and 16 said that they would be interested in seeing them. Several were concerned that general practitioners had not been consulted by the college when the guidelines were drawn up.

### Discussion

There is mounting and proper concern among both the public and the profession regarding the risks to health engendered by medical x rays, and this has resulted in statutory and advisory limitations on the use of ionising radiation in medical practice.<sup>5,6</sup> The most basic principle to be observed is that which states that no radiation exposure should be allowed unless there is a positive net benefit to the patient; there is therefore a responsibility for clinicians to ensure that radiographs are requested only when truly necessary.<sup>7</sup> The recent joint document of the Royal College of Radiologists and National Radiological Protection Board discusses means of reducing unnecessary exposure; indeed it states that probably a fifth of all medical examinations are unnecessary.<sup>7</sup> The total annual collective dose equivalent from medical examinations in Britain is considered to be 16000 manSv, and elimination of unhelpful examinations could save as much as 3200 manSv.

#### RISKS AND BENEFITS OF LUMBAR SPINE RADIOGRAPHY

As a subgroup medical sources are by far the largest artificial cause of ionising radiation, representing 12% of the background radiation in the United Kingdom, over ten times the radiation due to radioactive discharges.<sup>1</sup> Lumbar spine radiography entails a high cost in terms of radiation dose: although representing 3.3% of radiographic examinations nationwide, it forms 15% of the collective dose and is surpassed only by computed tomography.<sup>7</sup> For an individual patient the examination involves an average absorbed radiation dose of 2.2 mSv; this is about 40 times the dose received during chest radiography.<sup>3</sup> As every radiation exposure carries a one in 80 000 risk per mSv of inducing a fatal cancer,<sup>2</sup> and as in 1973, 700 000 people underwent lumbar spine radiography,<sup>1</sup> the statistical probability is that 19 people die each year as a result of this apparently innocuous test.

Every medical investigation entails a balance between the risks of the test and the potential benefit of a positive or negative result. The Royal College of Radiologists has taken an active interest in this issue, and several studies have investigated the proper role of diverse radiographic investigations in clinical contexts.<sup>8-10</sup> The current guidelines are a direct result of these studies, which show that radiological risks can be safely reduced without appreciable reduction in medical benefit.

It is of particular concern that so many of our patients were fairly young. Recent reports have emphasised the radiosensitivity of the gonads and stated that exposure to radiation should be avoided, if

at all possible, for six weeks before conception.<sup>11</sup> The testes can be shielded, but the ovaries are inevitably exposed when examining the lumbar spine, particularly if a lateral view of the sacrum is included, which is commonly the case when the L5/S1 disc is examined.

What of the financial cost? At Guy's hospital the cost of a lumbar spine examination is estimated at £13.04, excluding capital costs. Although our results cannot reliably be extrapolated nationwide, a considerable financial saving could probably be made if all clinicians took note of the college guidelines.

What, then, are the potential benefits of lumbar spine radiography? These can only be to make or confirm a diagnosis or to exclude serious disease, or both, and thereby reassure patients and their doctors.

In fact, plain radiographs are notoriously unreliable in these respects.<sup>12</sup> Significant disease can be present despite radiographs of normal appearance, and abnormalities in the lumbar region are so common that their clinical significance is often dubious. Postmortem studies of patients aged over 55 show degenerative changes in the lumbar spine in 85-95%<sup>13</sup>; this must cast serious doubt on the clinical significance of such findings in the context of back pain. Waddell found that various radiological abnormalities including spondylosis, osteophyte formation, disc calcification, and facet joint arthrosis were as common in symptomless patients as in those complaining of back pain.<sup>14</sup> Furthermore, our results confirm previous reports in showing the unreliability of the amount of pain in predicting abnormal radiological findings. Others have commented that radiographs have a role only in the investigation of acute back pain if medical management is likely to be altered; merely confirming a diagnosis may not be sufficient justification for the examination.<sup>15</sup>

Several general practitioners who were contacted said that their primary concern in ordering the radiographs was to exclude serious disease, such as malignancy. This can be done with reasonable accuracy by plain radiographs, but how often is malignancy seriously suspected by the referring general practitioner? Even in this context plain radiographs will miss a significant percentage of metastases, and radioisotopic bone scanning is needed in conjunction with plain films to exclude malignancy completely.

#### INDICATIONS FOR LUMBAR SPINE RADIOGRAPHY

When are lumbar spine radiographs likely to be helpful? Nachemson suggested that they should be reserved for patients with evidence of systemic disease, such as fever, weight loss, or a high erythrocyte sedimentation rate.<sup>16</sup> He also pointed out that the examination is more likely to have a significant result in fairly young patients (who may have spondylolisthesis) or in elderly patients (when malignancy or osteoporotic fractures become more likely) and reported that, in the absence of clinically suspicious features, routine radiographs in patients with back pain had a one in 2500 chance of detecting serious disease. Careful attention to the history and findings of the examination and a working knowledge of the college's guidelines, should minimise the non-detection of significant disease and prevent significant delay in diagnosing serious diseases. South East Thames Regional Health Authority guidelines for use of diagnostic radiology, closely modelled on those of the royal college, specifically state that in acute back pain without trauma radiographs should not be taken until a six week period has elapsed, as most such patients recover spontaneously within that time.<sup>17</sup>

Perhaps the examination reassures both patient and doctor: we doubt that reassurance is an adequate reason to submit a patient to ionising radiation. Unfortunately, it may in any case be a false sense of security that is engendered: Butt reported that routine

radiographs are commonly inadequate for diagnosing conditions such as spondylitis, metastasis at the base of a pedicle, and listhesis,<sup>18</sup> and therefore, apparently normal routine radiographs should not be considered adequate if the clinical picture indicates important disease.

It is surprising that so few patients were fully examined and that so many were not examined before the radiographs were requested. Although patients may forget much of what their general practitioner tells them in a consultation, we consider that most will remember whether or not they have been examined. At this unit most patients will have had their examination performed within a few days of the request so that elapsed time does not become a major factor in accuracy of recall. We thus believe that our figures are a reasonable approximation to the truth. It can only be that most of the doctors in our sample currently make their decision to request radiographs based on the patient's history and that the examination findings are unlikely to alter this decision one way or the other. We hope that dissemination of the college guidelines will help to modify this decision making process.

Few of the general practitioners we contacted were aware of the college guidelines, and most expressed an interest in seeing them. Radiologists should strive to ensure that their local general practitioners are informed of the guidelines and should discuss their implications with them.

Despite the pessimism of some authors,<sup>19</sup> there is evidence that educating clinicians about radiology can reduce the number of unnecessary examinations,<sup>20,21</sup> and in view of the many patients referred to our department for lumbar spine radiography, we hope that widespread acceptance of the guidelines will result in optimal use of radiological services. We also believe that there is a need for a guided increase in public awareness regarding the radiation engendered in diagnostic radiology. Though we do not wish to cause

unnecessary concern, the community as a whole would benefit from a reduction in medical radiation that might follow reduced demand from patients to have radiographic examinations for painful but benign conditions.

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## Association between secretor status and respiratory viral illness

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### Abstract

**Objective**—To determine whether non-secretion of blood group antigens is associated with respiratory virus diseases.

**Design**—Study of secretor status in patients with respiratory virus diseases determined by an enzyme linked immunosorbent assay (ELISA) developed to identify Lewis (Le) blood group antigen phenotypes (Le<sup>a</sup> non-secretor; Le<sup>b</sup> secretor).

**Subjects**—Patients aged 1 month to 90 years in hospital with respiratory virus diseases (584 nasal specimens).

**Main outcome measures**—Criteria for validation of ELISA (congruence between results on ELISA testing of 1155 saliva samples from a previous study and previously established results on haemagglutination inhibition (HAI) testing, proportions of Le<sup>a</sup>, Le<sup>b</sup>, and Le<sup>-</sup> phenotypes in 872 samples of nasal washings from a previous study compared with the normal population). Secretor status of patients determined by ELISA and viruses isolated.

**Results**—Agreement between HAI and ELISA for 1155 saliva samples was 97%. Lewis antigens were detected by ELISA in 854 (97.9%) of nasal washings (Le<sup>a</sup> 233 (26.7%), Le<sup>b</sup> 621 (71.2%), and Le<sup>-</sup> 18 (2.1%)) in proportions predicted for a northern European population. Secretors were significantly

overrepresented among patients from whom influenza viruses A and B (55/64, 86%; p<0.025), rhinoviruses (63/72, 88%; p<0.01), respiratory syncytial virus (97/109, 89%; p<0.0005), and echoviruses (44/44, p<0.0005) had been isolated compared with the distribution of secretors in the local population.

**Conclusion**—Secretion of blood group antigens is associated with respiratory virus diseases.

### Introduction

Susceptibility to a variety of bacterial and superficial fungal infections is associated with the genetically controlled inability of individual subjects to secrete the water soluble form of the ABO blood group antigens into body fluids (non-secretion).<sup>1,7</sup> Non-secretors are also significantly overrepresented among patients with some autoimmune diseases for which infectious triggers have been proposed.<sup>8-12</sup> Although studies of associations between ABO blood groups and susceptibility to natural or experimental viral infections have been reported,<sup>13-15</sup> there are no published studies of secretor status and viral infection. In this study we tested the hypothesis that non-secretors might also be at increased risk of viral illnesses.

Because the quantities of material available from

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