An appraisal of timely magnetic resonance imaging in diagnosing spinal cord compression

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ABSTRACT

Introduction: Spinal cord compression is a very debilitating condition and could be secondary to many causes. Urgent magnetic resonance (MR) imaging of the spine is crucial in making the diagnosis and guiding further management. Our objectives were to assess the nature of MR imaging requests, the diagnostic yield, and the subsequent management according to relevant MR imaging findings.

Methods: We focused on all the urgent MR imagings of the spine conducted from July 1, 2007 to December 31, 2007. Clinical data, including the demographical information, presenting symptoms, radiological diagnosis, waiting time for MR imaging and treatment, was reviewed.

Results: A total of 33 cases of urgent MR imaging of the spine were performed. Patients were aged 29–85 years, with 18 males and 15 females. Most of them (84.8 percent) presented with neurological symptoms. 84 percent of the MR imaging was performed within 24 hours. 76 percent of the examinations yielded significant cord compression, of which 56 percent were due to vertebral metastasis, while others were due to epidural haematoma (12 percent), infective spondylodiscitis (8 percent), vertebral fracture (8 percent) and disc herniation (16 percent). Of the vertebral metastasis patients, 43 percent had one region imaged. 64 percent of the cord compression patients received surgical treatment or radiotherapy, with a mean waiting time of 1.7 days.

Conclusion: The urgent MR imaging spine service was able to react promptly with a high diagnostic yield. One-third of the patients with vertebral metastasis had multiple levels involved, and imaging of the whole spine would be useful.

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INTRODUCTION

With the rising availability of magnetic resonance (MR) imaging, spinal cord compression secondary to vertebral metastasis, intramedullary spinal cord lesion, vertebral fracture or paraspinal soft tissue mass such as abscess or haematoma, can be readily and accurately diagnosed by MR imaging. Therefore, MR imaging of the spine is one of the commonest requests by clinicians in an urgent setting. We designed a retrospective study to review the performance of our urgent MR imaging spine service, which were all performed with a 1.5T machine. In this research, we tried to assess the nature of the requests made by the clinicians, the diagnostic yield of the MR imaging examination, and the subsequent patient treatment according to the relevant MR imaging findings.

METHODS

The study focused on urgent MR imagings of the spine conducted from July 1, 2007 to December 31, 2007. All urgent MR imaging requests during the period were reviewed. The definition of "urgent MR imaging of the spine" was based on the patients' conditions and the clinicians' requests. Clinical data, including the demographical information, presenting symptoms, time of onset, the time interval between the relevant MR imaging report and subsequent treatment, was reviewed from the electronic patient records. MR imaging waiting time, radiological findings and diagnosis were recorded from the information written on the radiology information system.

All MR imagings were performed on a Siemens 1.5-T Magnetom Avanto Syngo MR B13 (Siemens Medical Systems, Erlangen, Germany) whole body unit with a body coil for the thoracic and lumbar spine. An additional neck coil was added for imaging the cervical spine. The MR imaging sequences were as follows: for lumbar spine, short tau inversion recovery (STIR) fast spin-echo (FSE) sagittal (TI: 165 ms; TR: 3,100 ms; TE: 50 ms), T1-weighted FSE

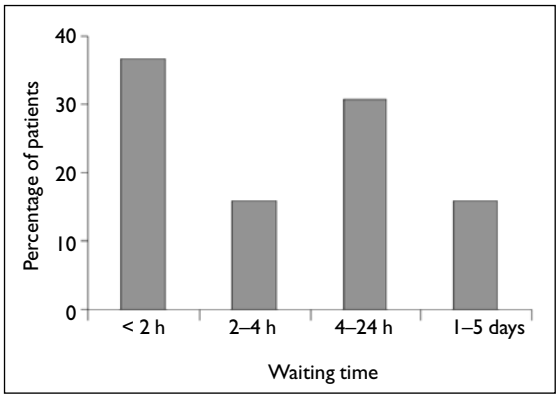

Fig. 1 Bar chart shows the waiting time for MR imaging.

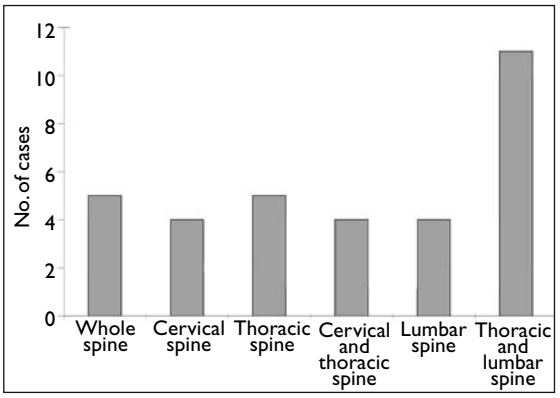

Fig. 2 Bar chart shows the distribution of the regions of interest in urgent MR imaging of the spine.

sagittal (TR: 450 ms; TE: 11 ms), T2-weighted FSE axial (TR: 1,830 ms; TE: 51 ms), T1-weighted FSE axial (TR: 671 ms; TE: 12 ms). For cervical or thoracic spine, STIR FSE sagittal (TI: 165 ms; TR: 3,470 ms; TE: 63 ms), T1-weighted FSE sagittal (TR: 436 ms; TE: 11 ms), MEDIC axial (TR: 941 ms; TE: 23 ms), T1-weighted FSE axial (TR: 458 ms; TE: 11 ms).

RESULTS

There were a total of 33 cases of urgent MR imaging of the spine performed during the study period. The patients' ages ranged from 29 to 85 years. There were 18 males and 15 females. The orthopaedics unit referred the most number of cases (12 cases, 36.4%), followed by the medical unit (ten cases, 30.3%), oncology unit (seven cases, 21.2%) and surgical/other units (four cases, 12.1%). Most of the patients (28 cases, 84.8%) referred to our unit for urgent MR imaging of the spine had neurological deficits. Significant neurological deficits, such as paraplegia or tetraplegia, accounted for 24.2% (8 cases) of the total. Other neurological symptoms, such as limb weakness, numbness and sphincter disturbance, were the most common indications and accounted for 60.6% (20 cases). The remaining five patients without neurological deficits all presented with neck or low back pain only.

In this study, we tried to analyse the time lag between the onset of symptoms and the request for urgent MR imaging for each case, and four categories were generated: within one day, within seven days, within 14 days and more than 14 days. 19 (57.6%) patients had symptom onset within seven days before the urgent MR imaging was requested, nine (27.3%) had symptom onset within one day, four (12.1%) had symptom onset within 14 days, and only one (3.0%) patient had symptom onset more than 14 days.

84% of the MR imagings were performed within 24 hours of the request, while the rest were done within 1–5 days after discussion and concurrence with the clinicians to have the examinations rescheduled with early appointments (Fig. 1). When we considered MR imaging of the spine as a regional study, i.e. cervical, thoracic or lumbar, 20 out of 33 (60.6%) cases had more than one region imaged, where among the 20 patients, five patients had the MR imaging of the whole spine requested, while four and 11, respectively, had the cervical/thoracic and thoracic/lumbar regions imaged. The remaining 13 patients had MR imaging of a single region, i.e. four, five and four patients were imaged in the cervival, thoracic and lumbar spine, respectively (Fig. 2).

All the images were interpreted by consultant radiologists, and formal, endorsed reports were written. 25 out of 33 cases (75.8%) showed significant cord compression related to the presenting symptoms, and most of them, 14 cases (56.0%), were due to vertebral metastasis (six cases from pulmonary carcinoma, four from colonic carcinoma, three from breast carcinoma and one from renal cell carcinoma). The rest, in descending order of frequency, were four cases (16.0%) of disc herniation, three (12.0%) epidural haematoma, two (8.0%) infective spondylodiscitis with paraspinal abscess and two (8.0%) vertebral fracture due to trauma.

On average, 64.0% (16 out of 25) patients with significant cord compression were treated by surgery or radiotherapy, with a mean waiting time of 1.7 days. In those 14 patients with spinal cord compression secondary to vertebral metastasis, 12 received radiotherapy and one was operated on. The remaining patient refused any treatment and he subsequently succumbed to the disease. The mean time interval between treatment and the MR report endorsement was 1.75 days. Only three patients (23.1%) were recorded to have improvement after treatment.

For the three patients with epidural haematoma, one patient received surgery, while the other two were treated conservatively. The time interval between surgical

treatment and the MR imaging report endorsement for that patient was two days. For the two patients with infective spondylodiscitis with paraspinal abscesses leading to cord compression, one was treated by surgical drainage and the other was treated conservatively. The time interval between surgical treatment and the MR imaging report endorsement for that patient was one day. For these two patients with vertebral fractures leading to cord compression, one of them was treated surgically and the other one was treated conservatively. The time interval between surgical treatment and the MR report endorsement for that patient was one day.

DISCUSSION

Urgent MR imaging of the spine occupied a significant proportion of the total urgent requests for our MR imaging service. We were able to accommodate the requests from different units. As prompt diagnosis and treatment were essential in alleviating the symptoms and prognostically significant,[1] our department provided prompt response upon requests by the clinicians, such that 84% of the cases had the examination done within 24 hours. Results were promising compared to another local study in a tertiary institute[2] and studies done in the United Kingdom.[3,4] Our MR imaging service provided us with very important results which had an immense impact on subsequent management. 75.8% of all urgent requests showed significant spinal cord compression, which proved our clinical colleagues to be highly clinically relevant. Clinicians were also able to provide prompt intervention for these patients. The mean time interval between treatment and the MR imaging report endorsement was 1.7 days.

In Princess Margaret Hospital, a recently-established tertiary centre for the treatment of cancer patients in Hong Kong, vertebral metastasis causing spinal cord compression would be a rising diagnosis in which urgent radiotherapy would be necessary. In fact, it constituted 42.4% of our total urgent MR imaging spine cases. According to the literature, 5% of cancer patients would eventually develop cord compression secondary to metastasis[5] and one-third of those would have multiple cord compression. Therefore, some authors recommended imaging of the whole spine or at least include the thoracolumbar spine to the region of interest, as cord compression at the cervical spine would rarely be asymptomatic.[6] In our study, 57% of vertebral metastasis cases had more than one region imaged, while for the rest, only the sole region of interest was assessed. Therefore, we might consider amending our present protocol so that subsequent radiotherapy could be more accurately planned.

All our positive results had neurological deficits documented. One case among the negative results had a local symptom such as pain only, which is not a strong clinical indicator for spinal cord compression. This case could possibly be arranged with an early appointment after discussion with the clinician so that the capacity of the MR imaging could be further enhanced for other potentially urgent cases with acute symptoms. The MR imaging service in our department had provided prompt responses upon the requests by the clinicians, and a very promising diagnostic yield was noted. Our clinical colleagues were also efficient in implementing further management. As one-third of the patients with vertebral metastases will have multiple levels involved, imaging of the whole spine, rather than a single region, will be useful.

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