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MRI Evaluation of Collapsed Vertebrae

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Abstract: ***Aim & Objectives: To evaluate cases of collapsed vertebrae by MRI.To evaluate the magnetic resonance imaging characteristics that will allow differentiation of compression fractures or vertebral lesions due to osteoporosis or tumour of both gender and age group.To determine difference between benign and malignant causes of vertebral collapse by MRI to help in treatment planning and surgery. Materials and Methods: 64 Patients suffering from low backache and referred by clinicians and surgeons will be included in this prospective study.A structural proforma will be used to collect relevant information for each individual patient selected. Results: The commonest cause of collapsed vertebrae was infective etiology, most common Dorsal level Apart from infective etiology, other causes of collapsed vertebrae like post traumatic, metastasis, senile degenerative changes were also diagnosed. Conclusion: From the present study it was concluded that MRI is one of the most comprehensive, non-invasive and safe imaging modality for early diagnosis of collapsed vertebrae. MRI using spin echo technique provides an excellent demonstration of the spine and the spinal cord. The ability to image the cord directly rather than indirectly as in myelography, the absence of bone artifact as in computed tomography, and the multiplanar capabilities shows that MRI should be the procedure of choice in the examination of cases of collapsed vertebrae. It can help in effective treatment planning to achieve better prognosis.***

Keywords: Collapsed Vertebrae, MRI

1. Introduction

Collapsed vertebrae affect many individuals worldwide. They are most common in elderly populations and postmenopausal women. they have the potential to cause significant disability and morbidity, often causing incapacitating back pain for many months. This study provides information on the pathogenesis and pathophysiology of collapsed vertebrae, as well as clinical manifestations and treatment options. Among the available treatment options, kyphoplasty and percutaneous vertebroplasty are two minimally invasive techniques to alleviate pain and correct the sagittal imbalance of the spine. [1]

Elderly patients presenting with backache and vertebral collapse are a diagnostic challenge. Plain X-rays, computed tomography and radionuclide bone scans have not always reliably distinguished between benign and malignant causes. Magnetic resonance imaging (MRI) is able to do so. MRI used to accurately differentiate between benign and malignant causes of vertebral collapse. Further differentiation between an osteoporotic, traumatic or infective cause can be done with the help of clinical history and evaluation of end-plate integrity. [2]

The distinction between malignant and benign compression fractures is a common problem in clinical practice. Various imaging techniques (plain radiography, computed tomography, bone scintigraphy) have been used to differentiate these conditions but they are often inadequate in distinguishing the nature of compression fracture. [3]

Many imaging techniques have been applied to the spine and its contents starting with plain x ray films and tomography. Myelography, Epidural venography and discography were developed specifically to evaluate spinal disorders. Other imaging techniques includes radionuclide scanning, ultrasonography(USG), computed tomography(CT) and magnetic resonance imaging(MRI). Epidural venography is no longer used and with exception of some applications, discography also falls into obsolete category. [3]

Tomography was used for many years to search for bony fragments within the spinal canal and to tool for subtle erosion of the cortical bone and associated periosteal reaction. [4]

USG has limited application within spine because of inability to see the spinal canal because of overlying osseous element. Use of spinal USG is therefore restricted to evaluation of fetal spine and intraoperative evaluation in the adults. Advantage includes wide spread availability, portability, real time imaging and low cost. [5]

Spine imaging received major boost with the introduction of CT. CT is a cross sectional imaging technique that images primarily in axial planes. They can be reformatted in coronal and oblique planes. It provides higher contrast resolution than conventional techniques. It allows better evaluation of intradural structures. However limitation of CT include difficulty in differentiating spinal cord from surrounding structures when subarachnoid space is narrow and there is paucity of epidural fat. [6]

MRI technology has progressed to the point where it has largely replaced many of the older modalities in the evaluation of the spine.MR imaging is able to detect within vertebra and endplate irregularity, earlier than radiography, bone scintigraphy and CT .The high contrast and soft tissue resolution and multiplanner capabilities of Mri Imaging make it the modality of choice for evaluating soft tissue lesions .early in the disease process, MRI is very sensitive in the detection of marrow changes. Intervertebral disc involvement is also well seen in MRI.

Diagnostic imaging, particularly Magnetic Resonance Imaging (MRI), plays a crucial role in evaluating and detecting collapsed vertebrae. Subtle bone marrow, soft-tissue and spinal cord abnormalities, which may not be

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apparent on other imaging modalities, can be readily detected on MRI. Early detection often leads to accurate diagnosis, prompt management and avoidance of unnecessary procedures. [7]

Many advantages of MRI such as, higher contrast resolution, absence of bony artefacts, multiplanar capability, and choice of various pulse sequences make possible to diagnose collapsed vertebrae more accurately.[7]

2. Materials and Methods

This study aims at evaluating the MRI EVALUTION OF COLLAPSED VERTEBRAE in the patients referred by the clinicians from our hospital and from outside to Radiology Department of Dhiraj General Hospital.

Source of data:
Each patient name, age, sex, occupation, habit, height, weight, medication history(corticosteroid/opioids) and hospital no. will be documented. Clinical symptoms and sign with the clinical diagnosis from case. Informed written consent in English and; local languages will be taken. Body mass index(BMI) will be calculated from patient's height and weight.

Non-contrast MRI scan will be performed in all cases including contrast study wherever necessary.

Prior consent will be taken for each case.

Selection of patient will be based on low back pain on clinical presentation and referral to MRI to detect pathology will be chosen for the study.

Inclusion Criteria
- Patients with low back pain.
- Positive signs on x ray
- For preoperative assessment
- Patients male or female of any age group clinically suspected of having back pain, trauma, coming to Dhiraj General Hospital

Exclusion Criteria
- Patients not willing for study.
- Patient in whom MRI is contraindicated and can't be completed patients with pacemaker, metallic implants, cochlear implant, bone and joint prosthesis and claustrophobics
- Pregnant woman

Examination Technique

MRI Scan
Standard room exclusion criteria will be followed, jewellery, watches, credit cards, mobile, hearing aides, pins, hairpins, metal zipper and other metallic objects which can distort images will be removed.
Patient will be given disposable earplugs to avoid noise.

Non contrast MRI examination will be performed using 1.5 Tesla Philips

Contrast MRI will be done using gadolinium IV injection at dose of 0.2 ml/kg as required.

Method of collection of Data
- Patients suffering from low backache and referred by clinicians and surgeons will be included in this prospective study.
- A structural proforma will be used to collect relevant information for each individual patient selected.
- **Sample size**:64

3. Observation and Results

- The study was carried out at the Department of Radio-diagnosis, Dhiraj Hospital, Pipariya, Vadodara. The study was coducted on 64 patients.
- In this study collapsed vertebrae were little higher in female as compared to male. Out of 64 cases, there were 30 male & 34 females with an incidence rate of 47% & 53% respectively. The female: male ratio was about 2:1.8.
- In my study the most common spinal region involved was Dorsal 53.12%, followed by lumbosacral spine 39.06% and cervical spine 7.81%.
- Most common age group in my study was 41-70 years with incidence rate of 42.18%; followed by 31-40years 23.43%; 21-30 years 17.18%; 10-21 years 10.93% and 71-90 years 6.25%.
- In this study out of 64 cases of collapsed vertebrae 26 cases were diagnosed to be of infective etiology 40.62%. followed by 21 cases to be of traumatic 32.81%, 8 cases to be of senile osteoporotic changes 12.50%, 7 cases to be of metastasis 10.93% ,1 case of multiple myeloma and 1 case of lymphoma 3.12% each.
- In this study out of 64 patients 45 patients were found to have spinal canal stenosis ,43 patients of cord compression ,39 patients of nerve root involvement, 38 patients of cord edema and 18 patients of annual disc tear.
- In the study all patient's bone was involved. But in 38 patients spinal cord was involved with the bone and in 31 patients extra spinal soft tissue was also involved with the bone.
- The study shows the positive factor of collapsed vertebrae were maximum in benign conditions 79.0%. and only in 20.9% of cases malignancy was the cause proved by histopathology.
- In my study maximum patient were presented with Atraumatic collapsed vertebrae 67% followed by traumatic 33%.

4. Discussion

- In my study collapsed vertebrae were little higher in female as compared to male. Out of 64 cases, there were 30 male & 34 females with an incidence rate of 47% & 53% respectively. The female: male ratio was about 2:1.8.
- Danchaivijitr N, E. A. [8] showed that tubercular spondylitis 68.8% in male and 31.2% of cases in female patients in his study. His observations did not tally with those of mine.

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- While Ahmed Hamimi [9] et al in his study showed Osteoporotic or malignant vertebral collapsed to be equal in both gender ratio being 1:1.
- In My study the most common spinal region involved was Dorsal 53.12%, followed by lumbosacral spine 39.06% and cervical spine 7.81%.
- Alexander r. Vaccaro et al [10], in their study osteomyelitis, a spinal Infection-Found that most vertebral body infections occur in the lumbar spine because of the blood flow to this region of the spine. Tuberculosis infections have a predilection for the thoracic spine, and intravenous drug abusers are more likely to contract an infection of the cervical spine.
- In my study Most common age group was 41-70 years with incidence rate of 42.18%; followed by 31-40 years 23.43%; 21-30 years 17.18%; 10-21 years 10.93% and 71-90 years 6.25%.
- The observations of my study are consistent with the study of Sinan, et al. [11] who showed that 43% cases in their study were in the age group of 30-49 years.
- In my study out of 64 cases of collapsed vertebrae 26 cases were diagnosed to be of infective etiology 40.62%. followed by 21 cases to be of traumatic 32.81%, 8 cases to be of senile osteoporotic changes 12.50%, 7 cases to be of metastasis 10.93% ,1 case of multiple myeloma and 1 case of lymphoma 3.12% each.
- Tandy et al [12] in their study differentiation of malignant vertebral collapse from osteoporotic and other benign causes using magnetic resonance imaging. Found that 36 benign vertebral collapses (20 osteoporotic, 7 post-traumatic, 9 infective) and 22 malignant ones (20 metastatic carcinomas, 2 multiple myeloma)
- In this study out of 64 patients 45 were found to have spinal canal stenosis ,43 patients of cord compression ,39 patients of nerve root involvement, 38 patients of cord edema and 18 patients of annual disc tear.
- My study shows that in all patient's bone was involved. But in 38 patients spinal cord was involved with the bone and in 31 patients extra spinal soft tissue was also involved with the bone.
- In my study the positive factor of collapsed vertebrae was maximum in benign conditions 79.0% and 20.9% of cases malignancy.
- Hamimi A, Kassab F, Kazkaz G. [13] in their study showed that the causative factor of vertebral collapse to be vertebral metastases in 70 patients (46.66%) and osteoporosis to be in 80 patients (53.33%) of their study. Their observations were similar as to those of mine.
- In my study maximum patient were presented with atraumatic collapsed vertebrae.
- Ahmed Hamimi et al [13] in his study Osteoporotic or malignant vertebral fracture found that Atraumatic vertebral compression fractures are a common clinical problem.
- In my study most common presenting symptom was low back pain 90%
- cyrus c wong and Matthew J McGirt [14] in their study Vertebral compression fractures: a review of current management and multimodal therapy found that back pain was commonest clinical presentation.
- In this study out of 64 patients 45(70.31%) patients were found to have spinal canal stenosis ,43 patients of cord compression ,39 patients of nerve root involvement, 38 patients of cord edema and 18 patients of annual disc tear.
- In my study all patient's bone was involved. But in 38 patients spinal cord was involved with the bone and in 31 patients extra spinal soft tissue was also involved with the bone.
- The study shows the positive factor of collapsed vertebrae were maximum in benign conditions 79.0%. and only in 20.9% of cases malignancy was the cause proved by histopathology.
- In my study maximum patient were presented with Atraumatic collapsed vertebrae 67% followed by traumatic 33%.

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