Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 9, Issue, 01, pp.45872-45874, January, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

SIGNIFICANCE OF INTERVERTEBRAL DISC FLUID SIGN IN DIFFERENTIATING BENIGN AND MALIGNANT VERTEBRAL COLLAPSE - MAGNETIC RESONANCE

***Satish Patil, Soumya S. Patil and Santosh Patil**

Department of Radiology, Shri B M Patil Medical College

ARTICLE INFO

Article History:
Received 17th October, 2016
Received in revised form
24th November, 2016
Accepted 30th December, 2016
Published online 31st January, 2017

Key words:

Intervertebral disc fluid sign,
Benign vertebral collapse,
Malignant vertebral collapse,
Magnetic resonance imaging.

ABSTRACT

Aim: 1. to determine significance of intervertebral disc fluid sign in differentiating benign and malignant vertebral collapse.
2.Accuracy of intervertebral disc fluid sign in determining osteoporotic vertebral collapse.

Materials and methods: The study was conducted in department of radiology and orthopedics .Study subjects belonging to all age groups, those who attended radiology and orthopedics department were included in the study.Detailed clinical history was taken and subjects were subjected to imaging and statistical analysis was done.

Results: Presence of intravertebral fluid sign was found to be statistically insignificant for malignant etiology (P>0.05). Presence of intravertebral fluid sign was found to be statistically significant for osteoporotic collapse (P= 0.002).

Conclusion: MRI is the reliable method to differentiate between benign and malignant compression fracture.MRI characteristics presence of fluid sign which allow early differentiation of benign and malignant vertebral fractures were studied. Presence of intravertebral fluid sign was found to be statistically significant for osteoporotic collapse. As fluid sign is one of the feature in acute vertebral compression fracture which is depicted as bone marrow edema .Fluid sign is one the additional feature most commonly seen in osteoporosis and rarely seen in vertebral fracture in metastatic etiology.

Citation: Satish Patil, Soumya S. Patil and Santosh Patil, 2017. "Significance of intervertebral disc fluid sign in differentiating benign and malignant vertebral collapse - magnetic resonance", *International Journal of Current Research*, 09, (01), 45872-45874.

INTRODUCTION

Vertebral collapse is the breakdown of a vertebra resulting in a decreased height of its body. There are multiple causes of vertebral collapse as trauma or due to a weakening of the vertebral body which is most commonly seen in patients with osteoporosis, osteogenesis imperfecta, lytic lesions (metastatic), primary tumors and infection. Collapsed vertebral body is common incidental finding in clinical radiological practice. Magnetic Resonance Imaging is investigation of choice to evaluate bone and bone marrow diseases .Magnetic Resonance Imaging also helps in differentiating benign and malignant compression fractures. About 1/3rd of primary malignant patient with history of veterbral collapse are benign. possibility of infection vertebral collapse should also be considered in primary cancer patient who are also immunocompromised (Castillo, 2002). The role of MRI in acute phase vertebral collapse is one of the clinical interested aspect which has been not fully described and no comprehensive study were conducted. Hence, the present study aims to evaluate the vertebral collapse on MRI based on differentiating benign and malignant condition and their etiological background of vertebral collapse. In acute vertebral body collapse the 'fluid sign' appears as a horizontal focal, linear, or triangular area of fluid intensity (hypointense on T1, hyperintense on T2, STIR) on a background of diffuse hyperintensity in the vertebral body and show bone marrow oedema (Baur, 2002).

****Corresponding author: Satish Patil***
Department of Radiology, Shri B M Patil Medical College

MATERIALS AND METHODS

The present study was conducted in the "Department Of Radiodiagnosis, Shri B M Patil Medical College Hospital & Research Centre, Bijapur". The study is basically a prospective observational study conducted from December 2014 to June 2016. The MR imaging protocol included nonenhanced T1-weighted spin-echo and short inversion time inversion-recovery sequences and Detailed examination and findings were recorded. Imaging was done with 1.5 TESLA MAGNETIC RESONANCE IMAGING equipment PHILIPS ACHIEVA. A detailed clinical history was obtained from all patients.

Inclusion criteria

Patients of all age groups, both sexes, referred for MRI, having vertebral collapse (whether solitary or multiple), from the Department of Radiodiagnosis and Department of Orthopedics, were included in this study.

Exclusion criteria

- Patients with benign or malignant spinal involvement without associated collapse were excluded.
- Patients who underwent previous spinal surgeries.

RESULTS

The present study was conducted in the "Department Of Radiodiagnosis, Shri B M Patil Medical College Hospital & Research Centre, Bijapur" on 50 patients with vertebral collapse. A complete history of patients was taken and relevant clinical examination was performed in all the cases. Besides the routine investigations, patients also underwent plain radiography of spine followed by MR imaging. The appearance of each MRI characteristic on images was determined and recorded. The fluid sign in vertebral fracture is adjacent to the fractured end plates and exhibited signal intensity isointense to that of cerebrospinal fluid. Statistical analysis was performed and results were compared.

Age and Sex Distribution

Table 1. Age and sex distribution (n =50)

Age	Male	Female	Total	
	No.	No.	No.	%
1-10	2	0	2	4.00
11-20	1	0	1	2.00
21-30	5	4	9	18.00
31-40	7	4	11	22.00
41-50	4	2	6	12.00
51-60	7	3	10	20.00
61-70	7	3	10	20.00
71-80	0	1	1	2.00
Total	33	17	50	100.00

Table II describes the distribution of cases according to number of vertebrae involved and their related etiology.

Table 2. Distribution of lesions according to number of vertebrae involved

Final Diagnosis	Number of Vertebrae Involved					
	Multiple		Solitary		Total	
	No.	%	No.	%	No.	%
Infective Collapse	11	100.00	0	0.00	11	100.00
Malignant Collapse	10	83.33	2	16.67	12	100.00
Osteoporotic Collapse	13	86.67	2	13.33	15	100.00
Traumatic Collapse	6	50.00	6	50.00	12	100.00
Total	40	80.00	10	20.00	50	100.00

Out of 50 cases, solitary vertebral collapse was seen in a total of 10 cases (20%) presenting with traumatic etiology in 6 cases (12%) and 2 cases each (4%) due to metastasis and osteoporosis. 40 cases (80%) presented with multiple vertebral collapses; 13 (32.5%) of them were osteoporotic in nature, 11 (27.5%) were due to infective causes, 10 (25%) were malignant and 6 (15%) were traumatic in nature. All infective cases had multiple vertebrae involvement. Multiple vertebrae involvement is not statistically significant for malignant collapse (P>0.05)

Table 3A. Distribution According to intravertebral fluid sign

Intravertebral Fluid Sign	Final Diagnosis					
	Benign		Malignant		Total	
	No.	%	No.	%	No.	%
Absent	30	78.95	11	91.67	41	82.00
Present	8	21.05	1	8.33	9	18.00
Total	38	100.00	12	100.00	50	100.00

Presence of intravertebral fluid sign was noted in 1 case (8.33%) of malignant collapse and in 8 cases(21.05%) of benign collapse. Presence of intravertebral fluid sign was found to be statistically insignificant for malignancy (P>0.05). Majority of these benign collapse cases were of osteoporotic etiology. Therefore, statistical significance of the presence of intravertebral fluid sign in differentiating osteoporotic etiology from other causes was also analysed using a contingency table.

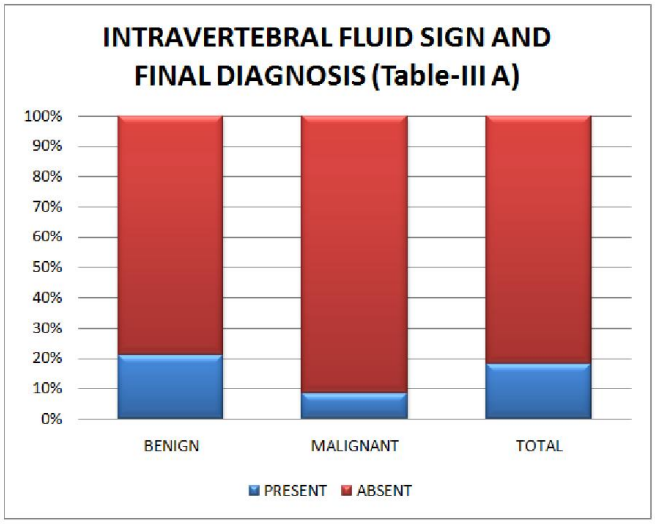

Table 3B. Statistical significance of intravertebral fluid sign in determining osteoporotic cases

Intravertebral Fluid Sign	Final Diagnosis					
	Others		Osteoporosis		Total	
	No.	%	No.	%	No.	%
Absent	33	94.29	8	53.33	41	82.00
Present	2	5.71	7	46.67	9	18.00
Total	35	100.00	15	100.00	50	100.00

Presence of intravertebral fluid sign was found to be statistically significant for osteoporotic collapse.(P=0.002)

DISSCUSSION

Lee et al, (2007) elucidated the marrow changes in post traumatic vertebral collapse and demonstrated fluid patterns characterized by hypo-intense signals on T1 weighted images, and hyperintense signals, similar to marrow edema, on T2 weighted images. These findings are consistent with the finding of post traumatic marrow edema as seen in 4 cases in our study. Multiple vertebrae involvement in lumbar region and acute schmorl's node displaying hyperintense signal on T2 weighted and STIR sequences were associated findings (Jung, 2003). Absence of Schmorls's node and fluid sign in collapsed vertebrae showed high negative predictive values i.e. 98% and 88.8% for malignancy. In present study also, absence of Schmorls's node and fluid sign showed high negative

predictive values i.e. 90% and 88.8% for malignancy. However as malignancy and osteoporosis, both are diseases of elderly, so, simultaneous presence of both the pathologies may be seen in few cases. Yuh, (Yuh, 2003), et al also highlighted several facts about fluid sign in osteoporotic fractures and their mechanism. The explanation for the presence of fluid sign in osteoporotic fractures is based on the arterial supply pattern to the vertebral system. The area surrounding the end plate is a linear strip of bone marrow that has sparse blood supply and is therefore susceptible to ischemic injury. When compared with well vascularized metastatic bone marrow, the aged osteoporotic bone is characterized by increased fatty infiltration of the overall bone and has poor vascular supply and hence more prone to ischemic injury. In addition, malignant fracture usually occurs after most or the entire bone marrow cavity is infiltrated with tumor, and the region surrounding the end plate is usually the first site for metastatic seeding.

The blood supply may thus actually be increased in region of end plate in metastatic vertebral involvement and thus more resistance to ischemic injury. Thus it is unlikely to see fluid sign in metastatic vertebral collapse which is a sign of intravertebral avascular necrosis (Yuh, 2003). The pathogenesis of osteonecrosis in vertebral body is twofold; the first mechanism is that of avascular necrosis, known as Kummel disease.

Table 4. Presence of intravertebral fluid sign

	Osteoporotic	Malignant
Baur A et al[7]	40%	6%
Abdel-Wanis et al[8]	35%	2%
Present study	46%	8%

The second mechanism is focal bone weakness in patients with osteoporosis in conjunction with minor trauma or even because of tumor infiltrate in metastatic disease.[6] Findings in our study are in conjunction with the above mentioned mechanism with an overall PPV of 77.7% and NPV of 80.8% for presence of intravertebral fluid sign in osteoporotic vertebral collapse and absence of sign showing a sensitivity of 91.6% for malign Baur A et al[7] also evaluated the occurrence, location and shape of fluid sign in acute osteoporotic and neoplastic vertebral compression fractures in 87 patients. They reported the fluid sign adjacent to the fractured end plates and exhibited CSF signal intensity in all sequences. It was linear, triangular or focal and was significantly associated with osteoporotic fractures. In our study, fluid sign was linear as well as focal and was noted in 6 cases of osteoporotic collapse, however also occured in one patient with malignant vertebral collapse. Possible explanation to this may be the metastatic involvement of previously collapsed vertebrae due to osteoporosis, although enough references on this finding are not available.

REFERENCES

Abdel-Wanis, M.E., Solyman, M.T., Hasan, N.M. 2011. Sentivity, specificity and accuracy of magnetic resonance imaging for differentiating vertebral compression fractures caused by malignancy, osteoporosis and infections. *J Orthop Surg (Hong Kong)*., 19(2):145-150.

Baur, A., StäBler, A., Arbogast, S. et al. Acute osteoporotic and neoplastic vertebral compression fractures: fluid sign at MR imaging. *Radiology,* 225 (3): 730-5.

Baur, A., Stabler, A., Arbogast, S., Duerr, H.R., Bartl, R., Reiser, M. 2002. Acute osteoporotic and neoplastic vertebral compression fractures: fluid sign at MR imaging. *Radiology*, 225(3):730-735.

Castillo, M., Arbelaez, A., Smith, J.K., Fisher, L.L. 2000. Diffusion weighted MR imaging offers no advantage over routine noncontrast MR imaging in the detection of vertebral metastases. *Am J Neuroradiol* 2000; 21(5):948-953.

Hsu, C.Y., Yu, C.W., Wu, M.Z., Chen, B.B., Huang, K.M., Shih, T.T. 2008. Unusual manifestations of vertebral osteomyelitis: intraosseous lesions mimicking metastases. *Am J Neuroradiol*, 29(6):1104-1110.

Jung, H.S., Jee, W.H., McCauley, T.R., Ha, K.Y., Choi, K.H. 2003. Discrimination of metastatic from acute osteoporotic compression spinal fractures with MR imaging. *Radiographics,* 23(1):179-187.

Lee, C.S., Yu, J.W., Chung, S.S., Suh, Y.L., Ahn, G., Ahn, J.M. 2007. Delayed Post-traumatic vertebral collapse: MR categorization and MR-Pathology Correlation. *Asian Spine J.,* 1(1):32-37

Yuh, W.T., Mayr, N.A., Petropoulou, K., Beall, D.P. 2003. MR fluid sign in osteoporotic vertebral fracture. *Radiology*, 227(3):905.

****