Publisher
MEDRESEARCH
www.medresearch.in

International Journal of Medical Research and Review

2020 Volume 8 Number 3 May-June

E-ISSN:2320-8686
P-ISSN:2321-127X

Research Article
Myelopathy

A study to find the various causes for compressive myelopathy

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DOI: https://doi.org/10.17511/ijmrr.2020.i03.05

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Introduction: Myelopathy was the term that describes any neurologic defect related to the spinal cord. A study was conducted to evaluate various causes of compressive myelopathy and also MR characterization of spinal cord compressive lesions. **Materials and Methods:** It is a hospital-based cross-sectional study, conducted in the department of radiodiagnosis, GSL Medical College, Rajahmundry from December 2014 to August 2016. All patients referred to the department of radiology with symptoms of compressive myelopathy of the spine were included. Pre-contrast scanning was done using TiWI, T2WI, FLAIR Sagittal, STIR sagittal. A Chi-square test was used to find the statistical significance, P > 0.05 was considered to be statistically significant. **Results:** During the study period total of 30 participants were included, spinal TB was diagnosed to be the most common cause of myelopathy (13; 43.3%) Extradural myelopathy was diagnosed in 23 (76.6%) participants and intradural in 7 (23.3%) members. Statistically, there was no significant difference between the age and cause for myelopathy and also between the gender. **Conclusion:** The most common cause of compressive myelopathy was identified to be extradural compression form TB followed by trauma. Spinal TB was the commonest site involved. In spine injury, the common site involved was the thoracic.

Keywords: Myelopathy, Participant, Tuberculosis, Cause, Infection

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How to Cite this Article

Mohan PK, Jaya KS, Anvitha M, Jaya TC. A study to find the various causes for compressive myelopathy. Int J Med Res Rev. 2020;8(3):247-251.
Available From
https://ijmrr.medresearch.in/index.php/ijmrr/article/view/1172

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Introduction

Myelopathy was the term that describes any neurologic defect related to the spinal cord. It is a broad term that refers to spinal cord involvement of multiple etiologies. It may be either compressive or non-compressive.

Compressive Myelopathy was the term used to describe the spinal cord compression either from outside or within the cord, maybe due to degenerative diseases, trauma, tumors, or infections [1]. Of all the areas of spinal pathology, it may be in the field of spinal tumors that MRI has the most impact [2]. Almost immediately after its inception, Even

Manuscript Received	Review Round 1	Review Round 2	Review Round 3	Accepted
2020-03-02	2020-03-10	2020-03-15		2020-03-19

Conflict of Interest	Funding	Ethical Approval	Plagiarism X-checker	Note
No	Nil	Yes	8%	

With poor quality of early scans, the potential of MR in the evaluation of suspected neoplasms of the cord was recognized. Today, MR is considered the procedure of choice for the work-up of all spinal tumors. Spinal tumors often are categorized as extradural, intradural (extramedullary, intramedullary), in the intramedullary space, primary tumors are far more common than secondary tumors or metastases. Metastases to the cord itself are comparatively unusual. The common intramedullary tumor is ependymoma. Astrocytoma is common in children [3]. The role of MRI is to distinguish compressive from non-compressive myelopathy. Once compressive lesions have been excluded, non-compressive causes of acute Myelopathy that are intrinsic to the cord are considered primarily vascular, inflammatory, and infectious etiologies. General imaging hallmarks of an extradural mass lesion are focal displacement of the thecal sac and its contents away from the mass. MR scans clearly show the dura draped over the mass. In some cases, a crescent of displaced epidural fat can be seen capping the lesion [4]. Two objectives exist in the MR evaluation of spinal tumors in the epidural space. The detection of vertebral body lesions, even if there is no suspicion of epidural impingement and the delineation of possible thecal sac impingement. With these, a study was conducted to evaluate various causes of compressive myelopathy and also MR characterization of spinal cord compressive lesions.

Materials and Methods

Setting: The study was conducted in the department of radiodiagnosis, GSL Medical College, Rajahmundry.

Duration and type of the study: The study was conducted from December 2014 to August 2016. It was a hospital-based cross-sectional study.

Study method: Random sampling was considered in this study.

Inclusion criteria: individuals of both gender, all age groups with compressive myelopathy were included in the study.

Exclusion criteria: Individuals with non-compressive myelopathy, degenerative disc herniation, and those who didn't submit the informed consent were not considered.

Study population: All patients referred to the department of radiology with symptoms of Compressive myelopathy of the spine.

Ethical approval: The study was approved by the institutional ethical committee.

Statistical analysis: All the statistical analysis is done using SPSS software version 21 and MS excel 2007. Descriptive statistics in the form of mean, percentage were used. A Chi-square test was used to find the statistical significance, $P > 0.05$ was considered to be statistically significant.

The procedure was explained to the patient. Detailed history for contraindication of MRI was specifically taken. They were provided with light music to decrease the noise within the MRI room. MRI Philips Achieva 1.5 TESLA 16 channel was used. Patients were evaluated with an MRI scan in a supine position with proper positioning and immobilization of the body. Standard surface coils were used for acquiring the images. Pre-contrast scanning was done using TiWI, T2WI, FLAIR Sagittal, STIR sagittal, T-WI, T2WI axial with a slice thickness of 4mm. Omniscan (Gadodiamide) or Magnevist (dimeglumine gadopentetate) were used as contrast agents in a dose of 0.1mmol /kg body weight in cases of tumors and infections. For spinal trauma contrast scan was not done. Post-contrast T1 WI sagittal, axial, and coronal images were obtained. Whenever required, thin sections were obtained in the region of interest, special MRI sequences like FLAIR and STIR were routinely obtained. The MRI images were analyzed based on location (cervical, thoracic lumbar), the segment of the spinal cord involvement, and the severity of the injury. In cases of trauma, site, and level of injury, vertebral fracture, ligamentous injury were analyzed. Neoplasms were classified based on appearance into benign/malignant, based on location into extradural, intradural (extramedullary/ intramedullary).

Results

During the study period, a total of 30 participants were included in the study. Among these, spinal TB was diagnosed to be the most common cause of myelopathy (13; 43.3%) followed by spinal trauma (7; 23.3%), METS (5; 16.6%), meningioma (2; 6.67%). Ependymoma, neurofibroma, and astrocytoma constitute one case (3.3%) each, respectively (Table 1). In the study group, out of 30 (100%) participants, extradural myelopathy was diagnosed in 23 (76.6%) participants and intradural in 7 (23.3%) members. In the extradural, infective

TB was diagnosed to be highest (43.3%; 13) followed by spinal injury (23.3%; 7) and secondary neoplasm (10%; 3). Whereas, out of 7 (23.3%) intradural participants, primary neoplasms were diagnosed in 5 (16.6%) participants and secondary neoplasms in 2 (6.6%) members (Table 2). In this study, age-wise, 2 (6.6%) participant was included in 13 – 23 years group, 7 (23.3%) participants were included in 23 – 33 years group, 6 (20%) participants were included in 33 – 43 years group, 7 (23.3%) participants were included in 43 – 53 years group, 5 (16.6%) participants were included in 53 – 63 years group and 3 (10%) participants were included in > 63 years group; statistically there was no significant difference (P>0.05; Table 3). Gender wise, 56.6% (17) were male participants and 43.3% (13) were female participants; statistically, there was no significant difference (Table 4).

Table 1: Causes of compressive myelopathy among the study participants.

MR diagnosis	Number	%
TB infections	13	43.33
TM trauma	7	23.35
Meningioma	2	6.67
Ependymoma	1	3.33
METS	5	16.66
Neurofibroma	1	3.33
Astrocytoma	1	3.33
Total	30	100

Table 2: Cause for myelopathy according to various compartments among the study participants; n (%)

Cause	Extradural	Intradural	Total
Spinal injury	7 (23.3)	0	7 (23.3)
Infective/TB	13 (43.3)	0	13 (43.3)
Primary neoplasms	0	5 (16.6)	5 (16.6)
Secondary neoplasms/ metastasis	3 (10)	2 (6.6)	5 (16.6)
Total	23 (76.6)	7 (23.3)	30 (100)

Table 3: Age-wise MR diagnostic results of the study participants; n (%)

Age	MR diagnosis							
	TB	TM	Men	Epe	METS	Neu	Ast	Total
13-23	1 (3.3)	1 (3.3)	0	0	0	0	0	2 (6.67)
23-33	3 (10)	1 (3.3)	1 (3.3)	0	0	1 (3.3)	1 (3.3)	7 (23.3)
33-43	3 (10)	1 (3.3)	1 (3.3)	1 (3.3)	0	0	0	6 (20)
43-53	2 (6.67)	1 (3.3)	0	0	4 (13.3)	0	0	7 (23.3)
53-63	2 (6.67)	3 (10)	0	0	0	0	0	5 (16.6)
>63	2 (6.67)	0	0	0	1 (3.3)	0	0	3 (10)
Total	13 (43.3)	7 (23.3)	2(6.67)	1 (3.3)	5(16.6)	1 (3.3)	1 (3.3)	30 (100)
Statistical analysis	P value = 0.489; Statistically no significant difference.							
Men: Meningioma; Epe: Ependymoma;								

Table 4: Gender wise MR diagnostic results of the study participants; n (%).

Gender	MR diagnosis							
	TB	TM	Men	Epe	METS	Neu	Ast	Total
Male	5 (16.6)	4 (13.3)	1 (3.3)	1 (3.3)	4 (13.3)	1 (3.3)	1 (3.3)	17 (56.6)
Female	8 (26.6)	3 (10)	1 (3.3)	0	1 (3.3)	0	0	13 (43.3)
Total	13 (43.3)	7 (23.3)	2 (6.6)	1 (3.3)	5 (16.6)	1 (3.3)	1 (3.3)	30 (100)
Statistical analysis	P value = 0.519; Statistically no significant difference.							
Men: Meningioma; Epe: Ependymoma;								

Discussion

MRI is the most sensitive and specific and is used for diagnosis of trauma, tumors, infections. MRI is the only currently available technique that provides direct visualization of the spinal cord. Out of 30 cases of compressive myelopathy, the current study had 13 cases of spinal TB). All cases occurred in the thoracic region. MRI showed vertebral body destruction with pre and paravertebral collection in all cases. The epidural component compressing the cord was seen in 7 cases. Lesions are iso/ hypointense on T1WI, hyperintense on T2WI and FLAIR images. Cord edema was present in 7 cases. A study by Roos DEA et al. showed the thoracic region as the most commonly affected site [5]. In case of involvement of single vertebral body nutrition of disc is maintained and disc appears normal [6]. When vertebral bodies on both sides of disc were involved, the disc loses its nutrition and gets secondarily involved. The involvement of posterior elements is well detected on MRI and is more common in TB than pyogenic infections. Contrast usually shows heterogeneous enhancement in the region of marrow infiltration. Paraspinal soft tissue masses are present in the majority of cases [8]. Atlas SW et al. found that skeletal involvement in tuberculosis occurs mainly by hematogenous dissemination [9]. He showed that MRI is more sensitive and specific in diagnosing spinal tuberculosis, cord changes. epidural component. Pre and paravertebral components are commonly seen in the late stages. The components are hypointense on TIWI and hyperintense on T2WI These soft tissue masses displace the thecal sac and the spinal cord is distorted. The sensitivity and specificity of MRI for diagnosis of spinal tuberculosis are 100% and 88%

Respectively. Mona s et al. reported that in TB spondylitis there was the loss of cortical definition of affected vertebrae [9]. On T2WI an indiscriminate increase in signal intensity is noted from vertebrae, soft tissues, and disks. T1W images usually show the decreased signal from the affected vertebral marrow. Posterior elements may be involved. Out of 30 cases of compressive myelopathy, 7 cases were due to spinal trauma. In a study conducted by Kulkarni et al. most common mode of injury to the spinal cord was a vehicular accident and the least cause was the fall [10]. A similar finding of the mode of injury was found in the present study conducted. The age of the patient in the current study ranged from 12-70 years and 4 were males and 3 were females. This was in comparison to the study conducted by Yamashita et al [11].

In the present study, the level of injuries among the 7 patients was 3 thoracic, 2 cervical, and lumbar 2. This is comparable to the study conducted by Kerslake et al [12]. The cord signal intensity has the prognostic implication where patients with cord edema recovered completely / partially. This has also been shown by studies done by Flanders et al [13]. In the present study, the common site of metastases was thoracic. This is in comparison to the study done by Livingston et al [14]. The most common primary tumors with metastases to the spine and extradural space were lung, breast, and lymphoma, prostrate. In this report, T1WI, T2WI, and STIR sequence were used and post-contrast to image spinal metastases. Smoker WRK et al. stated that metastatic lesions are often destructive and lytic but can be sclerotic, especially in prostate cancer [15]. MRI is extremely sensitive to the detection of metastasis in the vertebral bodies or extradural space. In the present study 2 cases of meningioma occurred at 30-40 years. This is in comparison to a study done by G.lacob who showed that meningiomas are common in the age group of 34-82 years [16]. Meningiomas were the second most common intradural tumors. This is in comparison to a study made by Gezen F et al., who showed that meningiomas are the second most common intradural tumors and they are common in intradural extramedullary compartment [17]. Gottfried et al. stated that Meningiomas have a significant predilection for females arising mainly in the thoracic region [18]. In this study, 1 case of astrocytoma was included, 24-year male patient. This is in comparison to a study made by Koeller K et al. who showed that astrocytomas are common in males and the mean age is at 29 years [19].

Tumour was hypointense on T1W1 and hyperintense on T2W1. In contrast, it showed heterogeneous enhancement. This was in comparison to a study made by Koeller et al. [17]. At MR imaging, these neoplasms usually have poorly defined margins and were similar to hypointense relative to the spinal cord on T1-weighted images and hyperintense on T2-weighted images. Cysts are a common feature, with both polar and intratumoral types being observed. Because astrocytomas arise from the cord parenchyma and not from the central canal, they are usually eccentric within the cord [20].

Limitations

A small sample size is the major limitation of this report because few clinical conditions were only analyzed.

Conclusion

The most common cause for compressive myelopathy in the present study was identified to be extradural compression from TB followed by trauma. Spinal TB was the commonest site involved. In spine injury, the common site involved was the thoracic was followed by the cervical region.

What does the study add to the existing knowledge

TB was identified to be the commonest cause of compressive myelopathy.

Author's contributions

Dr. Pottala Krishna Mohan: Literature survey, Paper writing, data analysis

Dr. K Jaya Sudha: Complete idea, statistical analysis, paper writing

Dr. M Anvitha; Benchwork, sample collection, literature search, paper writing

Dr. T Jaya Chandra: Data analysis, paper writing, statistical analysis

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