ETIOLOGY OF NON-TRAUMATIC SPINAL CORD INJURIES AS ASSESSED ON MAGNETIC RESONENCE IMAGING

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ABSTRACT

Background and Objectives: Non-traumatic spinal cord injuries are significant but under reported causes of paralysis with wide range of etiologic factors. The objective of the present study was to determine the frequency of causes of non-traumatic compressive myelopathy on Magnetic Resonance Imaging (MRI) in patients with paraplegia / quadriplegia.

Methods: This was a cross – sectional study conducted in Radiology department of Children Hospital and Institute of Child Health, Lahore. A total of 150 patients were included in this study, which was carried out over a period of six months from July 2010 to January 2011. Approval was taken from hospital ethical committee. After obtaining informed verbal consent demographic data and results of causes of non-traumatic compressive myelopathy on MRI were obtained.

Results: Mean age was 46.8 ± 11.6 years. Out of 150 patients, 99 patients (66%) were male while 51 patients (34%) were female. Male to female ratio was 3:2. Out of 150 patients 105 (70%) presented with paraplegia and 45 patients (30.0%) presented with quadriplegia. On MRI, 57 patients (38.0%) were found to have tuberculosis of spine, 56 (37.3%) had degenerative spondylosis, 34 patients (22.7%) had tumors and 3 patients (2.0%) had pyogenic epidural abscess.

Conclusion: It is concluded that tuberculosis of spine is the most common cause of compressive myelopathy followed by degenerative spondylosis and tumors.

Key Words: Non-traumatic, compressive myelopathy, MRI.

INTRODUCTION

Myelopathy describes any neurologic deficit related to the spinal cord[1]. Causes may be traumatic or non-traumatic. Non-traumatic spinal cord injury (NSCI) is a significant but under reported cause of paralysis. It encompasses a wide range of underlying etiologies which cause compressive myelopathy and severe disability. These include neoplastic, vascular, mechanical, infectious and degenerative pathologies. In developed countries the most common cause of NSCI is tumors, either primary or metastatic, followed by age related causes like degenerative disc disease[2], while in developing countries tuberculosis is the commonest cause with poverty, overpopulation and malnutrition being the causative factors[3]. However, a resurgence of tuberculosis has been seen in the past decades in developed countries, not only in the lungs, but also in extra pulmonary sites, e.g. the vertebral column[4]. This finding can largely be attributed to dynamic immigration patterns that have included an influx of persons from areas of the world where tuberculosis is endemic.[1,5,6]

Diagnosing causes of NSCI can be difficult because of varying clinical presentations. Imaging in conjunction with clinical and laboratory testing is used. MRI is the gold standard for diagnosing cord compression and has an overall accuracy of 95%.[7] Plain computerized tomography (CT) and plain X-rays of the cervical spine are not usually helpful, but can show fracture, stenosis due to osteophytes spurring and cervical spinal inst-ability.[8]

CT myelography is used in patients who are intolerant of closed spaces or who cannot undergo MRI[9]. MRI with and without gadolinium is better than CT myelography in diagnosing tumors, inflammation, demyelination, spondylosis, infection, ischemia, syringemyelia, and other spine conditions. Because patients with cervical myelopathy may have a paucity of upper extremity signs and symptoms, the cervical spine is often imaged along with the thoracic spine. For patients in whom MRI or CT myelography show evidence of an arteriovenous malformation and in patients with spinal cord ischemia, MR angiography or conventional trans femoral angiography is used to confirm the diagnosis, map out the blood supply, and potentially plan surgical intervention.[10,11]

Most studies focus on traumatic spinal cord inj-

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ury.[3,12] However, individuals with non-traumatic SCI account for a surprisingly large part (up to 50%) of the SCI cases admitted for rehabilitation.[1] As less work has been done regarding the incidence of non-traumatic paraplegia/quadriplegia in Pakistan, it is important to identify the common causes of non-traumatic spinal myelopathies in our population. This will facilitate the diagnosis of these clinically complicated conditions in future. Accordingly the objective of our study was to determine the frequency of the various causes of non-traumatic compressive myelopathy on MRI in patients with paraplegia or quadriplegia.

PATIENTS AND METHODS

This Descriptive cross-sectional study was conducted in Diagnostic Radiology Department of the Children's Hospital and Institute of Child Health, Lahore, over a period of six months from July 2010 to January 2011. The sample size was 150. Patients were selected by non-probability consecutive sampling. Patients of all age groups of either sex, referred to Radiology Department for imaging, presenting with quadriplegia or paraplegia were included. Exclusion criteria was trauma and congenital anomalies of spine.

After obtaining informed verbal consent, demographic data was obtained. MRI of all the cases was performed at 1.5 Tesla MR system (Philips Gyro scan NT, compact plus Holland). Our standard MRI technique of spine for evaluation of patient with paraplegia or quadriplegia included survey images (Coronal, Axial) followed by sagittal T1W/T2W scan. Slice thickness of 4mm and slice gap of 0.4 mm was selected. T1W and T2W axial images at the area of interest with average slice thickness of 4 mm and inter-slice gap of 4mm were obtained. FLAIR sequence was also done in case of abnormal signals in cord or thecal sac. Intravenous Gadolinium was used if needed, especially in suspected cases of infection or primary tumor. Imaging of the spine was performed in supine position.

Statistic Analysis

Data was entered and analyzed by using computer software SPSS 10. The quantitative variables like age were presented by mean and standard deviations. The qualitative variables like gender, tumor, infection and degenerative changes were presented by frequency and percentage. Data was stratified for causes of paraplegia or quadriplegia.

RESULTS

A total of 150 patients were included in this study. Mean age recorded was 46.8 ± 11.6 years, 27 (18.0%) patients were of 25 – 45 years of age, 67 (44.7%) were of 46 – 65 years of age and 56 (37.3%) were between 66 – 80 years of age. Out of 150 patients, 99 patients were male while 51 patients were female. Male to female ratio was 3:2.

Regarding distribution of causes for paraplegia and quadriplegia, it was found in this study that paraplegia was more common as compared to quadriplegia i.e. 7:3. In paraplegic patients commonest cause was tuberculosis of spine followed by degenerative spondylitis, tumors and pyogenic epidural abscess. In quadriplegic patients degenerative spondylitis was the commonest cause followed by tumors, tuberculosis of spine and pyogenic epidural abscess. Collectively tuberculosis of spine was the commonest cause followed by degenerative spondylitis, tumors and pyogenic abscess.

DISCUSSION

Mean age for spinal myloepathy in our study was 46 years which is comparable to other studies.[13,14] Majority of patients (105 out of 150) presented with paraplegia. In these patients, tuberculosis (TB) of spine (44.8%) was the most common cause followed by degenerative spondylosis (34.3%), tumors (19.0%) and pyogenic epidural abscess (1.9%) in that order.

These results are similar to studies conducted in other developing countries, where the incidence rate of non-traumatic compressive paraplegia was between 29.69% to 47%.[3,15-17] The vertebral column is the most common site of osseous involvement, comprising about 50% of cases of skeletal tuberculosis.[9] Skeletal involvement occurs in 1-5% of all TB patients.[18]

Interestingly in our study cervical spondylosis was more common than tuberculosis in qaudriplegics. This is probably because tuberculosis has been seen to effect the thoracic spine more commonly and cause paraplegia. In multiple studies the frequency of thoracic, lumbar and cervical involvement in tubercular vertebral spondylosis was 80%, 13.3% and 6.67% respectively.[12,15] In a study on local population, thoracic vertebrae (40%) were again most frequently involved followed by the lumbar spine.[14] Predilection for the thoracic and lumbar spine in tuberculosis is likely due to the close proximity of the involved vertebrae from the primary site as osseous tuberculosis is usually secondary to hematogenous spread from lungs.[19]

Other infectious cause of compressive myelopathy is pyogenic spinal epidural abscess. However it's incidence is very low, involving 1.59% of cases[15]. In our study the rate of pyogenic epidural abscess was 2%.

Overall, second commonest cause of cord compression was degenerative spondylosis with a frequency of 37.3%. Spondylotic myelopathy is due to stenosis caused by degenerative disc and joint disease with hypertrophic changes, with addition of a dynamic component related to movement of the cervical spine, chiefly flexion and extension.[20] Degenerative spondylosis is a common feature of aging with peak age between 40 to 60 years[21]. Men are more often affected than women in a ratio of about 3:2.

On the contrary, tumors both primary and second-

dary (metastatic) seem to be the most common cause of non-traumatic SCI in developed countries. Its incidence in our study was 22.7%, while in other studies its incidence varies from 20-35% of all compressions.[2,15]

Even though not demonstrated in our study; vascular lesions are also an important etiology for SCI and cannot be ignored. These include aneurysms and arteriovenous malformations. Dural arteriovenous fistulas (DAVF) are the most common spinal cord vascular malformation and most often affect the thoracic spinal cord.[22]

Our study is one of the few studies in the region looking at non-traumatic causes of spinal cord injury. It gives an idea of the incidence of these etiologies in our population. Paraplegia and quadriplegia are severely debilitating conditions with massive burden on the health economy. It is therefore important to identify the common etiologies and to better allocate resources. Tuberculosis of the spine e.g. is the most frequent but albeit preventable cause of non-traumatic paraplegia in our country.

The limitations of our study were its sample population which was limited to a tertiary care hospital in an urban setting. More multicentre studies need to be conducted that will generate more generalizable and accurate data.

It is ***concluded*** that non-traumatic causes of spinal cord injury are an important entity and often present with overlapping clinical symptoms. Nonetheless, an accurate diagnosis needs to be made in order to ensure proper treatment. Tuberculosis of spine is the most common cause of compressive myelopathy in our region, followed by cervical spondylosis and tumors.

ACKNOWLEDGEMENTS

The efforts and cooperation of staff of Radiology Dept. of Children's Hospital is thankfully acknowledged without which this research would not have been possible.

CONTRIBUTION OF AUTHORS

A. M., Conception of study / Data collection. M. C., Revising the article and approval of final version for publication. E. T., Data collection. F. S., Initial Drafting / Manuscript writing.

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