Original Research Article

Role of MRI spine in evaluation of cases of neurotrophic arthropathy

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Abstract

Introduction: A neurotrophic joint (also known as a Charcot joint) refers to a progressive degenerative/ destructive joint disorder in patients with abnormal pain sensation and proprioception. A substantial number of neurotrophic joints are caused secondary to lesions of the spine. Many a times the patient does not give any history indicating a spine lesion. Hence MRI scan of Spine should be made a part of the investigations in every case of neurotrophic joint.

Aims and objectives: To study the incidence of Spinal lesions as a primary causative factor behind a neurotrophic joint and to study the efficacy of MRI spine exam in correctly diagnosing Spinal lesions in patients presenting with a neurotrophic joint.

Materials and methods: This study was conducted in the Radiology department of Dhiraj general Hospital. 20 patients presenting with neurotrophic joint/joints but giving no history suggestive of an underlying spinal pathology were evaluated by MRI spine.

Results: Out of 20 patients presenting with neurotrophic joint who were evaluated by MRI spine, only 12 scans revealed a spinal pathology secondary to which the patient had developed neuropathic change of the affected joint.

Conclusion: Onset of joint neuropathy is usually insidious. If this pathological process continues unchecked, it can result in joint deformity, ulceration and/or super infection, loss of function, and in the worst-case scenario, amputation or death. Early identification of joint changes is the best way to limit morbidity and for that early diagnosis of any underlying pathology is important. MRI spine is a sensitive tool to detect any lesion of the spine. It helps to accurately diagnose a variety of spinal lesions and tells about its exact size, extent and severity and thereby contributes immensely in the management of a neurotrophic joint.

Key words

Neurotrophic joint, Charcot joint, MRI spine, Spinal lesions.

Introduction

A neurotrophic joint (also known as a Charcot joint) refers to a progressive degenerative/ destructive joint disorder in patients with abnormal pain sensation and proprioception [1].

Any condition causing loss of peripheral sensation, proprioception and fine motor control result in neuropathic alteration of the joints. The Etiological causes vary from metabolic disorders like the diabetes mellitus to spinal cord lesions such as syringomyelia, spina bifida, tabes dorsalis etc.The most common cause behind neurotrophic joint is diabetes and the foot is the most is the most affected region. Prevalence differs depending on severity of the disease [2] – 0.1 % in general diabetic population, 15% in high risk diabetic population and 30% in patients with peripheral neuropathy.

Two primary theories have been advanced in the development of neurotrophic joints.

Neurotrauma: Loss of peripheral sensation and proprioception leads to repetitive micro trauma to the joint in question; this damage goes unnoticed by the neuropathic patient, and the resultant inflammatory resorption of traumatized bone renders that region weak and susceptible to further trauma. In addition, poor fine motor control generates unnatural pressure on certain joints, leading to additional micro trauma.

Neurovascular: Neuropathic patients have dysregulated autonomic nervous system reflexes, and de-sensitized joints receive significantly greater blood flow. The resulting hyperemia leads to increased osteoclastic resorption of bone, and this, in concert with mechanical stress, leads to bony destruction.

In reality, both of these mechanisms probably play a role in the development of a Charcot joint [3].

Patients often present with a painless instability of the affected joint and many a times, do not provide any history pointing to or suspecting of an underlying Spine lesion as a primary causative factor behind the neurotrophic joint. Hence MRI Spine examination should be carried out in every case of neurotrophic joint and should become a routine part of management of the patients [4].

Aim and objectives

- To study the incidence of Spine Lesions as a primary causative factor behind a neurotrophic joint.
- To study the Efficacy of MRI spine exam in correctly diagnosing Spinal lesions in patients presenting with a neurotrophic joint.

Materials and methods

Study area

The study was carried out in the Department of Radiodiagnosis, S.B.K.S. Medical Institute and Research Centre, Waghodia, Vadodara.

Study design

Type of the study: An Observational, Descriptive Hospital Based Study.

Sample size: 20 patients.

Selection of subject

Inclusion criteria

- Only those patients who are willing to participate in study were included.
- Patients referred to the radiology department for evaluation of neurotrophic joint but giving no history suggestive of underlying spine lesions were selected.
- Patients coming for investigations for other diseases, and were accidentally found to have neurotrophic joint, were included in this study.

Exclusion criteria

- All patients unwilling were excluded from this study.

Study protocol

20 patients which comprised of male as well as female patients, where, either the patient presented with deformity, disability or destruction of one or multiple joints were first evaluated by plain radiographs of the affected joint and a diagnosis of neurotrophic joint was made from radiographs, or the patient presented with some other complaints and were incidentally found to have neurotrophic joint. All of the above patients were subjected to MRI scan of the spine irrespective of them having or not having complaints hinting to a spinal lesion.

Results

A total 20 patients were examined with plain radiographs and MRI spine.

The salient observations are as follows

- In my study neurotrophic joint is more common in males (66.6%) than in females (33.3%) which were a ratio of 2:1.
- The result of MRI spine conducted on the above 20 patients came out normal in 8(40%) patients and findings were present in 12(60%) patients.
- Diagnosis on MRI spine was as follows: Syringomyelia in 4(20%) patients, Meningomyelocele in 3(15%) patients, Arnold-Chiari malformation in 3(15%) patients, and Arterio-venous malformation in 1 (5%) patient and Syphillis in 1 (5%) patient.
- In my study the upper limb was involved in 13(65%) patients and lower limb in 7(35%) patients.
- The most common joint involved knee joint – in 30% patients, followed by shoulder joint and hip joint – each in 20% patients and least commonly involved joints were elbow joint, ankle joint and foot joints – in 15% patients.

Out of 20 patients presenting with neurotrophic joint 10 patients gave complaints suggesting of a spinal pathology. Outcome of MRI spine examination of these 10 patients gave a positive finding. Thus, from my study I conclude that MRI study of spine is 100% sensitive in detecting a spinal lesion.

Discussion

Neuropathic arthropathy (Charcot joint) can be defined as bone and joint changes that occur secondary to loss of sensation and that accompany a variety of disorders. There are two forms of Charcot joint - atrophic and hypertrophic. Charcot joints are typically unilateral but are bilateral in ~20% (range 5.9-39.3%) of cases [5].

Etiological Causes include**:** Syphilis, Steroid use, Syringomyelia, Spinal cord injury, Spina bifida, Meningomyelocele, Leprosy, Scleroderma.

The involved joint is highly suggestive of the aetiology: [6]

Wrist: diabetes, syringomyelia

Hip: alcohol, tabes dorsalis

Knee: tabes dorsalis, congenital insensitivity to pain

Ankle and Foot: diabetes

Spine: spinal cord injury, diabetes, tabes dorsalis

Clinical presentation

Patients typically present insidiously or are identified incidentally or as a result of investigation for deformity. Unlike septic arthritis, Charcot joints although swollen are normal temperature without elevated inflammatory markers. Importantly they are painless.

Radiographic features

Dense bones (subchondral sclerosis, degeneration, destruction of articular cartilage, deformity (pencil-point deformity of metatarsal heads), debris (loose bodies), dislocation.

Diagnosis on MRI

Syringomyleia - Syringomyelia is the development of a fluid-filled cavity or syrinx within the spinal cord. Peripheral neuropathic joints or even neuropathic alteration of the spine itself may develop in long-standing cases of syringomyelia. An atrophic form with resorption of the proximal humerus is described frequently in syringomyelia.

Arterio-venous malformation - Spinal arteriovenous malformations (AVMs) are abnormal collections of blood vessels in the spinal canal that have a direct connection between the arterial system and the venous system without intervening capillaries. AVMs account for about 4 percent of primary intraspinal masses. Symptoms involve progressive neurological symptoms over months to years, especially back pain associated with progressive sensory loss and lower extremity weakness. 10 percent to 20 percent involve a sudden onset of weakness, numbness, difficulty urinating, urinary incontinence, fecal incontinence, or paralysis (usually in patients younger than 30) as a result of hemorrhage.

Arnold-Chiari malformation – These are a group of defects associated with congential caudal displacement of the cerebellum and brainstem.

Tabes dorsalis - It is a form of tertiary neurosyphilis in which there is demyelination of the posterior columns of the spinal cord. Patients present with symptoms related to dorsal column/nerve-root involvement such as weakness, sensory ataxia (tabetic gait), lancinating pain, hypoesthesia, personality changes. It has the longest latent period of any neurosyphilis between primary infection and onset of symptoms, averaging about 20 years. Radiologically, it can manifest as a Charcot joint (neuropathic arthropathy), usually involving the hip, the knee or the spine.

Conclusion

A substantial number of neurotrophic joints are caused secondary to lesions of the spine. Many a times the patient does not give any history indicating a spine lesion. Hence MRI scan of Spine should be made a part of the investigations in every case of neurotrophic joint. It helps to accurately diagnose a variety of spinal lesions and tells about its exact size, extent and severity and thereby contributes immensely in the management of a neurotrophic joint.

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