Case Report and Review of the Literature

A rare case of myositis ossificans and Guillain-Barré syndrome

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Abstract

Myositis ossificans is a common condition following trauma to muscles in and around bone and major joints. Myositis ossificans which occurs spontaneously, has also been well described where the aetiology is unknown or where it is hypothesised that repetitive trivial trauma is the cause. Although myositis ossificans has been associated with neurological complications following head injuries and spinal injuries, it has never been associated with patients diagnosed with Guillain-Barré syndrome.

A case report is presented where a patient who had an acute onset of Guillain-Barré syndrome developed myositis ossificans in multiple areas around the major joints while still on a ventilator in the intensive care unit.

Introduction

Myositis ossificans (MO) is a self-limiting pseudotumorous condition which in most cases follows trauma, especially in young males. The sites of occurrence are commonly around joints and in major muscle groups, but rare sites where heterotopic bone formation occurred had been reported.

Various forms of MO have been described based on its aetiology and presentation. A literature search on MO and Guillain-Barré syndrome (GBS) revealed volumes of articles on both topics, but no association or relationship between the two conditions has been reported. In the following case report an attempt is made to examine whether any relationship between MO and GBS exists.

Case report

A 33-year-old Asian male presented with an acute onset of muscle weakness which involved the lower limbs and upper limbs. He had suffered from headache and fever two days prior to the onset of weakness. While being attended to in the casualty department, he became short of breath and developed respiratory difficulties. He subsequently collapsed and was successfully resuscitated. He was then transferred to the intensive care unit.

In the pursuing days a diagnosis was made of Guillain-Barré syndrome based on the investigations which included cerebrospinal fluid chemistry and cytology, haematological evaluations and imaging scans of the brain.

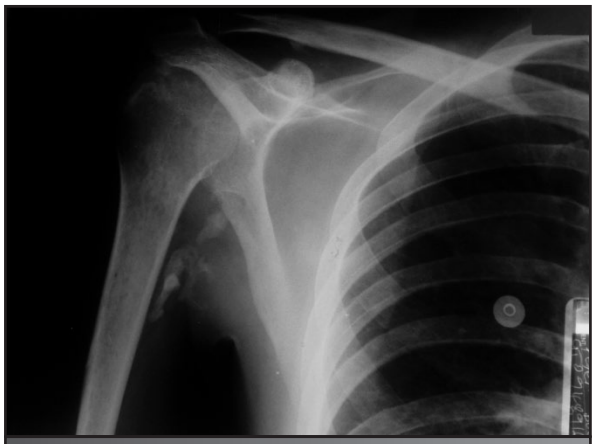

Figure 1. Right shoulder (AP view). Heterotopic bone formation seen on the medial aspect of the proximal humerus

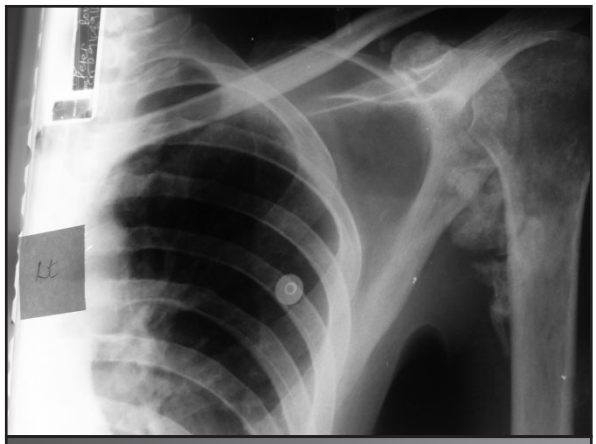

Figure 2. Left shoulder (AP view). Massive amounts of heterotopic bone seen on the medial aspect of the humerus

Treatment was directed at respiratory support, hence he remained sedated and ventilated. The treatment he received included steroid and immunoglobulin therapy. He had many episodes of chest infections which were treated with antibiotics.

Physiotherapy, in terms of joint mobility, started early to prevent joint contracture. After 6 weeks the physiotherapist reported that the right shoulder was becoming stiff with a palpable mass over the deltoid area. Radiographs of the shoulder showed a calcific mass in the deltoid muscle which was reported, by a radiologist, as MO *(Figure 1)*. An orthopaedic consult was requested and the diagnosis of MO was confirmed. Subsequently the left shoulder became gradually stiff and a radiograph of the shoulder showed a calcific mass around the shoulder joint. A diagnosis of MO was made of the left shoulder *(Figure 2)*.

He remained sedated and ventilated for a period of 8 months before he recovered from a ventilatory point of view. During this time, more joints became increasingly stiff. A bone scan was done which showed increase uptake at multiple sites *(Figure 3)*. Radiographs of all these 'hot sites' were obtained and a diagnosis of MO was made involving multiple periarticular sites *(Figures 4 and 5)*.

Discussion

Myositis ossificans

MO is a benign self-limiting condition in which a mass of heterotopic bone is formed within soft tissue.[1,5] Myositis ossificans is either localised or generalised. Localised MO commonly follows an incidence of trauma to muscle. Generalised myositis ossificans is less common and involves multiple sites. Heterotopic bone formation occurs predominantly around the hips, knees, shoulders and elbows and involves muscle groups like the quadriceps femoris, adductor muscles, gluteal muscles, biceps muscles of the arm and deltoid muscles.[1,5,6] Rare sites of occurrence have been described, e.g. in the abdominal muscles, temporal muscles, scalp muscles, paravertebral and neck muscles.[5,6,8,9]

Myositis ossificans occurs mostly in males, especially the adolescent and the young adult, and also in the athletic group of individuals (due to their physical activities).[2,5,9] It is also a recognised complication following surgery especially surgery around the hip, shoulder and elbows.[9]

Myositis ossificans has been known by different terms in the literature:[1]

- pseudomalignant myositis ossificans
- pseudomalignant osseous tumour of the soft tissue
- extra-osseous localised non-neoplastic bone and cartilage formation
- myositis ossificans circumscripta.

Myositis ossificans is classified mainly according to its aetiology:[5,7]

- Myositis ossificans traumatica – This is the most common form of MO with an incidence of Ī 75% of heterotopic bone formation.[5]
- Myositis ossificans following paraplegia – This is MO associated with head injury or spinal injury (neurological injury).[9]
- Myositis ossificans of unknown origin – In this form of MO there is little or no traumatic incidence.[5,9]

It is a recognised complication following surgery especially surgery around the hip, shoulder and elbows

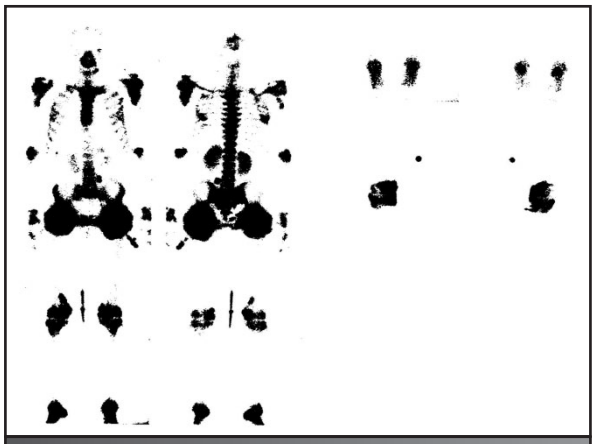

Figure 3: Bone scan: Showing multiple hot spots in keeping with heterotopic bone formation

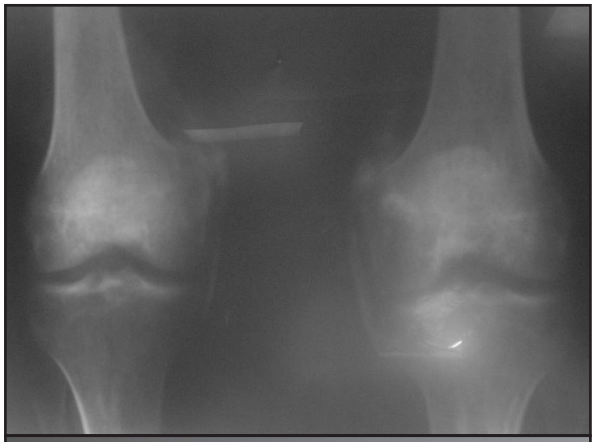

Figure 4. Radiograph of both knees (AP views): Heterotopic bone formation on the medial aspect of the knee joints

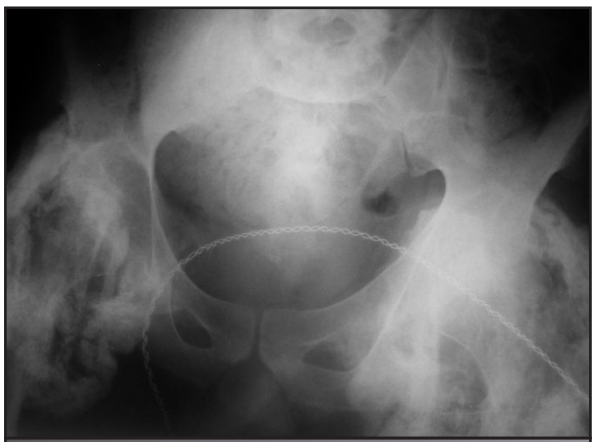

Figure 5. Radiograph (AP view) of the pelvis and hips showing massive amount of heterotopic bone formation around the hip joints

- Fibrodysplasia ossificans progressiva[9] – This form of MO involves multiple sites, it is progressive and associated with congenital abnormalities of the big toe and thumb. It is due to a spontaneous mutation but autosomal dominant transmission has been documented. The age of onset is 5 years and by age 15 years there is a severe restriction of movement of the upper limbs in over 95% of cases. The shoulder girdle, neck and spine are commonly involved.

In the pathogenesis of heterotopic bone formation one needs: 1) pluripotential cells capable of transformation; 2) an inducing stimulus; and 3) a local environment suitable for ossification. When an injury occurs to a muscle, there will be haemorrhage which will form a haematoma. The haematoma organises and a soft tissue mass forms. Microscopically there is marked proliferation of spindle cells which demonstrates a zoning phenomenon. The least differentiated cells lie in the central zone where rapid proliferating spindle cells of various shapes and sizes and atypical mitosis are seen. Adjacent to this zone is the middle zone where osteoid matrix of early bone formation is more organised. The outer zone is more matured and consists of well-formed bone which forms a shell around the entire lesion. It is crucial to identify the zonal phenomenon because it differentiates MO from tumours such as soft tissue sarcomas and osteosarcomas.[1,5,6,7] (The zonal phenomenon is pathognomonic in the diagnosis of MO).

Patients will generally complain of a lump or swelling over a specific area, which will gradually increase in size. The mass grows over a period of 1 to 2 months. The joint may become stiff and can progress to a totally immobile joint with time. There may be pain but the pain will decrease as the MO matures.[9]

The radiological appearances reflect the underlying histological pattern of maturation. In the early phase, radiographs are unremarkable or show non-specific soft tissue swelling. Occasionally a periosteal reaction may be seen if the lesion is juxtacortical. Calcification is visible in 2–3 weeks and complete maturation is reached in 5–6 months. After this the lesion starts to reduce in size.

The zonal phenomenon is better appreciated on computer tomography (CT) where the rim of mineralisation is seen with a centre of decreased density.[4] Ultrasound may be helpful in the diagnosis of MO because it can also demonstrate the zonal phenomenon. Scintigraphy is highly sensitive in detecting MO. There is an increased uptake of radioisotope due to the osteoblastic activity, and it can also identify multiple sites of heterotopic bone formation. MRI findings in MO vary according to the maturation phases of the disease.[1]

Guillain-Barré syndrome (GBS)

GBS is an auto-immune disorder of the peripheral nervous system where there is progressive ascending and symmetrical muscle weakness and areflexia.[12,13,15]

It is also described as an acute inflammatory demyelinating polyradiculoneuropathy with rapid progressive weakness of the limbs and frequent involvement of the bulbar muscles and respiratory muscles.[11,14] The weakness may affect the proximal or distal muscles predominantly. Sensory loss is mild in comparison with the motor loss. The disease can progress to maximum disability within 2 to 4 weeks, often leading to complete quadriparesis, respiratory paralysis and autonomic dysfunction.

The cerebrospinal fluid shows an elevated protein concentration with a normal cell count. Nerve conduction studies show marked slowing of conduction velocity which is consistent with the underlying pathology of demyelination of the nerves.

Part of the management of patients suffering from GBS includes assistance in respiratory ventilation. Intubation may be necessary. Plasmaphoresis and hyperimmune gammaglobulin therapy results in rapid recovery.[14]

There is a predictable prognosis in patients with GBS. Eighty per cent of patients will recover fully in 4 to 6 months; 20% will die or will have persistent disability despite treatment.[14]

Argument

In the case report above, two pathological conditions were diagnosed, namely GBS and MO. The questions that should be asked are: Is there a relationship between GBS and MO? Does the patient have two different disease patterns which co-exist?

A comprehensive literature search was done in an attempt to find a solution.

- **Is there a relationship between GBS and MO?** Heterotopic bone formation has been described in paraplegic patients with brain and spinal cord injuries (neurological injuries). It is thought to be due to an increase in the production of osteocalcin (a non-collagenous bone protein) which is found in patients with head injury. An increased level of osteocalcin has been associated with the formation of heterotopic bone but Mysiw *et al*[10] found no correlation between osteocalcin and heterotopic bone formation.
  Earlier literature suggests that GBS is triggered by a viral infection. GBS is described as an acute inflammatory neurological condition and not a condition due to a neurological injury. The pattern of paraplegia or paraparesis in GBS and in that of spinal or head injury (neurological injury) is also totally different.
  It is concluded that no relationship between GBS and MO can be identified.
- **Does the patient have two different disease patterns which incidentally co-exist?** The rapidly progressing paralytic condition of GBS rendered the patient immobile.
  Immobility leads to contractures of soft tissue around the joints for which physiotherapy is the treatment of choice. Aggressive physiotherapy can cause muscle injury and hence MO as a complication.
  This patient received physiotherapy to prevent joint contractures and to keep the joints mobile.
- **Could the immobilisation be a cause for the MO?** It has been reported that prolonged immobilisation can lead to MO especially in paraplegic patients due to head or spinal injuries. In contrast, patients who are immobile due to prolonged ventilation and sedation (for other medical or surgical reasons) do not develop heterotopic ossification.
- **Could the physical stretching of muscle across a joint cause trivial repetitive injuries to the muscle and soft tissue?** If this is true, then a diagnosis of myositis ossificans atraumatica is possible, but the pattern of the involvement of multiple sites is not in keeping with this diagnosis.
- **Could there be a genetic predisposition to MO?** Fibrodysplasia ossificans progressiva is autosomal dominant and involves many sites. This may seem a likely diagnosis based on the generalised nature of the heterotopic bone formation. But the patient has no congenital abnormalities and fibrodysplasia ossificans progressiva occurs in children.
- **Could the patient have risk factors that predispose him to MO?** Arhengart & Lindgren[3] identified patients at risk for MO. These risk factors include: 1) a history of previous MO; 2) ankylosing spondylitis; and 3) diffuse idiopathic skeletal hyperostosis. A history taken from the patient's family yielded no information of risk factors.

Conclusion

MO as a diagnosis can be difficult in the early stages where it is easily confused with soft tissue sarcomas and osteosarcomas. In its matured stage, the diagnosis is often straightforward. This cannot always be said about the aetiology of MO in the absence of trauma to muscle. Much of the basic science in the formation of heterotopic bone formation is still unknown, therefore continuing methods in the identification of high risk patients is warranted.

The authors conclude that Guillain-Barré syndrome or its sequellae could not be associated with the development of myositis ossificans in this case report.

This article has been submitted to an ethical committee and is awaiting approval. The content of this article is the sole work of the authors.

No benefits of any form have been derived from any commercial party related directly or indirectly to the subject of this article.

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