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CASE REPORT

Non-traumatic Myositis Ossificans as Unusual Cause of Neck Pain During COVID-19 Pandemic: a Case Report

Valerio Vitale[1] · Cosimo Bleve[2] · Mariam Mansour[1] · Federica De Corti[3] · Leonardo Giarraputo[4] · Alessandra Brugiolo[5] · Maria Carmen Affinita[6] · Luisa Santoro[7] · Salvatore Fabio Chiarenza[2] · Giuseppe Iannucci[1]

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Abstract

Myositis ossificans circumscripta (MOC) is a benign disease characterized by localized heterotopic bone formation within muscles or soft tissue, usually interesting great muscles of extremities. We report a rare case of unusual location in the neck not associated with previous trauma, mimicking a solid tumor, with well-documented diagnostic imaging features. During COVID-19 pandemic outbreak in Italy, in May 2020, a 14-year-old boy developed a progressive and persistent neck pain on the right side, without known history of trauma. Initial therapy with non-steroid anti-inflammatory drugs and physiokinetic therapy gave only a slight improvement. A neck ultrasound showed an inhomogeneous right neck mass, with posterior shadowing due to calcifications. Computed tomography and magnetic resonance imaging confirmed a huge right neck mass, located in the paravertebral space with peripheral calcifications and mild central contrast enhancement. After surgical excision of the lesion, pathology revealed the presence of muscular tissue mixed with fibroblastic/myofibroblastic proliferation and ossification areas consistent with myositis ossificans. A careful analysis of clinical and radiological features is very important to manage young patients showing progressive pain and swelling of the neck, since MOC can mimic soft tissue or bone tumors, and it should be suspected even in the absence of a known history of trauma.

Keywords Myositis ossificans · Head-neck · MRI · Tumor · Case report

Introduction

Myositis ossificans circumscripta (MOC) is a benign disease characterized by localized heterotopic bone formation within muscles or soft tissue [1, 2]. Usually, it occurs in the extremities and after history of trauma, but pathogenesis is still unclear in non-traumatic cases [3, 4]. Men and young athletes are most commonly affected [3, 5]. The evolution of MOC is a dynamic process that can last from weeks to several months to complete maturation of the lesion [3, 5].

We describe a rare case of non-traumatic neck MOC in an otherwise healthy adolescent, mimicking a solid tumor, with well-documented diagnostic imaging features.

Case Description

A 14-year-old boy, during COVID-19 pandemic outbreak in Italy in May 2020, developed a progressive and persistent neck pain on the right side, without known history of

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✉ Valerio Vitale
valerio.vitale@aulss8.veneto.it

1 Department of Neurosciences, Neuroradiology Unit, San Bortolo Hospital, AULSS 8 Berica, Vicenza, Italy

2 Department of Pediatric Surgery and Pediatric Minimally Invasive Surgery and New Technologies, San Bortolo Hospital, AULSS 8 Berica, Vicenza, Italy

3 Pediatric Surgery Unit, Department of Women's and Children's Health, Padua University Hospital, Padua, Italy

4 Radiology Unit, San Bortolo Hospital, AULSS 8 Berica, Vicenza, Italy

5 Pediatrics Unit, San Bortolo Hospital, AULSS 8 Berica, Vicenza, Italy

6 Hematology and Oncology Unit, Department of Women's and Children's Health, University of Padua, Padua, Italy

7 Pathology Unit, University Hospital of Padua, Padua, Italy

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trauma. During that period, all sport activities were suspended and patient stayed home for distance learning. No relevant past health history was reported and no abnormalities of the cervical spine were found on radiography, executed 1 month after clinical onset. The persistence of pain and slight swelling led to a progressive movement limitation. Therefore, he was treated with non-steroid anti-inflammatory drugs and physiokinetic therapy with only slight improvement.

Four months later, he underwent a neck ultrasound (US) showing an inhomogeneous right neck mass, with posterior shadowing (Fig. 1A) indicating the presence of calcifications. Further in-depth analysis was carried out using computed tomography (CT) and magnetic resonance imaging (MRI).

CT scan images (64 channels General Electric, Boston, Massachusetts) confirmed the presence of a huge right neck mass, located in the paravertebral space between the scalene muscles anteriorly and paraspinal muscles posteriorly (i.e., longissimus capitis muscle, longissimus cervicis muscle, semispinalis capitis muscle, and splenius cervicis muscle), and closely related to the right transverse process of C7 and the first rib, which showed cortical bone irregularity (Fig. 1B–G). The lesion was also characterized by peripheral calcifications and mild central contrast enhancement (CE).

At MRI (3 Tesla Skyra Siemens, Erlangen, Germany), the lesion was hypointense on T1-weighted (w) and hyperintense on T2w images, with mild signal inhomogeneity corresponding to calcifications, showed a more vivid CE compared to CT, and a peripheral tissue alteration was revealed (Fig. 2); no relationship with right C6–C7 neuroforamina or nerve roots was found.

Retrospective revision of spine X-ray evidenced subtle swelling of right cervical soft tissues (Fig. 3).

Percutanous US-guided biopsy, performed to rule out the benign or malignant nature of the lesion, was unsuccessful.

Therefore, patient underwent a partial surgical excision of the lesion, which was strongly attached to the right transverse process of C7.

Pathology revealed the presence of muscular tissue mixed with fibroblastic/myofibroblastic proliferation and ossification areas consistent with myositis ossificans (Fig. 4); *COL1A1-USP6* fusion transcript upon molecular investigation by RT-PCR method was found.

After surgery, the patient's course was regular, with no sequelae.

Discussion

MOC is a non-neoplastic ossification, appearing as a mass, involving soft tissue [7]. Commonly, it can be consequence of a muscular lesion. In fact, 80% of cases are located in the extremities [1, 3]. A neck location is quite infrequent particularly within paraspinal muscles, as it is in our case [1, 2, 4, 5].

In our case, patient experienced neck pain and swelling with movement impairment, consistent with other reported cases associated with MOC [1].

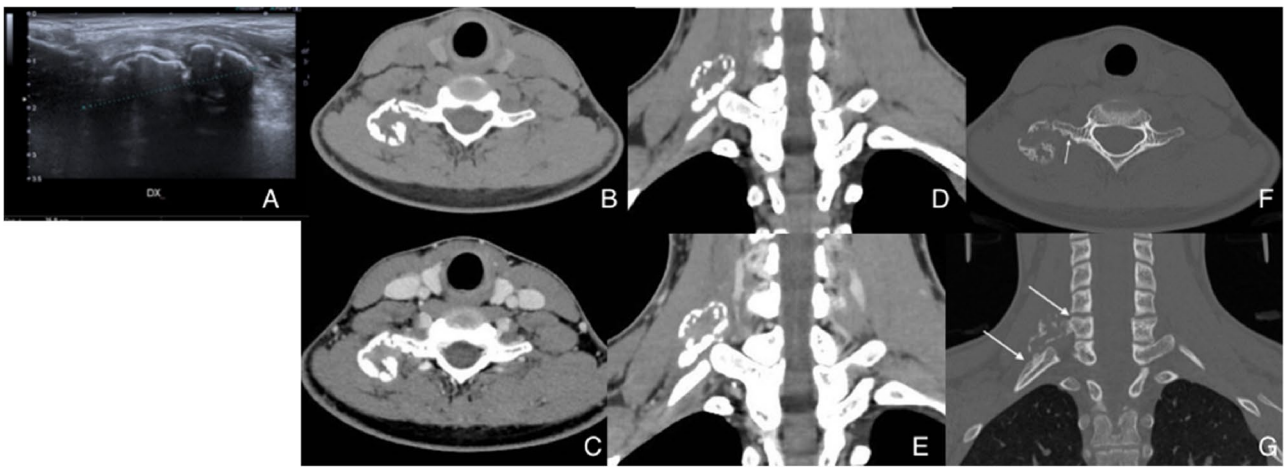

Fig. 1 Ultrasound scan showing a right-sided neck mass with posterior shadowing (caliper) (**A**); axial and coronal CT scans before (**B**, **D**) and after (**C**, **E**) contrast injection, showing the right inhomogeneous mass located between scalene and paraspinals muscles, with prevalent peripheral calcifications and central contrast enhancement. Axial and coronal bone window (**F**, **G**) showing close relationship with transverse process of C7 and the first right rib (white arrows in **G**); note also irregular sclerotic reaction (white arrow in **F**)

Differential diagnosis in a child or adolescent can be very difficult in the absence of known history of trauma, including musculoskeletal neoplasm or infection [1, 3]. In our case, patient and parents were asked several times if previous traumas occurred, but they always denied. Moreover, the absence of trauma was indirectly confirmed by the on-going COVID-19 pandemic lockdown between March and May 2020, in which all sport activities were suppressed and there was mandatory home confinement of the population.

Also, poor response to conservative therapy was an additional negative predictor in the patient's medical history.

In this context, multimodality imaging can have a crucial role in suspecting MOC, particularly showing progressive evolution of the lesion [3].

In our case, US, CT, and MRI were performed after months from clinical onset, and by then, the lesion was in its last stage, with central "soft" part and prominent peripheral floccular calcifications, signs which were absent on the first cervical spine X-ray, which showed only a slight soft tissue swelling.

Although these features and the evolution of the lesion may be suspect of MOC, the presence of contrast enhancement, peripheral tissue swelling, and irregular sclerotic bone reaction could also mimic a tumoral soft tissue or bone lesion.

Synovial sarcoma, rhabdomyosarcoma or osteosarcoma, could be counted among the differential diagnosis; these lesions often show calcifications in the central portion [3]. In the initial phase of the disease, infections or hematomas should be excluded [4]. To rule out the nature of the lesion, in our case, a first approach with percutanous US-guided biopsy was chosen; but it was unsuccessful confirming

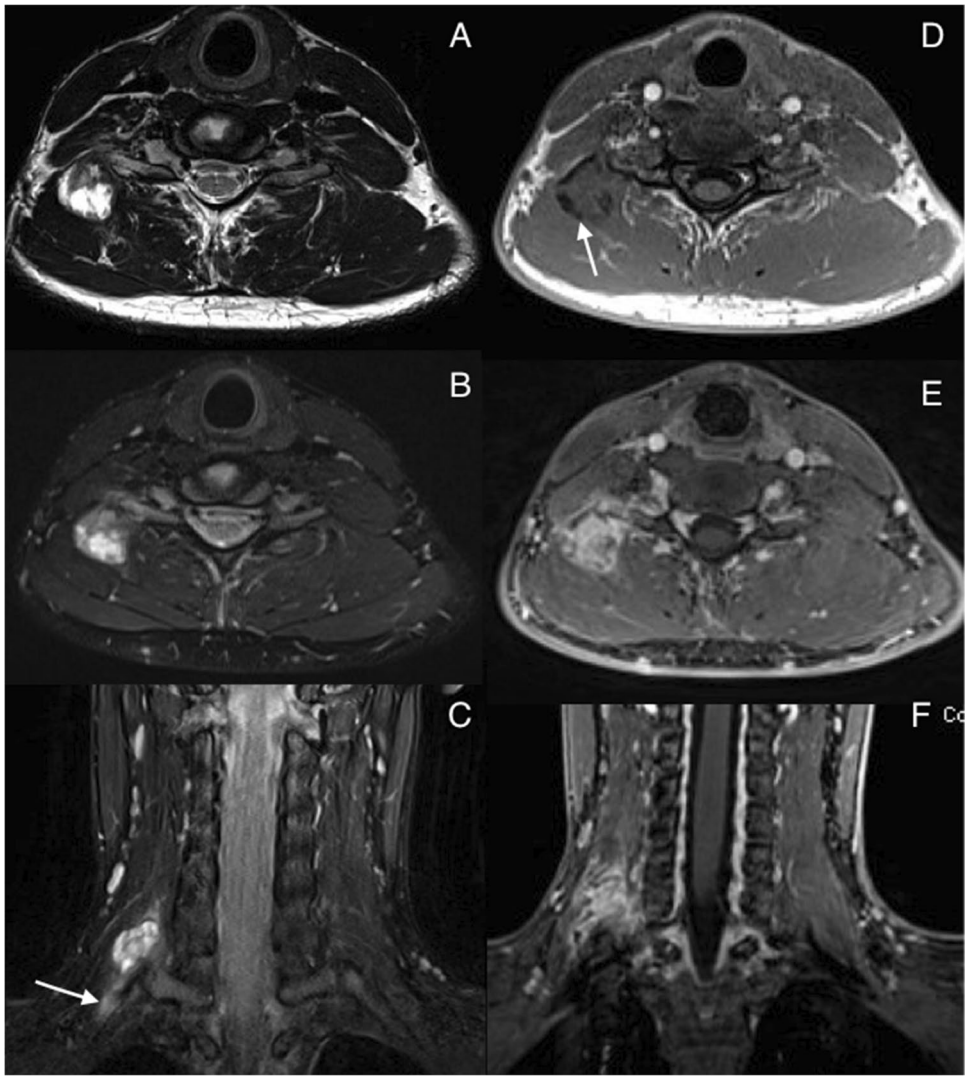

Fig. 2 MRI scan: T2-weighted (w) sequences without (**A**, axial) and with (**B**–**C**, axial and coronal) fat saturation showing the lobulated right neck mass, inhomogeneously hyperintense with swelling of surrounding tissues (white arrow); there is no relationship with right neuroforamina. 3D T1-w (VIBE sequence) before (**D**, axial) and after (**E**–**F**, axial and coronal) contrast injection: note contrast enhancement of the lesion and peripheral dark rim related to calcifications (white arrow in **D**)

some difficulties in diagnose MOC with this less invasive method [5]; so patient underwent surgery. In addition to histological features consistent with MOC, PCR analysis identified the transcript *COL1A1-USP6*, recently reported in some cases of MOC [6].

MOC is a benign lesion, and it can be managed conservatively; nevertheless if other lesions are suspected, a surgical approach should be considered. In fact, cases of recurrence after surgery or malignant transformation have been described [7].

Conclusion

MOC could be a rare cause of neck mass associated with prolonged pain and progressive movement impairment over the weeks in child or adolescent. Since it can mimic soft tissue or bone tumors, a careful analysis of clinical history and radiological features is very important to manage these young patients; MOC should be suspected even in the absence of history of trauma or if the anatomical location of the lesion is unusual.

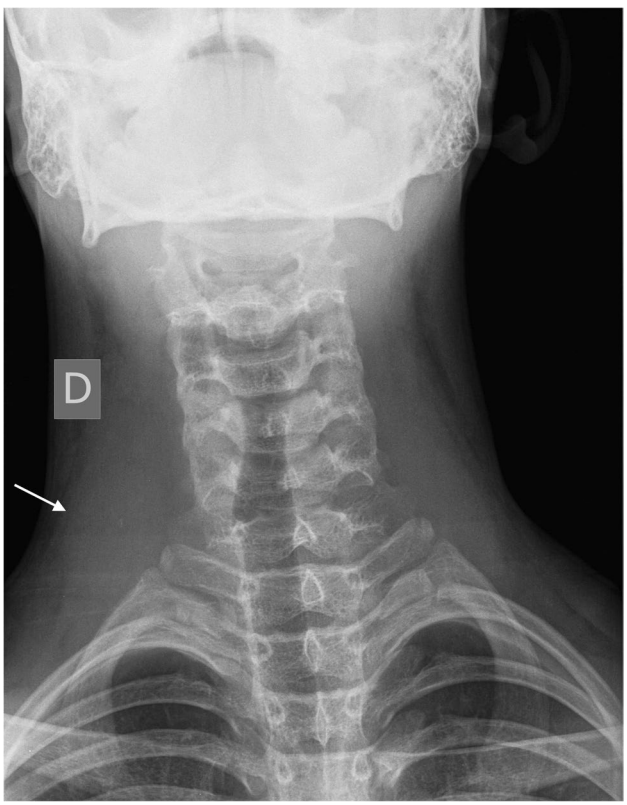

Fig. 3 X-ray scans: note right soft tissue neck opacity compared with left side, indicating swelling (**A**, white arrow)

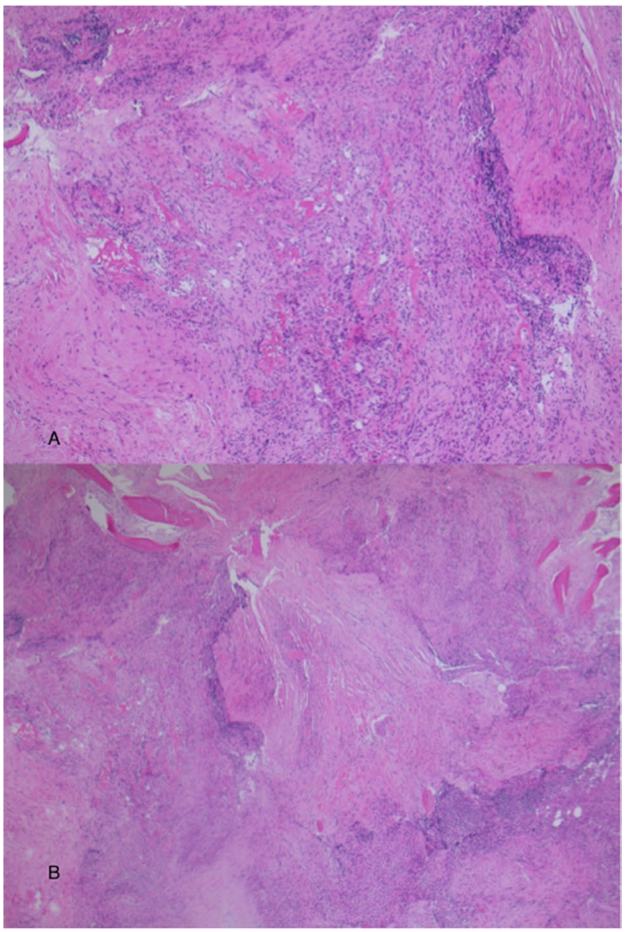

Fig. 4 **A–B** Histologically, the lesion shows a zonation pattern characterized by hypercellular spindle areas surrounding progressively maturing woven and well-formed/trabecular bone. Molecular analysis revealed the presence of *COL1A1-USP6* transcript

Author Contribution All authors have contributed significantly to this paper and agree with the content of the manuscript.

Data Availability Data available upon reasonable request.

Code Availability Not applicable.

Declarations

Ethics Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Consent to Participate Not applicable.

Consent for Publication The patient itself and his parents signed the consent for publication and the consent is held by our institution.

Conflict of Interest The authors declare no competing interests.

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