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# Bilateral heterotopic ossification of the hip in a patient COVID19: A case report

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**Abstract**
We present the case of a 62-year-old man who, after suffering a severe COVID infection, spent 45 days in the intensive care unit. He developed bilateral heterotopic calcifications in his hips and within a few months a complete joint ankylosis.
The surgery consisted of resection of most of the heterotopic ossification using a posterolaterally surgical approach in the right hip until restoring mobility to the joint intraoperatively.
It is necessary to develop studies to determine if heterotopic ossifications are related to the viral infection itself, hypoxia, the need for invasive mechanical ventilation, immobility, or other causes in order to establish a prevention strategy for this type of complications.

**Keywords:** heterotopic ossification, myositis ossificans, COVID19, hip

## Introduction
Heterotopic ossification is defined as the formation and growth of bone tissue in soft tissues [1, 2]. The prevalence ranges from 0.2% to 4% in burn patients, from 10% to 53% in traumatic injuries to the central nervous system, and up to more than 40% after acetabulum fractures or hip replacement surgeries [2].

## Ethiopathogenesis
This occurs due to progenitor cells converting into osteogenic precursor cells. Despite the controversy, it is postulated that the ethiopathogenesis has to do with the oxygen pressure and available micronutrients, the pH, and the mechanical stimuli 1.3 that alter the interaction between cells and tissue environment and lead to heterotopic ossification

## History and Clinical Examination
Clinically two phases can be defined 3. An early or inflammatory phase characterized mainly by localized swelling, pain and discomfort, and a later stage where ossification maturation occurs, presenting itself as a firmer and more delimited tumor, with restricted mobility if it is periarticular. There are various classifications, including that of Brooker *et al.*, which divides the heterotopic calcifications of hip depending on its severity.

## Imaging tests
When this pathology is suspected, the first test to request is simple X-rays [3, 4], in which the different stages of heterotypic ossification maturation should be objectified when they are performed serially. In mature ossification, the visualization of a well-defined radiopaque mass with areas in the process of ossification is characteristic.
CT can also be helpful, especially when the diagnosis and conventional radiography may not provide enough information. It is also useful for pre-surgical planning.
MRI offers different images depending on the evolutionary stage. It is usual to find a well-defined mass with characteristic perilesional edema. It also helps the differential diagnosis with soft tissue sarcoma, since in the case of mature heterotopic ossification the edges of the lesion are more noticeable after contrast administration.

**Treatment**

Regarding therapeutic management, there are numerous strategies for preventing or reducing the incidence of heterotopic ossifications, such as the postoperative use of selective COX-2 inhibitor anti-inflammatory drugs. [2], low-dose radiation therapy or bisphosphonates, although the latter have not shown clear benefits [3, 4]. Once the ossifications are established, the treatment involves performing rehabilitative physical therapy and surgery by excision of the same [2, 4].

There is controversy regarding timing of the intervention. In a study published by Ranganathan *et al*. they suggest that excision should be carried out depending on the cause and degree of bone maturation of heterotopic calcifications [4]. Thus, calcifications after trauma should be intervened at 6-9 months, those due to spinal cord injury should be resected at 12 months, and those caused by traumatic brain injury at 18 months. However, they emphasize that it should be performed when there is little functional improvement with minimally invasive treatment strategies and that the patient is informed of the risks of slower wound healing due to fragility of soft tissues, infection and recurrence of the wound contracture. Also noted is the high incidence of neurovascular lesions in the resection of this type of lesion, since they do not respect natural anatomical barriers [3].

**Case report.**

We present the case of a 62-year-old man who was attended in the hospital emergency department of our center, one week after being diagnosed with the SARS-CoV-2 infection due to persistent fever of up to 39ºC, dry cough and asthenia. His medical history was arterial hypertension under treatment with candesartan 32 mg / 24h, eplerenone 25mg / 24h, bisoprolol 2.5mg / 12h and paroxysmal atrial fibrillation being treated with dabigatran 110mg / 12h and dronedarone 400mg / 12h. A simple chest X-ray revealed a slight increase in density in the right base, right upper lobe and left parahium, in addition to a blood test compatible with coronavirus infection, for which hospitalization was decided on the diagnosis of COVID-19 pneumonia.

During the stay he suffered clinical deterioration (Adult Respiratory Distress Syndrome) requiring prolonged admission to the ICU (45 days). He presented various complications, including septic shock due to Pseudomonas aeruginosa, secondary acute renal failure, pneumonia associated with mechanical ventilation due to Pseudomonas and Klebsiella pneumoniae, hemophagocytic syndrome, polyneuropathy and severe myopathy.

Upon discharge, he was referred to a medium / long stay hospital for intensive rehabilitation treatment.

He came to our office because after extubation, the patient developed pain in both hips and severe functional impotence. On plain radiographs, he showed incipient periarticular calcifications. [3] months later, given the persistence of these symptoms, radiographs were repeated showing progression of the calcifications bilaterally causing the total ankylosis of both hips (Figure 1-A).

The patient was walking with great difficulty using a walker. On physical examination, both his hips presented a 30º flexion lock, with the range of motion of the knees limited to 0-90º.

A CT scan was requested, which showed voluminous calcifications of motley morphology that extended posteriorly to both hip joints with radiolucent internal areas, with affecting both internal oblique and square femoral muscles and as well as the most caudal region of the muscle belly of both gluteus medius. The calcifications touched the posterior cortex of the iliac blades, ischial bones and lesser trochanters, with a cleavage plane in most locations. (Figure 1-B, 1-C, 1- D). ?

An MRI was also requested, which helped to establish the relationship between calcifications and nearby structures, especially with n. sciatica.

Finally, with a view to preoperative planning, a 3D printing model was designed to give us a global idea of the appearance and spatial location of the calcification (Figure 1-F).

**Results**

The surgery consisted of resection of most of the heterotopic ossification for a posterolaterally surgical approach in the right hip. As intraoperative findings, it was observed that all the external rollers were included in the ossification mass with the exception of the pyramidal muscle. It was necessary to release the sciatic nerve, which in the case of our patient was divided into 2 branches from its origin beyond the sciatic notch (Figure 2-A), and inside two parallel bone tunnels (Figure 2-B ) one for each branch of the nerve. A large number of ossification fragments were extracted (Figure 2-C), achieving intraoperative recovery of hip mobility (Figure 2-D).

Celecoxib 200 mg / 24 hours for 4 weeks was established as postoperative prophylaxis to prevent recurrence of the hererotopic ossification. The patient began early physiotherapy treatment for mobilization of the operated hip 24 hours after the surgery.

In the immediate postoperative period, his case was complicated by a clear weakness in the dorsiflexion of the ankle and the 1st toe, which has been attributed to a postoperative paresis of the external popliteal sciatic nerve. he resection of the contralateral heterotopic calcification is pending in the next few weeks.

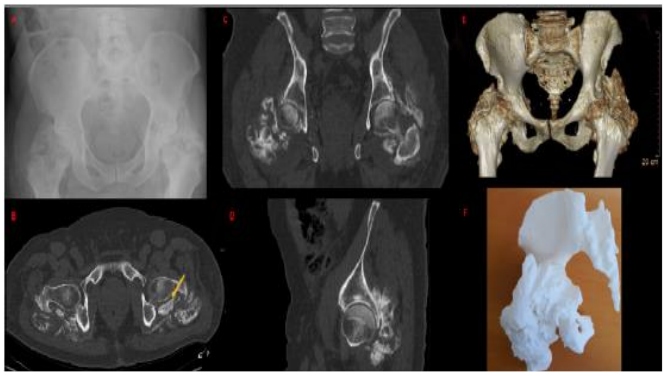

**Fig 1:** A. Plain radiography. CT images: B. Axial section, cleavage plane (yellow arrow); C. Coronal section; D. Sagittal section; E. Reconstruction 3-D anteroposterior vision; F. 3-D impression model.

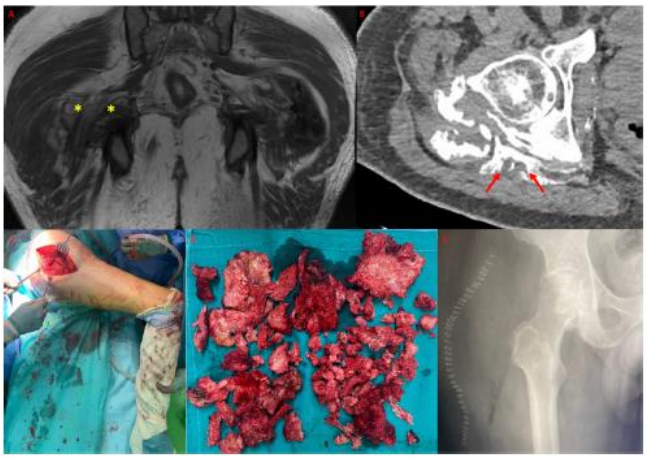

**Fig 2:** A. Sciatic nerve divided into two branches (asterisks); B. Sciatic branches embedded in individual bony tunnels (red arrows); C. Hip flexed intraoperatively; D. Resected heterotopic calcifications; E. Post-operative control radiography

**Discussion**

There are few published cases in the current literature of hospitalized patients after severe SARS-CoV-2 infection who have presented heterotopic ossification as a complication. In an article published by Meyer *et al.* [4] cases were collected of patients who presented heterotopic calcifications (3 of them in the hips and 1 in the shoulder) as a complication of severe SARS-CoV-2 infections that prized mechanical ventilation [5, 6].

It is not understood by what process these calcifications have developed on the posterior aspect of the hip joint, although some authors (Denormandie *et al.*) have described the association between the posterior location of ossification, as in our case, with cerebral anoxia [7]. Neither do we know why they have occurred bilaterally and almost symmetrically. In a recent article by Aziz *et al.* [2] other cases of patients with COVID-19 are presented who required, like our patient, invasive mechanical ventilation and who developed heterotopic calcifications in the posterior region of the shoulder, one of which was bilaterally and practically symmetrical [7]. Likewise, the authors of this article suggest that the limited mobilization of the extremities in these patients could be related to the pathogenesis of the disease.

Studies need to be carried out to determine whether heterotopic calcifications are related to the viral infection itself, its complications, hypoxia, the need for invasive mechanical ventilation, with the limited mobilization of patients, who remain in the prone position alternating with supine, or other causes in order to establish a prevention strategy for this type of complications.

**Disclosure of interest.**

The authors declare that they have no conflict of interest concerning this article.

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