

CASE REPORT

TETRACYCLINE FLUORESCENCE FOR THE PEROPERATIVE LOCALIZATION OF OSTEIOD OSTEOMA OF THE TRIQUETRUM

N. OLMEDO-GARCIA, F. LOPEZ-PRATS

Osteoid osteoma is infrequently encountered in the carpal bones. Its typical radiological features are not usually observed in this localization, which may result in delayed diagnosis. Since incomplete removal of the nidus may result in persistence or recurrence of the symptoms, other methods of locating the tumour during the resection should be used. We report a case of an osteoid osteoma of the triquetrum which, after incomplete initial resection and several revisions, developed instability of the carpus which required a limited intracarpal arthrodesis. A screw fragment left after implant extraction limited the imaging possibilities to study the persistent nidus. Intra-operative localization of the nidus with tetracycline dye and its visualization with ultraviolet light facilitated the complete removal.

Keywords : osteoid osteoma ; carpus ; triquetrum ; tetracycline fluorescence.

Mots-clés : ostéome ostéoïde ; carpe ; pyramidal ; fluorescence à la tétracycline.

INTRODUCTION

Osteoid osteoma is a benign bone lesion, characterized by a richly innervated nidus that is less than two centimetres in diameter and consists of primitive woven bone and osteoid. It can affect every bone, but the most frequent localization is in the metaphyses of the long bones. It is rarely located in the carpus (2, 6), where the typical radiological features of a central radiolucent lesion surrounded by a reactive margin of sclerotic bone are not usually observed. Osteoid osteoma can be cured after total resection of the nidus. Frequently, the resection is

incomplete and the pain may persist or recur after surgery, requiring a new operation (7, 9). For this reason, complementary methods of intra-operative localization of the nidus should be used, since visual or radiological localization sometimes proves to be difficult.

This is a case report of a persistent osteoid osteoma of the triquetrum. We have pointed out the help provided by the use of tetracycline fluorescence for intra-operative localization of the lesion.

CASE REPORT

A 29-year-old right-handed woman without any history of trauma or infection, experienced gradually increasing pain and tenderness in the ventral ulnar area of her left wrist. The pain worsened at night. Pressure on the distal end of the ulna and the pisiform was painful. The mobility of the left wrist was normal, similar to the contralateral side. She was initially treated with nonsteroid prostaglandin inhibitors that briefly relieved the pain and with local hydrocortisone injections which failed to do so. The patient was referred to an orthopedic consultation because of the persistent pain.

Conventional xrays showed nothing significant, except an oblique projection of the carpus,

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Fig. 1. — Bone scintigraphy showing increased uptake in the left triquetral bone.

displaying a radiolucent area in the cancellous bone of the triquetrum. Bone scintigraphy with ^{99m}Tc methylene diphosphonate (fig. 1) exhibited intense focal uptake over the left triquetrum. An intratriquetral lesion was revealed by the Magnetic Resonance Imaging (MRI) sequence, T-2.

A surgical resection with a curettage was planned, based upon a presumptive diagnosis of osteoid osteoma. Histological study of the extracted material confirmed the diagnosis. During the intervention an arthrodesis between triquetrum and hamate was carried out because a degenerative process with osteophytes was seen. The pain recurred owing to incomplete removal of the osteoid osteoma, and the patient underwent two consecutive surgical revisions, without success. The material implanted for the arthrodesis was removed in the third operation, but a fragment of a broken screw was left inside the bone.

After these three operations the pain persisted and clearly increased with wrist movement. The radiological work up showed volar intercalated segment instability (VISI) of the lunate and degenerative arthritis in the lunate-capitate joint. Stabilization of the VISI and a further curettage was done 24 months after the first operation.

The patient continued suffering pain and the bone scintigraphy showed the same increased uptake in the carpus that previous studies had revealed. The xray image showed a radiolucent



Fig. 2. — Anteroposterior x-rays of the wrist showing the limited intracarpal arthrodesis between scaphoid, lunate, capitate, triquetrum and hamate bone. A radiolucent area adjacent to the screw fragment can be seen.

area adjacent to the screw fragment (fig. 2), coinciding with increased radioisotope uptake. The repeated failures suggested that an intra-operative method should be used to localize the nidus. Because of the screw fragment, CT could not be used as a guide, therefore tetracycline was used such as described by Ayala *et al.* (1). Two days before surgery, the patient began to take 250 mg of oxytetracycline every 6 hours. A tourniquet was used. During surgery, the screw fragment was detected using fluoroscopy. A golden yellow area could be seen on the exposed bone under ultraviolet light. The lesion was removed en bloc and the extracted piece was checked for fluorescence. The

bone bed still showed diffuse fluorescence and curettage was done until all the fluorescent tissue was extracted. The bone defect was filled in with lyophilized bone. After this operation, pain vanished immediately. The mobility of the wrist showed complete pronation and supination, with a 10° loss of radial deviation, a 20° loss of ulnar deviation, a 45° loss of flexion and a 35° loss of extension compared to the contralateral side. About sixty-five months after the onset of pain the patient was able to return to a normal lifestyle. Four years after the last surgery she no longer complained of any symptom.

DISCUSSION

Localization of the osteoid osteoma in the carpus, and particularly in the triquetrum, is rare (2, 6). Consequently, the diagnosis may be difficult and delayed. In a conventional radiographic study, the triquetrum is superposed by other bones of the carpus. It is covered by the pisiform in the antero-posterior xray and by the proximal row of carpal bones in the lateral xray. Special projections are required. When the osteoma is intra-articular, it can produce an interarticular apophysis (2). In the reported case, these osteophytes between the triquetrum and hamate were not interpreted as a manifestation of the intra-articular osteoid osteoma, which led to the unnecessary arthrodesis during the first surgical intervention. The patient's further evolution was unfortunate, given, not only the persistence of pain, but also the appearance of carpal instability (VISI). The carpal instability was probably provoked by the previous surgical aggression and the triquetrum-hamate arthrodesis.

The conventional treatment of osteoid osteoma consists of complete resection of the nidus. Incomplete excision of the nidus is the most frequent cause of the recurrence of symptoms. Because effective resection depends on the accuracy of the localization, several methods have been used for intra-operative localization of the nidus. The introduction of a wire under CT guidance, is one of the most widespread techniques (4, 7). In the reported case, this technique could not be used because of the existence of the screw fragment,

which made an artefact in the image. The radioisotope count, detected with a portable nuclear camera, is also used to localize the nidus intra-operatively. However, it requires expensive equipment, and the patient, as well as the personnel in the operating room, are subjected to a considerable amount of radiation (9).

The Ultraviolet Fluorescence test with tetracycline is the macroscopic extrapolation of a histomorphometric technique. Ayala *et al.* (1), in 1986, were the first to use it to confirm the extirpation of the osteoid osteoma nidus. After ingestion and transportation by the serum, the tetracycline molecule settles in the osteoid in the mineralization phase. This test is easy to carry out because the tetracycline is ingested in the pre-operative period and the test only requires an ultraviolet source. This technique is radiation free and permits complete resection of the tumour, confirmed by the absence of fluorescence in the remaining bone and evidence of it in the extirpated piece. Its use should be avoided in children under eight years of age, in women during the second half of pregnancy and in allergic patients (3, 8). In our case, the tetracycline fluorescence test facilitated the complete resection and the pain disappeared.

In agreement with Lee and Malawer (5), we think that complementary methods should be used for intra-operative detection in order to assure complete extirpation. They are to be recommended when lesions are persistent or recurrent, in those growths localized in areas difficult to access, as well as in those that do not permit wide resection (small bones or in areas subject to load). The fluorescence test of tetracycline is an economical, simple, safe, and reliable method of showing whether the nidus is part of the excised tissue. We believe that it should be used in all cases, with the exceptions described, to check the complete resection of the nidus, whether it is associated or not with other intra-operative detection methods.

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SAMENVATTING

N. OLMEDO-GARCIA, F. LOPEZ-PRATS. Peroperatieve localisatie van een osteoid osteoma van het triquetrum door tetracycline fluorescentie.

Osteoid osteoma in de carpale botjes is zeldzaam. Het typisch radiografisch voorkomen is gewoonlijk niet aan-

wezig en uitstel van diagnose is hierdoor mogelijk. De kans op onvolledige wegname met terugkeren van de symptomen maakt betere peroperatieve localisatie technieken noodzakelijk. Een geval van osteoid osteoma van het triquetrum wordt beschreven, waarbij na herhaalde resectie pogingen, carpale instabiliteit ontstond en een beperkte intracarpale arthrodesis diende te worden uitgevoerd. Een nagebleven schroef fragment verhinderde de opzoeking van de resterende nidus. Intra-operatieve localisatie van de nidus was mogelijk door kleuring met tetracycline en visualisatie met ultraviolet licht.

RÉSUMÉ

N. OLMEDO-GARCIA, F. LOPEZ-PRATS. Localisation per-opératoire d'un ostéome ostéoïde du pyramidal par fluorescence à la tétracycline.

L'ostéome ostéoïde se rencontre rarement au niveau du carpe. Dans cette localisation, ses aspects radiologiques typiques font habituellement défaut, ce qui peut retarder le diagnostic. La résection incomplète du nidus peut laisser persister les symptômes, ce qui rend souhaitable le recours à une autre méthode pour localiser la tumeur. Les auteurs rapportent un cas d'ostéome ostéoïde du pyramidal qui, après une résection initiale incomplète et plusieurs interventions, a présenté une instabilité du carpe qui a imposé une arthrodesse intra-carpienne limitée. Un fragment de vis laissé en place limitait les possibilités de recours à l'imagerie pour localiser le nidus persistant. Sa localisation peropératoire a été facilitée par la fluorescence à la tétracycline sous lumière ultraviolette.