

Radiological evaluation of Calcium Hydroxyapatite-based cutaneous fillers

Avaliação radiológica de implantes cutâneos com Hidroxiapatita de Cálcio

ABSTRACT

Introduction: Calcium hydroxyapatite is a radiopaque material that was traditionally used to provide radiologic contrast. It has recently been approved for use in cutaneous filling.

Objectives: To define the radiologic characteristics of Calcium hydroxyapatite and its potential to compromise radiologic evaluations.

Methods: Twelve patients received Calcium hydroxyapatite filler in the malar eminence and had radiography of the face (frontal, lateral, mentum-nasal-plaque (Waters), and Hirtz axial incidence technique) 1-8 weeks after the procedure. The X-rays were examined by two radiologists – one of whom was unaware of the filling procedure.

Results: The Hirtz axial incidence technique demonstrated amorphous radiopaque images in the suprazygomatic soft tissues in all cases, in both evaluations. Radiesse® was not detected using the other techniques, and did not illustrate the filler's position and symmetry. The evaluation of subjacent osseous structures was not compromised by the material's presence.

Discussion: Calcium hydroxyapatite can be identified in facial radiography when evaluated using a method that avoids overlapping with adjacent osseous structures. Although it does not impair the osseous evaluation, it is recommended that the radiologist or dentist is notified of the material's presence.

Conclusion: Cutaneous fillings containing Calcium hydroxyapatite can be identified, although not precisely located, using conventional X-ray.

Keywords: face, durapatite, X-rays.

RESUMO

Introdução: A hidroxiapatita de cálcio é material radiopaco, usado como contraste radiológico décadas antes de seu emprego na dermatologia. Recentemente teve seu uso cosmético aprovado para preenchimento cutâneo, esperando-se que, quando aplicado em tecidos moles da face, possa ser identificado no raio X convencional.

Objetivos: Definir as características radiológicas da hidroxiapatita de cálcio usada em preenchimentos e seu potencial de comprometer avaliações radiológicas.

Método: 12 pacientes realizaram preenchimento com hidroxiapatita de cálcio na eminência malar. Foram submetidas à radiografia de face nas incidências frontal, perfil, mento-naso-placa (Waters) e axial de Hirtz, no intervalo de uma a oito semanas após o preenchimento. Esses exames foram avaliados por dois radiologistas; um deles desconhecia o antecedente do preenchimento.

Resultados: A incidência axial de Hirtz evidenciou em todos os casos imagens radiopacas amorfas em partes moles suprazigomáticas, nas duas avaliações. O Radiesse® não foi detectado nas demais incidências. Não se mostrou útil como método para avaliar posição e simetria do preenchedor. Sua presença não prejudicou a avaliação das estruturas ósseas subjacentes.

Discussão: A hidroxiapatita de cálcio usada em preenchimentos cutâneos pode ser identificada em radiografias de face quando avaliada em incidência que evite sobreposição com as estruturas ósseas adjacentes. Apesar de não prejudicar a avaliação óssea, recomenda-se comunicar previamente sua presença ao radiologista ou dentista, já que seu reconhecimento inadvertido pode gerar dúvidas diagnósticas e investigações desnecessárias.

Conclusão: O preenchedor cutâneo composto por hidroxiapatita de cálcio pode ser reconhecido no raio X convencional, porém sem determinação precisa de posição e simetria. Sua presença não interferiu na avaliação das estruturas ósseas da face.

Palavras-chave: face, durapatita, raio X

Original Article

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Received on: 22/03/2011

Approved on: 25/04/2011

This study was carried out at the Hospital de Clínicas de Curitiba, Serviço de Dermatologia da Universidade Federal do Paraná (UFPR) – Curitiba (PR), Brazil

Conflicts of interests: none
Financial support: none

INTRODUCTION

Cutaneous fillers have been increasingly used during the last decade as a versatile and safe non-surgical alternative for the correction of contours and volumetric augmentation with multiple aesthetic applications.¹ Radiesse® is a cutaneous filler compounded by microspheres of calcium hydroxyapatite (CaHA) dispersed in a carrier gel. CaHA is known to have radiopaque properties, and has been used as a radiological contrast for two decades.²

Some reports and case series demonstrate that conventional x-ray can occasionally clearly show CaHA that has been applied in facial soft tissue for aesthetic purposes – especially when large volumes are used, for example in the treatment of HIV-related lipodystrophy.³ CaHA is also identifiable in computerized tomography (CT), magnetic resonance imaging (MRI) and in positron emission tomography (PET/CT), when the 2-fluoro 2-dioxi-D-glucose (FDG) is detected in the area that received that filler.⁴

This study evaluates the radiological repercussions of using a small volume of CaHA in the restoration of the malar volume for facial rejuvenation.

OBJECTIVE

To evaluate the radiological characteristics of CaHA when applied in small volumes to the soft tissue of the face for aesthetic reasons, the interference capacity of CaHA in conventional x-ray evaluations, and the use of x-ray to evaluate the presence and position of the filler.

METHOD

This observational, qualitative prospective study was approved by the Ethics Committee of the Hospital de Clínicas da Universidade Federal do Paraná (PR), Brazil. Female patients (n = 12) aged 41-73, received 0.05 ml CaHA (Radiesse®, Merz-Biolab, São Paulo, Brazil,) in the deep dermis and subcutaneous region of the malar eminence for correcting age-related hypotrophy (Figure 1). The patients underwent facial radiography using frontal, lateral, mentum-nasal-plaque (Waters), and Hirtz axial (Figure 2) incidence techniques, with two penetration intensities. The study complied with good clinical practice rules and the patients signed a term of free and informed consent.

Examinations were carried out in intervals of one to eight weeks after the filling procedure. The radiographies were evaluated at different time points by two radiologists – one of whom was unaware that the filling procedure had been carried out.

RESULTS

The Hirtz's axial incidence technique demonstrated amorphous radiopaque images projected in the soft parts of each paramedian region of the face, in suprazygomatic position, in sites corresponding to the Radiesse® injection points (Figures 3 and 4). This finding was present in all 12 images when the evaluation was carried out under strong light. The filler was seen more clearly in radiographies with smaller penetration of the x-



Figure 1: Lateral malar region above the zygomatic arch; the site that received CaHA filling is indicated



Figure 2: Technique for obtaining the Hirtz's axial incidence

ray. Similar results were obtained in the evaluation conducted by the radiologist who was unaware of the filler's presence, who supplied a descriptive report of the finding without suggesting its etiology. Radiesse® was not detected in the lateral, frontal or Waters incidence x-rays.

DISCUSSION

According to the literature, CT is more sensitive to Radiesse®, while x-rays only present positive results when large volumes are used.³ However, this study suggests that when the correct incidence is used, Radiesse® can be detected by x-ray even in small volumes. In order to choose the best incidence, the physician must know the studied region's anatomy, the available incidence options and how the relevant images are obtained. For that, the physician can rely on the opinion of a radiologist. CaHA is visible in x-rays with a higher density than that of soft tissue, but lower than that of the cortical and medullar bone⁵ (Figures 3 and 4). Therefore it is not usually visible when its image overlaps that of a bone, as happened in the lateral, frontal and Waters (or chin-nasal-plaque) images.

The Hirtz incidence involves the patient lying on their back, with their head in maximum extension and the rays beaming perpendicularly on his/her face in the inferior to supe-

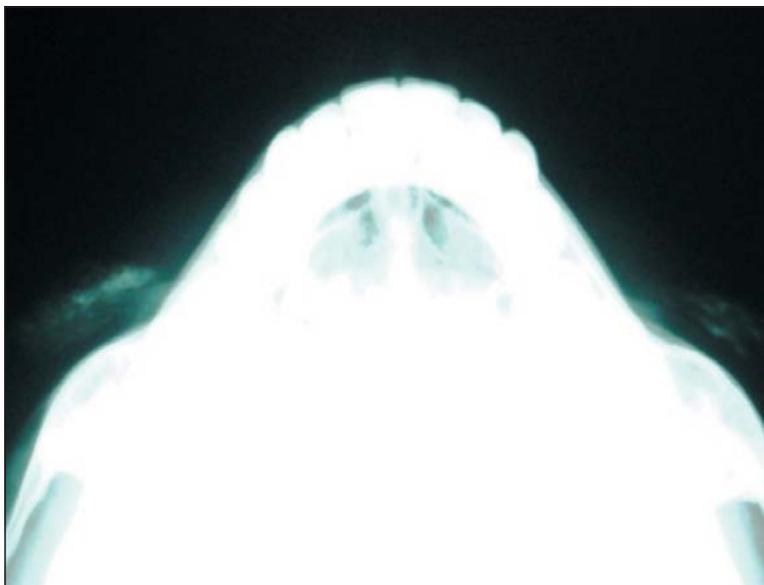


Figure 3: Radiological image with Hirtz's axial incidence: CaHA appears as a radiopaque image in a region of soft tissue above the zygomatic arch



Figure 4: Detail of the radiological image of the zygomatic arch region: CaHA has intermediate radiopacity between those of the bone and the soft tissue

rior direction (Figure 2). In this position, the malar region's soft tissue can be analyzed without osseous superposition. In practice, this position is used for diagnosing fractures in the zygomatic arch. The absence of an overlap between the zygomatic bone and the filler makes it unlikely that the latter would obstruct the diagnosis of a fracture. Carruthers and colleagues also assert that the presence of CaHA does not compromise the evaluation of adjacent structures; in addition, the bilateral symmetrical position helps distinguish them from pathological findings that would not otherwise show those features.³

It was not possible to evaluate the filler's position and symmetry in this study. That would have been possible if the filler was identified in orthogonal incidences, allowing the analysis of its relationship with adjacent structures in two dimensions and the inference of its height and depth. For that purpose, CT would be more suitable. CaHA radiopacity might help verify the type of filler used, information that is not always reliably obtained in the patient history yet is necessary when planning new procedures in the region or treating complications. A histopathologic evaluation is often necessary if there is a complication. X-rays – a cost-effective, accessible and non-

invasive type of examination – can assist in that investigation, given that radiopacity is a feature that distinguishes fillers containing CaHA from others.

When CaHA is detected in soft tissue, it needs to be distinguished from other entities such as dystrophic or heterotopic calcifications, multiple millary osteoma cutis, myositis ossificans and foreign bodies.^{4,6} Patients who receive fillers with CaHA should be aware that they need to warn their physician or dentist before an x-ray of the treated site in order to avoid diagnostic suspicions that could lead to unnecessary additional examinations.

CONCLUSION

When a cutaneous filler containing CaHA microspheres (Radiesse®) is applied in the malar region, it can be recognized in conventional x-ray examinations when Hirtz's axial incidence technique is used. Nevertheless, this technique was proven to be ineffective in determining the position and symmetry of the filler. Its presence does not impede the diagnosis of osseous fractures in the face – the original purpose of that incidence type – given that the filler image does not superpose that of the zygomatic bone. ●

ACKNOWLEDGEMENTS

We would like to thank the radiology team of the Hospital de Clínica da Universidade Federal do Paraná (UFPR) – Curitiba (PR), Brasil.

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