Uncommon Foreign Body Reactions Occurring in the Lip: Clinical Misdiagnosis and the Use of Special Techniques of Analysis

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Abstract This study reports three interesting cases of nodular submucosal lip lesions where foreign-body reactions of unknown origin were detected on hematoxylin and eosin (H&E) analysis. These materials were evaluated under polarized light microscopy, scanning electron microscopy and by energy dispersive X-ray analysis. The results revealed the following materials: an interdental toothbrush bristle, silica, and iron. Unusual mucosal foreign body reaction cases have been reported, but few publications used special techniques to identify the specific foreign material. Clinicians and pathologists might consider these techniques for identifying the precise origin of these foreign bodies.

Keywords Oral mucosa · Lip · Uncommon · Misdiagnosis · Foreign body · Polarized light microscopy · Scanning electron microscopy · Energy dispersive X-ray analysis

Introduction

Foreign bodies are occasionally seen in oral biopsies and may cause granulomatous reactions with multinucleated

giant cells, associated or not with acute or chronic inflammatory infiltrate. Many materials have already been described such as suture material [1], abrasives and restorative materials [2], denture teeth [3, 4], broken anesthetic needles [5] and toothbrush bristle [6]. More atypical reported cases describe wooden fragments [7, 8], grill cleaner bristle [9], an artificial nail and a plastic teddy bear nose [10]. Some materials are uncommon and of an unknown origin, making the final diagnosis difficult [11–13].

The aim of this study was to report three interesting new cases of foreign-body reactions affecting the oral mucosa in which different laboratory techniques were used to facilitate the identification of such exogenous materials.

Cases Reports

Case 1

A 49-year-old Caucasian male patient was referred to the Piracicaba Dental School (Piracicaba–Sao Paulo), Oral Diagnosis Service, for the evaluation of a nodule in the lower lip mucosa. On oral examination, there was a sessile nodular lesion measuring 2.0 cm in diameter, which was fibrous in consistency and mildly tender on palpation (Fig. 1a). The patient reported a previous mucocele excision in the same area. An excisional biopsy was performed considering the diagnosis of recurrent mucocele or fibrous hyperplasia, and the specimen was sent for histopathological examination. Microscopic evaluation showed a chronic inflammatory infiltrate in the connective tissue beneath the squamous epithelium, bacterial colonies, inconspicuous giant cells and elongated eosinophilic structures associated with microabscesses (Fig. 1b).

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Although there was no granuloma formation, the histopathological analysis was suggestive of a foreign body reaction.

In order to elucidate the nature of the eosinophilic materials, polarized light microscopy and scanning electron microscopy were performed on the slides. In some areas of the slides we could observe birefringent material under polarized light microscopy (Fig. 1c). These fragments were regular, round with dimensions of 210 μm diameter (Fig. 2a–d) and other round structures of an almost constant thickness (approximately 4.15 μm) were also observed. Based on the patient's clinical history of periodontal treatment at the time of the mucocele excision, we compared a bristle from an interdental tooth brush with the foreign material in the slides (Fig. 2e, f). The characteristics were extremely similar and prompted us to diagnose a foreign body reaction by interdental brush bristle. The nodule was completely excised, healing was uneventful

and no recurrence has been observed so far. The patient confirmed the use of an interdental tooth brush at the time of the periodontal treatment.

Case 2

A 73-year-old woman was referred to the Federal University of Alfenas—Minas Gerais, Oral Diagnosis Service, for evaluation of a nodule in the lower lip submucosa. It was firm to the touch and had been present for several years. The patient was clearly beauty conscious but denied applying any cosmetic filler and reported having a previous car accident which resulted in excoriations to the lower lip. Based on the clinical diagnosis of foreign body reaction to cosmetic fillers or benign mesenchymal neoplasia, an excisional biopsy was performed. Microscopically confluent and nonconfluent epithelioid granulomas infiltrating muscular fibers, diffuse fibrosis, and scarce scattered

Fig. 1 **a** Sessile nodular lesion on the inferior labial mucosa. Note the fibrous scar due to the previous surgery (arrow). **b** Oral mucosa fragment showing an eosinophilic elongated foreign-body associated

with an inflammatory infiltrate and focal microabscess (H&E stain, $\times 10$); **c** birefringence of the foreign-body under polarized light microscopy ($\times 10$)

Fig. 2 Foreign-body fragments viewed on scanning electron microscopy: **a** Convolute fragments; **b** distended structures on the connective tissue; **c** approximate view—note the almost constant diameter

(210 μm) and thickness (approximately 4.1 μm); **d** view of an interdental tooth bristle tuft. Note the average diameter: 220 μm ; **e** approximate vision of these bristle

Fig. 3 **a** Granulomas on the connective tissue infiltrating muscular fibers. Note the diffuse fibrosis (H&E stain, $\times 10$); **b** presence of asteroid body-like formation within macrophages in the epithelioid granuloma (arrow, H&E stain, $\times 40$); **c** light microscopy of a granuloma in an approximated view: presence of two almost translucent structures (H&E stain, $\times 40$); **d** polarization microscopy of the same area in the former picture: birefringent crystals, sharply angulated ($\times 40$)

foreign body-type giant cells were present (Fig. 3a). The visibility of the foreign bodies was difficult with conventional light microscopy and their detection was noticeably enhanced by polarization microscopy. Under polarized light, numerous birefringent crystals with irregular shapes and sharply angulated edges were found scattered diffusely within and around the epithelioid granulomas (Fig. 3c, d). Interestingly, asteroid body-like formations within macrophages were observed, a characteristic similar to that found in sarcoidosis (Fig. 3b). Based on the clinical and microscopical features the diagnosis of foreign-body reaction to silica was suggested. The patient's recovery was complete and follow-up showed no recurrence.

Case 3

A 36-year-old Caucasian man was referred to the Piracicaba Dental School, (Piracicaba—Sao Paulo), Oral

Diagnosis Service, for evaluation of a fibrous non-tender nodule in the upper lip mucosa, with approximately 4 years of evolution (Fig 4a, b). Based on a clinical impression of salivary gland neoplasia, an incisional biopsy was performed. Unexpectedly, a hard blackened mass measuring approximately 0.6 mm associated with a spotty soft tissue was removed and sent for histopathological examination (Fig. 5a). The H&E section showed a large amount of round brownish particles, which were positive to Perls' staining. One remarkable feature was the absence of inflammatory infiltrate in the connective tissue (Fig. 6). The blackened fragment was evaluated under the scanning electron microscopy (JEOL, JSM-5600LV, Scanning Electron Microscope, Japan) (Fig. 5b) and by energy dispersive X-ray analysis, which showed large amounts of phosphorus and iron (Fig. 7a, b). The diagnosis was consistent with an iron fragment as the foreign body. The patient had no memory of any event that could justify the

Fig. 4 **a** An apparently normal labial mucosa/submucosa without observable swelling; **b** a nodular area was noticed when the mucosa was everted

Fig. 5 **a** Macroscopic aspect of the blackened hard mass found at biopsy; **b** the surface of this material on scanning electron microscopy (10 μ m)

Fig. 6 **a** Microscopic view of the mucosa fragment: presence of numerous brownish particles on the connective tissue. Note a fragment of a grayish/brownish foreign material of considerable size (H&E stain, $\times 10$); **b** these particles and the wide foreign fragment was proven to be iron (Perls stain, $\times 10$); **c** again, a multitude of round brownish granulations were noted in the connective tissue (H&E stain, $\times 20$); **d** perls' stain: note that the deposition of the particles follows the collagen fibers disposition ($\times 10$)

Fig. 7 **a** Scanning electron microscopy of the iron fragment: details of the different areas analyzed (800 μ m); **b** energy dispersive X-ray analysis: peaks of phosphorus and iron

presence of the iron fragment in his mucosa. The patient is in follow-up and has had no complaints.

Discussion

The presence of foreign bodies in the oral mucosa is considered rare although some materials such as buttons, wood, an artificial nail, anesthetic needles, grill cleaner bristle, a fingernail and even dental toothbrushes have been reported [5–10, 14].

Foreign bodies are usually found in the oral mucosa due to accidental implantation or to iatrogenic causes [8, 11, 12]. The main clinical aspect of a foreign-body reaction consists of ulcerated and nodular reactive lesions that may affect any site of the oral mucosa of young and elderly patients. Microscopic features include foreign bodies of variable morphologies with or without granuloma formation, multinucleated giant cells and acute or chronic inflammatory infiltrate. There are several proposed treatments according to the different granulomatous foreign-body reactions: antibiotics, steroids (oral and intralesional), immunomodulating agents (oral, intramuscular, and intravenous), and complete surgical excision [15–17].

This report describes three cases of implantation of foreign bodies in the lips. All of the lesions presented similar clinical characteristics and were initially diagnosed as traumatic/reactive lesions or as a benign salivary gland tumor.

Case 1 was surprising because the histopathological features showed a chronic inflammatory infiltrate, absence of granulomatous formation and the presence of scattered eosinophilic foreign bodies. These aspects associated with polarized light microscopy, scanning electron microscopy and the patient's clinical history were highly suggestive of a reaction to an interdental toothbrush bristle. To the best of our knowledge, there is just one case reported in the English literature of a foreign body reaction case caused by a toothbrush bristle and confirmed by polarized light microscopy [6], but none have been reported so far with the diagnosis confirmed by polarized light microscopy associated with scanning electron microscopy.

Case 2 was quite fascinating due to the microscopic presentation: the presence of well formed confluent granulomas and the presence of asteroid bodies and multinucleated foreign body-type giant cells. According to these microscopic findings alone, several differential diagnoses could be considered—from tuberculosis, certain fungal infections, lepromatous leprosy and sarcoidosis to certain foreign-body reactions [15–19]. Although the polarized light microscopy excluded the majority of these interesting hypotheses, it would have been perfect if the compounds could have been analyzed by X-ray dispersive energy analysis, as performed in other studies [15, 16, 18].

Unfortunately, we could not obtain a sufficient amount of material for this study. Silica granuloma is a poorly understood, uncommon condition and other foreign bodies, such as powders, talc or starch, can produce similar microscopic findings [15–20]. Generally, the treatment of choice is complete surgical excision of the lesion, but intralesional steroid injections, systemic steroids and antibiotics have been considered as alternative treatments. Interestingly, the spontaneous resolution of silica granuloma has already been described obscuring the effectiveness of these therapies [21].

In summary, these three cases had a similar clinical presentation but different microscopic features. Nodular lesions in lips can be clinically mistaken with fibrous hyperplasia, a salivary gland tumor, or even a reaction to cosmetic fillers. Clinicians and pathologists should consider the occurrence of these materials in the lips, and these special diagnostic techniques could be used for identifying the real origin of foreign bodies.

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