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Perspective article

# Differential diagnoses for the bilateral multiple radiopaque materials superimposed in the panoramic and periapical radiographs

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Nowadays, the panoramic radiograph becomes an important screening tool in the dental clinics. In addition to the dental related findings, some soft tissue calcifications sometimes appear in the radiographs and might cause misdiagnosis due to superimpositions. Although these soft tissue calcifications are often asymptomatic and found accidentally during routine dental examinations, accurate diagnosis of these soft tissue calcifications is important to avoid misdiagnosis and prevent serious disease.<sup>1,2</sup> Here, we reported a case with multiple radiopaque materials incidentally identified in the panoramic and periapical radiographs and discussed the differential diagnosis for this case.

This 87-year-old female patient came to our dental outpatient clinic with a chief complaint of chewing pain and gingival swelling at the right anterior mandibular area. The retained root of the right mandibular lateral incisor with apical lesion was diagnosed (Fig. 1A). The tooth was extracted and the apical soft tissue sent for pathological examination showed a radicular cyst. The extraction wound healed well in the subsequent follow-up appointment 2 months later after extraction of the retained root (Fig. 1B). The patient's dental problem was properly solved. However, the multiple radiopaque materials incidentally identified in both the pre-extraction evaluation and the subsequent follow-up panoramic radiographs (Fig. 1A and B). Due to the angle of the projections, the radiopaque materials were not distributed in completely the same locations in these two panoramic radiographs, but quite similar distributions were noted. The multiple radiopaque materials were found to be superimposed over the upper medial portions of the bilateral ascending rami, the lateral portions of the bilateral maxillary sinuses, and the air spaces between the maxilla and the mandible at the bilateral second to third molar regions (Fig. 1A and B). Some radiopaque materials were also seen in the two periapical radiographs from the right maxillary premolar (Fig. 1C) and the left mandibular molar regions (Fig. 1D) taken in the follow-up appointment. These radiopaque materials were found to be superimposed over the air spaces between the maxilla and the mandible and near the bilateral maxillary and mandibular second to third molar regions (Fig. 1C and D).

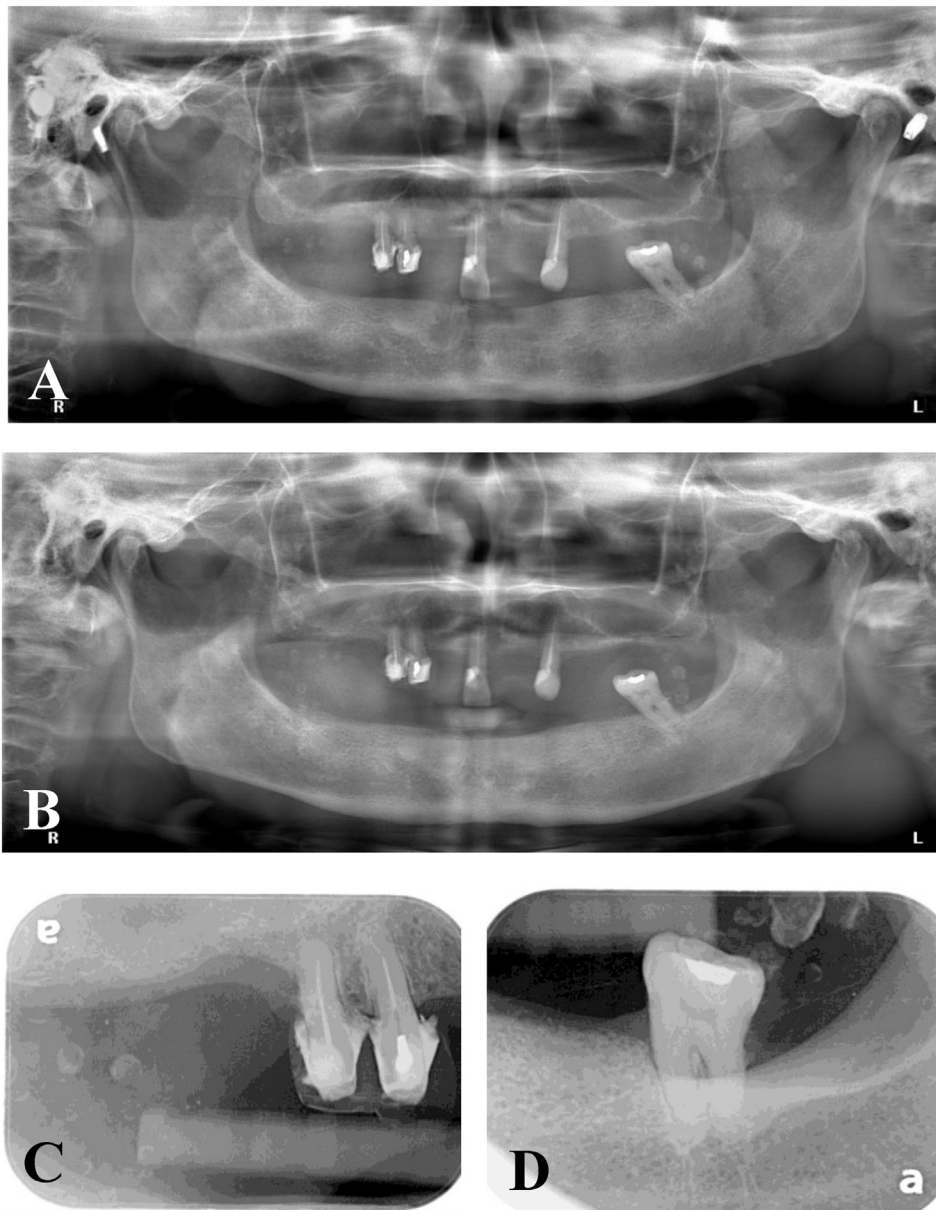
In this case, the radiopaque materials distributed mainly in the air spaces and occasionally superimposed in the sinus and jaw bones. Thus, the images were suggestive of soft tissue calcifications. There are a variety of soft tissue calcifications identified and reported in the panoramic radiographs, including styloid ligament calcification, calcified lymph node, calcified atherosclerotic plaque along blood vessel wall, tonsillolith, sialolith, antrolith, phlebolith, calcinosis or osteoma cutis and foreign materials, especially cosmetic dermal fillers.<sup>1,2</sup> Accurate interpretation of these soft tissue calcifications requires the clinical history and examination, the knowledge about the anatomic locations, and the information of shape, number, internal structure, and the pattern of distribution of these soft tissue calcifications in the radiographs. Styloid ligament calcification occurs next to or crossing angle of the mandible. Calcified lymph nodes appear in the submental, submandibular or cervical region. Calcified atherosclerotic plaques commonly occur in carotid artery and are seen in regions postero-inferior to the mandibular angle. Tonsilloliths usually

located in the mid-portion of ascending ramus, where the image of dorsum of tongue crosses the ramus and angle in the oropharyngeal air spaces. Sialoliths are most commonly occurred in the submandibular glands and seen superimposed in mandibular alveolar process of premolar to molar region. The sialoliths in the parotid glands can be seen superimposed in the upper third of the ramus or the anterior or posterior of the ramus. Phleboliths are most commonly seen in the posterior body of the mandible. The calcinosis or osteoma cutis are most commonly multiple miliary type and scattered symmetrically in the skin of the cheek and mandibular angle, and thus might be seen superimposed in the panoramic and periapical radiographs in the molar regions or airspaces between the maxilla and mandible. Filler-related radiopacities are also most commonly demonstrated as clusters or multiple radiopaque shadows superimposed in the molar regions or airspaces between the maxilla and mandible.

In our case, some of the calcified materials were distributed in the midportion of the bilateral ascending rami and anteriorly or posteriorly along with the oropharyngeal air spaces, which were the common locations for tonsilloliths. However, some calcifications were superimposed in the mid-maxillary sinus level, which were uncommon for tonsilloliths.<sup>3</sup> Furthermore, the two periapical radiographs focusing on the right posterior maxillary molar and left mandibular molar regions also showed calcified materials, which were not quite possible for tonsilloliths. Few case reports have shown phleboliths occurring in this region. However, in the head and neck, phleboliths are always associated with a vascular malformation or hemangioma. Bilateral involvement is rare. Combined the panoramic and periapical radiographic findings, sialoliths in the parotid glands, calcinosis or osteoma cutis in the skin, or dermal filler-related radiopacities were more likely.

Different calcifications have different shapes and internal structures. Tonsilloliths are usually multiple small or single larger, well-defined, round, oval to irregular shape calcifications with radiopaque density similar to the cortical bone. Phleboliths are usually multiple, small, round or oval shape calcifications with smooth periphery and laminated appearance, giving to the well-known bull's eye or targetoid appearance. However, sometimes homogeneous radiopacity or radiolucent flow voids can also be seen. The calcinosis or osteoma cutis shows various shapes and numbers, such as a single nodule, single or multiple plate like lesions, trans-epidermal, and multiple disseminated (miliary) lesions.<sup>4</sup> The most common type, more than three quarters of these cases, is multiple miliary pattern. These materials show oval or gourd-shaped nodule with the smooth outlines, homogenous internal structures, usually a radiolucent center and ranging from 0.5 mm to 2 mm in diameter. Filler-related radiopacities show various shape, such as ring/donut, shadow, nodule, and plate appearances with the size ranging from 3 mm to 15 mm.<sup>2</sup>

In our case, the calcifications mainly showed ring/donut shape with some irregular shadow or plate-like appearances. The density was lower than the cortical bone. Based on the shape, internal structure, and size, multiple sialoliths in the parotid glands or calcinosis or osteoma cutis in the skin or dermal filler-related radiopacities were still most possible differential diagnoses. Sialoliths usually are



**Figure 1** Asymptomatic bilateral multiple radiopaque materials superimposed in the panoramic and periapical radiographs of an elderly patient. (A) On the panoramic radiograph taken at the visit for extraction of the retained root of the right mandibular lateral incisor, the multiple radiopaque materials were found to be superimposed over the upper medial portion of the bilateral ascending rami, the lateral portion of the bilateral maxillary sinuses, and the air spaces between the maxilla and the mandible at the bilateral second to third molar regions. (B) On another panoramic radiograph taken at the follow-up visit for wound examination 2 months after extraction of the retained root, the same radiographic imaging pattern of the multiple radiopaque materials was discovered at the similar locations as those described in Fig. 1A. (C) On the periapical radiograph taken at the same time as that described in Fig. 1B, two major and several minor radiopaque materials were found to be superimposed over the air space between the maxilla and the mandible and near the right maxillary and mandibular second to third molar regions. (D) On another periapical radiograph taken at the same time as that described in Fig. 1B and C, several radiopaque materials of various sizes were discovered to be superimposed over the air space between the maxilla and the mandible and near the left maxillary and mandibular second to third molar regions.

associated with pain or swelling of the affected glands. In our case, no pain or swelling of salivary glands were complained. It has been reported most filler-related radiopacities can be observed in the panoramic radiograph, however, multiple miliary osteoma cutis is rarely detected in the panoramic radiograph. Due to the size of the

materials and easily detected in the panoramic radiographs, filler-related radiopacity is the most likely diagnosis for our case.

The panoramic radiograph is indeed a good screening tool for detecting oral and maxillofacial diseases within and outside the jawbones, and now becomes a basic

examination for the first visit patients in Taiwan.<sup>5</sup> We used this case to briefly review the common soft tissue calcifications. As a well-trained dentist, it is also one of the responsibilities to use the opportunity of interpreting panoramic radiographs to detect possible lesions other than oral diseases for our dental patients.

### Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

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