

The prevalence of foreign bodies in jaw bones on panoramic radiography

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Abstract

Objective: Foreign bodies can be deposited in the oral cavity either by traumatic or iatrogenic injury. The most common foreign bodies of iatrogenic origin encountered are restorative materials, like amalgam, and root canal fillings. The aim of this study was to determine the prevalence of foreign bodies detected with panoramic radiography in the jawbones, as well as to evaluate the etiology and characteristics of these pathologies. **Materials and Methods:** From March 2012 to January 2014, 11,144 panoramic radiographs were taken and retrospectively reviewed. The number, characteristics, location of the foreign bodies, age, and gender of the patients were recorded. **Results:** Of the 11,144 patients reviewed, 62 of them have a foreign body with a frequency of 0.6%. The patients who had a foreign body were between 14 and 81 years old. Female patients showed more foreign bodies than male patients. Among the 62 patients, 63 filling materials, one stapler, and five shrapnel were detected. Only 8 patients had symptoms associated with foreign bodies and these foreign bodies excised surgically. **Conclusion:** If possible, these pathologies must be removed at the time of detection to prevent further complications; however, in asymptomatic cases, according to location and the characteristic of the foreign body, they can be kept under observation without performing any operations.

Key words: Foreign bodies, panoramic radiography, prevalence

INTRODUCTION

Foreign bodies in the head and neck area occur as a sequela of trauma or therapeutic interventions.^[1] A wide variety of substances and locations of foreign bodies have been reported.^[2,3] Most of these foreign bodies originated from car accidents, other types of injuries and trauma, or earlier surgeries in which broken instruments were left behind.^[4] However, in the jaw bones, the most frequent foreign bodies are filling materials.^[5] Used during therapeutic interventions, these include canal sealer, amalgam, cement, mineral trioxide aggregate, and Ca(OH)₂. Approximately, one-third of all foreign bodies are overlooked during initial clinical and radiographic examinations.^[4,6] Several imaging methods for locating foreign bodies can be used, including plain radiographs, computerized tomography (CT), magnetic resonance imaging (MRI), an electromagnetic metal detector, and

ultrasound (US).^[7-10] Usually, panoramic radiography is used for the first diagnosis and localization of the foreign bodies.^[5] If these objects cause symptoms, visualization and exact localization still represent a challenge for the clinician.^[11,12]

The objective of the study was to investigate the prevalence of foreign bodies that can be diagnosed using panoramic radiography in the Middle Black Sea region of Turkey and to evaluate the etiology and characteristics of these pathologies.

MATERIALS AND METHODS

We designed a descriptive study composed of 11,874 panoramic radiographs of patients who presented to our Oral and Maxillofacial Surgery Services of Dentistry Faculty at Ordu University for routine dental examination between March 2012 and January 2014. Regardless of gender, the 11,144 panoramic radiographs obtained from patients aged 10 to 90-year-old were included in the study. 730 panoramic

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radiographs of low-resolution quality and/or those in which the presence of artifacts impaired the visualization were excluded from the study. The study design was approved by the Ordu University Ethics Committee (protocol number 2013/35). Foreign bodies were diagnosed by assessing the radiolucent or radiopaque abnormalities on panoramic radiography with the dental history of the patient. The number, characteristics, location of foreign bodies, the age, and gender of the patients were recorded.

The panoramic radiographs were obtained using a Kodak 8000C Digital Panoramic and Cephalometric Extraoral Imaging System (Kodak Dental Systems, Rochester, NY, USA) and images stored in a digital database. All radiographic images were reviewed and discussed by one group of researches to determine the presence, localization, and characteristics of foreign bodies. Acquired data were recorded and classified for statistical analysis. The foreign bodies were identified as filling materials (amalgam, root canal filing material), shrapnel and stapler [Figures 1 and 2].

All descriptive and comparative statistical analyses were performed using the SPSS software package (Statistical Package for Social Sciences, version 16.0, SPSS Inc., Chicago, USA). Chi-square analysis and Fisher's exact test were used to correlate the frequency of foreign bodies with patient gender. Chi-square analysis was used to investigate the distribution/location of foreign bodies in the jaws and

to compare the frequency among the foreign bodies. $P < 0.05$ was considered to be significant.

RESULTS

Foreign bodies were observed in 62 patients (19 males and 43 females) with a frequency of 0.6%. Patients ranged in age from 14 to 81-year-old with a mean of 37 [Figure 3]. Female patients showed more foreign bodies than male patients ($P = 0.021$) [Table 1]. Regarding location, 17 (27%) of the foreign bodies were found in the right maxilla and 16 (26%) of them were found in the left maxilla. In mandible 18 (29%) and 18 (29%) foreign bodies were detected on the right and left side [Table 2]. The prevalence of foreign bodies regarding the side of the jaws showed no significant difference in the entire study group ($P = 0.963$). Between the foreign bodies in the study group, filling materials were found significantly more frequent than other foreign bodies ($P < 0.001$) [Figure 4]. In the study group, 8 of the patients had symptoms associated with the foreign bodies. One of the patients showed signs of discomfort in the area in which the foreign body was located, and the foreign body was surgically removed. Apical resection was performed on 6 of these patients that showed pain, swelling and periapical infection due to a displaced root canal filing [Figure 5]. In the other 2 patients, cystic mass was detected and

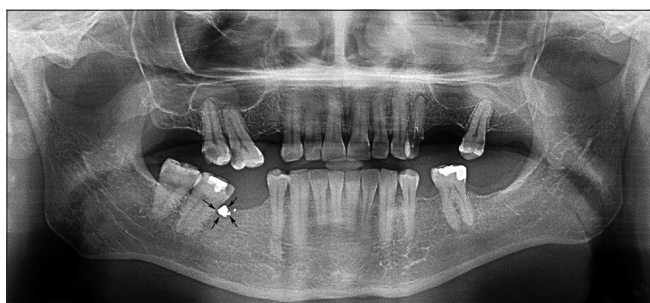


Figure 1: Amalgam particles in right mandibular region



Figure 2: A panoramic view of shrapnel particles in left mandibular and left maxillary region

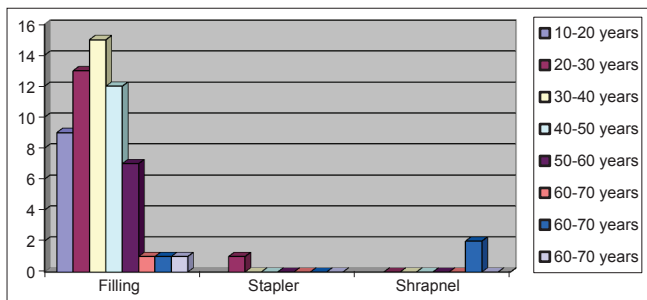


Figure 3: Distribution of foreign bodies regarding age groups

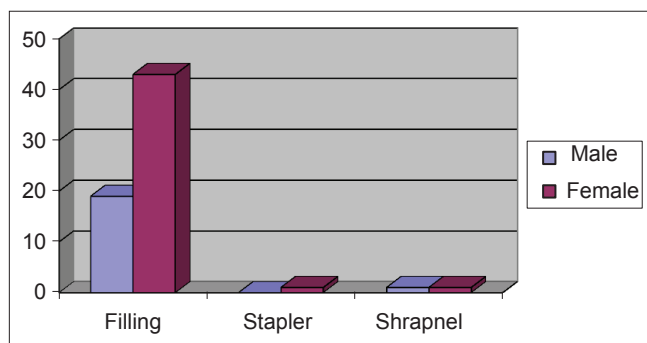


Figure 4: Distribution of foreign bodies regarding gender

cystectomy was performed to excise the cyst and eliminate the symptoms.

DISCUSSION

Foreign bodies are rare entities in the oral and maxillofacial region.^[13] The majority of these pathologies occur as a result of motor vehicle accidents, assaults, bullet wounds, and iatrogenic dental injuries.^[14] Foreign bodies are usually forced into the bone, the surrounding soft tissues, or the antral cavity, and occasionally fragments are displaced into the respiratory tract.^[15] Therefore, foreign bodies can be located in different localizations in the maxillofacial region.^[16-18]

Different kinds of foreign bodies, such as staples,^[19] filling materials,^[20] and orthodontic brackets,^[16] have been reported in the literature. The most common foreign bodies seen in dental practice and caused by dental therapy are fragments of filling materials, fractured hypodermic needles, and instruments.^[15] According to Eggers *et al.*,^[5] in the jaw bones, the most frequent foreign bodies are metallic foreign bodies, such as amalgam particles and dental instruments, mostly endodontic instruments. Similarly, in this study,



Figure 5: A panoramic radiography showing displaced root canal filling in the maxillary second incisor

Foreign bodies	Frequency	Female	Male	Male/female
Filling materials	0.005	43	19	0.44
Stapler	0.00007	1	0	0
Shrapnel	0.0001	1	1	1

Table 2: Distribution of foreign bodies regarding demographical and radiographical data

Foreign bodies	Location				Total	Presence of symptoms	Treatment
	Right maxilla	Left maxilla	Right mandible	Left mandible			
Amalgam and root canal filling materials	15	14	18	16	63	8	6 AR* 1 CRFB† 1 RFB‡
Stapler	1	-	-	-	1	-	-
Shrapnel	1	2	-	2	5	-	-

*AR: Apical resection and removal of the foreign body; †CRFB: Cystectomy and removal of the foreign body; ‡RFB: Removal of the foreign body

we detected amalgam particles in 19 patients. Rasines Alcaraz *et al.*,^[21] reported that due to its effectiveness and cost, amalgam is still the restorative material of choice in certain parts of the world. In the study of Bodrumlu,^[22] it was mentioned that amalgam has been a frequently used root-end filling material. Therefore, it can be said that amalgam can be used in several procedures in dental practice, which may explain the predominance of amalgam among the foreign bodies located in the jaws. In the present study, we also observed metallic foreign bodies such as shrapnel and staples. However, we have not observed any endodontic instruments in whole study group. We thought that the possible cause of this may be the broken endodontic instruments are generally located in the root canal rather than the jaw bones and also the difficulty in the detection of these pathologies on panoramic radiography.

Foreign bodies are often difficult to diagnose and detection of these pathologies depends on the size and the composition of foreign body, anatomic relation to different vital structures, and the imaging modality used.^[5,12] There are many ways of detecting and localizing foreign bodies. Conventional radiographies, computerized tomography (CT), MRI, and US may be used, depending on their site and composition.^[6] Conventional radiographies are generally the first complementary imaging tools, which is preferred because of low cost and easy access.^[12] However, Holmes *et al.*,^[23] reported that CT is the gold standard for detection of foreign bodies. According to Schnider *et al.*,^[4] in comparison to CT, cone beam CT provides fewer metal artifacts and allows for exact localization of small metallic objects, such as amalgam particles. Because of its low cost, easy access, and availability in our clinic, we used panoramic radiographs to detect the presence of foreign bodies located in the jawbones.

Approximately, one-third of all foreign bodies are initially missed or misdiagnosed.^[6] These foreign bodies might be overlooked with one method but can be successfully detected with another.^[5] One of the first described methods for detecting foreign bodies is conventional radiographies;^[23] the prevalence of

foreign bodies on panoramic radiography varies within the range of 0.3–2.8% in the literature.^[15] In our study, the prevalence of foreign bodies was found to be 0.6%. This low incidence in the literature and our study may be associated with the difference between the imaging methods used in studies and the difficulty in detection of the foreign bodies.

Usually foreign bodies are small in size and relatively inert in nature, thus, eliciting no or a very limited inflammatory response. Occasionally, foreign bodies may be retained for a prolonged period, causing persistent and distressing symptoms.^[24] Complications caused by impacted foreign bodies include infection, peripheral nerve damage, pseudoaneurysm, and synovitis.^[12] Foreign body associated complications have been published in earlier studies. Nayak *et al.*,^[25] reported paresthesia in the inferior alveolar nerve due to the displaced calcium hydroxide paste. As reported by Heo *et al.*, a foreign body reaction to a small piece of gauze resulted in a cystic mass in mandible.^[26] Eczematous symptoms in patients showing metal allergies^[20] and dysplastic transformations due to the metal foreign bodies^[18] have been also reported. In the present study, 8 patients showed pain, swelling, periapical infection, and cystic mass associated with foreign bodies.

The correct approach in the treatment of these injuries requires a multidisciplinary team and the proper sequencing, with the administration of adequate procedures and techniques that offer a satisfactory result. Although some foreign bodies may be left *in situ* for good clinical reasons, most are removed prior to the onset of a complication, notably infection.^[24] In this study, foreign bodies were detected incidentally in 62 patients during the retrospective analysis of panoramic radiographies. According to data that received from the archive, we observed that eight of the 62 patients have been operated because of the symptoms associated with foreign bodies. The other 54 patients were asymptomatic and did not operate.

Therefore, we conclude that if possible, these pathologies must be removed at the time of detection to prevent further complications; however, in asymptomatic cases, according to location and the characteristic of the foreign body, they can be kept under observation without performing any operations.

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REFERENCES

- Oikarinen KS, Nieminen TM, Mäkäräinen H, Pyhtinen J. Visibility of foreign bodies in soft tissue in plain radiographs, computed tomography, magnetic resonance imaging, and ultrasound. An *in vitro* study. *Int J Oral Maxillofac Surg* 1993;22:119-24.
- Clark JC, Jones JE. Tooth fragments embedded in soft tissue: A diagnostic consideration. *Quintessence Int* 1987;18:653-4.
- Dort JC, Robertson D. Nonmetallic foreign bodies of the skull base: A diagnostic challenge. *J Otolaryngol* 1995;24:69-72.
- Schnider N, Reichart PA, Bornstein MM. Intraoral foreign bodies detected 40 years after a car accident using cone beam computed tomography. *Quintessence Int* 2012;43:741-5.
- Eggers G, Mukhamadiev D, Hassfeld S. Detection of foreign bodies of the head with digital volume tomography. *Dentomaxillofac Radiol* 2005;34:74-9.
- Acharya S, Padhiary SK. Foreign body in the mid-face: An unusual case report. *Indian J Dent* 2012;3:156-8.
- Veselko M, Trobec R. Intraoperative localization of retained metallic fragments in missile wounds. *J Trauma* 2000;49:1052-8.
- Charney DB, Manzi JA, Turlik M, Young M. Nonmetallic foreign bodies in the foot: Radiography versus xeroradiography. *J Foot Surg* 1986;25:44-9.
- Ginsburg MJ, Ellis GL, Flom LL. Detection of soft-tissue foreign bodies by plain radiography, xerography, computed tomography, and ultrasonography. *Ann Emerg Med* 1990;19:701-3.
- Glatt HJ, Custer PL, Barrett L, Sartor K. Magnetic resonance imaging and computed tomography in a model of wooden foreign bodies in the orbit. *Ophthal Plast Reconstr Surg* 1990;6:108-14.
- Krimmel M, Cornelius CP, Stojadinovic S, Hoffmann J, Reinert S. Wooden foreign bodies in facial injury: A radiological pitfall. *Int J Oral Maxillofac Surg* 2001;30:445-7.
- de Santana Santos T, Avelar RL, Melo AR, de Moraes HH, Dourado E. Current approach in the management of patients with foreign bodies in the maxillofacial region. *J Oral Maxillofac Surg* 2011;69:2376-82.
- Anderson MA, Newmeyer WL 3rd, Kilgore ES Jr. Diagnosis and treatment of retained foreign bodies in the hand. *Am J Surg* 1982;144:63-7.
- Shehata E, Moussa K, Al-Gorashi A. A foreign body in the floor of the mouth. *Saudi Dent J* 2010;22:141-3.
- de Visscher JG. A foreign body near the ramus of the mandible. *Oral Surg Oral Med Oral Pathol* 1984;58:484-5.
- Conti G, Dolci M, Borgonovo A, Maiorana C. Aesthetic restoration of upper lip after removal of post-trauma foreign body (orthodontic bracket). *Eur J Paediatr Dent* 2012;13:239-40.
- Hussain K, Brown AJ, Chavda D. Case report: Foreign body in the palate of an infant. *Br Dent J* 2008;205:23-5.
- Kühnel TV, Tudor C, Neukam FW, Nkenke E, Stockmann P. Air gun pellet remaining in the maxillary sinus for 50 years: A relevant risk factor for the patient? *Int J Oral Maxillofac Surg* 2010;39:407-11.
- McAuliffe N, Drage NA, Hunter B. Staple diet: A foreign body in a tooth. *Int J Paediatr Dent* 2005;15:468-71.
- Matsuzaka K, Mabuchi R, Nagasaka H, Yoshinari M, Inoue T. Improvement of eczematous symptoms after removal of amalgam-like metal in alveolar bone. *Bull Tokyo Dent Coll* 2006;47:13-7.
- Rasines Alcaraz MG, Veitz-Keenan A, Sahrman P,

- Schmidlin PR, Davis D, Iheozor-Ejiofor Z. Direct composite resin fillings versus amalgam fillings for permanent or adult posterior teeth. *Cochrane Database Syst Rev* 2014;3:CD005620.
22. Bodrumlu E. Biocompatibility of retrograde root filling materials: A review. *Aust Endod J* 2008;34:30-5.
23. Holmes PJ, Miller JR, Gutta R, Louis PJ. Intraoperative imaging techniques: A guide to retrieval of foreign bodies. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2005;100:614-8.
24. Vikram A, Mowar A, Kumar S. Wooden foreign body embedded in the zygomatic region for 2 years. *J Maxillofac Oral Surg* 2012;11:96-100.
25. Nayak RN, Hiremath S, Shaikh S, Nayak AR. Dysesthesia with pain due to a broken endodontic instrument lodged in the mandibular canal – A simple deroofing technique for its retrieval: Case report. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2011;111:e48-51.
26. Heo MS, Song MY, Lim JJ, Lee SS. Foreign-body granuloma occurring in the mandible subsequent to orthognathic surgery: A case report. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2001;91:483-5.

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