Journal of Pakistan Association of Dermatologists.2023;**33(4)**:1589-1593.

Review Article

Oral Mucosa Amalgam Tattoo: Literature Review

Hiba H. Al-Rikaby, Muhanad L. Alshami*

Department of Periodontics, Al-Amiriya Specialist Dental Centre, Ministry of Health, Iraq.
* Department of Dentistry, Dijlah University College, Iraq.

Abstract

Amalgam tattoo is a type of pigmentation that appears in the mouth due to small particles of dental amalgam becoming embedded in the soft tissues. Dental work such as placement or removal of silver fillings is the most common cause of amalgam tattoo, and it is more commonly found in people with a high number of fillings. The tattoo is usually asymptomatic and discovered during routine dental examinations. Treatment is generally not necessary, but if a patient is concerned about the appearance of the tattoo, there are a few options for removal. The histopathological picture of an amalgam tattoo typically shows the presence of small, dark granules or particles of dental amalgam within the soft tissues of the oral cavity. A proper clinical and histopathological evaluation is necessary to accurately diagnose and distinguish an amalgam tattoo from other more serious conditions. The radiographic image of an amalgam tattoo may show a radiopaque object in the soft tissues of the oral cavity. It can occur due to various factors, including dental procedures, trauma, overloading of amalgam fillings, and poor oral hygiene.

Key words
Amalgam tattoo; Oral mucosa; Pigmentation.

Introduction

Dental amalgam is a silver-colored material that is typically composed of a mixture of metals including silver, mercury, copper, and tin. This material is commonly used by dentists to fill cavities in teeth, and it has been a popular choice for over a century as a dental filling material to repair and restore teeth damaged by decay, wear, or trauma.[1] The combination of metals in a powdered form produces a malleable and easily manipulated material. When the powdered metal mixture is mixed with a small amount of liquid mercury, it forms a soft, pliable mass that can be placed into the prepared cavity. After placement in the cavity, dental amalgam hardens and sets in place, creating a long-lasting and durable restoration for the tooth.[2] The cost-effectiveness, high mechanical strength, and notable resistance to abrasion and degradation have contributed to the widespread application of this material in the dental field, particularly in the restoration of posterior teeth that are subjected to substantial occlusal forces during mastication.[3] Despite its strength and durability, dental amalgam has been a source of controversy due to the potential health risks associated with its mercury content. As a result, many dentists are now opting for alternative materials like composite resin or ceramic for dental restorations.[4] Nevertheless, dental amalgam remains a viable option for patients who have extensive dental decay or are unable to afford more expensive restorative materials.[5] Amalgam tattoo, otherwise referred to as amalgam pigmentation, is a harmless pathological condition that may develop within the oral cavity. It is caused by the deposition of small particles of dental amalgam within the soft tissues of the oral cavity, leading to a type of pigmentation.[6] The aim of this current review is to emphasize the principal characteristics (causes, clinical manifestation, histopathological

Address for correspondence
Dr. Muhanad L. Alshami
Department of Dentistry,
Dijlah University College, Iraq.
Email: iraqnoafct83@gmail.com

features, and therapeutic interventions) associated with amalgam tattoo.

Etiology

Amalgam particles can be deposited in oral tissues due to various factors, including Dental procedures, such as the placement, removal, or replacement of dental amalgam fillings, can lead to the deposition of small particles in the surrounding soft tissues.[7] This can occur either through the accidental dislodgment of amalgam material during the procedure or because of the breakdown of the filling over time, which causes particles to migrate into nearby tissues like the gingiva or buccal mucosa.[8] Trauma to the oral tissues, such as accidental injury or surgical procedures (e.g., tooth extraction), can also lead to the deposition of amalgam particles. This can occur when small particles of amalgam are implanted into the affected area as a result of the trauma.[7, 9] The deposition of amalgam particles on dental floss due to a recent restorative procedure can result in the appearance of linear pigmentation in the gingival tissue following oral hygiene practices.[10] While performing apicoectomy, there is a possibility of unintentionally leaving amalgam residue in the soft tissue around the surgical area.[11]

Clinical features

Amalgam tattoos affect around 3% of the population. The occurrence of tattoos is observed with a higher frequency in female patients in comparison to male patients, possibly due to greater utilization of dental healthcare services by females.[12] Furthermore, tattoos are more frequently observed in older patients, presumably due to a higher accumulation of dental interventions and procedures over time.[13] Amalgam tattoo lesions appear as single or multiple soft, small, nonulcerated, asymptomatic macules, and in a few reports, the lesions may be raised. The erythematous reaction surrounding the lesion was absent. The size of the lesions may vary from a few millimeters to greater than 1 cm, and their color can range from blue to gray or black. These lesions are typically situated on the gingiva and edentulous mucosa but can also be observed on any site in the oral cavity **(Figure 1)**.[14]

Figure 1 Amalgam tattoo on
a) the buccal mucosa [15],
b) the palate [15],
c) the gingiva [16], and
d) the edentulous gingiva [17].

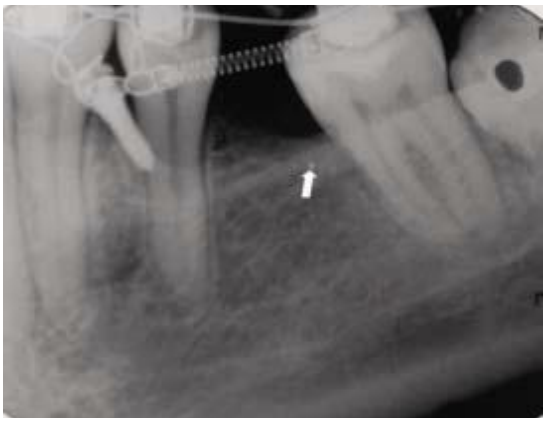

Figure 2 A periapical radiograph shows a radiopaque material (arrow) within the alveolar ridge, suggesting the existing of metal particle.[7]

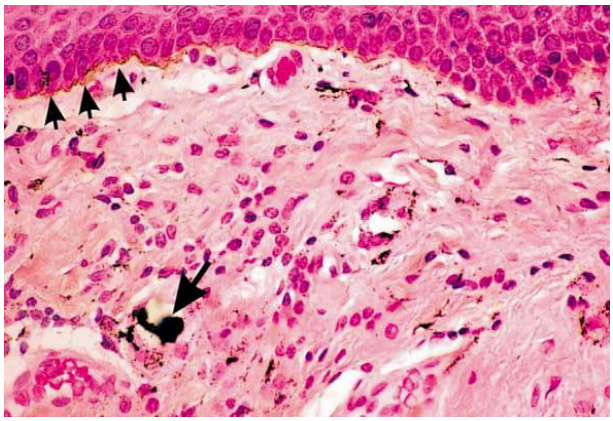

Figure 3 Amalgam tattoo was observed microscopely (20X), as either macroscopic globular aggregates (arrow) or fine particles that exhibit alignment with the reticulin fibers or basement membranes (small arrows). [23]

The radiographic image of an amalgam tattoo may show a radiopaque area in the soft tissues of the oral cavity **(Figure 2)**. This radiopacity is caused by the presence of small particles of dental amalgam within the tissues, which are composed of metal alloys that are highly radiopaque. The appearance of an amalgam tattoo on a radiograph can vary depending on various factors, such as the size and location of the particle deposit, as well as the technique and quality of the radiograph. In some cases, the radiopaque area may be well-defined and clearly visible, while in others it may be less distinct and difficult to discern.[7,18] In general, the radiographic appearance of an amalgam tattoo is not specific and can be like other radiopaque lesions, such as metallic foreign bodies or calcifications. Therefore, a clinical examination and history are usually necessary to make an accurate diagnosis and distinguish an amalgam tattoo from other similar conditions.[19] If there is no indication of an amalgam tattoo in the patient's medical history or radiographic images, a biopsy is recommended to rule out the presence of melanocytic lesions.[19-20]

Histopathological features

Patients who have a history of dental amalgam restorations in their primary or permanent dentition may not require a biopsy. However, in cases where there is uncertainty, including confusion with melanin pigmentation, a biopsy should be performed to confirm the presence of amalgam particles in the connective tissue.[21]

Amalgam tattoo lesions under microscope appeared as solid, dark-brown, large, or fine granules. Dental amalgam release silver salts that stain reticulin fibers that enclose the nerves and blood vessels **(Figure 3)**.[22] Dense fibrous connective tissue typically envelops large fragments with little or no inflammation. The more intense inflammatory response is associated with small-sized particles, which are represented by granulomatous reaction and a collection of inflammatory cells. Granulomas associated with amalgam tattoos are generally small and non-specific, and do not usually cause any significant symptoms.[23]

Treatment

The diagnosis of an amalgam tattoo is confirmed when it appears by X-ray as a circumscribed radiopaque area near a tooth restored with an amalgam filling.[15] When the diagnosis is challenging or melanoma is suspected, a biopsy is required. Generally, no treatment is necessary for an amalgam tattoo, especially if there are no

complaints of discomfort. The decision to remove an amalgam tattoo is made when aesthetic concerns arise, particularly in the anterior gingiva or lips. Removal can be achieved through surgical or non-surgical methods. The surgical option can involve grafts (gingival or connective tissue graft). Surgical procedures might be associated with bleeding, discomfort, and invasiveness, prompting physicians to opt for laser techniques. Laser treatment enhances the healing process and reduces the time needed for amalgam removal.[16,24] The potential for transformation was not recorded for amalgam tattoo.[25]

References

1. Bharti R, Wadhwani KK, Tikku AP, Chandra A. Dental amalgam: An update. Journal of conservative dentistry: JCD. 2010;13(4):204.
2. Spencer A. Dental amalgam and mercury in dentistry. Australian Dental Journal. 2000;45(4):224-34.
3. Fathi M, Mortazavi V. A review on dental amalgam corrosion and its consequences. 2004.
4. Luchowska A, Sroczyńska M, Żaczek A. Assessment of the Impact of Dental Amalgam on Human Health: A Literature Review. Journal of Education, Health and Sport. 2023;13(3):105-12.
5. Bissoon S, Moodley R. Should dental amalgams be used in dental training? The perspectives of dental academics at a university in South Africa. South African Dental Journal. 2021;76(9):524-31.
6. Dubach P, Caversaccio M. Amalgam tattoo. New England Journal of Medicine. 2011;364(15):e29.
7. Galletta VC, Artico G, Dal Vechio A, Lemos Jr CA, Migliari DA. Extensive amalgam tattoo on the alveolar-gingival mucosa. Anais Brasileiros de Dermatologia. 2011;86:1019-21.
8. Campbell CM, Deas DE. Removal of an amalgam tattoo using a subepithelial connective tissue graft and laser deepithelialization. Journal of periodontology. 2009;80(5):860-4.
9. Martin J, Nagore E, Cremades A, Botella-Estrada R, Sanmartin O, Sevila A, *et al*. An amalgam tattoo on the oral mucosa related to a dental prosthesis. Journal of the European Academy of Dermatology and Venereology. 2005;19(1):90-2.
10. Sreeja C, Ramakrishnan K, Vijayalakshmi D, Devi M, Aesha I, Vijayabanu B. Oral pigmentation: A review. Journal of pharmacy & bioallied sciences. 2015;7(Suppl 2):S403.
11. Ganapathy N, Kuttappa M, Anil M. Amalgam tattoo-A case report. Endodontology. 2008;20(1):44.
12. aLim SO. Differential Expression of Program Death Ligand 1 in Proliferative Verrucous Leukoplakia. 2019; bda Silva Albuquerque DM, Cunha JLS, Roza ALOC, Arboleda LPA, Santos-Silva AR, Lopes MA, *et al*. Oral pigmented lesions: a retrospective analysis from Brazil. Medicina Oral, Patologia Oral y Cirugia Bucal. 2021;26(3):e284.
13. Dhanuthai K, Theungtin N, Theungtin N, Thep-Akrapong P, Kintarak S, Klanrit P, *et al*. Pigmented Oral Lesions: A Multicenter Study. European Journal of Dentistry. 2022;16(02):315-9.
14. aBorkar SA, Dhupar V, Gadkar AM, Nivedita C. Management of large radicular cyst associated with amalgam particles in cystic lining. Journal of Conservative Dentistry: JCD. 2016;19(3):280; bDeinlein T, Zalaudek I. Dermoscopy. Hyperpigmentation: CRC Press; 2017. p. 148-55; cLodi G, Deschler DG. Oral lesions. UpToDate April. 2019;9.
15. Kamal FM, Essaoudi MA, Khalfi L, Elkhatib K. Extensive amalgam tattoo (amalgam pigmentation) on the palatal mucosa: a short case report. Journal of Oral Medicine and Oral Surgery. 2019;25(1):7.
16. Mathews DP. Treatment of the amalgam tattoo in the esthetic zone. Journal of Esthetic and Restorative Dentistry. 2020;32(8):770-5.
17. Amérigo-Góngora M, Machuca-Portillo G, Torres-Lagares D, Lesclous P, Amérigo-Navarro J, González-Cámpora R. Clinicopathological and immunohistochemical analysis of oral melanocytic nevi and review of the literature. Journal of Stomatology, Oral and Maxillofacial Surgery. 2017;118(3):151-5.
18. Andrade SA, de Pilla Varotti F. Detection of amalgam tattoo in oral mucosa by wide-field

optical fluorescence. The Indian Journal of Medical Research. 2018;148(2):240.
19. Yeta N, Yeta EN, Önder C, Akkaya M, Günhan Ö. Graphite tattoo on the gingiva: a case report. Clinical Advances in Periodontics. 2016;6(3):140-5.
20. Soares MQS, Lopes IA, Ferreira GZ, Oliveira DT, Capelloza ALA, Rubira-Bullen IRF, *et al*. Amalgam tattoo and the differential diagnosis of pigmented oral lesions. International Journal of Clinical Dentistry. 2019;12(3):201-8.
21. Laimer J, Henn R, Helten T, Sprung S, Zelger B, Zelger B, *et al*. Amalgam tattoo versus melanocytic neoplasm-Differential diagnosis of dark pigmented oral mucosa lesions using infrared spectroscopy. PLoS One. 2018;13(11):e0207026.
22. Vera-Sirera B, Risueño-Mata P, Ricart-Vayá JM, de la Hermosa CBR, Vera-Sempere F. Clinicopathological and immunohistochemical study of oral amalgam pigmentation. Acta Otorrinolaringologica (English Edition). 2012;63(5):376-81.
23. Lau JC, Jackson-Boeters L, Daley TD, Wysocki GP, Cherian MG. Metallothionein in human gingival amalgam tattoos. Archives of Oral Biology. 2001;46(11):1015-20.
24. Yilmaz HG, Bayindir H, Kusakci-Seker B, Tasar S, Kurtulmus-Yilmaz S. Treatment of amalgam tattoo with an Er, Cr: YSGG laser. Journal of investigative and clinical dentistry. 2010;1(1):50-4.
25. Tarakji B, Umair A, Prasad D, Altamimi MA. Diagnosis of oral pigmentations and malignant transformations. Singapore dental journal. 2014;35:39-46.