Treatment of Amalgam Tattoo with a Subepithelial Connective Tissue Graft and Acellular Dermal Matrix

Vivek Thumbigere-Math and Deborah K. Johnson

Division of Periodontology, University of Minnesota School of Dentistry, Minneapolis, MN

Abstract

A 54-year-old female was referred for management of a large amalgam tattoo involving the alveolar mucosa between teeth #6 and #9. The lesion had been present for over 20 years following endodontic treatment of teeth #7 and #8. A two-stage surgical approach was used to remove the pigmentation, beginning with removal of amalgam fragments from the underlying bone and placement of a subepithelial connective tissue graft and acellular dermal matrix to increase soft tissue thickness subadjacent to the amalgam. Following 7 weeks of healing, gingivoplasty was performed to remove the overlying pigmented tissue. At the 21-month follow-up appointment, the patient exhibited naturally appearing soft tissue with no evidence of amalgam tattoo.

Key words: Amalgam tattoo; graft; connective tissue; acellular dermal matrix; pigmentation; tattoo

Introduction

Amalgam tattoo is an unintended sequela of dental treatment. Amalgam tattoo results from inadvertent deposition of dental amalgam within the oral mucosa or alveolar bone during dental procedures. Over time, metallic particles from dental amalgam leach into the soft tissue, causing discoloration (Buchner and Hansen, 1980; Harrison *et al.*, 1977).

Clinically, amalgam tattoos appear as blue-black or blue-gray asymptomatic pigmentation, most commonly involving the gingival surfaces (Buchner and Hansen, 1980; Neville, 2008). Radiographically, they appear as radiopaque particles at the site of the lesion, but in many cases these particles are too small or too diffuse to be identified (Neville, 2008). Microscopic examination reveals dark solid fragments or numerous fine granules dispersed along collagen bundles and around blood vessels, frequently surrounded by inflammatory infiltrate (Buchner and Hansen, 1980; Harrison *et al.*, 1977; Neville, 2008).

Correspondence to: Vivek Thumbigere-Math, BDS, PhD, Adjunct Assistant Professor, Division of Periodontology, Developmental and Surgical Science, University of Minnesota School of Dentistry, 515 Delaware Street SE, Minneapolis, MN 55455. Tel: 612-625-6155/Fax: 612-626-3076. Email: thumb002@umn.edu

Amalgam tattoos often do not require treatment, as the mercury present in dental amalgam is not in a free state and does not pose a health hazard. However, amalgam tattoos in an esthetic region can be of cosmetic concern, especially for patients with a high smile line. Various techniques have been described to treat amalgam tattoos depending on their size, location and complexity (Griffin *et al.*, 2005; Shah and Alster, 2002; Shiloah *et al.*, 1988). The management of large lesions is challenging when there is limited availability of donor tissue. This deficiency could be overcome by utilizing allografts such as acellular dermal matrix. This case report highlights a two-stage surgical procedure for the management of large amalgam tattoos in the esthetic zone utilizing an acellular dermal matrix.

Case Description

A 54-year-old Caucasian female was referred for management of a large amalgam tattoo involving the alveolar mucosa between teeth #6 and #9. Her past medical history was significant for epilepsy (last episode in 1995), chronic gastritis, herpetic stomatitis and restless leg syndrome, which were controlled with medications. Her present medication list included: esomeprazole, ranitidine, sucralfate, valacyclovir and pramipexole.

Dental history revealed that the patient had had traumatic fractures of teeth #7 and #8 over 20 years ago. Following this incident, root canal therapy was performed and crowns were placed. A few years later,

she underwent root-end resection of teeth #7 and #8, subsequent to which she started noticing the pigmented lesion. Eventually, teeth #7 and #8 were extracted. Clinical examination revealed an 18 x 10 mm diffuse, bluish-pigmented lesion in the alveolar mucosa between teeth #6 and #9 (*Figure 1A*). The lesion had progressively darkened and enlarged until reaching the present size. Although asymptomatic, the pigmentation was esthetically unappealing to the patient.

Given the clinical appearance, past dental history, and presence of radiopaque fragments consistent with amalgam scatter, a biopsy to confirm the diagnosis of amalgam tattoo was considered unnecessary. After discussing the possible risks, including incomplete removal of the pigmentation and scar formation, the patient initially consented to a two-stage surgical treatment plan. Following the administration of local anesthesia, a sulcular incision was made on tooth #6 with a crestal incision in the region of teeth #7 and #8. A vertical releasing incision sparing the papilla was made on the mesial surface of tooth #9, which extended beyond the mucogingival junction. A second vertical releasing incision was made on the distal surface of tooth #6 (one tooth surface beyond the pigmented area). A full

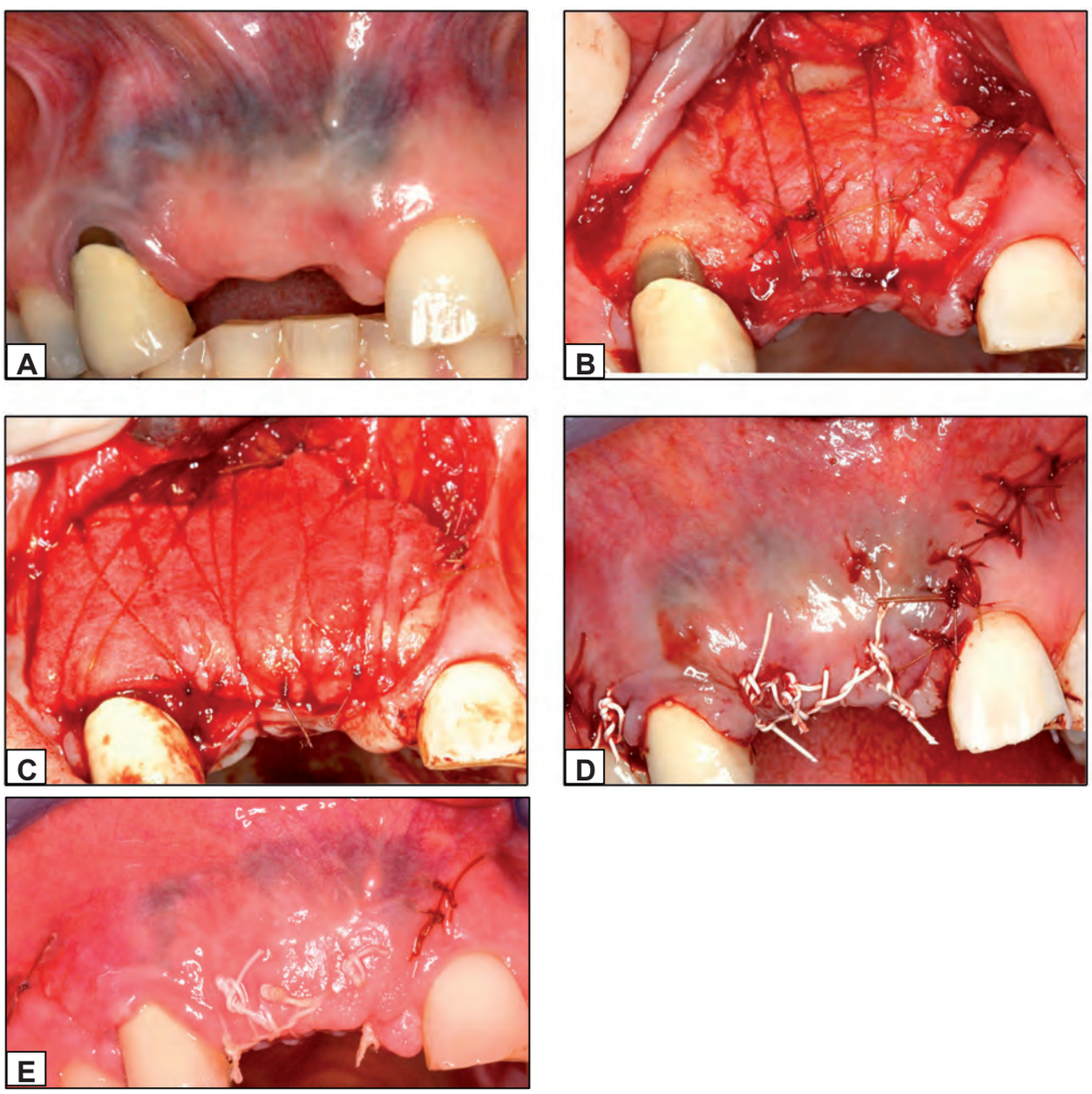

Figure 1: A) Initial presentation of the amalgam tattoo (18 x 10 mm) that resulted from root-end resective surgery performed 20 years earlier. B) Subepithelial connective tissue graft placed over the recipient site after traces of metallic fragments in the bone were removed. C) Because of the limited availability of donor tissue, acellular dermal matrix was also placed over the subepithelial connective tissue graft to further thicken the underlying connective tissue. D) Surgical site after the first grafting phase, closed with polytetrafluoroethylene (e-PTFE) sutures and 5-0 chromic gut sutures. E) Two weeks post-operative healing without any evidence of graft exposure or sloughing

thickness flap was reflected and any traces of metallic fragments in the bone were removed using hand and rotary instruments under copious irrigation. A 2 mm thick subepithelial connective tissue graft harvested from the left palate was placed over the recipient site in the area of teeth #7 and #8 (*Figure 1B*). It was realized that the donor tissue was inadequate in relation to the lesion size (the pigmentation extended through the entire thickness of soft tissue from the epithelium to the periosteum along the area of teeth #6 to #9). Upon the patient's objection to harvesting another connective tissue graft from a contralateral site, an acellular dermal matrix (AlloDerm, LifeCell Corporation, NJ) was used over the subepithelial connective tissue graft to further thicken the underlying connective tissue (*Figure 1C*). Both grafts were secured separately with 5-0 chromic gut sutures. A periosteal release was performed and coronal advancement of the flap was obtained. Primary closure was achieved with polytetrafluoroethylene (e-PTFE) sutures (GORE-TEX, W.L. Gore) and 5-0 chromic gut sutures (*Figure 1D*). The patient was prescribed ibuprofen (600 mg) and acetaminophen (500 mg) with codeine (5 mg) for pain management along with amoxicillin (500 mg) and a medrol dose pack (oral methylprednisolone tapered in one week). The patient was instructed to rinse twice daily with 0.12% chlorhexidine gluconate for 2 weeks. The post-operative healing (*Figure 1 E*) was uneventful, without any graft exposure or sloughing, and the sutures were removed after 2 weeks.

Seven weeks after the first surgery, the patient returned to the clinic for the second phase of treatment (*Figure 2A*). The soft tissue was evaluated to confirm that the thickness had increased by 2-3 mm following grafting. At this visit, gingivoplasty was performed using a high-speed diamond bur under copious irrigation to remove approximately 0.5 mm of overlying pigmented tissue. The pigmented tissue was completely removed, exposing the underlying graft (*Figure 2B*). Complete hemostasis was achieved and a layer of oxidized cellulose (Surgicel, Ethicon, Inc., a Johnson & Johnson company; NJ) was applied to the surgical site, over which cyanoacrylate gel was applied. The patient was again prescribed ibuprofen (600 mg) for pain management.

Around 5 weeks later the entire surgical area was covered by new epithelium. At the 10- and 21-month follow-up appointments, there was no evidence of re-

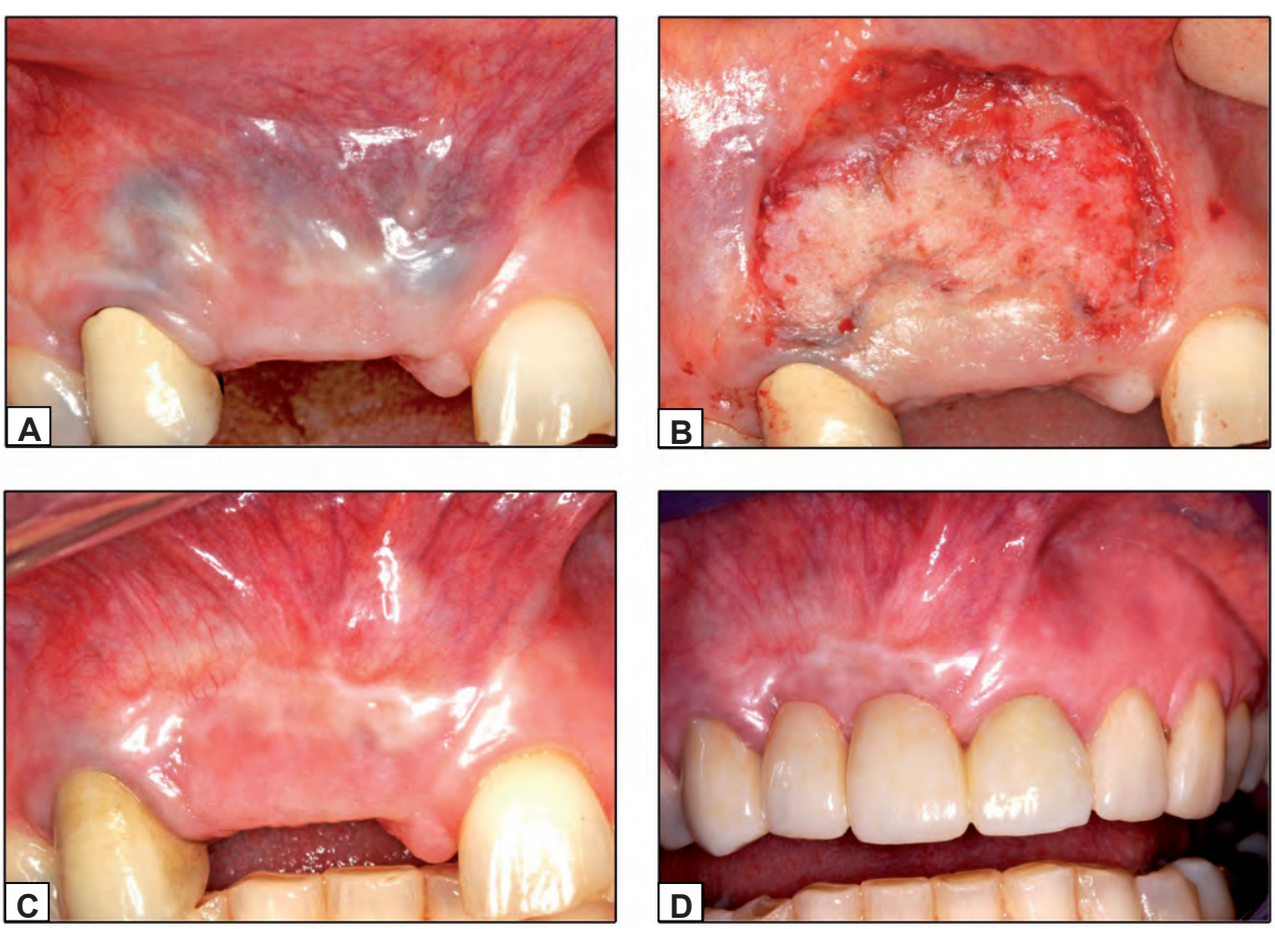

Figure 2: A) Surgical site 7 weeks after grafting. B) Seven weeks after grafting, gingivoplasty was performed to remove the overlying pigmented tissue. Note the underlying graft from the initial surgery is now exposed. C) At the 10-month follow-up appointment, there is no evidence of residual pigmentation. D) Final restoration and clinical appearance at 21 months after grafting. Note the color change between native tissue and grafted site.

sidual pigmentation (*Figures 2C and 2D*) and the patient was pleased with the outcome. As expected, there was some amount of thickness reduction during the first year of grafting owing to the shrinkage of the acellular dermal matrix; however, the thickness was stabilized after one year.

Discussion

The incidence of amalgam tattoo has been reported to be around 8% in previously surveyed samples (Buchner and Hansen, 1980; Owens *et al.*, 1992). Amalgam tattoos can be of esthetic concern, especially when located in the maxillary anterior region. Various techniques have been described for the management of amalgam tattoos depending on their size, location and complexity (Griffin *et al.*, 2005; Shah and Alster, 2002; Shiloah *et al.*, 1988).

Small superficial lesions can be removed using rotary instruments (round or diamond bur) in the form of a localized gingivoplasty. However, large lesions require advanced management. Kissel and Hanratty described a two-stage surgical treatment in which a connective tissue graft was placed deep to the pigmented area followed by gingivoplasty of the overlying tissue (Kissel and Hanratty, 2002). Although this technique results in a favorable outcome with minimal scarring and good color match, the limitation in availability of donor tissue can be disadvantageous. Shiloah *et al.* utilized an epithelialized free soft tissue graft to treat amalgam tattoos (Shiloah *et al.*, 1988). The epithelialized free soft tissue graft was placed over the curetted bone in the maxillary anterior region; however, this technique has a significant risk for scarring and poor color match. Furthermore, Griffin *et al.* utilized acellular dermal matrix as an onlay graft over the completely excised amalgam tattoo (Griffin *et al.*, 2005). In this study, the full thickness of the soft tissue outlining the amalgam tattoo was excised before the acellular dermal matrix was placed over the surgical site. The authors suggest that acellular dermal matrix is a viable option in treating large amalgam tattoos, which are otherwise very difficult to treat with autogenous grafts. However, previous studies have reported that uncovered acellular dermal matrix may not increase the zone of keratinized tissue as predictably as an autologous soft tissue graft, which is of importance in the esthetic zone (Harris, 2004; Yan *et al*,. 2006).

Shah *et al.* utilized an alexandrite laser to remove amalgam tattoo on the buccal mucosa and gingiva over the course of three treatments at 8-week intervals (Shah and Alster, 2002). Similarly, Campbell and Deas used ER,Cr:YSGG laser to remove pigmented tissue in a single treatment (Campbell and Deas, 2009). Although this technique is feasible, the use of lasers (Nd:YAG, Er:YAG, and Nd:YLF) has been reported to trigger the release of mercury vapor from mercury-containing amalgam surfaces (Pioch and Matthias, 1998). Mercury released into the oral cavity by laser ablation may elicit an intense inflammatory response and may also play a role in triggering oral neuropathy (Donetti *et al.*, 2008; Forsell *et al.*, 1998) and lichen planus (Staines and Wray, 2007). Furthermore, when ablating relatively thin soft tissues (e.g., facial gingival and alveolar mucosa) using lasers without irrigation, there is an apparent risk of irreversible bone damage due to the excessive heat generated by lasers.

Alternatively, amalgam tattoos or pigmentations in the high smile line area can be masked using a lip repositioning technique (Jacobs and Jacobs, 2013). This technique involves precise resection of maxillary mucosal tissues with reattachment of the lip in a more coronal position, resulting in limited lip elevation on smiling and increased lip fullness.

Although several techniques have been described to remove amalgam tattoos, the current report highlights the significance of using acellular dermal matrix when there is limitation in the availability of donor tissue. A two-stage surgical approach can be used to remove amalgam tattoos, beginning with a subepithelial connective tissue graft and acellular dermal matrix to increase tissue thickness and allow removal of amalgam fragments in bone, followed by gingivoplasty of the surface tissue. In conclusion, clinicians need to be aware of various treatment strategies for amalgam tattoos in esthetic zones that result in esthetically appealing outcomes.

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