

Local argyrosis of oral mucosa or amalgam tattoo. A problem in diagnosis and treatment

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Abstract

The authors, basing on three cases published by different authors in the years 1995-2003, discuss the problem of diagnosis and treatment of local gingival argyrosis and amalgam tattoo. Treatment methods carried out consisted of the following procedures free gingival graft, subepithelial connective tissue graft in a two-step procedure and subepithelial connective tissue graft without flap coverage. In the authors opinion in some cases a connective tissue graft does not need flap coverage, therefore a dual blood supply is not necessary.

Key words: amalgam tattoo, argyrosis, treatment of pigmentations.

Introduction

Available literature of the past 10 years presents cases of gingival pigmentation, caused by the presence of silver particles. Surgical procedures with the use of free gingival graft or connective tissue graft were most often incorporated in treatment [1-3]. These publications show some vagueness and disagreement particularly concerning diagnosis and methods of treatment. In this article worth looking into information has been gathered and discussed.

Rusch-Behrend and Guttman [1] in 1995 presented a case of gingival argyrosis in a 26-year-old woman. According to the

authors this lesion is also referred to as amalgam pigmentation or amalgam tattoo. The lesion was located on the upper gingiva overlying central incisors. Radiographic examination showed that both central incisors were treated endodontically. The root canals were obturated with a silver cone and an amalgam root-end restoration. The authors suggested that gingival pigmentation was caused by silver particles released from the silver cones and amalgam restorations as a result of material corrosion.

Carried out treatment consisted of removal of the prosthetic crowns, removal of silver cones and amalgam restorations. The root canals were refilled with thermoplasticized gutta-percha. A full-thickness mucoperiosteal tissue flap was reflected and curettage of the osseous tissue along with thinning of the reflected tissue was carried out. Root-ends were resected.

Histological analysis of biopsied tissues revealed chronic inflammatory cell infiltrate predominantly plasmocytic and multiple aggregates of black foreign material, which was recognized as silver containing salts also localized in granulation tissue.

To further reduce tissue argyria four weeks following endodontic surgical intervention periodontal grafting procedures were performed. A full-thickness free gingival graft from the palate was placed at the site of the discoloration. After 8 months healing was completed but pigmentation was still observed localized in the vestibule above the lateral incisors, a whitish scar formed between the pigmented gingiva and facial mucosa.

Kissel and Hanratty presented a different method of treating gingival metallic discolorations [2]. These authors proposed a total surgical removal of pigmentation from the underlying gingival connective tissue and coverage by a subepithelial connective tissue graft from the palate. The graft was placed between the periosteum and the overlying partial thickness gingival flap.

Two and a half months post surgery a thin partial thickness flap was performed along the same incision lines and removed. Clinical examination following further 2½ months after the second surgery showed complete rekeratinization of the subepithelial connective tissue and achievement of ideal gingival color matching the surrounding tissues. The technique incorporated

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Figure 1. Discoloration of the gingiva to superior teeth



Figure 2. Directly after removing of discoloration of the gingiva



Figure 3. Palatal discolored gingiva was kept intact



Figure 4. Subepithelial connective tissue in the region of removed gingiva discoloration



Figure 5. Subepithelial connective tissue sutured to the regional gingiva



by Kissel and Hanratty has been described as suprapariosteal ridge replacement technique.

The third case was described by authors of this article [3] and concerned a gray discoloration of the gingiva superior to maxillary left, central and lateral incisors, 21, 22. The discoloration appeared around these teeth 6 years ago after placement of acrylic crowns (Fig. 1). The discolored gingiva gave no dental symptoms but on smiling esthetics were disturbed.

The above described discoloration appeared as a result of accidental implantation of silver particles during aggressive preparation of cemented posts and cores probably with the use

of a high speed handpiece without irrigation [3]. In January 2003 a surgical procedure was carried out which consisted of excision of the labially discolored gingiva beyond the border of the discoloration and curettage of the osseous and connective tissues covering the roots of both teeth (Fig. 2). The gingival papillas between the upper, left, central and lateral incisors and between the central incisors and the left lateral incisor and canine were completely removed. Palatal discolored gingiva was kept intact (Fig. 3).

After removal of discolored gingiva root denudation was estimated at approximately 2.5-3.0 mm.

A subepithelial connective tissue graft was harvested from the palate in the region of the right premolars the size of the recipient site (Fig. 4). The graft was secured using non-absorbable sutures 7-0 (Fig. 5) and care was taken to achieve precise adherence to all margins of the surgical wound. This contact allowed for blood supply to the graft, which was not even partially covered by a gingival flap. The recipient site was covered by surgical cement for a period of 10 days. In the same way the palatal wound was provided.

Healing after 4 months revealed total incorporation of the graft, complete rekeratinization of the subepithelial connective tissue and achievement of ideal color match to the surrounding tissues (Fig. 6, 7). The reproduced gingiva healed with the partially left gingival papilla and palatal gingiva. Root denudation was completely covered with produced gingiva,

Figure 6. 4 months after the operation and changing the crowns



epithelial attachment was probably achieved as probing depth was 1.5 mm. This confirms Harris's reports about regeneration abilities of connective tissue grafts [4].

Discussion

All of the presented cases were caused by different factors and were also treated by different methods.

The first case [1] concerned an amalgam tattoo treated surgically with the use of a free gingival graft placed in the discolored site but results were unsatisfactory.

The second case [2] described a gingival pigmentation above the maxillary lateral incisor it was not certain whether it was gingival argyrosis or an amalgam tattoo. The patient was treated by a two-step surgical method with the use of a subepithelial connective tissue graft. The method was quite complicated but effective.

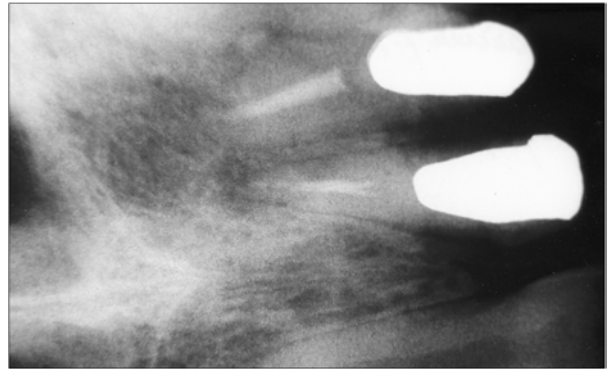
The third case [3] described gingival argyrosis treated with a subepithelial connective tissue graft without flap coverage. Treatment results were astoundingly effective.

The three presented surgical methods of treating gingival pigmentation show that the least effective seems to be the use of free gingival grafts harvested from the hard palate. These grafting procedures were described by Björn in 1963 [15], although there were earlier reports by Younger in 1902 and Hartland in 1906 [13]. These methods were recommended to manage tissues in case of discolorations [1,2]. However, from the esthetic point of view employment of these grafts in surgical procedures should be rejected, for the reason that color match to surrounding tissues is unsatisfactory [17] (Fig. 6).

Rusch-Behrend and Guttman [1] in their discussion of results of the first presented case mention the disadvantages of free gingival grafts. For the patient treated in their study other periodontal techniques – such as subepithelial connective tissue graft known in the 90s for its esthetic value – were considered inappropriate because of the size of the defect and of the wide dissemination of amalgam particles what could have detracted from the final result.

The use of subepithelial connective tissue grafts, harvested from the hard palate, to widen keratinized gingiva was described in 1971 by Karring and Ellegaard [cit. 16].

Figure 7. Silver cones in the root canals of both teeth



In 1980 Langer and Calagna [cit. 2] reported a technique using a subepithelial connective tissue graft to correct ridge deformities caused by extractions. According to these authors this type of graft should be provided with a dual blood supply, from the gingival flap and periosteum. All other authors employing connective tissue grafts are in agreement with this opinion [5,7,13,16-21]. Kissel and Hanratty [2] introduced a special method “supraperiosteal ridge replacement technique” to eliminate amalgam tattoo while maintaining ridge form. They introduced two surgical concepts:

1. replacement of connective tissue containing amalgam particles with subepithelial connective tissue graft eliminating most pigmentation and maintaining ridge form.
2. elimination of remaining epithelial pigmentation by excision of thin partial thickness flap allowing the graft to rekeratinize and achieve an esthetic result.

Results of the third case [3] treated with subepithelial connective tissue graft without flap coverage, are not consistent with other authors opinions concerning the need of dual blood supply to the graft. In this case the graft received blood supply only from gingiva surrounding the recipient site and remnants of periosteum and bone. The graft was placed in the recipient site where blood supply came only from the margins of the incised gingiva, the periosteum was removed as biopsy results showed that it contained silver particles. In these conditions for 2-3 days the graft was supplied only by plasmatic circulation [22]. Wilcko at al. [20] in similar cases suggest creating bone penetration to improve blood supply to the connective tissue graft from the bone.

Not all properties of connective tissue grafts have been recognized. Harris [4] emphasizes that these grafts have regenerative properties and can be used to increase the width of keratinized gingiva. Zabalagni at al. [21] emphasize that in the case of connective tissue grafts formation of periodontal attachment to root surface occurs but the formation mechanism is not well known. The authors of the third case [3] confirm this. In the carried out study as a consequence of gingival formation the periodontal sulcus depth was 1.0-1.5 mm while root denudation after excision of pigmented gingiva came to 2.5-3.0 mm.

Root coverage could take place primary directly following grafting or secondary with the participation of creeping attachment [21].

The final question needs answering: was there a need for a two-step surgery in the second case published by Kissel and Hanratty [2]? According to the authors this surgical procedure was necessary as coverage of connective tissue graft with a mucosal flap was not possible and only after healing-in of the connective tissue graft it was deprived of epithelial coverage.

In the third case, the epithelium was formed from the connective tissue flap or crept in from incision margins. According to Harris [4] a connective tissue graft has the ability to form epithelium. Therefore it can be certainly confirmed that in some cases the connective tissue graft can heal-in even with only a unilateral blood supply.

Another problem is the differential diagnosis of gingival discolorations.

Eversole [5] basing on Buchners and Hansens [6] study concerning 268 cases of amalgam tattoo confirms iatrogenic mechanism of forming of these discolorations caused by accidental implantation of amalgam particles in the mucosa during routine dental procedures such as preparation of teeth with amalgam fillings. Terheyden and Kern [7] warn against implantation of metal particles into the gingiva and formation of discolorations during preparation of titanic implants without irrigation.

Other cases presented in literature concern systemic argyrosis resulting from oral application of pharmaceuticals containing silver for a long period of time. Such a case was reported by Pardo et al. [8] and concerned a 45-year-old woman who received a pharmaceutical containing silver for a period of 25 months. This was followed by argyrosis of skin, nails, hair and mucosa. Another case of systemic argyrosis was described by Marshall and Schneider [9] and occurred as a result of 2½ year local application of silver nitrate in the oral cavity and resulted in discoloration of skin, stomach and duodenum. Haseth et al. [10] reported presence of silver selenide (Ag₂Se) concretions in the skin following several months of treatment of gingival erosions with silver nitrate. After a period of 11 years selenium was found in 4 cases of systemic and local argyrosis basing on results of radiographic microanalysis [11].

The problem arising in discussion as a result of the presented cases is differentiation of amalgam tattoo and gingival argyrosis. Differentiation of these changes was studied by Dominiak et al. [12] and resulted in the following conclusions: local argyrosis is only related with silver particles implanted in tissues or released during corrosion of silver while amalgam tattoo contains silver and particles of other metals such as: copper, mercury, tin, iron, selenium, molybdenum and sulphur [13]. Wu et al. [14] in 16 out of 24 examined discolorations found to contain amalgam remnants and only 8 contained other particles: Ag, Hg, Sn and Co. Harrison et al. and Wethers and Fince (cit. 13) basing on examinations in electron microscope and sample microanalysis found that in case of amalgam corrosion silver and tin are absorbed by macrophages and are surrounded by giant cells. Macrophages are migrating cell this could explain the spreading of tattoos. Silver also cumulates in basal membrane of epithelium, smooth muscles of blood vessels, fibroblasts, collagen, elastic tissue and fibers of Schwann's capsule [2]. Unknown is the length of time mercury remains in tissues and what role it can play. Unexplained is the role of electrogalvanic currents and

their influence on metal particles migration. According to Kissel and Hanratty [2] particles of silver remaining in tissues attract other silver particles causing enlargement of the tattoo.

Differential diagnosis of amalgam tattoo and gingival argyrosis has not been settled. There are differences in chemical composition of factors causing discoloration and divergent opinions concerning their migration in tissues but it is not resolved whether these findings have influence on treatment efficiency.

References

1. Rusch-Behrend GD, Guttman JL. Management of diffuse tissue argyria subsequent to endodontic therapy; report of a case. *Quintessence Int*, 1995; 26(8): 553-7.
2. Kissel SO, Hanratty JJ. Periodontal treatment of an amalgam tattoo. *Compend Contin Educ Dent*, 2002; 23(10): 930-96.
3. Jańczuk Z, Tołoczko-Grabarek A, Krężel G, Banach J. Srebrzyca dziąsła leczona przeszczepem łącznotkankowym. *Mag Stomat*, 2004; 2(147): XIV, 48-51.
4. Harris RJ. Histologic evaluation of connective tissue grafts in humans. *Int J Periodont Restorative Dent*, 2003; 23: 575-93.
5. Eversole LR. Pigmented lesion of the oral mucosa. In: *Burkett's Oral Medicine*, B.C. Decker Inc., 2003.
6. Buchner A, Hansen IS. Amalgam pigmentation (amalgam tattoo) of oral mucosa. A clinico-pathologic study of 268 cases. *Oral Surg Oral Med Oral Pathol*, 1980; 49: 139.
7. Terheyden H, Kern M. Resective Therapie der Periimplantitis in Kombination mit Implantatglättung und Schaffung befestigter Gingiva-Falldarstellung. *Parodontologie*, 2005; 3: 269-77.
8. Pardo-Peret P, Sans-Sabafén J, Boledó-Relats M. Argirosis. Description de un caso. *Medicine clinica*, 1979; 73(9): 386-8.
9. Marshall JP, Schneider RP. Systemic argyria secondary to topical silver nitrate. *Arch Dermatol*, 1977; 113(8): 1077-9.
10. Aaseth J, et al. Argiria-tissue deposition of silver as selenide. *Scand J Clin Lab Invest*, 1981; 41(3): 247-51.
11. Matsumario T, et al. Detection of selenium in generalized and localized argyria: report of four cases with X-y microanalysis. *Jour of Dermatol*, 1992; 19(2): 87-93.
12. Dominiak M, et al. Przebarwienia amalgamatowe błony śluzowej jamy ustnej – przegląd piśmiennictwa. *Stomatol Współczesna*, 2004; 6: 32-7.
13. Mauer S, Leone CW. Use of serially layered, double connective tissue graft approach to enhance maxillary interior esthetics. *Int Jour of Periodont and Rest Dent*, 2001; 21(5): 497-503.
14. Wu Q, Yang Z, Su L. Light microscope and energy dispersive X-ray analysis of amalgam pigmentation. *Chinese Jour of Stomat*, 1995; 30(3): 140-2.
15. Björn H. Free transplantation of gingival propria. *Odontol Revy*, 1963; 14: 323.
16. Allen EP, Schmideder J. Aesthetic periodontal surgery in color atlas of dental medicine, Aesthetic Dentistry, J. Schmideder. Thieme. Stuttgart – New York 2000.
17. Jańczuk Z, Banach J, Syryńska M. Wolne przeszczepy dziąsłowe w opinii operowanych pacjentów i operujących lekarzy. *Czas Stomat, Parodontologia*, 1983; 36(1): 65-70.
18. Harris RJ. Connective tissue grafts combined with either double pedicle grafts or coronally positioned pedicle grafts: results of 266 consecutively treated defects in 200 patients. *Int Jour of Periodontics and Rest Dent*, 2002; 5: 463-71.
19. Harris RJ. Erfolgreiche Wurzeldeckung: Histologischer Fallbericht am Menschen. *Int Jour für Parodontol and Rest, Zahnhlk*, 1999; 5: 425-33.
20. Wilcko MT, et al. Full thickness flap/subepithelial connective tissue grafting with intramarrow penetrations: three cases reports of lingual root coverage. *Int Jour of Period Restorative Dent*, 2005; 25: 561-9.
21. Zahalegni J, et al. Treatment of multiple adjacent gingival recessions with the tunnel subepithelial connective tissue graft: a clinical report. *Int J Periodont Restorative Dent*, 1999; 19: 199-206.
22. Sullivan HC, Atkins JH. Free autogenous gingival grafts. Utilization of grafts in the treatment of gingival recession. *Periodontics*, 1968; 6(4): 152-60.