Cyst Formation After Subepithelial Connective Tissue Grafting: Management And Review.

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Abstract

Lesion formation after soft tissue gingival grafting is a rare but challenging clinical scenario to manage. This report presents a unique case of cyst formation after connective tissue grafting. All previously reported cases are confined to the mandibular labial lateral-canine space, and the present case is the first found in the maxilla. These cysts manifest clinically 9 months to one and a half years after grafting and may communicate with the surface, as evidenced by sinus tract or cystic discharge. Because of the unique nature of these lesions with respect to clinical history, appearance, symptoms, and location, the differential diagnosis should be limited. The authors’ treatment recommendation is
complete surgical excision which should eliminate the risk of recurrence. This report presents a novel case and reviews the literature to discuss etiology and provide treatment recommendations.

Introduction

A rare and confounding complication after root coverage grafting is cyst formation. This report reviews the existing literature, provides a case with novel location and histologic findings, and gives recommendations for management and treatment.

Four identified case reports exist illustrating post-operative clinically evident cyst formation at the site of autogenous soft-tissue grafting, all in the mandibular labial lateral-canine site. Breault et al. first described this phenomenon in 1997 and proposed the description of “surgical cyst” as appropriate for the lesion(1). Their theory suggested that cyst formation occurs due to the inclusion of transplanted epithelium with the subepithelial connective tissue graft (CTG). In this case and the others, clinically appreciable swelling occurred at or near the grafted site, which required subsequent surgical removal and histologic interpretation. Two cases reported post-operative swelling with verified cyst formation after CTG procedures(1, 2), whereas one suggested (unverified) cyst formation after initial healing and post-operative de-epithelialization(3). A single report found cyst formation after free-gingival grafting (FGG)(4).

In all cases, the clinical finding of swelling was incidental during recall therapy or was self-reported with a chief complaint of a gingival mass. No other symptoms were reported. For the three reports verifying cyst formation, excisional biopsy showed a keratinized stratified squamous epithelium lining histologically consistent with origin from the palatal masticatory mucosa (Table 1).

Despite the existence of these case reports, differential diagnosis and treatment planning can be difficult.
Case Review

A healthy 38 year-old white female was referred to the graduate periodontics clinic at the Medical University of South Carolina diagnosed with localized gingivitis and acquired mucogingival defects in the form of 3-4 mm of gingival recession at teeth 10 and 11 respectively (Miller Class I at #10 and II at #11) (Figure 1.a). The etiology was identified as related to trauma from toothbrush abrasion and flossing, and due to tooth position relative to the alveolar bone. The defects were treated with a tunneled CTG procedure in conjunction with appropriate behavioral modification (Figure 1.b). The graft was harvested from a single palatal incision, and healing was uneventful. Nearly 100% defect coverage was observed at the 4-week post-operative timepoint, and the graft was perceived in position extending beyond the superficial mucogingival junction (Figure 1.c). Written consent was obtained for all treatment and for collection of information for case reporting.

Nine months after the grafting procedure, the patient reported intermittent swelling and drainage in the area of teeth #10 and #11, prompting referral to endodontics. Labial vestibular swelling extended from the interproximal area between teeth #9 and #10 to the distal of #11, along with a sinus tract at the mesial extent of the swelling (distal of 9 near the mucogingival junction). Tracing of the tract with a half gutta-percha cone showed termination around the root of tooth #10 (Figure 2.a). Endodontic testing and evaluation with computed tomography (CBCT) were inconclusive. Tooth #11 had previous root canal therapy (RCT) with small radiographic voids in the RCT fill, and tooth #10 tested vital. The CBCT showed no periapical radiolucency or widening, nor communication through the labial cortical bone (Figure 2.b,c). In addition, the patient also reported occasional sensations of swelling and pressure on the facial and palatal of #11, even prior the CTG procedure, which challenged the differential diagnosis. To rule out endodontic origin, the access to #11 was opened and gutta-percha staining was observed along with retained cotton fibers in the canal orifice, leading to retreatment of root canal #11.
The sinus tract closed spontaneously, but the patient continued to experience swelling. She was referred again to periodontics for evaluation, at this point 12 months after grafting. A firm, pink raised 12mm hemispherical submucosal mass was present at the labial mucosa between teeth 10 and 11 (Figure 3.a). The differential diagnosis at this time was a soft-tissue lesion of non-endodontic origin, related to the previous CTG. The patient consented for biopsy, and a labial sulcular incision was made from the distal of #9 to the distal of #11. Upon full-thickness flap reflection, a creamy pale-white fluid was released resulting in deflation of the mass. No significant findings were made while inspecting the alveolar bone, confirming the previous CBCT findings. The submucosal area of the flap was curetted but insufficient sample was obtained for submission for pathology; clinically it was impossible to differentiate between what may have been cystic epithelium and the surrounding connective tissues. The flap was replaced, and healing was uneventful although the patient continued to report occasional swelling.

At post-grafting month 20, the swelling had completely returned (Figure 3.b) and an excisional biopsy was performed. Sulcular incisions were made on the labial from the distal of tooth #9 to the distal of #11 with vertical releasing incisions beyond the mucogingival junctions made at the terminal ends of the flap for access, and to avoid exposure of her existing implant #12. A full thickness mucoperiosteal flap was carefully reflected, confirming the complete intact mass contained within the flap. Split thickness dissection was performed between the mass and overlying epithelium (Figure 4.a). The clinical impression was that of a pale yellow-white cystic mass surrounded by fibrous connective tissue. The mass was delivered intact, and the surface of the alveolar bone and the connective tissue side of the overlying flap were carefully examined and curetted to remove any remaining cystic tissue to limit the chance of recurrence. The flap was coronally advanced to try to gain additional root coverage (Figure 4.b). To date there is no evidence of recurrence at eight months post excisional biopsy (Figure 4c).
Microscopic examination showed a cyst lined primarily by parakeratinized stratified squamous epithelium of variable thickness (Figure 5 a, b). Focal transition to ciliated columnar cells was noted (Figure 5b). The cyst wall was composed of fibrous connective tissue with a chronic inflammatory cell infiltrate. Features suggestive of a developmental odontogenic cyst (e.g., gingival cyst of the adult; odontogenic keratocyst) were not observed. Based on the clinical history, the microscopic findings were thought to be consistent with an epithelial inclusion cyst related to the previous grafting procedure.

Discussion

The histopathologic findings from our case and the previously reported examples imply that these cysts are derived either from the transplanted palatal tissues or from downgrowth of the native flap gingival/mucosal epithelium at the recipient sites. Unless a collar of the CTG is intentionally left epithelialized and left exposed surgically, it is considered mandatory to remove any remaining epithelium from the graft prior to implantation. However, even when epithelial removal is performed, up to 80% of harvested CTGs maintain residual epithelium(5). In an evaluation of CTG biopsy specimens, 2 of the 16 samples showed epithelial inclusions in the connective tissue, with one showing a solid cystic cavity with a stratified squamous epithelial lining (6). Therefore, it seems likely that the clinical cases (Table 1), could result from these epithelial inclusions. However, it is also possible that the epithelium could derive from the overlying flap with the observed cystic phenotype induced by the transplanted connective tissue(7). Therefore, we are not sure whether the description should be of a “surgical” cyst in which the cyst is a result of healing in-situ; or “inclusion” cyst in which the cystic epithelium is transplanted with the graft. In the case observed by Wei et al., it is possible that the “cul-de-sac” lesion resulted from direct epithelial ingrowth and invagination as the lesion arose after the post-operative de-epithelialization(3). Given the variety of potential surgical methods for grafting and flap positioning, there is sufficient opportunity for epithelial downgrowth due to incision lines, flap
margins, and graft exposure. In 3 of the previous cases and in ours, superficial drainage was observed, and in a single report it wasn’t mentioned. The observed drainage may reinforce the concept of epithelial downgrowth, or suggest the cysts extend peripherally resulting in forced external communication. Gordon et al. observed epithelial downgrowth via histology in one of their five FGG cases and suggested the possibility for cyst formation(8). Ouhayoun observed similar inclusions to be prevalent in post-CTG biopsy specimens taken 6 and 12 months post-operatively, with epithelial projections forming microscopic cyst-like spaces at the junction of the graft and the overlying flap. However, there were no communications to the overlying anatomic surface(9).

Of the existing published cases, all arose in the mandibular labial lateral/canine space. The homogeneity of these cases led Wei et al. to speculate that the location and presentation are consistent enough with the gingival cyst of the adult to suggest a common etiology, in that the grafting surgery provides a stimulus for the transformation of the dental lamina into a cystic lesion(3). However, even though origin from dental lamina rests cannot be entirely excluded, we believe that these post-surgical cysts should not be confused with the gingival cyst of the adult(10). The gingival cyst of the adult is a developmental lesion that shows a characteristic thin flattened epithelial lining, often with elevated nodular plaques composed of cells with a clear cytoplasm(11, 12). This microscopic pattern is completely different from the thicker lining observed in these cysts. Likewise, although these post-CTG cysts can show keratinizing features, the histopathologic pattern is entirely different from the odontogenic keratocyst, which rarely develops in gingival soft tissues(13). Because of the anatomic location of our case, a developmental nasolabial cyst might be suggested in the differential diagnosis. However, the lesion was not located as high in the labial vestibule as would be expected for a nasolabial cyst, plus the clinical history of surgical grafting at this specific site strongly supported the post-surgical etiology.

Ours is the first CTG-related cyst case found outside the anterior mandible, although it also occurred in the lateral/canine space. The previous cases visually involved the gingiva, whereas ours
seemed primarily submucosal and separate from the gingiva and was subjectively much larger. This could be a consequence of the extent of the surgical graft site. Histologically, in addition to the observed stratified squamous epithelial lining, we found focal ciliated columnar cells. We theorize this represents isolated respiratory metaplasia of the epithelial lining, although the impetus is unknown. Post-operative surgical ciliated cysts, which sometimes may mimic radicular or residual cysts, are well-known to exhibit a respiratory epithelial lining because the source of the implanted epithelium is from the sinonasal mucosa (14). However, in these post-CTG cysts, we have no reason to assume the graft included any tissue from the sinus mucosa. In addition, because the graft was taken from the palate, which contains minor salivary glands, one might speculate that the focal ciliated columnar epithelium could have been derived from remnants of salivary ductal cells.

The initial differential diagnosis was confounded by multiple factors. Once we ruled out endodontic origin, we suspected the CTG to be the source and provided appropriate treatment. In the other cases, surgical excision with the superficial epithelium was performed, as recommended for treatment of a true gingival cyst of the adult(11). If there were an active superficial communication, we would have included the surface. Due to the seeming lack of direct gingival involvement, and due to the risks, we dissected the lesion subepithelially, and to date (currently 12 months post-removal) we see no signs or symptoms of recurrence.

Conclusions

Although the sample of documented cases is small, we suggest the following conclusions relating to the management of post-grafting cyst formation: First, the epithelial origin of these lesions remains uncertain; average time from grafting to clinical identification is approximately 9 months to 2 years; all but one case reported superficial communication with the expression of pale viscous fluid upon palpation; and recurrence does not seem to be a risk with adequate excision and enucleation of the cystic lesion. We speculate that the surgical technique at the time of grafting plays little or no role in
the risk of cyst formation; therefore, the very low risk of cyst formation should not affect surgical planning. However, in the lateral/canine space, the epithelial “surgical” or “inclusion” cyst should be part of the differential diagnosis if the clinical signs are similar to those reviewed and presented in this report.

Acknowledgments

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References


Figure Legends:

Figure 1: A: Pre-operative photograph of recession teeth 10 and 11. B: Immediate post-operative photograph with tunnelled CTG in position. C: 4-week post-operative photograph with subepithelial graft visible beyond the superficial mucogingival junction.

Figure 2: Radiographic evaluation. A: Periapical radiograph with gutta-percha tracing of the clinical sinus tract (arrow indicating tracing). B: Volumetric CBCT rendering of the hard tissue labial surface. C: CBCT panoramic curve cross sectional view of tooth #10 perpendicular. D cross sectional view parallel.
Figure 3: Post-operative photograph of the clinical swelling of the grafted site after CTG at A: 12 months, B: 20 Months

Figure 4: Surgical treatment. A: Visual appearance of mass during sharp excisional dissection. B: Mass removed and flap readapted and sutured. C: 6 months following lesion excision.

Figure 5: A: Low-power photomicrograph showing a cystic cavity lined by stratified squamous epithelium. B: High-power photomicrograph showing an isolated zone of cilia on the epithelial surface.
<table>
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<tr>
<th>Citation</th>
<th>Treatment</th>
<th>Sex</th>
<th>Age</th>
<th>Site</th>
<th>Histologic Findings of Cyst</th>
<th>Post-op time to clinical identification (Months)</th>
<th>Surface communication and discharge</th>
<th>Treatment</th>
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<td>Breault, J Perio 1997</td>
<td>CTG</td>
<td>M</td>
<td>76</td>
<td>Mandibular lateral/canine</td>
<td>Stratified squamous epithelial lining with hyperplasia and focal inflammation</td>
<td>15</td>
<td>No</td>
<td>Excisional biopsy, no regrafting.</td>
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<td>Harris, J Perio 2002</td>
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<td>F</td>
<td>27</td>
<td>Mandibular lateral/canine</td>
<td>Parakeratinized, stratified squamous epithelium lining with hyperplasia</td>
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<td>Yes</td>
<td>Excisional punch biopsy with gingivoplasty. No regrafting.</td>
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<td>Yes</td>
<td>Superficial excisional “stripping” to periosteum and regrafting.</td>
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<td>de Castro IJPRD, 2007</td>
<td>FGG</td>
<td>F</td>
<td>22</td>
<td>Mandibular lateral/canine</td>
<td>Orthokeratinized stratified squamous epithelial lining with hyperplasia</td>
<td>11</td>
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<td>Current case</td>
<td>CTG</td>
<td>F</td>
<td>38</td>
<td>Maxillary lateral/canine</td>
<td>Parakeratinized, stratified squamous epithelium and ciliated columnar lining</td>
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