Use of Emdogain® in the Management of a Lateral Periodontal Cyst: A Clinical Report

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This clinical report presents a case of a lateral periodontal cyst of odontogenic rather than inflammatory origin, and illustrates its successful management using Emdogain® as a means of regenerating a viable periodontal attachment prior to osseous infill of the resulting cyst cavity. Lateral periodontal cysts are relatively rare, slow-growing developmental cysts, typically associated with vital teeth. Management usually involves enucleation and bone-cavity healing by secondary intention, but care must be taken during surgery to avoid root surface damage and subsequent root resorption. The presented case illustrates the diagnostic pathway for lateral periodontal cysts and the radiological and clinical outcomes following the use of Emdogain® to encourage periodontal regeneration. A careful step-wise approach is needed to enable accurate diagnosis and to facilitate surgical treatment planning.

Key words: botryoid cyst, developmental cyst, Emdogain®, lateral periodontal cyst, regenerative surgery

INTRODUCTION

The lateral periodontal cyst (LPC) is a rare, slow-growing developmental cyst of odontogenic origin and accounts for 0.8% of all odontogenic cysts (Altini and Shear, 1992). Clinically, LPCs are usually asymptomatic, are frequently an incidental radiographic finding, and are always associated with vital teeth. In some cases, a bluish swelling may be seen on the labial surface of the gingivae due to thinning of the outer cortical plate following cyst growth. They have a predisposition for the mandibular canine and premolar region (Suljak et al, 1998). Some studies report only a slight male predilection (Fantasia, 1979; Angelopoulou and Angelopoulos, 1990; Altini and Shear, 1992), whilst others show a definite predominance in males (Wysocki et al, 1980; Rasmusson et al, 1991). The age of occurrence varies between 26 and 77 with a mean age of 55 years (Rasmusson et al, 1991).

The LPC is usually an incidental finding on routine radiological examination. It presents as a well-circumscribed, corticated radiolucency in close proximity to the lateral aspect of the root surface (Altini and Shear, 1992). It is round or tear-drop shaped, frequently bordered by an area of sclerotic bone (Cohen et al, 1984). Root resorption arises occasionally (Lindh and Larsson, 1990).

Histologically, LPCs have a non-keratinised and thin epithelial lining that varies from 1–3 cell layers in thickness. Interspersed within the lining are also clear cells containing glycogen. Close to the cyst wall, rest cells of the dental lamina are frequently observed, which appear as islands of squamous or clear cells (Cohen et al, 1984). Less commonly, the LPC may be polycystic in morphology, and is recog-

nised radiographically as a 'botryoid' odontogenic cyst (botryoid meaning 'bunch of grapes'). Histological examination is essential following enucleation, to exclude the possibility of odontogenic keratocysts, which may present in a similar manner radiographically, but have a greater propensity to recur.

Cyst enucleation is the treatment of choice for a LPC, followed by radiographic monitoring of the site for several years (Eliasson et al, 1989). Enucleation must be conducted carefully so as to avoid damaging the adjacent root surface structure. Recurrence is rare but has been well reported in cases of its variant, the botryoid odontogenic cyst (Greer and Johnson, 1988; Phelan et al, 1988; Heikinheimo, 1989).

Emdogain® is an enamel-matrix derivative used to enhance periodontal regeneration. The term regeneration suggests restoration of the integrity and function of destroyed tissues with tissues that replicate those lost in structure and function. Enamel-matrix proteins that form the basis of Emdogain® have been extracted from developing embryonal enamel of porcine origin (Heijl et al, 1997). Emdogain® provides a protein-rich matrix, which induces differentiation and cellular proliferation of the adjacent tissues. This ultimately leads to tissue regeneration and, in turn, a new attachment (Haase and Bartold, 2001). It has been hypothesised that the amelogenins within Emdogain® stimulate the recapitulation of embryonic development by inducing new acellular cementum to form on the root surface to which they are applied. This subsequently leads to formation of alveolar bone and a new periodontal ligament attachment. Emdogain® has also been shown to inhibit downward growth of epithelium (Gestrelius et al, 1997), thereby preventing long junctional epithelium formation and allowing a new connective tissue attachment to form.

Emdogain® has been extensively used alongside modified Widman flap surgery in the treatment of infrabony periodontal defects, and furcation and recession defects. Recently, it has been used in re-implanted traumatically avulsed teeth or re-implanted ankylotic teeth (Hamamoto et al, 2005). Results of Emdogain® therapy so far have been contradictory (Filippi et al, 2001, 2002; Schjøtt and Andreason, 2005). A recently published Cochrane review (Esposito et al, 2005) looked at the effectiveness of Emdogain® and also compared it to guided tissue regeneration (GTR) and various bone-grafting procedures. The authors concluded that after one year there was a significant increase in periodontal attachment levels (1.2 mm) and a significant reduction in probing pocket depth (0.8 mm), but the overall treatment effect may be overestimated. The actual clinical advantages of Emdogain® over membrane GTR are still unknown as no major differences were found in treatment outcomes. One of the main advantages of Emdogain® is its simplicity and speed of application, which do not add significantly to the length of a procedure.

There are various techniques available to repair or regenerate bone defects that remain following cyst enucleation, including:

- closure without adjunctive therapy;
- use of GTR membranes;
- use of de-calcified freeze-dried bone (Lehrhaupt et al, 1997);
- use of autogenous bone;
- cavity infill with bioceramic materials;
- various combinations of the above.

The aim of this paper is to present a report of a LPC, which following enucleation of the lesion was treated using Emdogain®, with the aim of instigating periodontal regeneration coincident with cyst cavity osseous healing.

CASE REPORT

Presentation

A 56-year-old, non-smoking, male patient in good general health was referred to the Department of Periodontology at Birmingham Dental Hospital following radiographic observation of a radiolucency on the lateral aspect of the 45 root.

The initial complaint was of a poorly localised, dull ache from the teeth in the lower right quadrant, which prompted further investigation of these teeth. Extra-oral examination was unremarkable. Intra-oral examination showed a degree of marginal gingival inflammation although periodontal probing revealed pocket depths of only 4 mm or below. Soft tissue assessment showed no other abnormalities. The teeth were not mobile and were not tender to percussion. A porcelain-fused-to-metal crown with a pinned core was present on 45 and large amalgam restorations within 44, 46 and 47 were also evident.

Additional investigations included vitality testing and long cone periapical radiographs. Radio-

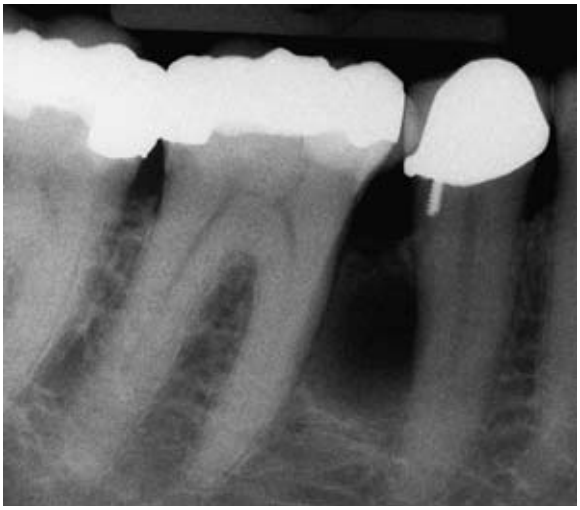

Fig 1 Radiograph of lesion at presentation, demonstrating well-circumscribed radiolucency distal to the 45 root at the mid-third.

Fig 2 Initial healing 6 months post-surgery, demonstrating a ligament space at the mid-third of the root, early lamina dura formation and early bony infill of the cyst cavity.

graphic examination showed a large, round radiolucent area on the distal root surface of 45 (Fig 1). The 44, 46 and 47 teeth responded normally to vitality testing using an electrical pulp tester (Analytical Technology, Redmond, USA). Testing of 45 proved to be more difficult due to the crown restoration, hence a small test cavity was prepared. The tooth gave a positive response and was considered vital. Arrangements were made for exploratory flap surgery under local anaesthesia of 45.

Surgical procedure

Under local anaesthesia, full thickness buccal and lingual mucoperiosteal flaps were raised in the 45, 46 region. The buccal plate of bone distal to 45 appeared to be thin but intact and a 'purple tinge' was noted beneath. Buccal bone was removed carefully using a curette (Gracey curette, LM Dental, Finland – supplied by JS Davis, UK), revealing a cyst beneath. The lesion was enucleated and sent for histopathological diagnosis. There appeared to be a communication between the cyst cavity and the crestal bone coronally. Careful examination of the root surfaces of 45 and 46 was carried out with the aid of a surgical microscope (Global Surgical Corporation, St Louis, USA), but no cracks or perforations were seen affecting either root surface.

The bony cavity and root surfaces underwent thorough debridement (Cavitron, Dentsply, UK, slimline insert nos. FSI-SLI-10S/10R/10L; and Gracey area-specific curettes, LM-Dental). The exposed root surfaces were rinsed with sterile saline and conditioned with Prefgel™ in accordance with manufacturer's instructions, to remove the smear layer and to selectively expose the collagen fibres of the root dentine. Following thorough rinsing with sterile saline, Emdogain® gel was applied to cover the exposed root surfaces. This material was applied to help prevent down-growth of the long junctional epithelium through the crestal bone communication identified at the time of surgery. The flap was repositioned and sutured with 3.0 black silk sutures.

Post-surgical care and results

The patient was asked not to brush the operative area for 1 week post-surgery and instructed to use 0.2% chlorhexidine gluconate, twice daily. Sutures were removed 7 days post-operatively and soft tissue healing occurred uneventfully. The histopathological report confirmed the presence of a fibrous cyst wall containing a very mild lymphoplasmacytic infiltrate and lined in places by thin non-keratinised stratified squamous epithelium. There was extensive hyalinisation.

A radiograph taken 6 months post-surgery (Fig 2) demonstrated initial bony infill, and the 12-month post-operative radiograph (Fig 3) showed complete resolution of the cystic cavity with good bony infill. The core and crown restoration were subsequently replaced and the area has remained asymptomatic.

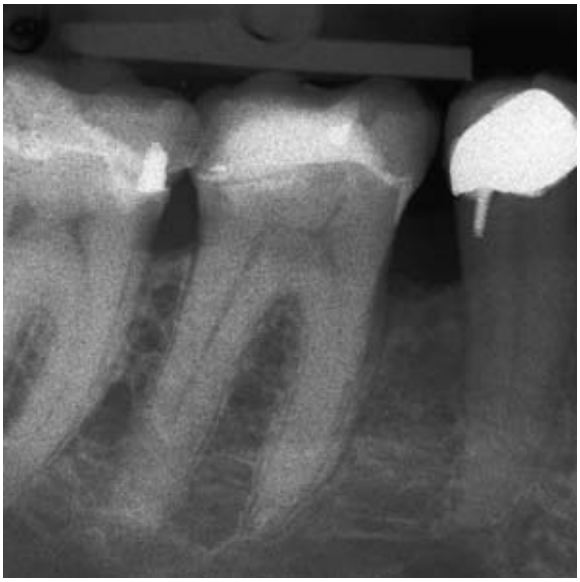

Fig 3 12 months post-surgery, illustrating complete healing of cyst cavity and further coronal bone formation in the 45, 46 interdental region.

Fig 4 24 months post-surgery. The coronal lamina dura has reformed. This view was taken chair-side and not using a paralleling technique, so a double image of the interdental crest is evident (45, 46).

DISCUSSION

The WHO classification of cysts (Kramer et al, 1992) classifies epithelial-lined cysts broadly as being of developmental or inflammatory origin. The pathogenesis of the LPC is not completely understood. Although the cyst's epithelial lining is probably derived from dental lamina (Shear and Pindborg, 1975; Wysocki et al, 1980), it has been suggested that it originates from reduced enamel epithelium (Shear and Pindborg, 1975; Altini and Shear, 1992) or from rests of Malassez (Shear and Pindborg, 1975; Gurol et al, 1995). It was noted that the majority of LPCs arise on the buccal aspect of the alveolus; this distribution would be consistent with the rests of the dental lamina and not with the rests of Malassez, which are more plentiful in a periapical locus (Wysocki et al, 1980).

It is important when attempting to formulate a diagnosis for a dental cyst, to piece all the clinical and radiological information together, and to consider this with the histopathological features to attain a definitive diagnosis. In this case, the typical features of a LPC were displayed: it presented in a 56-year-old male, in the mandibular premolar region. It was not considered to be a botryoid cyst, but a LPC as the lesion was radiographically and surgically unilocular. Due to the heavily restored nature of the 45 tooth with a large pinned core and crown, it was important to consider an inflammatory origin for the cyst and therefore to test the vitality of the tooth. The radicular cyst of inflammatory origin is the most common cyst of the jaws, but establishing the vitality of the relevant tooth is essential to confirm or refute such a diagnosis prior to considering endodontic treatment.

The use of Emdogain® following enucleation of the cyst has produced a very good end-result, both clinically and radiographically. The reason for the use of Emdogain® in this case was to help prevent the down-growth of the long junctional epithelium through the alveolar crest communication and to encourage periodontal regeneration prior to organisation and ossification of the blood clot within the cyst cavity.

This report has illustrated a successful outcome to cyst enucleation using Emdogain® to try to create a viable new periodontal attachment to the bone that formed within the cyst cavity. It is, however, important to recognise that similar healing may well have taken place, even if Emdogain® had not been employed. However, the risks of not using a regenerative approach need to be balanced against the cost–benefit ratio for the surgery and the patient. A

careful step-wise approach is needed with cyst-like lesions or radiolucencies to determine whether they are of inflammatory or odontogenic origin, prior to any surgical planning.

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