

IN BRIEF

- Deep traumatic overbite may be associated with lateral periodontal lesions.
- Physical impaction of debris or plaque into the periodontal pocket aggravated by deep traumatic overbite may lead to formation of bony defects.
- Treatment of these lesions should address the deep traumatic overbite as well as the periodontal element.
- Deep traumatic overbite is detailed in Akerly's classification.

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CPD PAPER

Periodontal lesions associated with deep traumatic overbite

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Certain aspects of malocclusion, particularly deep overbite, can be related to periodontal pathology, especially in the presence of poor oral hygiene. The authors have noted an association between deep overbite and unusual periodontal lesions. These lesions often appear on radiographs as circumscribed radiolucencies, remote from the alveolar crest and sometimes close to the apex. Gingival surface injury and food impaction may be important aetiological factors. This is illustrated in this article by a number of case studies.

INTRODUCTION

It is believed that destructive periodontal lesions similar to chronic periodontal abscesses may result from trauma to the periodontal tissues already affected by chronic inflammatory periodontal disease, resulting in extension of the infection. Clinical symptoms usually include pain, swelling of the gingiva, erythema and discharge through a fistula or through the pocket orifice.

Non-periodontitis related lesions may occur in the absence of chronic inflammatory periodontal disease due to impaction of a foreign body or food particles into the periodontal pocket or gingival sulcus, leading to inflammation. This impaction may be caused acutely by inappropriate use of oral hygiene devices such as toothbrushes or tooth picks,^{1,2} or more chronically by the opposing dentition as in the case of deep traumatic overbite.

Deep traumatic overbite is mostly associated with a class II incisor relationship (either division i or ii), usually with an associated skeletal class II component.

This manifests as trauma to the palatal gingiva behind the upper incisors or the labial gingiva of the lower incisors (gum stripping). Deep traumatic overbite is detailed in Akerly's classification³ which is summarised below.

Akerly I

The skeletal base for this overbite is class II and the incisal relationship is Angle's class II div. i; this causes the lower incisors to push against the palatal mucosa and manifests as mucosal trauma of the palate away from the palatal gingival margins of the upper incisors.

Akerly II

The skeletal base is class I or II and the incisor relationship is Angle's class II div. i or ii; this overbite causes trauma to the palatal gingival margin of the upper incisors. It is this relationship that has been implicated in impacting food or foreign bodies into the gingival crevice of the upper incisors.

Akerly III

The skeletal base is class II and the incisor relationship is Angle's class II div. ii. This causes the upper and lower incisors to

shear past each other in contact leading to stripping of the lower labial gingiva and the upper palatal gingiva surrounding the incisor teeth. This can also lead to food impaction into the gingival crevices.

Akerly IV

The skeletal base for this overbite is class I or II and the incisor relationship is Angle's class I or class II div. i. There are often wear facets on the palatal aspects of the upper incisors and wear may also affect the labial aspect of the lower incisors. This may be due to loss of posterior support, displacement of the mandible and/or a parafunctional habit.

The occlusal trauma which is described in this paper is 'gingival surface injury', caused by the direct impingement of a tooth on the gingival margin and periodontal tissues of an opposing tooth, and as such is different to 'trauma from occlusion' mentioned in the literature. The latter type of occlusal trauma has been defined by the American Academy of Periodontology as '*An injury to the attachment apparatus as a result of excessive occlusal force*'. The manner in which the roots are orientated in relation to the forces to which they are exposed may have an effect on the periodontal health of these teeth. Axially inclined forces are better tolerated than non-axially inclined forces; when teeth are

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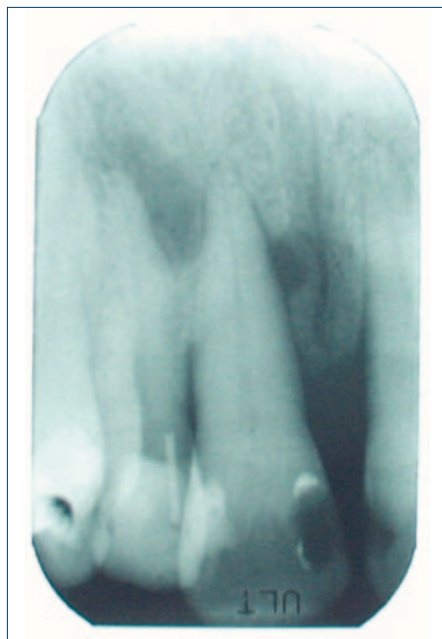


Fig. 1 Case 1, anterior bone loss



Fig. 2 Case 2, showing a deep infra-bony defect

badly aligned the effect of excessive forces can be exaggerated.^{4,5}

Experimental data suggest that malocclusion alone does not cause periodontal problems. However, some authors have found a correlation between periodontal disease and malocclusion^{6,7} while others failed to show a relationship.^{8,9}

A recent study has indicated that occlusal trauma may play a significant role in the progression of periodontal disease in humans.¹⁰

The effect of trauma from a deep overbite has been mentioned scarcely in the literature. Deep traumatic overbite can lead to enhanced levels of inflammation and periodontal deterioration in the presence of plaque.⁵ Individuals with a high overbite to overjet ratio were reported to have a more favourable periodontal condition than those with lower ratios.¹¹

The authors suggest that in certain deep overbite cases, physical impaction of food debris or plaque into the periodontal pocket aggravated by the contact of opposing teeth with the gingival margin in a class II Akerly relationship may lead to the formation of apparent 'lateral periodontal abscesses' or bony defects. These changes were noted on radiographs and in some cases clinically as sinuses on the labial gingiva which could be deemed erroneously to be suggestive of periradicular pathology of endodontic origin, in situations where the teeth were found to be vital. Radiographically, this is associated with the appearance of very discrete and specific lateral periradicular radiolucencies.

The need to recognise the potential for a deep traumatic occlusion to precipitate this unusual clinical and radiographic appearance is highlighted.

CASE REPORTS

Case 1

A 54-year-old female patient was initially referred to a dental teaching hospital with regard to a recurring sinus associated with 11 and 21, in addition to looseness and labial drifting of these teeth; she was also aware of bleeding on brushing.

Clinical examination showed a poor level of oral hygiene, bleeding on probing and 6 mm pocketing on 11 and 21; otherwise pocketing was less than 4 mm.

There was evidence of recession and a degree of root surface loss associated with the deep traumatic overbite on the palatal aspect of 11 and 21. The patient was aware of regular bouts of trauma to this area. She had a class II division i occlusal relationship with reduced posterior support.

As seen from the radiographs (Fig. 1), there was 20–30% of bone loss in this area and apical pathology on tooth 12. Radiographic evidence of a lateral radiolucency related to tooth 11 was noted; this was consistent with an apparent sinus tract passing mesially around the root of the tooth to discharge labially, probably arising from the deep traumatic overbite.

The patient had tooth 12 root treated. Tooth 11 underwent non-surgical management in the first instance. A replaced flap procedure around 11 and 21 was carried out subsequently.

Partial upper and lower dentures combined with milled crowns on strategic teeth to increase vertical dimension were used, providing stable occlusal/incisal contacts and reducing the extent of the deep traumatic overbite. Regular hygiene visits were maintained with noticeable improvement in the oral hygiene and resolution of the periodontal pocket associated with 11 and healing of the labial sinus.

Case 2

A 50-year-old female patient was originally referred to a dental teaching hospital regarding gingival recession labial to the upper incisors. Examination revealed a complete anterior overbite with associated gingival trauma palatal to the upper incisors. 11 was post-crowned and root filled.

The oral hygiene was fair with localised plaque deposits and generalised pocketing of 2–3 mm. However, a 7 mm pocket was noted disto-palatal to 11 and a 4 mm pocket mesial to 21. Gingival recession of 3 mm was noted on the palatal aspect of 11. This was associated with a deep traumatic overbite and lack of posterior support.

As seen from the radiograph (Fig. 2) a deep infra-bony defect was noted mesial to 11. A differential diagnosis of root fracture, root perforation or of a lateral periodontal abscess was reached.

The patient had three visits for root planing of 11 and 21 under local anaesthesia and oral hygiene instruction by a hygienist.

The lesion associated with 11 responded well to non-surgical periodontal management and provision of partial upper and lower dentures, with reduction of the pocket depth. The partial upper denture included an anterior bite plane to increase the face height and to reduce depth of the overbite and the adverse effect on the periodontium.



Fig. 3 Case 3, showing a lateral radiolucency

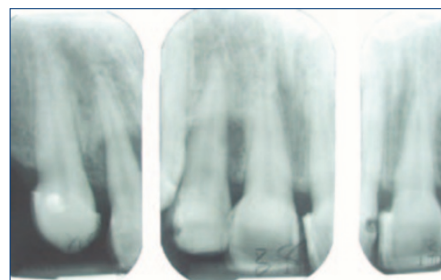


Fig. 4 Case 4, showing lateral radiolucency



Fig. 5 Case 5, buccal view



Fig. 6 Case 5, palatal view

Case 3

A 42-year-old female patient presented to a dental teaching hospital complaining of pain related to 13 which had a disto-palatal pocket of 6 mm, bleeding on probing and grade I mobility. The patient also had a deep overbite and radiographs showed a lateral radiolucency mesially (Fig. 3). The tooth was vital.

This lesion was thought to be aggravated by the deep overbite and debris impaction. The patient was referred to the school of dental hygiene for root planing of this area, oral hygiene instruction and full mouth scaling. The patient responded well to non-surgical management with resolution of the pocket and associated pain from 13 and general improvement of the oral hygiene. The maintenance regime was continued at the hospital and the patient was referred back to her general dental practitioner for construction of a partial upper denture with a bite plane and a lower partial denture to protect against the recurrence of the traumatic overbite.

Case 4

A 33-year-old female patient was referred to a dental teaching hospital with regard

to a painful gingival swelling in the 12 region following food impaction. The patient was aware of her lower incisors impinging on the gingiva behind the upper anterior teeth.

On examination the patient had a heavily restored dentition with inadequate posterior support and a deep traumatic overbite associated with a class II div. i malocclusion. There was generalised mild gingivitis with localised pocketing and bleeding on probing. There was a 6 mm pocket mesial to 12. Radiographs taken showed a lateral radiolucency associated with the mesial surface of tooth 12 (Fig. 4). A diagnosis of generalised periodontitis associated with inadequate oral hygiene and complicated by a deep traumatic overbite in the upper anterior segment was made.

Oral hygiene instruction and root planing of deep pockets was carried out; this resulted in a noticeable improvement in pocket depth in relation to 12. A partial upper denture to increase the vertical dimension was constructed to reduce the deep overbite with occlusal stability achieved by provision of an anterior bite plane. The above treatment resulted in resolution of symptoms and the patient was



Fig. 7 Case 5, radiograph showing peri-radicular

placed on a maintenance regime and was subsequently discharged.

Case 5

A 39-year-old female patient was referred to a dental teaching hospital with regard to pain from the upper anterior teeth. The pain occurred on biting and there was dentine hypersensitivity on the palatal aspects of 12, 11, 21 and 22. There was increased mobility of 22 in recent months and anterior spacing was a concern.

Examination revealed inadequate oral hygiene with bleeding on probing, 3-4 mm pocketing and a 5 mm pocket present on the distal aspect of 22 which had an associated buccal sinus (Fig. 5). The tooth was vital to electric pulp testing. The patient had a class II div. i occlusion with a combination of class II and IV Akerly's classification (Fig. 6). Radiographs revealed minimal bone loss but the presence of a localised peri-radicular defect was seen distal to 22 (Fig. 7).

Initial treatment involved hygiene therapy, followed after establishment of good oral hygiene by a replaced flap procedure for 12, 22 region (Fig. 8). A post-operative upper splint was constructed in heat cure acrylic to protect the palatal gingival margins of the treated teeth from the traumatic overbite.

A further open flap curettage procedure was carried out six months later due to persistence of the sinus; this was combined with systemic antibiotics.

Ultimately orthodontic treatment to reduce the depth of the overbite as well as continuation of hygiene therapy led to eventual resolution of the sinus. Fixed retention using a modified rochette splint to stabilise the occlusion was carried out.¹²



Fig. 8 Case 5 following initial treatment

Case 6

In another case, a 45-year-old male was referred to a dental teaching hospital with pain and swelling, which had been present for three months in the upper incisor region. There was a small discharging labial sinus associated with 11, with mesial pocketing of 6-7 mm. The patient had a deep anterior overbite associated with a class II incisor relationship.

As seen from the radiographs (Fig. 9) a lateral periradicular radiolucency was evident and root planing of 11 was prescribed. The patient failed to attend his appointments and follow up was not possible.

DISCUSSION

All of the above cases were noted retrospectively to have a similar history involving a deep traumatic overbite and a characteristic radiographic appearance of a discrete lateral radiolucency with a possible 'tunnel like' lesion extending round the root from the palatal aspect to, in most cases, a buccal discharging sinus. The patients presented with a range of symptoms, including pain, localised swelling and discharge.

This appearance on radiograph of a radiolucency on the proximal surfaces of anterior teeth, associated clinically with deep traumatic overbite, has been highlighted previously.¹² It is suggested that this arises from infection tracking labially, creating a 'tunnel' through the apical bone.

Normally pockets develop at right angles to the gingival margin and progress apically, presumably because anaerobic bacteria thrive at the base of the pocket where the environment is most favourable for their growth. In the cases reported, the initial lesion in deep overbite cases is traumatically induced gingival recession, encouraging pocket and sinus tract development at right angles through the inter-radicular bone

towards the labial plate, with regular food debris and plaque impaction, and compression of the palatal gingiva tending to drive the infection labially.

In most of the cases reported a diagnosis of a chronic lateral peri-radicular periodontitis could be considered as a possible initial differential diagnosis, attributed to the traumatic overbite and the presence of subgingival plaque.

In the view of the authors, where the combination of deep overbite and labial sinus formation is identified, periodontal treatment should be instigated in the first instance with a view to starting root canal treatment only if the associated tooth becomes non-vital. The latter development is likely only to arise in these cases if a lateral accessory canal is affected by the lesion. However, if the tooth is non-vital on first presentation then endodontic treatment should be initially instigated.

As the traumatic overbite is a major factor, care should also be taken to address the deep traumatic overbite element. There is overwhelming evidence that occlusal trauma does not cause periodontitis *per se*, however the above cases show that deep traumatic overbite can in certain cases cause significant localised periodontal breakdown.

Reports have been presented in the literature of how to treat the deep traumatic overbite; the treatment is usually complex and involves different disciplines.¹³

Conservative treatment of the deep traumatic overbite starts by achieving a good level of oral hygiene and a stable periodontal condition. A soft splint to protect both soft and hard tissues from any nocturnal trauma is a simple additional element of treatment.

Orthodontic treatment to reduce the depth of the overbite can be successful but is technically demanding and time consuming. Where a loss of posterior support

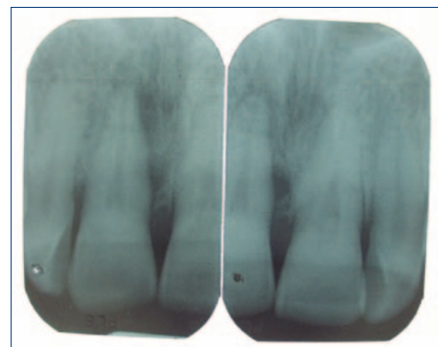


Fig. 9 Case 6, radiographs showing lateral periradicular radiolucency

has occurred, partial dentures at increased face height can protect both hard and soft tissues from the effect of the deep overbite. Care to ensure stable occlusal contacts is essential. Additionally they are not without the oral hygiene risks inherent in partial dentures. Hard splints or bite planes on their own or as a preliminary step in occlusal reconstruction can also be used in the treatment of deep traumatic overbite.^{13,14}

A more definitive way of correcting the deep overbite is by increasing the face height on existing posterior teeth and achieving a stable contact between the upper and lower anteriors to prevent the recurrence of deep overbite. The use of composite or palatal shims on the palatal surface of anterior teeth or in certain cases crowns with a palatal ledge for the lower incisors to occlude against have been employed with varying success.¹⁵

The initial treatment in the above cases involved standard non-surgical periodontal therapy: root planing and antibacterial irrigation of the deep pocket with, in some cases, topical applications of antimicrobials. Root canal treatment was initiated only in one case where the tooth was found to be non vital. Subsequent modification of the occlusion was required in most.

The periodontal treatment with associated prosthodontic and endodontic treatment as required resulted in resolution of symptoms; in one case the tooth was lost as a result of root fracture.

CONCLUSIONS

This report offers a possible diagnosis of lateral root radiolucencies noted in cases with a deep traumatic overbite in Akerly class I and II situations. It also highlights the potential extent of bony destruction caused by the impaction of foreign bodies in cases with traumatic overbite, especially in the presence of plaque and poor oral hygiene. The infection appears to track labially, creating a tunnel through the bone adjacent to the root surface, with the radiographic appearance as described. Methods of management have been described.

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