

# Tooth Surface Floss Loss: Unusual Interproximal and Lingual Cervical Lesions as a Result of Bizarre Dental Flossing

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**Abstract:** There are many reported cases of cervical abrasion/erosion cavities in the literature with various theories offered in support of their pathogenesis. The vast majority of these cases involve the labial cervical regions of the affected teeth. This case report describes an unusual dental presentation of severe lingual cervical and interproximal lesions predominantly affecting the upper and lower anterior and premolar teeth. The differential diagnosis is presented, along with the likely cause of the lesions: in this case, a bizarre oral hygiene technique. The proposed treatment plan is outlined and the problems associated with restoring such cavities are highlighted.

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**Clinical Relevance:** This article provides awareness of an unusual dental presentation of tooth surface loss and of its differential diagnosis.

Non-developmental cervical lesions of the hard tissues occur after tooth eruption and can take varying amounts of time to develop and progress. The causative processes involved in the development of these lesions include:

- caries;
- abrasion;
- erosion;
- attrition; and
- abfraction.<sup>1</sup>

Cariou lesion formation depends

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upon the negative alteration of the dynamic equilibrium between demineralization, as a result of the action of cariogenic bacteria, and remineralization, as a result of the buffering action of saliva.

Abrasion defects are related to excessive wear from an object other than a tooth, most commonly a toothbrush.

Erosive lesions can be caused by both extrinsic and intrinsic factors. Extrinsic factors include exposure to acid solutions from the diet, medications, lifestyle and environment. Intrinsic factors include exposure of the tooth to acid solution from gastric reflux.

Attrition is the loss of tooth structure as a result of tooth-to-tooth contact and may be physiological or pathological in extent. It most commonly affects the occlusal and incisal surfaces of teeth, as well as the proximal contact areas.

Abfraction has been described as a

biomechanical process involving occlusal loading, causing deformation and flexure of the tooth and resulting in disruption of the enamel crystals at the labio-cervical region. This results in the formation of non-carious cervical lesions (NCCL) which are typically wedge-shaped with sharp line angles. Levitch (1994)<sup>2</sup> described the causation and pathogenesis of NCCL and, since then, further workers have confirmed that the pathogenesis is probably multifactorial, resulting in many different clinical presentations.<sup>3</sup> Much has been written on the subject of abfraction in the dental literature over the last 15 years, with proponents claiming scientific evidence.<sup>4</sup> There is still some considerable controversy about the formation of these lesions, but there is probably now little doubt that abfraction does have some role to play in the formation of these lesions.

There is often a multi-factorial aetiology associated with any tooth surface loss and, in approximately one-third of cases, definitive aetiological factors may not be identified.<sup>5</sup>

Developmental lesions, such as linear enamel hypoplasia, result in clinically visible horizontal defects in the enamel, which are present on eruption of the tooth.<sup>6</sup> Because these hypoplastic lesions are present on eruption of the tooth and are exposed to all of the factors responsible for caries, erosion, abrasion, attrition and abfraction, it would be expected that the non-developmental lesions described above would occur within them in any



Figure 1. Clinical presentation.

combination. This might result in an acceleration of the pathogenesis of such lesions.

An understanding of the aetiology, pathogenesis and clinical presentation of all of these lesions is therefore important in reaching a diagnosis and formulating an appropriate treatment plan.

## CASE REPORT

### Case History

A 61-year-old male was referred from his general dental practitioner as a result of the discovery by his dentist of 'mysterious lesions' on the lingual surfaces of his premolars, particularly on the left-hand side. He reported having recently broken a tooth on the lower left-hand side, but this had been successfully restored by his dentist and was not causing any problems. His general dental practitioner also reported that the lower left first premolar had recently become so undermined that the crown of this tooth had completely snapped off and, as a result, he requested further consultation for investigation of this condition.

The patient was not in pain and was not aware of these lesions other than having been informed of their presence by his dentist.

The patient reported normal oral hygiene measures, including toothbrushing and flossing on a twice daily basis. There were no abnormal dietary factors identified and the patient was not aware of a history of gastric reflux.

His medical history revealed a history

of Type 2 non-insulin dependent diabetes for which he was taking Gliclazide and Metformin. There were no other relevant medical conditions.

### Clinical and Radiographic Examination

Extra-oral examination revealed nothing abnormal. Intra-oral examination revealed the soft tissues to be healthy and oral hygiene was good. Salivary flow and consistency appeared to be normal. A brief periodontal examination revealed no pocketing greater than 3 mm. There was some recession of 2–3 mm around the upper molar teeth. The teeth present were moderately restored with all teeth and restorations being intact – a generally normal and well-preserved dentition for someone of this age (Figure 1).

Clinical examination of the lesions described by the dentist revealed subgingival notch-like circumferential lesions extending around the lingual aspects of the teeth, just below the cervical enamel, from the mesial to distal mid interproximal regions. These lesions were detected around the lower left and right premolars and subsequent radiographic examination revealed multiple semi-lunar circumferential radiolucent lesions around the cervical margins of not only the lower premolars, but also of the upper premolar and anterior teeth, as well as the lower

anterior teeth (Figures 2 and 3). None of these lesions was observed clinically prior to the radiographic examination being carried out.

### Diagnosis and Treatment

A differential diagnosis of this clinical presentation included the following:

- Cervical carious lesions (e.g. as a result of xerostomia following head and neck radiotherapy treatment);
- Abrasion – toothbrush or floss induced;
- Idiopathic post-surgical cervical resorption (e.g. as a result of interdental eyelet wiring);
- Linear enamel hypoplasia;
- Abfraction.

Further questioning revealed that the patient had not undergone radiotherapy treatment nor had he had eyelet wires placed to help reduce any facial bony fractures.

The patient was then asked to describe his oral hygiene practices. His toothbrushing technique revealed nothing abnormal, but when asked to demonstrate how he flossed his teeth the aetiology of the lesions became apparent. The patient proceeded to take a piece of floss approximately 40–50 cm in length and pass it through the mesial interproximal region of his upper right central incisor, pass it around the palatal

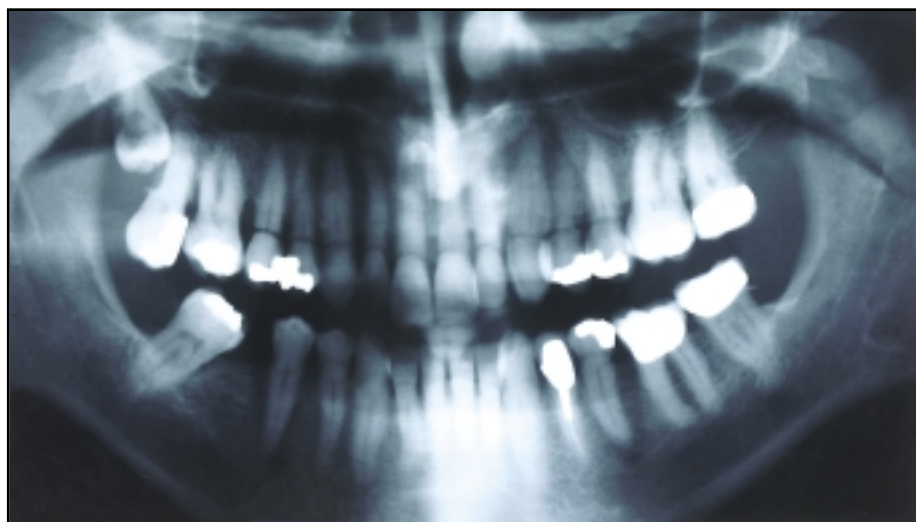


Figure 2. Rotational tomogram.

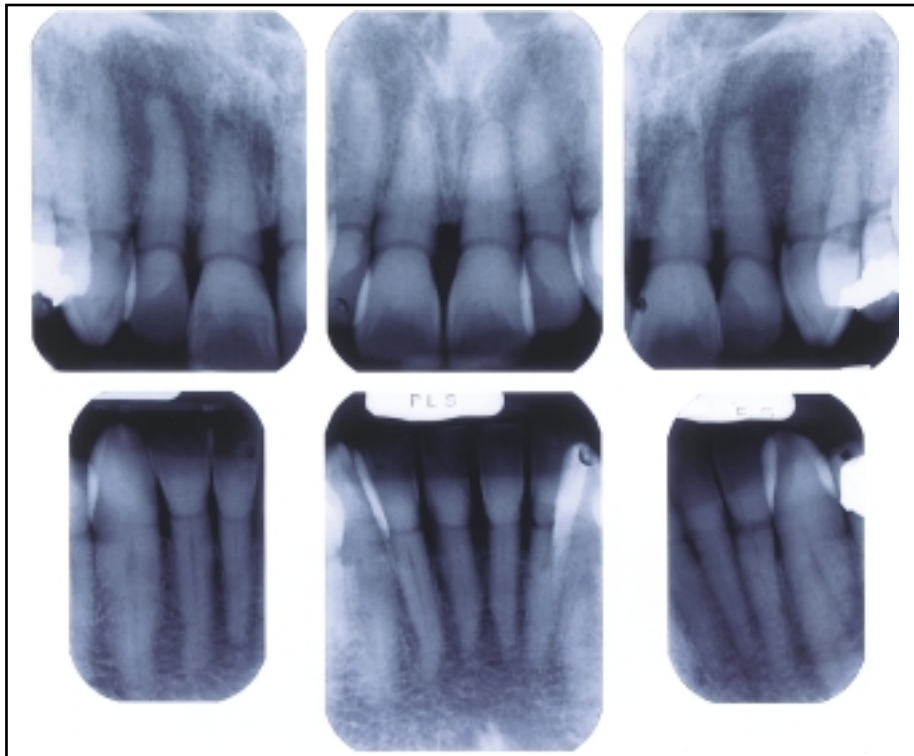


Figure 3. Intra-oral periapical radiographs.

aspect of the tooth and then back through the distal interproximal region of the same tooth. Each end of the floss was passed over each thumb and both thumbs held the floss taut at a considerable distance from the face (Figures 4 a–d).

The floss was then pulled by one thumb so that the other thumb was pulled to the labial surface of the incisor. This was then repeated in the opposite direction so that in one ‘cycle’ approximately 80 cm of floss was pulled across the palatal and interproximal surface of the tooth and the ‘stroke length’ of each thumb was about 40 cm. This cycle was then repeated vigorously 8–10 times on that tooth and the whole procedure repeated for each tooth between left and right upper and lower premolars (Figures 5a and b).

Further questioning revealed that this flossing technique was carried out after the patient had brushed his teeth. This meant that there would have been residual toothpaste slurry left in the mouth providing an abrasive paste through which the floss was being pulled.

Treatment of these lesions involved:

- Re-education of the patient in the use of effective oral hygiene techniques that are non destructive (interproximal brushes and effective non-traumatic flossing technique).
- Elimination of the potential stagnation areas that have been created. This was achieved by

restoration of the larger lesions with glass ionomer cement, ensuring a good marginal adaptation. The smaller lesions are simply cleaned by the patient with the new cleaning techniques and kept under observation.

### DISCUSSION

It was very clear following demonstration by the patient of his oral hygiene practice what the aetiology was for this tooth surface loss. There have been other reports in the literature of oral hygiene practices leading to traumatized gingivae and teeth,<sup>7,8,9</sup> though these are few in number. It may therefore be assumed that this is a relatively rare occurrence.

However, an understanding of all the possible causes presented in the differential diagnosis is fundamental in reaching a definitive diagnosis as only then may each item on the list be excluded appropriately.

Linear enamel hypoplasia is a relatively common developmental disturbance of enamel affecting 5–18% of populations.<sup>6</sup> Its distinguishing characteristic is the presence of clinically visible horizontal defects in the enamel surface on both the lingual and labial aspects of teeth. As reported in

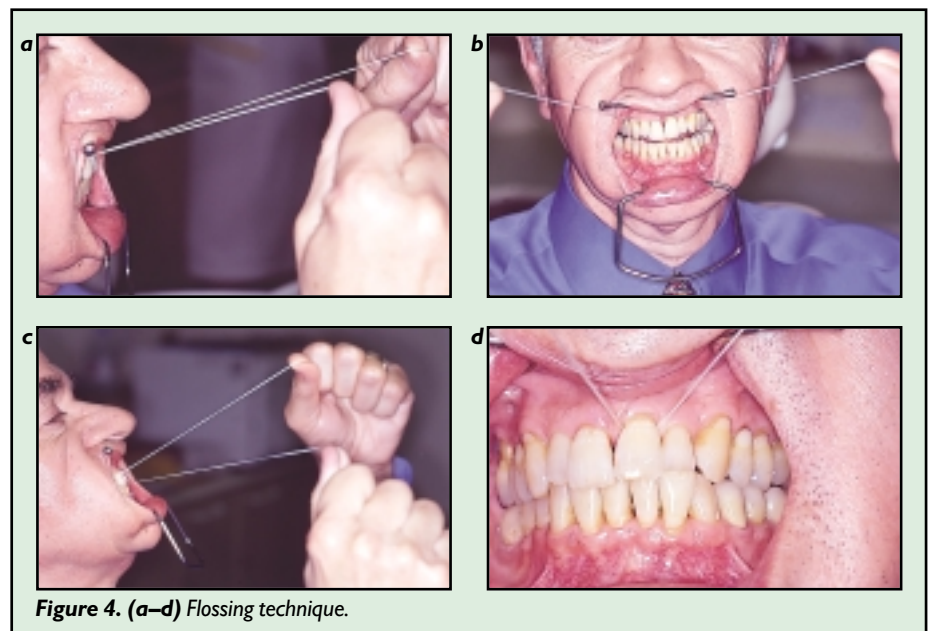


Figure 4. (a–d) Flossing technique.

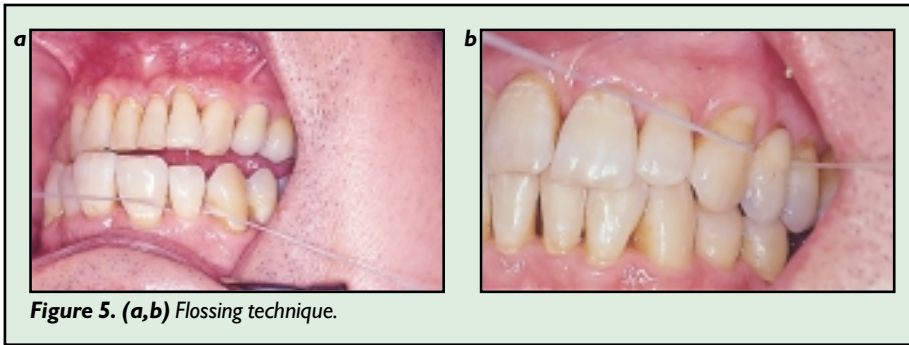


Figure 5. (a,b) Flossing technique.

this case, however, the lesions were present only on the lingual and interproximal aspects and were, in fact, in dentine just below the cervical enamel margin and not in the enamel itself. Thus, an understanding of this condition allows its exclusion.

Abfraction has been described as a biomechanical process involving occlusal loading, causing deformation and flexure of the tooth and resulting in disruption of the enamel crystals at the labio-cervical region. This results in the formation of non-carious cervical lesions (NCCL) which are typically wedge-shaped with sharp line angles. The distinguishing characteristics of these lesions are that they are non-carious and occur mainly on the labio-cervical aspects of teeth, with only 2% being found lingually.<sup>10</sup> This is not the clinical presentation found in this case, thus this condition may also be excluded.

When considering the overall treatment plan for such cervical lesions, oral hygiene maintenance needed to be addressed. As an effective alternative to dental floss, there is good evidence to support the use of interdental brushes.<sup>11</sup> In this case, the use of interdental brushes was encouraged, although a modified (correct) flossing technique was also used around those lesions that were not restored.

On considering the restoration of cervical lesions, it may also be useful to consider issues in the restoration of abfraction lesions. The accumulation of experimental and clinical evidence during the past decade has significantly contributed to the understanding of the role of occlusally generated tensile

stress in the aetiology of NCCL.<sup>12</sup> More importantly, this knowledge has led to an understanding of the reasons why traditional restorative treatments might fail. Restorative approaches that combine chemical adhesion with restorative materials of appropriate elastic properties may result in higher success rates.<sup>12</sup>

Treatment of NCCL (or the abrasion lesions presented here) may be limited to monitoring only if the causative factors have been eliminated and the patient is prepared to have the unrestored lesions observed on a regular basis. However, clinical evidence suggests that the restoration of such lesions may be necessary to protect the remaining tooth tissue and prevent their enlargement.<sup>3</sup>

Primary indications for treatment of any cervical lesion are:

- sensitivity;
- poor aesthetics (in the case of labial lesions); and
- food/plaque stagnation.

There may, however, be a number of additional indications for restoration including:

- risk of pulpal exposure;
- the position of the lesion compromising partial denture design;
- the structural integrity of the tooth being threatened (as in the case of the lower left first premolar in this case); and
- aiming to improve gingival health by facilitating better plaque control.

However, it must be stressed that an appreciation of the aetiology and cessation of the progression of the lesion by appropriate preventive measures must precede treatment and result in elimination of aggravating factors.

The most appropriate restorative materials are those that adhere to tooth substance, such as glass ionomers or resin composites retained with dentine bonding systems. A potential advantage of glass ionomers in such circumstances is their cariostatic property. Resin composites, however, may produce a superior aesthetic result.

The use of amalgam to restore such lesions may require further retentive features to be prepared in an already weakened part of the tooth and cannot therefore be recommended. However, the subtle rounding of sharp internal and external line angles may alter the stress distribution in such cavities, thus aiding the retention of adhesive materials.

The greater resilience of glass ionomer materials when compared with resin composites may allow them to 'flex' with the tooth in this region of potential stress concentration. This, in turn, may mean less bond failure and therefore better retention over the long term.<sup>13</sup>

Recently introduced glass ionomer/resin hybrids may be of value because they are claimed to combine the ideal properties of both glass ionomers and resin composites. Such combinations rarely result in the optimal properties of each material being incorporated into the collective product and therefore the use of these materials should be approached with caution until further satisfactory clinical evidence is available.

## SUMMARY

Though a rare presentation, unusual cases of extreme cervical abrasion do occur. It is important for the practitioner to be able to consider the possible causes of such lesions (by taking a comprehensive history) thereby allowing implementation of an appropriate preventive treatment plan. Subsequent restoration of such cases

should be carefully considered bearing in mind the potential numerous aetiological factors involved.

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ABSTRACTS

**DOES THE COLOUR OF THAT CROWN REALLY MATCH?**

The Reliability of an Intraoral Dental Colorimeter. F.F. Tung, G.R. Goldstein, S. Jang and E. Hittelman. *Journal of Prosthetic Dentistry* 2002; **88**: 585–590.

Shade taking has always been a difficult subject. Indeed, I myself once sat next to a dentist at a national conference who was extremely distressed to discover, during the presentation, that she was severely colour blind in the green range! (The shade she claimed to choose most frequently was C3, and amongst her least favourite shades was A3.) This paper describes a system for automatically recording the shade of a patient's teeth, and attempts to assess its accuracy. Interestingly, perhaps, the examiners in the study had not themselves been assessed for colour vision deficiencies.

The colorimeter measures the colour of both natural teeth and metal-ceramic restorations and prints out a prescription for a particular porcelain system. The study assessed the reliability of the machine by taking shades on separate occasions, and

compared its decisions with those of the two dental examiners.

It is reported that the colorimeter agreed with itself on only 82% of readings, slightly better than the examiners themselves (73%). However, shades selected by the colorimeter matched the two examiners on only 55% and 64% of the time. Whether or not the research is conclusive is doubtful, and the authors suggest that further investigations are required. Whether or not the purchase of such a machine will improve your clinical practice may also require further investigation!

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**HOW SHOULD I CLEAN MY DENTURES, DOCTOR?**

The Effectiveness of Seven Denture Cleansers on Tea Stain Removal from PMAA Acrylic Resin. D.C. Jagger, L. Al-Akhazami, A. Harrison and J. S. Rees. *International Journal of Prosthodontics* 2002; **15**: 549–552.

Patients faced with a plethora of commercial products frequently seek professional advice as to how best to clean their dentures. In this *in vitro*

study the authors created simulated stained acrylic dentures with tea, chlorhexidine and a salivary pellicle. Samples were prepared with both smooth and roughened surfaces. The samples were then exposed for 5 minutes to 7 different cleansers to assess the percentage efficiency of each system. This was determined by measuring the optical density of the treated specimens using a spectrophotometer.

It was found that products containing alkaline hypochlorite were best at removing the stains. Not surprisingly, the roughened acrylic surfaces were less well cleaned, suggesting that abrasive cleansers should be avoided. The authors give details of various difficult stain situations, and also point out that some cleansers should not be used on metal-based dentures. The report provides full details of the products tested. The authors conclude that agents containing hypochlorite were the most effective, giving particular mention to the efficacy of Boots Denture Cleaning Powder whilst observing that the manufacturers do not provide details of its constituents.

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