

Clinical quandaries: Strategies for dealing with space closure following the loss of a central incisor

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Introduction

The loss of a maxillary central incisor may be the result of trauma or extraction necessitated by a number of conditions including periodontal disease, caries, root fracture, resorption and tooth malformation. In most cases, the patient will either be under the care of a dentist or will seek help shortly after the tooth has been lost and the most common course of action will be to maintain the space and provide some form of prosthetic (implant, bridge or denture) replacement. A number of patients, however, do not for whatever reason seek professional help for some time resulting in space loss caused by mesial drift of the lateral incisor.

In such cases the long-term management rests on choosing between one of two approaches: a) re-opening the space followed by prosthetic replacement (Figure 1) or b) maintaining the closed space together with modification of the lateral incisor to mimic the missing central (Figure 2).

Most readers will be aware of the various treatment issues that present when replacing a missing central incisor by means of an implant or a fixed or removable prosthesis whereas the problems associated with the second option may be somewhat less familiar.

Any aesthetic-oriented treatment-planning should take into account a variety of clinical and non-clinical factors (Spear et al 2006). In all cases featuring missing upper

anterior teeth these include the age of the patient; facial morphology; assessment of available space; width of the lateral incisor and length of its root; size and shape of other teeth; colour and morphology of the canine; nature of any malocclusion and cuspal interdigitation; risk of future trauma; and finally, the patient's willingness to undergo complex, expensive treatment. While clinical experience underlines the technical problems associated with both treatment options and confirms the clinical difficulty in predicting the final outcome we believe that the 'space closure' option is the most problematic and hence this paper focuses on the challenges intrinsic in adopting this treatment strategy.

Stenvick and Zachrisson (1993) compiled a comprehensive list of criteria to help clinicians arrive at a final treatment decision suggesting that the 'ideal' candidate for space closure (using the lateral incisor to mimic the missing central incisor) would be a young individual with a full profile, no gingival display on smiling, a crowded maxillary arch, enlarged overjet, open bite, large lateral incisors and small white canines.

Modifying upper laterals to mimic the missing central incisor

This strategy may or may not require adjunctive orthodontic treatment. Either way, the following difficulties may arise when pursuing this approach.

1. Residual midline diastema

This results from the presence of excess space following loss of the central. Where the space available is wider than the width of the missing central incisor, increasing the width of the lateral is not usually acceptable.

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Solutions:

- Use of a pre-treatment diagnostic wax-up allows both operator and patient to assess the likely problems and the aesthetic outcome.
- The assessment of space needed for the lateral is made easier by modifying the lateral prior to orthodontic treatment.
- Ensure that the lateral is moved to within 1mm of the central.
- Excess space should be placed distally where it is more easily hidden from view.

2. Unattractive triangular gingival cleft between the central and lateral incisors

This occurs because of the difference in cervical widths of the central and the narrower lateral. It is often made worse in older patients because of a failure of the gingival tissue to adapt to the changed tooth position.

Building out the lateral in an attempt to compensate for the narrower cervical width will likely lead to plaque retention and a deteriorating periodontal condition.

Solutions:

- Ensure that the lateral root is uprighted mesially as much as possible during the orthodontic phase of treatment (Figure 3). This will bring the mesial aspect of the lateral root into a more vertical position which, in turn, allows the creation of a more natural contact relationship with the adjacent central and canine.
- Treat patients sooner rather than later.
- Stress the importance of excellent oral hygiene.
- Gingivoplasty may improve the gingival contour.

3. Discrepancy between the gingival levels of the central, lateral and canine

Different teeth have different crown heights and associated gingival levels and in the case of the central and lateral this difference can be visually significant. Two separate treatment approaches are available. These may be used separately or in combination.

Solutions:

- A surgical crown lengthening procedure on the lateral incisor featuring an apically repositioned flap combined with osteoplasty of the bony margin may be performed (Levine et al 1999; Camargo et al 2007). If meticulous oral hygiene is maintained a healthy gingival contour will be restored within four to five weeks. One drawback of this approach is that surgery will reveal the narrow lateral root thus potentially magnifying the triangular cleft



Figure 1a: The upper right central has been lost and there has been some space closure due to mesial drift of the upper right lateral incisor.

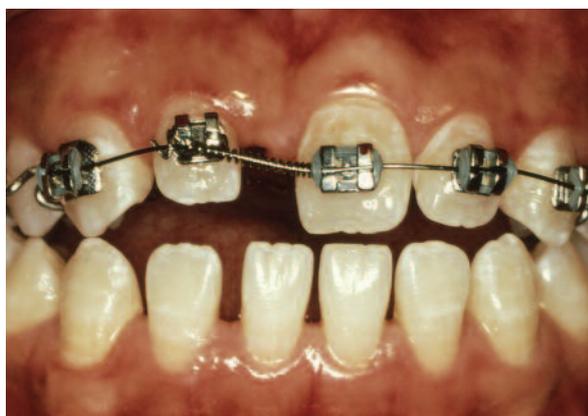


Figure 1b: The decision was taken to undergo orthodontic treatment in order to re-open the space.



Figure 1c: Once orthodontic treatment was completed a resin-bonded bridge was placed to replace the missing central incisor.

discussed earlier, thus making the final restoration, be that bonded composite or crown, more difficult.

- Alternatively, intrusion of the lateral may be considered (Kokich et al 1984). The main advantage of this technique is that the attached gingiva follows the intruded clinical crown and therefore restores the natural contour and balance of the gingival margins in the anterior labial segment. Intrusion also facilitates the



Figure 2a: This middle-aged lady complained of the poor appearance of her anterior gold bridge. This had been placed after the loss of the upper right central incisor and subsequent mesial drifting of the upper right lateral incisor.
Figure 2b: Following removal of the bridge the extent of the mesial drift of the lateral incisor is clear.
Figure 2c: A diagnostic wax-up was done to estimate the likely outcome of crowning a) the upper right lateral incisor to mimic the missing central left central incisor and b) the upper left central incisor. The discrepancy in crown heights is apparent



Figure 2d: The former bridge abutments were found to be non-vital and so were root-filled and cast metal post and cores placed.
Figure 2e: Crown lengthening surgery was carried out to rectify the differing crown heights.
Figure 2f: The post-operative appearance. Crown heights are more even now and care has been taken to minimise the interproximal space between the two crowns. The appearance of the upper right canine has been modified by the use of composite resin.

provision of an aesthetic final restoration - without prior intrusion it is often difficult to create ideal crown form. Matching the gingival levels by tooth intrusion allows the proximal surfaces of the modified lateral to be tapered gradually from the cervical margin to the incisal edge. This enhances the aesthetic outcome and permits adequate space for the interdental papilla. It is widely recommended that when using this technique the tooth be intruded 1mm beyond the desired position to allow for relapse.

4. Increased prominence of the canine on the extraction side

If the lateral is being used as a 'surrogate' central then it follows that the canine must assume the role of the lateral. It does, however, possess a very different morphology being more pointed and bulbous and is usually darker in colour.

Solutions:

- The canine can be made to mimic the lateral more closely by selectively grinding its tip, adding composite mesio-occlusally or by reducing the canine thickness bucco-lingually.
- The canine may be moved palatally during the orthodontic phase of treatment in order to reduce its prominence

- Individual tooth whitening can improve the shade of the canine.

5. Palatal cusp of the first premolar on the extraction side may become visible

This may arise as a result of mesial movement of the buccal segment following incisor loss and subsequent space closure.

Solutions:

- Mesially rotating the premolar during the orthodontic phase of treatment will hide the palatal cusp and accentuate its similarity to the canine.
- The first premolar may be used to create a 'canine' eminence. This is aided by slightly rotating the buccal root mesio-palatally.

6. Centre-line discrepancy

This is a result of the asymmetric tooth loss. Centre-line shifts tend to be worse when overjets are reduced and this should therefore be taken into account during the initial diagnosis and treatment planning phases.

Solutions:

- Such anomalies are difficult to avoid with asymmetric

extractions and therefore compensating extractions in the maxillary arch are usually required. It may be possible to improve the situation by moving the upper buccal segment (on the side of the missing tooth) into a Class II relationship with the lower arch. This manoeuvre is difficult to achieve unilaterally but a satisfactory compromise with relatively flat cusped teeth is to accept a non-intercusating cusp to cusp half-unit Class II on the affected side. As in all completed cases, occlusal adjustments may be needed to eliminate balancing side interferences.

7. Orthodontic relapse of the modified lateral incisor

This may occur whenever inadequate retention has been employed following tooth movement.

Solutions:

- Adequate retention must be placed immediately after removal of the orthodontic appliance. Bony readaptation to tooth movement takes three to six months while soft tissue and periodontal fibre re-organisation may take 9-18 months.
- Splinting of the anterior teeth could also be considered.

8. Insufficient interocclusal space for a crown on the lateral incisor

Rotated lower incisors or crowded lower canines may occlude heavily against the palatal surface of the lateral incisor.

Solutions:

- The need for lower arch orthodontic treatment must be determined at the initial planning stage. Minor occlusal adjustments may be possible but it should be realized that lower labial segment crowding usually deteriorates during the teenage years.
- Rather than crowning the lateral incisor it may be possible to veneer the tooth thus keeping the palatal surface largely intact.

Discussion

Management of patients with a missing central incisor by means of space closure followed by modification of the lateral to mimic the central is possible (Figure 2) but is an approach fraught with problems. Many of the pitfalls are virtually unavoidable and it can be extremely difficult to produce a satisfactory aesthetic result. Initial space assessment is difficult and there are numerous problems associated with the positioning and modification of lateral incisors as well as those related to mesial movement of the canine and premolar. There may be additional periodontal



Figure 3: Orthodontic treatment is being performed to upright and move the upper right lateral incisor mesially. As a result of this, the subsequent restoration of the lateral incisor to mimic the missing central will be easier.

problems. All these factors lead us to believe that, on balance, it is generally preferable to maintain the space and provide some form of prosthetic replacement.

Definite clinical circumstances remain, however, where the space closure option is preferred, for example where there is crowding or where an overjet needs reduction. Given the increased predictability of implant procedures an approach involving extraction of the drifted lateral followed by placement of an implant has recently been advocated (Chaushu 2001). Should this approach to treatment be chosen then attention to detail and close collaboration between restorative and orthodontic operators is essential.

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