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Diagnosis and Treatment of Missing Upper Lateral Incisors Part 1

Abstract: These two articles aim to outline the assessment and explain the treatment options for those patients who present with missing upper lateral incisors. In Part 1, emphasis is placed on the diagnosis and need for a combined orthodontic-restorative approach to provide optimal patient care.

Clinical Relevance: The management of patients with absence of one or both lateral incisors can be an aesthetic and functional challenge. Frequently, a number of different factors need to be considered in order to achieve the best end result. We suggest that a combined orthodontic-restorative approach be considered at the start of the planning process, in order to consider all treatment possibilities.

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The developmental absence of teeth (hypodontia) is not an uncommon finding amongst orthodontic patients and maxillary incisors are amongst the most commonly found to be absent, with a reported incidence of 1–2% in Caucasians,¹ accounting for approximately 20% of all absent permanent teeth.^{2,3} The background incidence of hypodontia of secondary teeth in North-Western Europe is between 3.5 and 10%.^{4–7} It is more common in females.⁸

The lateral incisors may be unilaterally or bilaterally absent, with bilateral agenesis more common than unilateral agenesis.⁹ The absence of maxillary lateral incisors generally follows an autosomal dominant mode of inheritance with incomplete penetrance.¹⁰ Its absence can also be associated with conditions such as ectodermal dysplasia, cleft lip and palate, Down's syndrome, Incontinentia pigmenti and following early irradiation of tooth germs.¹¹

Problems associated with missing lateral incisors

The patient's, or parents', concern will often relate to the dental aesthetics, for



Figure 1. A patient with missing upper left lateral incisor and peg-shaped upper right lateral incisor – the patient may be aware of the prominent left canine or small right lateral incisor.

example spacing, rotations and centreline deviation (Figures 1 and 2). They may comment on the canines which are more prominent, with the patient being unaware of a missing incisor tooth. An asymmetrical smile may also be of concern, specifically in the case of an absent single maxillary lateral incisor. This is a frequent finding as the contralateral incisors are commonly diminutive and peg-shaped.¹²

Additionally, some have demonstrated a link between the absence



Figure 2. Bilateral agenesis of maxillary incisors associated with anterior spacing and centreline discrepancy.

of maxillary lateral incisors and ectopic permanent canines^{13,14} (Figure 3). This may represent a dental health risk, should the canine impaction lead to pathological cystic change or root resorption of the adjacent teeth.

From a psycho-social standpoint, the absence of upper lateral incisors may affect how a child is perceived by his/her peers. This particular dental anomaly has been associated with a perceived aggressive attitude and may be associated with negative social experiences.^{15,16}

Functional problems need to be

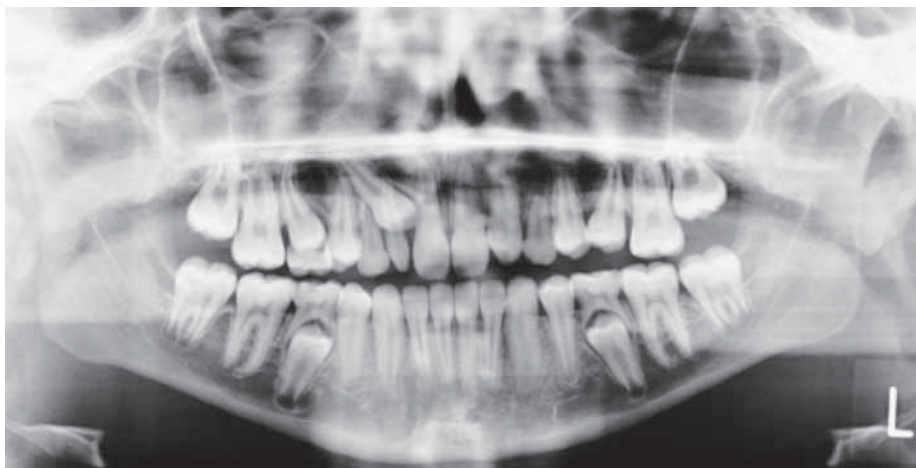


Figure 3. DPT radiograph demonstrating an ectopic canine associated with a missing lateral incisor and peg-shaped lateral incisor.



Figure 4. Reduced inter-occlusal space due to the over-eruption of the lower canine and attrition of the deciduous upper canine. This would complicate any restorative treatment if the inter-occlusal space was not increased.



Figure 5. A patient with a high smile line – revealing the gingival margin heights.



Figure 6. A patient with a lower smile line – hiding the gingival margins.

assessed in both static and dynamic occlusion. When assessing the static occlusion, attention should be paid to the inter-occlusal space in the lateral incisor region. This may be reduced due to the over-eruption of the opposing canine tooth (Figure 4). Replacement of the lateral incisor might then be compromised in the absence of orthodontic bite opening prior to restoration of the space. Assessing the dynamic occlusion will determine the

existence of canine guidance and whether it could be retained.

Patient factors

At the back of the clinician's mind there needs to be an awareness of the patient's present and potential future access and attitude to specialist and general dentistry. In many ways this is the starting point of any treatment planning process.

A good rule of thumb is that the treatment of choice should be the least invasive that satisfies the expected aesthetics and functional needs of the patient.¹⁷ Outlined below are other factors that should be considered in the planning process.

Patient preference

It should be borne in mind that patients may choose one option over another for psychosocial or financial reasons. To some the thought of 'false teeth' is unacceptable whereas others are driven by the best aesthetic result, whatever that involves. The financial considerations are variable and depend on the individual and local NHS funding. The maintenance of any restorative treatment will involve a cost implication. Planning ahead for implant funding on the NHS is not possible for the majority of patients. Such 'ring fencing' is not available and application for funding is required once the patient reaches skeletal maturity.

Age

Consideration of the stage of skeletal and dental maturity is important when planning treatment, especially when considering restorative replacement of the missing teeth with dental implants. Optimum timing for placing implants is when the facial growth is complete, as placement of implants prior to completion of facial growth will lead to infraocclusion of the implant relative to

the adjacent teeth.¹⁸ Young patients and their families need to be aware of this at the start of treatment as intermediate restorations, such as resin-retained bridges or partial acrylic dentures, will be required on completion of the orthodontic treatment.

Para-functional activity

Habits such as nail-biting, grinding/clenching can adversely affect the success of restorative treatments, particularly implant-retained crowns and resin-retained bridgework.¹⁹

Clinical examination

Skeletal relationship

In the first instance, the skeletal relationship needs to be assessed as this would influence the treatment approach, in particular the decision as to whether the space associated with a missing lateral incisor is to be closed or opened/re-distributed for a prosthetic replacement.² For example, a patient with a mild skeletal III pattern may be better served with space opening and bringing the upper incisor teeth forward, as opposed to space closure at the risk of further retracting the upper labial segment.

Soft tissues

The amount of gingival tissue exposure when the lips are at rest and on smiling should be assessed. When camouflaging the missing incisor with space closure the emergence profile of the canine might differ from the contralateral tooth or be out of balance with the central incisor teeth. A canine with a narrow mesiodistal width at the CEJ will produce a more aesthetic emergence profile.²⁰ With a high lip line this would be more obvious, however, with a lower lip line the soft tissue curtain would cover the gingival margins and so hide this discrepancy (Figures 5 and 6). The same thought pattern exists with the heights of the gingival margins.

Classically, the gingival margins of the central incisors and the canines should ideally be level with each other and the gingival margin of the lateral incisors should be slightly lower.²¹ The importance of achieving this is again influenced by the amount of exposure of these gingival margins, and so on the resting lip line and smile line. Finally, in patients with a high smile line the prominence of the canine root may also cause aesthetic concerns.²⁰

Prior to treatment planning, a detailed assessment of the periodontal structures, including plaque control, is required. The existing teeth are evaluated for caries, restorations, colour and shape. The quality and the amount of hard and soft tissue in the edentulous spaces should also be taken



Figure 7. A patient with a full unit Class II molar relationship. To reopen the lateral incisor space would have required buccal segment distalization or the extraction of a premolar unit.



Figure 8. A patient with a Class III incisor relationship. Space closure in this case would be difficult owing to the anchorage limitations.

into consideration.¹⁹ Poor cervical margin appearance can be a problem if there is no bone in the desired position.²² Lack of labio-lingual width of alveolar bone will compromise future prosthetic tooth replacement. If insufficient ridge width exists, a bone graft may become necessary.

Type of malocclusion

To a certain degree the malocclusion may dictate the final treatment plan. For example, in the case of a patient with a well aligned lower arch and a full unit Class II molar relationship, if it were acceptable to close the spaces fully and align the canines (with or without later adjustment) next to the central incisors, this would be the treatment of choice. To open the spaces for prosthetic lateral incisors would require distalization of the upper buccal segment or extraction of a premolar unit. This treatment plan may also be suitable for Class I patients with lower arch crowding which would benefit from lower arch extractions²³(Figure 7).

As indicated above, in a mild Class III case where dento-alveolar compensation is planned, space opening may be the most appropriate option as the mechanics of space opening would help to create a Class I incisor relationship, which would be stable if the overbite was adequate. Space closure would worsen a Class III incisor relationship (Figure 8). In orthognathic cases, space closure in Class III cases and space opening in Class II cases may be appropriate treatment plans as the surgical movements will overcome any changes in the incisor relationship.



Figure 9. (a, b) Good lateral incisor substitution, with a favourably-sized and coloured canine. The patient was keen to avoid a prosthetic tooth. The final plan was to increase the width of the upper right lateral and reshape the upper left canine.

Canines: size, shape and colour

The aim of the combined orthodontic-restorative approach is to create an aesthetic arrangement of teeth that have a colour, size and morphology which are within normal limits.¹⁹ This requires the anterior teeth to be in a harmonious relationship. The permanent lateral incisor crown is usually 5.5–6.7 mm wide and is in 'golden proportion' to the width of the permanent central incisor and canine. The 'golden proportion' implies a ratio of 1:1.618 in the arrangement of the maxillary teeth from a frontal view, but its strict use in clinical dentistry is limited,²⁴ though its importance should not be overlooked. An ideal canine would be one where its dimensions are similar to that of the missing unit (Figures 9 and 10). A pointed canine can be trimmed and it is possible to restore the mesio-incisal and disto-incisal edges of the canine to recreate normal lateral contours.²⁵ A slightly wider canine can be reduced and masked but a bulky and broad tooth would not be in harmony with the surrounding dentition (Figures 11 and 12). It is important to avoid over reduction as the underlying dentine will show through the thin enamel.²⁶ Any dentine exposure will require restorative intervention.

It is not unusual for the canines to be darker than the central incisors. The colour discrepancy between the central incisor and the canine has been reported to be the primary cause of dissatisfaction in people who have completed a space-closure treatment plan.² Restorative options to address this may include bleaching (less invasive) or veneering (more invasive) of the canine. Finally, as mentioned above, consideration to the width



Figure 10. (a, b) Canines of acceptable colour and size for lateralization. Owing to the Class II molar relationships, the preferred option would be to close all spacing and make small adjustments to the canines.



Figure 11. (a, b) Demonstrating canines which would make poor lateral substitutes owing to their width, bulk and colour. Space recreation would be preferred.

of the canine crown at the cemento-enamel junction (CEJ) should be made. This could be evaluated radiographically.

Tooth size discrepancies

It is thought that microdontia is a variable expression of the same developmental disturbance that causes tooth agenesis.²⁷ Therefore, it is not uncommon to find cases where one lateral incisor is absent whilst the contralateral tooth is present but diminutive and peg-shaped. Depending on other factors, it may be best to build up the smaller tooth or extract the peg-shaped lateral incisor rather than the restorative build-up to create symmetry.

Tooth size-arch length discrepancy

The need to create space for the missing tooth must be balanced with the



Figure 12. (a, b) Canines which would make poor lateral incisor substitutes due to their width and bulk. Their colour is favourable. Space recreation would be preferred due to the aesthetics and the Class I buccal segment relationship.

space available. Space closure in spaced arches with well intercuspatated occlusion may be a difficult and lengthy process. In such cases, it may be easier and quicker to redistribute the space for the restorative replacement of the missing tooth/teeth. In crowded upper arches, where already there has been some space loss, further space closure may be preferable, as often a premolar tooth would have to be extracted to provide adequate space for the replacement of the missing tooth. This is at times considered an excessive biological cost for a modest functional and aesthetic gain.²⁰ However, if space closure causes a poor aesthetic central incisor-permanent canine relationship, the patient may prefer re-creation of space for the replacement of the missing tooth. Clearly, the need for the patient to understand the long-term implications of this decision fully is paramount.

Radiographic examination

The suspected absence of the permanent lateral incisor should be confirmed radiographically if the tooth has failed to erupt by the age of 9 years or within 6 months of the contralateral tooth. There are a number of different radiographs which may aid the treatment planning process. The simplest is a peri-apical image, though the dental panoramic radiograph is the most commonly used. With this image it should be remembered that a tooth may be outside of the focal trough and so appear 'absent'.

Diagnostic set-up

A diagnostic set-up is a very useful tool to evaluate the orthodontic tooth movements and the nature of the restorative input, as well as the suitability of a particular treatment plan.

It also helps to decide between a



Figure 13. Demonstrating the original study models of a patient with missing upper right lateral incisor followed by a Kesling set-up where the space has been opened and the missing tooth replaced with a prosthetic tooth.

number of treatment options, as well as acting as a visual aid to the patient.²⁸ A diagnostic set-up may simply involve the intra-oral addition of either white orthodontic wax or composite resin to unetched tooth surfaces at the chairside.

This is especially useful in cases where a build-up of the existing teeth is indicated rather than space opening.

A traditional wax-up, or Kesling set-up, involves the repositioning of the teeth to mimic the orthodontic tooth movements, as well as replacement of the missing teeth and reshaping others, if indicated (Figure 13). It is possible to undertake a facebow recording and mount the wax-ups on an adjustable articulator to replicate the dynamic occlusion.²⁸

Conclusion

In order to address the aesthetics and functional concerns of patients with missing upper lateral incisors, detailed and thorough clinical and radiographic examinations are required. In addition, diagnostic aids such as Kesling set-ups may prove to be very useful in planning the treatment as a visual aid for patients.

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