

CLINICAL SECTION

Maxillary Midline Diastema: a case report involving a combined orthodontic/maxillofacial approach

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This paper presents an orthodontic case of a large (14.5 mm) maxillary midline diastema that was related to the presence, and subsequent removal of 2 median maxillary supernumerary teeth and resulting bone loss. A combined orthodontic and maxillofacial approach involving bone grafting and fixed appliances was used to close the space. This episode of care was organized as interceptive treatment during development of the permanent dentition.

Key words: Bone graft, interceptive orthodontics, median/midline diastema, supernumerary teeth

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Introduction

Midline diastemata (or diastemas) occur in approximately 98% of 6 year olds, 49% of 11 year olds and 7% of 12–18 year olds.^{1,2} There are many possible causes of midline diastemata—physiological, dentoalveolar disproportion, missing teeth, midline supernumerary teeth, proclination of the upper labial segment and a prominent fraenum.³ There have also recently been reports of self-inflicted pathological cases of diastemata caused by tongue piercing.⁴ In many of these cases, orthodontic treatment alone can help close a diastema. Combined treatment with orthodontic, restorative and oral surgery techniques may be advocated when, for example, tooth size discrepancies exist or supernumerary teeth are present.

When teeth are removed, it is normal for bony infill to occur and, therefore, allow movement of teeth into the space. The case presented describes the loss of alveolar bone following the surgical removal of 2 midline tuberculate supernumerary teeth, and closure of the subsequent median diastema by a combination of alveolar bone grafting and orthodontic treatment.

Case presentation

An 8 year old Caucasian male was referred by his General Dental Practitioner to the Maxillofacial Department at York Hospital with failed eruption of

his upper permanent central incisors. Radiography revealed 2 midline tuberculate supernumerary teeth and possible dilaceration of the upper right central incisor (UR1).

Extra-oral examination

The patient had a Class II skeletal base and average vertical facial proportion. Lips were competent.

Intra-oral examination

The patient presented in the mixed dentition, with all first permanent molars, the lower permanent incisors and the upper left lateral incisor erupted. The deciduous incisors and canines were still *in situ*. Incisor relationship was Class I with centre lines correct and coincident. Molar relationships were recorded as Class II both left and right, and the LR6 was noted to be in crossbite. Both upper canines were palpable buccally. Oral hygiene was good and there was no evidence of gingivitis.

Special investigations

An orthopantomogram (Figure 1a) and upper standard occlusal (Figure 1b) revealed the presence of all remaining permanent teeth and 2 midline supernumerary teeth. Dilaceration of the UR1 root was also suspected. It should also be noted that no clinical photographs or study models were recorded as having

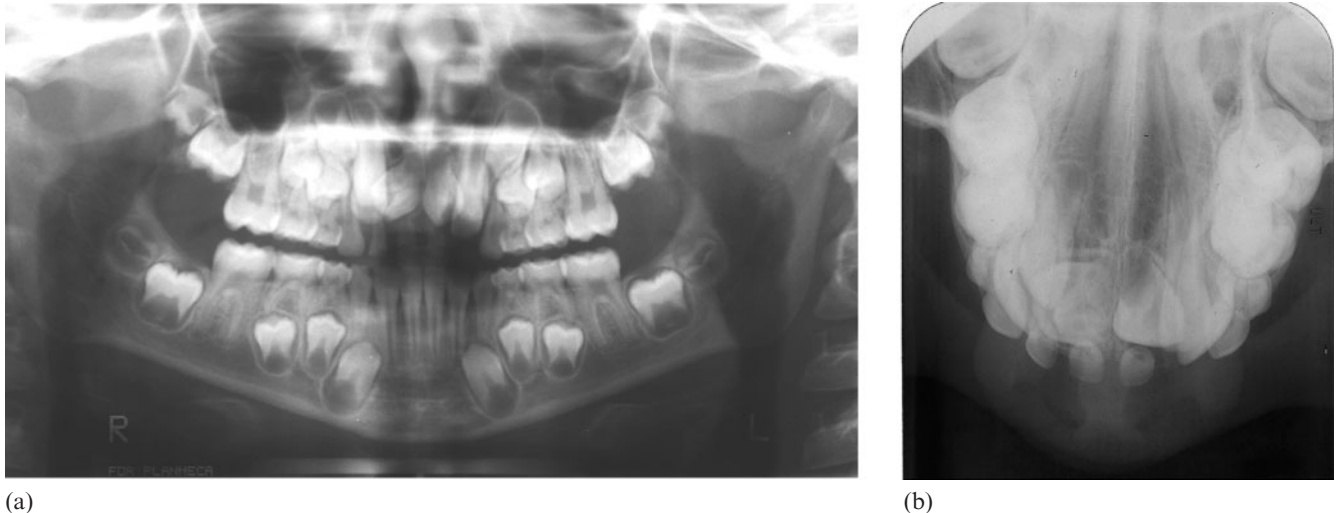


Figure 1 (a,b) Orthopantomogram (OPT) and Upper Standard Occlusal (USO) films taken at initial visit. Tuberculate supernumerary teeth are evident in the midline

been taken. The Dental Health Component in the Index of Orthodontic Treatment Need was scored 5i.

Aetiology

The delayed eruption of the maxillary central incisors was due to the presence of the supernumerary teeth. The possible dilaceration of the UR1 root may have been due to trauma to the deciduous incisors (although none recorded in the notes), but may also have been due to the supernumerary teeth.

Aims of treatment

The aims were to remove supernumerary teeth and upper anterior deciduous teeth to allow eruption of permanent maxillary incisors and review.

Treatment plan

- Extraction of URC, URB, URA, ULA, ULB, ULC plus surgical removal of the 2 supernumerary teeth.
- Await eruption of permanent maxillary incisors.

Rationale

The removal of the deciduous incisors along with the supernumerary teeth should allow eruption of the permanent successors. A further assessment of the case could then be made once eruption had occurred.

Treatment progress

Deciduous teeth, as noted above, were removed together with both upper supernumerary teeth. Eruption of UR1,

UR2, UL1, UL2 occurred as planned; however, the central incisors erupted labial to the lateral incisors, leaving a midline diastema of 14.5 mm (Figure 2a,b). Clinical examination and radiographs revealed bone loss in the midline of the alveolus (Figure 3a,b).

Further assessment was undertaken on the combined maxillofacial/orthodontic clinic. Space analysis revealed UR1 to be 8.2 mm wide and UL1 to be 8.5 mm wide, thus giving a total width of 16.7 mm. The space between the upper lateral incisors was measured at 14.2 mm.

Treatment plan

1. Distalize lateral incisors with an upper removable appliance.
2. Alveolar bone grafting to the midline defect.
3. Alignment of upper incisors and closure of the diastema by approximation of UR1, UL1 with a sectional fixed appliance.
4. Retention and await further eruption of permanent successors.

Rationale

Creation of space to allow alignment of the upper incisors and closure of the diastema was needed. This could be achieved with a removable appliance with palatal finger springs avoiding potential damage to the lateral incisor root apices due to the adjacent developing canines. This did not reduce space for the bone graft as the bony defect was saucer-shaped and mesial to the central incisor roots. The bony defect in the maxillary midline needed to be corrected prior to mesial



(a)



(b)

Figure 2 (a,b) The resulting diastema following eruption of the central incisors after removal of the supernumerary teeth



(a)



(b)

Figure 3 (a,b) OPT and upper standard occlusal films showing midline alveolar bone loss and diastema



Figure 4 Sectional fixed appliance *in situ* with power chain to approximate the central incisors and upper removable appliance distalizing the lateral incisors

movement of the central incisors. A sectional fixed appliance could be used in the first instance, therefore allowing continued eruption and development of the permanent dentition.

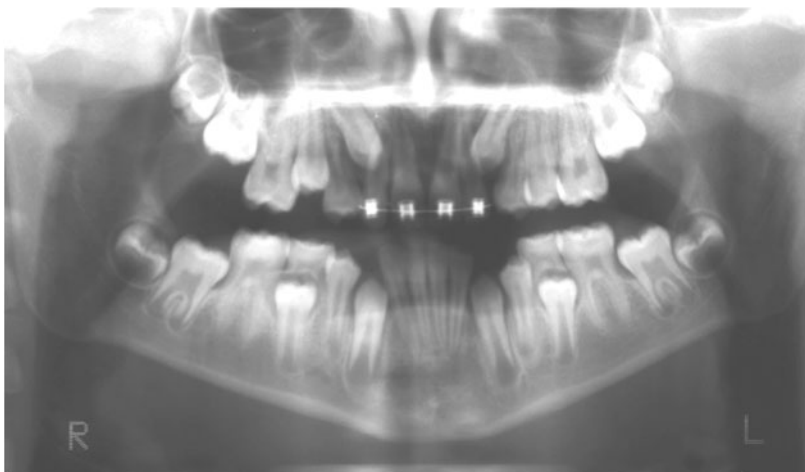
Treatment progress

A total of 16.9 mm of space was created between the upper lateral incisors with an upper removable appliance. The patient underwent surgical exposure and curettage of the midline defect. Bone grafting from the right iliac crest was performed. Approximately 12 weeks later, a sectional fixed appliance was fitted to the upper central incisors and power chain was applied to begin space closure along a 0.016 × 0.022-inch stainless steel (SS) wire. The upper removable appliance was worn as a space maintainer (Figure 4). Four months later, enough closure of the central incisors had been achieved to allow



Figure 5 Diastema now closed. Note torque of lateral incisors

bonding of the lateral incisors. A 0.012-inch nickel-titanium (NiTi) sectional wire was placed to align and level all four incisors. Treatment progressed with an 0.018 × 0.025-inch heat activated NiTi wire (Figure 5) and finally 0.016 × 0.022-inch SS. Radiographs taken at this stage demonstrated incomplete uprighting of roots UR1, UL1 (Figure 6a,b). This was used as a final wire in order to prevent further root torque of the lateral incisors, whilst the permanent canines were still erupting. Ideally, more root uprighting would have been carried out to the central incisors using second-order bends in the archwire. However, the patient would require definitive treatment on eruption of the permanent canines and it was decided to minimize interceptive treatment time, finally correcting the central incisors' tip when complete fixed appliances were placed. Debonding of the sectional fixed appliance and placement of a palatal bonded retainer to UR1, UL1 was undertaken 8 months after fixed therapy began (Figure 7a-d).



(a)



(b)

Figure 6 (a,b) OPT and upper standard occlusal films showing closed diastema and position of canines



(a)



(b)



(c)



(d)

Figure 7 (a–d) Completion of interceptive treatment phase

Re-assessment

Completion of the initial phase of treatment was followed by review and final phase treatment planning. Both upper first premolars were extracted to allow space for the upper canines to erupt fully (Figure 8a,b). Full upper fixed appliance therapy was commenced, but 1 year later the patient moved to Scotland and his treatment was transferred. Unfortunately, no clinical photographs were taken at that stage of treatment.

Discussion

There are many etiological factors in the development of a median diastema and most have been investigated to some degree. A study by Gass *et al.*⁵ has suggested there may be genetic susceptibility to the development of midline diastemata. The presence of supernumerary teeth and their effect on the developing occlusion has been investigated by numerous authors, but notably,

Nik-Hussein⁶ found that a high proportion (38%) of patients with supernumerary teeth had delayed or failed eruption of permanent teeth. Tay *et al.*⁷ had previously reported that, where supernumeraries were normally orientated, delayed eruption was likely to occur, whereas inverted supernumeraries were more likely to be associated with bodily displacement of the permanent incisors, median diastema and torsion. In the case presented, the supernumeraries were, indeed, normally orientated, but delayed eruption and bodily displacement were evident.

Healing following the surgical removal of teeth usually involves the formation of a blood clot in the bony defect. Reorganization of the clot, involving angiogenesis and later osteogenesis, leads to bony infill of the socket. Occasionally, this process is impaired and soft tissue granulation may remain or a bony defect may result. Orthodontic repositioning of teeth into this soft tissue will not result in good bony support for the teeth. Bone grafting from one of the commonly utilized sites (iliac crest or alveolar) can be used to repair defects

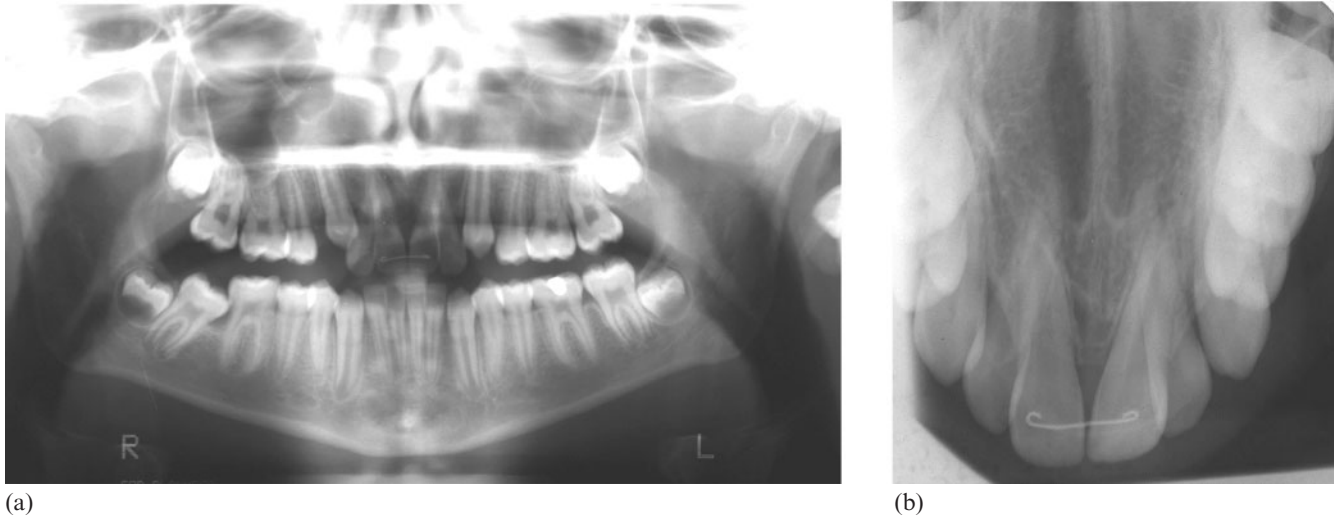


Figure 8 (a,b) OPT and upper standard occlusal following extraction of UL4, UR4 to allow eruption of UL3, UR3

prior to orthodontic movement of teeth. In this case, the use of iliac crestal bone worked well without obvious morbidity.

Conclusion

The case described exhibited delayed eruption of the permanent maxillary incisors due to the presence of midline tuberculate supernumerary teeth. Surgical removal of the supernumerary teeth unfortunately resulted in severe bone loss. However, the case demonstrates that alveolar bone grafting can allow even a very large diastema to be closed with interceptive orthodontics. The final root position of the central incisors was slightly less than ideal; however, it was planned to treat the malocclusion definitively in the permanent dentition when full correction could be more easily provided.

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