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CLINICAL SECTION

Extraction of four first molars: a case for a general practitioner?

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It has been suggested that the extraction of four first molars 'doubles the treatment time and halves the prognosis' (Mills). It is also thought by some that these cases are unsuitable for treatment by General Dental Practitioners. The aim of this article is to illustrate that, with careful case selection, space analysis and good anchorage control, first molar extraction cases can be relatively straightforward.

Key words: Orthodontics, first permanent molars, fixed appliance therapy

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Introduction

Four sixes cases were once considered difficult for a variety of reasons, including the relative difficulty of extraction of molars, unsuitability for removable appliance therapy and increased length of treatment time. Lower first molar space closure is time-consuming, and the lower second molars have a tendency to tilt mesially and roll lingually.

This case report describes a 12-year-old Caucasian female who presented with a Class I malocclusion on a Skeletal I base, having an average maxillary–mandibular planes angle and slightly increased lower facial height. She had moderate upper and lower crowding, and her first molars had suffered previous caries. Treatment was carried out using fixed appliances with reinforced anchorage and first molars were extracted in all four quadrants.

Dental features, diagnosis and treatment planning

A Caucasian girl aged 12 years was referred by her GDP complaining of the appearance of her crooked front teeth. The medical, dental, family and social histories revealed nothing abnormal.

Extra-oral assessment

She presented with a Skeletal I base, an average Frankfurt-mandibular planes angle and slightly increased lower facial height. Her lips were competent with the lower lip lying just below the upper incisor tips and both lips lying behind Ricketts' E-plane. The naso-labial angle was obtuse (Figure 1a–d). The TMJs were normal and the face was symmetrical.

Intra-oral examination

Her oral hygiene was poor with inflamed gingival margins. She presented in the permanent dentition and all first molars showed evidence of previous caries. The lower arch was moderately crowded. The lower right canine was distally inclined, the lower left canine was normally inclined and both were slightly buccally displaced. The lower incisors were imbricated and the lower lateral incisors were displaced lingually. The upper labial segment was moderately crowded, with the upper canines upright and the upper incisors mildly proclined. Bolton analysis revealed no significant tooth size discrepancy, but upper and lower anterior teeth were broad. The curve of Spee was shallow and the buccal segments were mildly crowded.

The inter-arch assessment showed the molars to be Class I on each side, with good buccal interdigitation of the posterior segments. The incisor relationship was Class I with an overjet of 4.5 mm and a normal, but incomplete overbite of 2 mm. The upper and lower center lines were mid-face and coincident (Figure 2a–e). There was a mild crossbite at 25,35, but no displacement. The functional occlusion demonstrated canine guidance right and left, with no non-working side contacts.

Space analysis indicated a space requirement of 10 mm in the lower arch and 8 mm in the upper arch.

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Figure 1a

Figure 1b

Figure 1c

Figure 1d

Figure 1 Pre-treatment extra-oral photographs

Figure 2a

Figure 2b

Figure 2c

Figure 2d

Figure 2e

Figure 2 Pre-treatment intra-oral photographs

Radiographs

The dental panoramic tomogram (Figure 3a) confirmed the presence of all permanent teeth, including developing third molars. The first molars were all restored or carious, and their long-term prognosis was considered to be poor.

The lateral cephalogram (Figure 3b) indicated a Skeletal I bordering on mild Skeletal III pattern, with an ANB of 0. This was confirmed by the Wits analysis that showed AO and BO to be coincident. The maxillary–mandibular planes angle was within normal limits at 29°. The upper incisors were slightly proclined at 114° and the lower incisors normally inclined at 91°. The resultant inter-incisal angle was 126° (Table 1).

Aetiology

The Class I skeletal pattern is inherited, and a tooth size/arch length discrepancy is responsible for the amount of upper and lower crowding, especially as the anterior teeth are notably broad.

The position of the lower lip at rest could have contributed to the proclination of the upper incisors. The sequence and timing of deciduous tooth loss may have affected final canine positions and angulations.

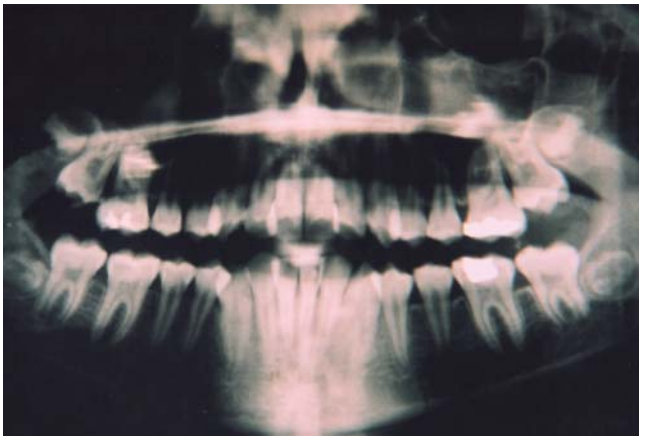

Figure 3a

Figure 3b

Figure 3 Pre-treatment radiographs

Table 1 Cephalometric analysis

Parameter	Value pre-treatment
SNA	80°
SNB	80°
ANB	0°
MMPA	29°
U1Mx	114°
L1Mn	91°
I:I	126°
L1–Apo	+2 mm
LFH	56.6%

IOTN

The classification of treatment need for the patient was IOTN 4d as there was a contact point displacement of more than 4 mm.

Aims of treatment

- Achieve and maintain a high standard of oral hygiene.
- Maintain the patient's existing profile.
- Alleviate the upper and lower crowding.
- Level and align upper and lower arches.
- Achieve Class I molar and canine relationships.
- Achieve normal overjet and overbite, and establish an optimal edge-centroid relationship.
- Establish good functional occlusion.

Treatment plan

- Oral hygiene and dietary advice.
- Upper palatal arch to upper second molars with anterior Nance button.
- Extraction of 16,26 and 36,46.
- Upper and lower fixed appliances using pre-adjusted Edgewise system.
- Upper removable wraparound retainer. Lower bonded retainer 43,42,41,31,32,33.

Treatment progress

The 4 first molars were extracted to relieve the upper and lower crowding. Three of these teeth were heavily restored and had a poor long-term prognosis. Because of this the first molars were chosen instead of first premolars, which would normally have been the extraction choice, being nearer to the site of crowding.

A good standard of oral hygiene was established then an upper palatal arch with Nance button was fitted to bands on the fully erupted second molars. This would maintain sufficient upper first molar space for correction of the malocclusion. The 4 first molars were extracted, the lower second molars banded and all the remaining teeth were bonded with brackets of 0.022×0.028-inch slot size, Andrew's prescription.

Initial alignment was carried out with upper and lower 0.016-inch nickel- titanium wires, using stainless steel tubing to protect the wires in the extraction sites and lace-backs in all 4 quadrants. Space was created for the lower lateral incisors by the use of a NiTi coil spring on a lower 0.018-inch stainless steel round wire. Subsequently, a 0.012-inch nickel-titanium piggy-back archwire was used to align the lateral incisors to the base archwire. After full expression of the round nickel-titanium wires, 0.018×0.025-inch rectangular nickel-titanium wires were placed, and followed by upper and lower 0.019×0.025-inch stainless steel working wires to allow final space closure.

Intra-arch nickel-titanium closed-coil springs in all four quadrants were used for space closure after removal of

the upper palatal arch. After complete correction of the lower second molars, dead ligatures were used to maintain space closure, whilst upper and lower 0.014-inch stainless steel wires were placed with minor bends to allow final tooth positioning. No inter-arch elastics were used as this might have reduced the overbite.

Following debond, an upper removable wraparound retainer was provided for 3 months full-time wear, 6 months night time wear and a lower 0.0175-inch annealed twistflex retainer was bonded lingually to the lower incisors and canines.

Case assessment

A second set of radiographs was not indicated, as this case did not aim for any alteration to the skeletal base and clinically all the teeth appeared to be in an acceptable position.

After treatment, the extra-oral appearance was acceptable (Figure 4a–d). The overjet and overbite was 2 mm with good tooth alignment. The lower inter-canine width was unaltered and the interdigitation of the buccal segments was good, which may improve the chances of the result remaining stable (Figure 5a–e).

Figure 4a

Figure 4b

Figure 4c

Figure 4d

Figure 4 Post-treatment extra-oral photographs

Figure 5a

Figure 5b

Figure 5c

Figure 5d

Figure 5e

Figure 5 Post-treatment intra-oral photographs

Figure 6a

Figure 6b

Figure 6c

Figure 6d

Figure 6 Post-treatment bilateral canine guidance

PAR scores showed that the pre-treatment index was 32 and the post-treatment index was 3, with a 90.6% reduction in weighted PAR score. Following treatment there was a good static occlusion together with a good functional occlusion with bilateral canine guidance and absence of non-working side contacts (Figure 6a–d).

Discussion

First molars may be chosen as the teeth for extraction in preference to premolars for a number of reasons, including gross caries, large restorations, root filled teeth, significant hypoplasia, to aid in treatment of anterior open bites, to relieve crowding towards the back of the arch and in high maxillary-mandibular planes angle cases.[1] It is important to assess the presence and eruption path of the other molar teeth, as they will form part of the functional dentition.

In the lower arch, the first molars were extracted after full eruption of the lower second molars. There was a reasonably large space requirement in the lower arch, which was beneficial as during alignment there would be less risk of retraction of the lower labial segment. Upper anchorage reinforcement was required to maximize the use of upper first molar space. Upper molar space closure can be rapid as second molars rapidly move mesially during treatment. The case would have been more difficult had there been more upper arch crowding and extra-oral anchorage would probably have been required. The underlying Class I skeletal base made the case easier to treat as no camouflage procedures were required.

The extraction of four first molars often presents difficulties with space closure in the lower arch as the lower second molars tend to tilt mesially and roll lingually. It is imperative, therefore, that full size rectangular steel 0.019×0.025 working wires are in place before active space closure is attempted. McLaughlin Bennett Trevisi (MBT) prescription bands, which have 10° of lingual crown torque (20–25° less than most other prescriptions), are designed to reduce lower molar lingual roll.

Nickel-titanium coil springs were chosen to deliver a constant low-grade force, which generally provides efficient space closure. Labial crown torque of the lower incisors can be used if required to minimize lower labial segment retraction during space closure. At the end of space closure, gentle tip-back bends in the wire on the second molars encouraged correction of the root angulations, whilst dead ligatures maintained the crown position. Class II elastics (buccal) were not used in this case as this may have promoted lingual roll of the molars, as well as detrimentally affecting the overbite. Class II elastics from the lingual cleats of lower second molars can help reduce lingual roll, but again would tend to extrude the lower molars and reduce the overbite, which in this case would have been inappropriate.

The treatment time, when compared to a similar case treated with the extraction of 4 premolars, is probably 4–6 months longer. After 3 months retention, a space of 1 mm had opened up in the upper left first premolar region, although not an extraction site. If this fails to spontaneously close and the patient finds the gap unacceptable, it could be closed easily using composite restorations.

Conclusion

This case report has been used to demonstrate that, with patience and careful technique, a good orthodontic result is achievable in an acceptable treatment time of only 24 months.

References

1. Sandler PJ, Atkinson R, Murray AM. 'For Four Sixes'. *Am J Orthod Dentofac Orthop* 2000; **117**: 418–34.