The orthodontic-oral surgery interface. Part one: A service evaluation and overview of the diagnosis and management of common anomalies

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Key points

- Aids with recognition and diagnosis of common dental anomalies.
- Discusses management of these anomalies.
- Highlights the importance of the orthodontic-oral surgery interface for the diagnosis and management of these common anomalies.

Introduction Complex dental anomalies often require multidisciplinary management in secondary care. These anomalies may present to general dental practitioners in the first instance, therefore it is important that all clinicians are aware of such anomalies and their management. **Aims** This service evaluation aimed to profile the dental anomalies presenting to the multidisciplinary joint dento-alveolar clinic at a district general hospital and to outline the management of the common anomalies. **Method** This two-part series details a service evaluation and profiles the dental anomalies presenting to the joint dento-alveolar clinic at a district general hospital. In addition, the features and management of the common dental anomalies are outlined. **Results** Fifty-four percent of patients were female, with a mean age of 17 years. The most common anomalies were impacted canines (49%), followed by supernumerary teeth (16%) and impacted premolars (10%). Other anomalies accounted for only a small percentage of referrals. **Conclusion** A wide range of anomalies presented to the joint dento-alveolar clinic. It is important for all clinicians to be aware of such anomalies, their diagnosis and management. Part one and two of this article therefore provide an overview of the common anomalies and highlight their management.

Service evaluation

Introduction

The joint dento-alveolar (JDA) clinic at Croydon University Hospital (CUH) has been established for more than 15 years. This was in response to the complex nature of referrals received at CUH. This multidisciplinary clinic supports specialists and hospital-based consultants in the management of complex dental anomalies. The team comprises of senior members from the hospital orthodontic and oral surgery departments as well as hospital-based dental foundation and speciality trainees. The availability of this clinic allows for input from both the orthodontic and oral surgery specialties at one visit allowing for a holistic, comprehensive treatment plan to be developed. This process ensures that all of the available treatment options can be discussed, and enables patients to be more fully involved in their decision making. In addition, a service evaluation conducted in 2013 revealed that this clinic enhanced the patient experience.[1]

The aim of this two part series is to outline the origin of referrals to the JDA clinic and the presenting anomalies. Furthermore, a summary of the most common and interesting conditions as well as their management will be provided. Part One will cover soft tissue anomalies, dentigerous cysts, transpositions and supernumerary teeth. Part Two will focus on impacted teeth (incisors, canines, second premolars and molars), as well as generalised delayed eruption, primary failure of eruption, ankylosed incisors and infra-occluded deciduous molars. Both parts of the series detail the important role of the general dental practitioner (GDP) in identifying and diagnosing these complex anomalies as well as the importance of onward referral to secondary care for specialist opinions and management where required.

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Method

A prospective analysis of patient hospital notes was performed for 100 consecutive new patients attending the JDA at CUH from November 2014 to September 2015. Data were collected using a pre-designed and piloted data collection sheet. The following data were collected for each patient:

- Age
- Gender
- Diagnosis/reason for referral
- The patient's pathway from referral to attendance at the JDA clinic.

Data was entered into a Microsoft Excel spreadsheet and summary statistics were produced and evaluated.

Results

To attend the JDA clinic patients are initially referred internally from different departments within CUH. Table 1 outlines the origin of both the original referral to the hospital, and the source of the internal referral to the JDA.

The majority of patients were originally referred to CUH by a specialist orthodontist in practice (79%), followed by GDPs (20%), and only 1% were referred by a district general hospital. Internally, the majority of patients on the JDA were referred from the CUH Orthodontic department (92%), with a much smaller number referred from the CUH Oral Surgery department (8%).

Figure 1 illustrates the profile of anomalies presenting on the JDA clinic for the 100 patients included in the service evaluation. Ectopic canines were the most frequently occurring anomaly accounting for 49% of the referrals. Supernumerary teeth accounted for 16% of referrals and impacted premolars 10%. All other anomalies accounted for only a small percentage of the referrals; 4% of patients had grossly carious first premolars and were seen on the clinic for confirmation of an extraction pattern.

Table 2 shows the patient demographic details relating to each anomaly seen on the JDA clinic. The majority of patients were female (54%), the mean age was 17 years, with a range of 8–50 years.

Discussion

The majority of new patients attending the JDA clinic were originally referred by specialist orthodontists (79%). This supports the view that the throughput of this clinic comprises a variety of complex cases and that this clinic is invaluable in supporting primary care orthodontic services in Croydon.

Ectopic canines (49%) were the most common presenting anomaly, followed by supernumerary teeth (16%). The majority of patients with ectopic canines were female and those with supernumeraries were male, which supports previous reports in the literature.[2,3]

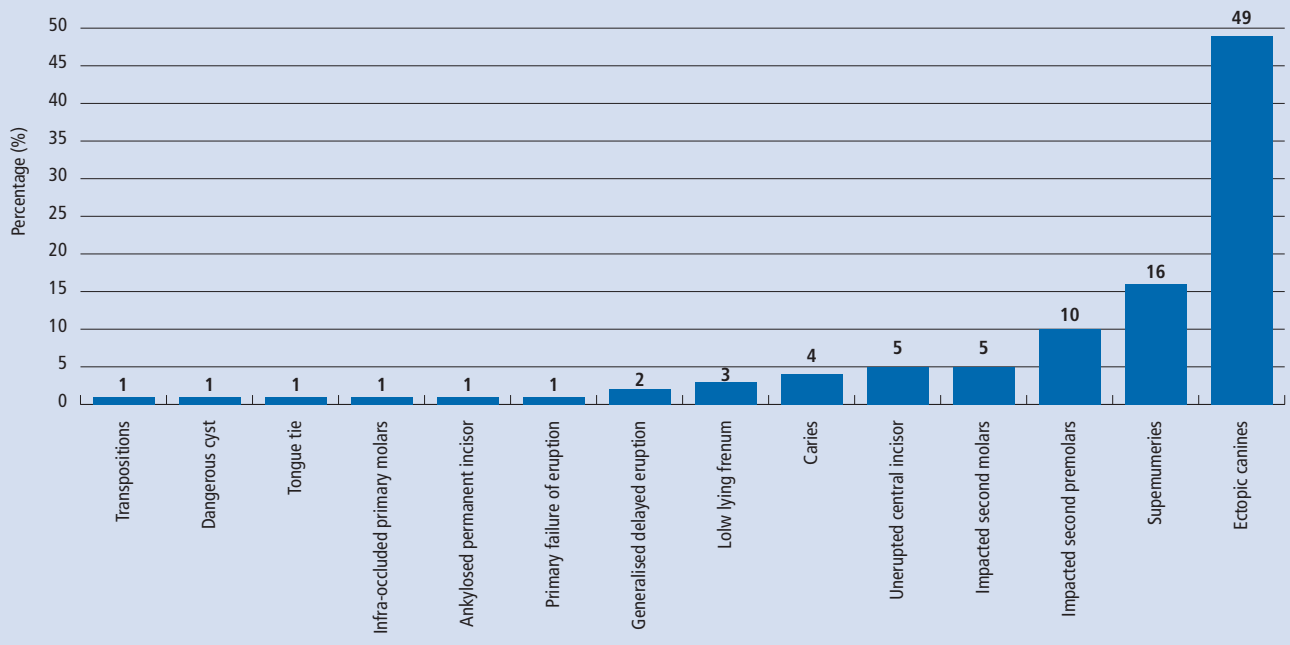
Completion of this service evaluation of the JDA clinics has allowed the department to recognise the high demand for such multidisciplinary clinics due to the high number of patients presenting with abnormalities which required multidisciplinary assessment and management. Following the service evaluation, more oral surgery specialists were allocated for the JDA clinics and the clinics were run more frequently. The service evaluation also aided the evolution of the JDA clinics by recognising the need for the use of enhanced imaging modalities such as cone beam CT scans (CBCT) and the development of patient pathways for the multidisciplinary management of many of these complex patients.

Given the breadth of dento-alveolar pathologies (both common and rare) presenting to the clinic, we feel that it is important for the GDP to have an understanding of these conditions, and what types of management may be discussed when patients are referred. This article will provide the reader with an overview of the aetiology, prevalence, classification, diagnosis, features and management of soft tissue anomalies, cysts, and supernumerary teeth. Part Two in this series will focus on impacted teeth as well as generalised delayed eruption, primary failure of eruption, ankylosed incisors and infra-occluded deciduous molars.

Table 1 Origin of new referrals to CUH and internal referral to the JDA clinic

Origin of new patient referrals to CUH	%
Orthodontic specialist	79
General dental practitioners	20
District general hospital	1
Origin of internal patient referrals to the JDA clinic	**%**
Orthodontic department	92
Oral Surgery department	8

Fig. 1 The profile of anomalies seen as new referrals on the JDA clinic



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Common anomalies

Low lying labial frenum

Definition:
The low insertion of the upper or lower labial frenum into the gingival tissue that can cause aesthetic or functional problems (Fig. 2).[4]

Aetiology: Variation of normal anatomy, with a possible genetic link.

Prevalence: 26.1%.[4]

Classification:
Frenums can be classified according to the tissue into which the frenal fibres attach; mucosal (at the mucogingival junction), gingival (within attached gingiva), papillary (into the interdental papilla) or papilla penetrating (into the palatine papilla).

Diagnosis:
A low lying labial frenum can usually be seen on clinical examination. If there is blanching of the interdental papilla in the midline when the upper lip is everted, the frenum may be contributing to a midline diastema. However, commonly it may not be possible to ascertain whether a low lying labial frenum is causing a midline diastema or if it is a consequence of a midline diastema. In either case the management of the low lying labial frenum will be the same.

Features:
A midline diastema is often associated with a low lying labial frenum. They may also be related to existing dento-alveolar anatomy including spaced teeth and unerupted teeth. Low frenums can cause gingival recession and can easily be traumatised, for example, when toothbrushing.

Management:
Low labial frenums may occasionally resolve spontaneously. Even if they do not resolve spontaneously the majority of low lying frenums will not require treatment. Interventional management (frenectomy) may be indicated if the low frenal attachment is associated with a midline diastema, if there is gingival recession or if there is difficulty maintaining oral hygiene around the frenum.

If a low lying frenum is associated with a midline diastema and is assessed as being likely to prevent orthodontic closure of the diastema a frenectomy is indicated. The frenectomy can be carried out before orthodontic treatment, during treatment, or following removal of the orthodontic appliances. A frenectomy during orthodontic treatment carried out just before space closure allows good surgical access and space closure can be started following the frenectomy, contraction of the scar tissue may aid closure of the diastema. A frenectomy before orthodontic treatment allows for better surgical access, however, scar tissue may have formed once the patient is ready to commence orthodontic space closure and this may impede space closure.

Frenectomies can also be carried out following orthodontic treatment. In this instance, surgical access may be difficult but there is the advantage that scar tissue contraction may contribute to keeping the diastema closed. Despite the proposed advantages and disadvantages of the different timing of carrying out a frenectomy there is little evidence to support the type and timing of any surgical intervention.[5]

Role of the GDP:
To diagnose the presence of low lying frenums and give appropriate oral hygiene advice to prevent recession and gingival trauma. Referral onwards to secondary care if the frenum is causing aesthetic or functional concerns.

Table 2 Demographic details of the anomalies seen on the JDA clinic

Presenting anomaly	Male:female	Average age (years)	Age range (years)
Ectopic canines	17:32	17	11 to 50
Supernumeraries	14:2	13	9 to 18
Impacted second premolars	3:7	15	12 to 28
Impacted second molars	3:2	15	13 to 18
Unerupted central incisors	4:1	10	8 to 14
Caries	2:2	11	8 to 14
Low lying labial frenum	1:2	14	11 to 16
Generalised delayed eruption	0:2	14	13 to 15
Primary failure of eruption	1:0	8	n/a
Ankylosed permanent incisor	0:1	15	n/a
Infra-occluded primary molars	1:0	16	n/a
Tongue tie	0:1	12	n/a
Dentigerous cyst	0:1	14	n/a
Transpositions	0:1	13	n/a
Total	**46:54**	**15**	**8 to 50**

Fig. 2 A low lying labial frenum

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Fig. 3 A tongue-tie

Fig. 4 A sagittal section of a CBCT image showing a dentigerous cyst associated with the lower right second premolar

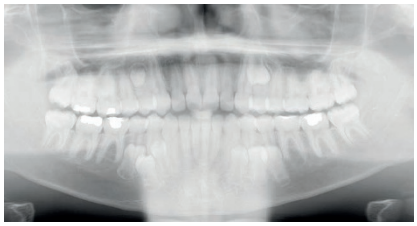

Fig. 5 A DPT showing the presence of supplemental premolars in all quadrants

Tongue-tie

Definition:
Often referred to as anklyoglossia, a tongue-tie usually refers to a lingual frenum that causes anatomical restriction of tongue movement (Fig. 3).

Aetiology: Variation of normal anatomy.

Prevalence: 4.2% in newborns.[6]

Classification:
There is no uniform classification of tongue-ties, however they are commonly classified according to whether they are anterior or posterior (or submucosal). Anterior (visible) tongue ties may insert to the tip of the tongue or ventral surface.

Diagnosis:
Based on a history of functional difficulties with tongue movement, supported by clinical examination. The mid tongue may not elevate compared to the lateral aspects.

Features:
In the newborn, breastfeeding problems (nipple pain or difficulty latching) may be present. Theoretically, certain consonant sounds ('s', 'th', 'r') could be affected by impeded tongue movement, however, there is a lack of clinical evidence for this.

Management:
Tongue ties may resolve spontaneously over time. Frenotomy, frenectomy, or frenuloplasty can be performed to release the tongue-tie. However, there is little evidence available regarding which surgical method may be superior.[7] Surgery may be indicated if the infant is having feeding difficulties, however, there is little evidence on whether surgical treatment or leaving and monitoring the tongue-tie is preferable.[7] The timing of surgery for tongue-ties can be classified as 'early' or 'late'. Early surgery is carried out in early infancy and has the advantage that no analgesia or anaesthesia is usually required due to the tongue having limited nerve endings at this time. Late surgery often requires a local or general anaesthetic, however, there is limited evidence on whether early or late surgery is superior.

Role of the GDP:
The GDP can diagnose tongue-ties and reassure parents of the diagnosis. If there are feeding concerns with infants an onward referral is indicated.

Dentigerous cyst

Definition:
A cyst is an abnormal, lined, fluid filled cavity within the body. A dentigerous cyst is a developmental cyst that is associated with the crown of an unerupted or partially erupted tooth (Fig. 4).

Aetiology:
Proliferation of enamel epithelium after enamel formation. The pathogenesis is poorly understood; one theory is that proliferation is induced by the osmotic pressure during an extended period of impaction.

Prevalence: 1.2%.[8]

Classification:
According to the teeth associated with the cyst.

Diagnosis:
A provisional diagnosis is made from clinical and radiographic findings of an unerupted tooth with an associated radiolucency enveloping the tooth. CBCT imaging may help determine the size and anatomical structures associated with a cyst. A definitive diagnosis is made through histological examination of the lining of the cyst.[9]

Features:
Unerupted or impacted teeth, displaced or mobile adjacent teeth, bony destruction, root resorption of adjacent teeth, crowding, spacing.

Management:
Depending on the size and location, cysts may be managed by either enucleation or marsupialisation (decompression) followed by enucleation after the lesion shrinks. Diagnosis is then confirmed from histological analysis of the lining. The involved tooth may be allowed

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Table 3 Classification of supernumerary teeth according to morphology and location

Morphology	**Conical (most common)**	Small, peg-shaped tooth. Termed a mesiodens if it occurs between the central incisors. This is the most common presentation, with root formation equal to or ahead of the permanent incisors.
	Tuberculate	Tooth with multiple cusps or tubercles, described as 'barrel-shaped'. Commonly paired and located palatal to the maxillary central incisors, with incomplete root formation. Can prevent the incisors from erupting.
	Supplemental	Anatomical duplication of a normal tooth, found at the end of a tooth series. Most commonly, distal to the maxillary lateral incisor.
	Odontome	Benign, disordered growth of mature dental tissues, described as compound (separate, small tooth-like structures) or complex (single, irregular mass of dental tissue).
Location	**Mesiodens**	Most often a conical tooth located between and palatal to the maxillary central incisors.
	Parapremolar	A supernumerary that forms in the premolar region and resembles a premolar.
	Paramolar	A supernumerary molar, adjacent to a normal molar, situated buccal, lingual/ palatal, or in the interproximal space.
	Distomolar	A supernumerary tooth located distal to the third molars.

to spontaneously erupt (if root formation is incomplete), orthodontically aligned, or extracted.[10] The dentigerous cyst presenting in Figure 4 was managed by enucleation.

Role of the GDP:
The GDP may be the first clinician to suspect a dentigerous cyst following a clinical and radiographic examination. If a cyst is suspected the patient should be referred to secondary care for a further assessment and for management of the cyst.

Supernumerary teeth

Definition:
A supernumerary tooth is a tooth occurring in addition to the normal series of teeth (Fig. 5).

Aetiology:
There are multiple aetiological theories including; hyperactivity of the dental lamina, genetic factors, and the now largely discounted theories of dichotomy of the tooth bud and atavism. Supernumeraries can be associated with cleft lip and palate and with certain syndromes, for example: cleidocranial dysostosis and Gardener's syndrome.

Prevalence: 0.91–2.1%.[3]

Classification:
According to morphology or location (Table 3).

Diagnosis:
Erupted supernumeraries can be detected by conducting a dental examination. Unerupted supernumeraries are most commonly detected as an incidental find on radiographs. If plain film radiographs are unclear a CBCT may be required to confirm the presence, morphology and location of some supernumerary teeth. Supernumerary teeth may also be unclear or undetected on dental panoramic tomograph (DPT) radiographs if they are outside of the focal trough. In these situations, further imaging, either with intra-oral plain films or CBCTs may be indicated. It is important to appreciate that supernumeraries can develop later in life.[3] Therefore, the absence of any supernumeraries in the early years does not rule out their development in the later years.

Features:
Complications of the adjacent permanent teeth, such as dilaceration, failed or delayed eruption, impaction, rotation, root resorption, crowding, spacing, and retained primary teeth. The supernumerary itself may undergo cystic change, or rarely, migration into the nasal cavity or maxillary sinus.[11]

Management:
If there is no associated pathology or underlying malocclusion, supernumerary teeth may be left *in situ*. If unerupted, periodic radiographic review is recommended to assess for any cystic change or damage to adjacent structures. Alternatively, supernumeraries may require extraction, if there is any associated pathology or if orthodontic treatment is required and if the supernumerary would interfere with tooth movement. Unerupted supernumeraries can be extracted surgically or occasionally supernumerary teeth erupt and then a simple extraction can be undertaken.

Role of the GDP:
The GDP can identify and diagnose supernumerary teeth and can also often identify if there is any associated pathology. Referral to secondary care for a specialist opinion is advisable. If supernumerary teeth are left *in situ*, the GDP can carry out regular reviews with radiographic monitoring and re-refer if required. If the supernumerary is to be extracted, simple extractions of erupted supernumeraries may be undertaken by the GDP. However, surgical extraction of unerupted supernumeraries is often undertaken in secondary care by a specialist oral surgeon.

Conclusion

This article has summarised the profile of the cases seen on the JDA at CUH and given an overview of the common soft tissue anomalies, dentigerous cysts, and supernumerary teeth including their diagnosis, management and the role of the GDP. It has also highlighted the invaluable role of the GDP in identifying and aiding the diagnosis of these anomalies so that patients can be referred for specialist opinion in a timely manner. The second part of this series will focus on anomalies in eruption, as well as transpositions and infra-occluded deciduous molars.

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