

Management of unerupted maxillary incisors

Omar Yaqoob
Julian O'Neill
Terry Gregg

Joe Noar
Martyn Cobourne
David Morris

Introduction

Missing and unerupted maxillary incisors can have a major impact on dental and facial aesthetics and were considered to be the most unattractive deviant occlusal trait in one American study.¹ There are very few studies reporting any functional problems associated with missing anterior teeth although some speech difficulties have been reported, particularly with the 's' sound.²⁻⁴ As missing upper incisors are regarded as unattractive this may have an effect on self-esteem and general social interaction and it is important to detect and manage the problem as early as possible.⁵

This guideline has been based on current evidence and should be continually developed as further evidence is made available. In the current literature, there are no controlled trials, 23 retrospective case studies reporting on 12 to 213 cases, 4 epidemiological studies reporting on 41 to 48,550 individuals, 52 case reports and 23 articles portraying clinical techniques, overviews and personal impressions.

1. DIAGNOSIS AND MANAGEMENT

1.1 Definition

Delayed eruption of maxillary incisors requires monitoring or intervention when:

- > there is eruption of contralateral teeth that occurred greater than six months previously;
- > both central incisors remain unerupted and the lower incisors have erupted greater than one year

- previously; or
- > there is deviation from the normal sequence of eruption (eg lateral incisors erupting prior to the central incisor).

1.2 Causes of delayed eruption

Delayed eruption can be classified into two causative groups.⁶

1.2.1 Hereditary

Supernumerary teeth, cleft lip and palate, cleidocranial dysostosis, odontomes, abnormal tooth/tissue ratio, generalised retarded eruption, gingival fibromatosis.

1.2.2 Environmental

Trauma, early extraction or loss of deciduous teeth (with or without space loss), retained deciduous teeth, cystic formation, endocrine abnormalities, bone disease.

2. INCIDENCE/PREVALENCE

The incidence of unerupted maxillary central incisor in the 5–12 year-old age group has been reported as 0.13%.⁷ In a referred population to regional hospitals the prevalence has been estimated as 2.6%.⁸

3. DETECTION OF CAUSES OF FAILURE OF ERUPTION

Dental and medical history:

A detailed dental and medical history should be obtained to determine possible hereditary or environmental factors, which may be contributory to the delay in eruption.

4. EXAMINATION

An intra-oral examination should be undertaken to identify the presence of deciduous teeth retained beyond their normal exfoliation dates. Buccal or palatal swellings should be noted as well as the availability of suitable space for the eruption of the incisors (9mm for a central and 7mm for a lateral incisor).⁹

Radiographs should be taken. A dental panoramic tomography and anterior occlusal radiograph can be taken for general assessment purposes. For detailed assessment of position it has been shown that the use of a horizontal parallax technique is better than vertical.¹⁰ For more accurate assessment of root and crown morphology, periapical radiographs should be taken using the long cone technique.^{11,12}

More recently, cone beam computed tomography technology has become available for imaging the maxillofacial region and this can be used for the localisation of impacted teeth, including incisors. This technique allows accurate localisation of the impacted tooth and visualisation of associated structures. However, it is associated with a higher overall effective dose than conventional radiography and currently there are no official guidelines or formal selection criteria with regard to its use in the UK.¹²

5. MANAGEMENT PRINCIPLES

5.1 Remove retained deciduous tooth

Any retained deciduous tooth should be extracted if there is no other obvious causative factor or if the permanent incisor is close to eruption.

5.2 Create and maintain sufficient mesial and distal space

Seventy-five per cent of incisors erupt spontaneously after space creation. Of these, 55% will align spontaneously while the rest will require some form of orthodontic alignment.^{13,14}

5.3 Physical obstruction

The presence of a supernumerary tooth or odontome does not necessarily cause delayed eruption of incisors.¹⁵ In the premaxillary region, where there is a failure of eruption of the permanent incisors, the effects of supernumerary teeth have been reported variably at 28% and 38%.^{15,16} Tuberculate supernumerary teeth are more likely to cause an obstruction than conical supernumerary teeth (1 in 5 compared to 1 in 1).¹⁷ In addition, one-third of compound odontomes and one-half of complex odontomes prevent eruption of teeth (compound odontomes are four times more common than complex odontomes).¹⁸ Odontomes are most common in Caucasian populations, where they account for over 65% of all odontogenic tumours. In general, odontomes occur more often in the permanent dentition and are very rarely associated with the primary teeth.¹⁹ It is felt that, in general, if there is an obstruction it should be removed as the early removal of the causative factor preventing eruption of the incisor improves the prognosis.²⁰

In 54 to 78% of cases in which supernumerary teeth overlie the incisor, removal of the supernumerary will result in the permanent incisor erupting spontaneously within an average time of 16 months,^{21,22} provided there is enough space.²³ The incisor may also be exposed at the same time as the removal of the supernumerary tooth as this will help aid the path of eruption.²⁴ Maxillary incisors that fail to erupt due to the presence of supernumerary teeth have a better prognosis than unerupted incisors with fewer common aetiologies.¹⁶

There are a number of different approaches:

5.3.1 Exposure

A minimal approach can be employed in which a small window is created if the permanent incisor is close to the surface, the attached gingiva is wide and there is extensive preservation possible at the gingival margin.²⁵ Otherwise, palatal or buccal mucosal flaps should be raised to reveal the tooth. In the case of a buccal flap, as much attached gingiva as possible

should be preserved using an apically positioned flap.²⁵ The exposure may need to be maintained using a non-eugenol based periodontal dressing.²⁶ Whitehead's varnish pack may cause discoloration of the underlying tooth.¹⁴ The short-term use of a chlorhexidine mouthwash should be prescribed to reduce gingival inflammation.²⁷

5.3.2 Closed eruption technique

A flap is raised and a bracket attached to a gold chain, steel ligature,^{28,29} magnet³⁰ or elastomeric material is bonded to the tooth followed by replacement of the palatal flap. Orthodontic traction should then be applied.^{31,32} The bracket should be bonded palatally so that early buccal fenestration does not occur in order to avoid an unfavourable gingival contour. Placement of a customised bracket bonded to the incisal tip has been described to reduce the risk of fenestration.³³

Traction in a forwards and downwards direction may cause the tooth to erupt in too high a gingival position and is not recommended. Therefore, in order to avoid exposure of the unerupted tooth into a high gingival position, it is necessary to apply traction carefully. The final position of the gingival margin is technique-sensitive. It is important not to remove the gingivae and surrounding tissues during exposure of the impacted incisor. Two weeks after surgical exposure, orthodontic traction may be started.^{34–36}

5.4 Unfavourable root formation

Dilaceration can occur in both primary and permanent dentitions. This malformation can occur in permanent incisors as a result of trauma to primary predecessors whose apices lie close to the permanent tooth germ. The prevalence of traumatic injuries to the primary dentition ranges from 11 to 30%.¹⁹

A study of 41 dilacerated unerupted maxillary central incisors revealed that 7% were associated with cysts or supernumerary teeth, 22% resulted from trauma to the deciduous predecessor and the remaining 71% were developmental in nature.³⁷ The dilacerated incisor may be brought into the line of the arch by exposure and closed technique.^{38,39} Elective root filling and apicectomy may

be undertaken where there is unfavourable labial root dilaceration. If the malformation is severe, the incisor may have to be removed.

5.5 Incisor removal

If a permanent incisor has to be removed (for example, if it is ankylosed) space can be maintained initially with a fixed or removable prosthesis.⁴⁰ An implant may then be considered as a long-term solution.^{41–43} However, prolonged space maintenance can lead to significant alveolar bone loss in the affected region, making later implant placement more difficult. An alternative strategy, particularly in the younger child, is to allow spontaneous space closure in the labial segment and then to open up space with fixed appliances prior to definitive restoration in the permanent dentition.⁴⁴

5.6 Ankylosed maxillary incisors

Severe intrusion and infection of the primary incisors or traumatic avulsion of the permanent incisors can cause ankylosis of permanent incisors.

5.6.1 The following treatment options are available:

- > Extraction of the ankylosed incisor followed by reimplantation in an ideal position; or extraction followed by orthodontic space closure with lateral incisor as surrogate.
- > Extraction followed by placement of an osseointegrated implant if the patient has completed growth.
- > Prosthetic replacement or augmentation.
- > Osteotomy of the dentoalveolar segment with immediate repositioning.⁴⁰

5.6.2 Osteotomy of the segment and repositioning of the dentoalveolar structures is a feasible option in some cases.

Distraction osteogenesis of ankylosed maxillary incisors with subsequent orthodontic adjustment has been reported.^{45–47} Growth of the patient is of special concern because of the risk of vertical relapse.

5.7 Autotransplantation

Autotransplantation of developing premolars to replace missing maxillary incisors has been documented 'to provide physiologically sound results'.⁴⁸ The most commonly selected tooth for transplantation is the lower second premolar. This has been documented to produce successful outcomes.^{48,49}

The main advantage is physiological as the process involves placement of the patient's own vital tooth, with preserved periodontium, followed by some morphological alteration by reshaping.^{50–53}

6. DISCUSSION

The occurrence of unerupted maxillary incisors can be associated with hereditary and environmental factors. However, the relevant importance of these different factors is not known. For example, the presence of supernumerary teeth does not necessarily mean that the incisor will be prevented from eruption.⁵⁴

Often the position of the impacted incisor (ie distance from alveolar crest, rotation, angulation and inclination) determines the surgical procedure used. One study of 30 patients suggested that the closed technique resulted in a more aesthetically pleasing gingiva than the apically repositioned flap.

However, there was no significant difference between the techniques regarding periodontal attachment. In contrast, superior results have been reported in terms of gingival, periodontal and pulp status using the closed eruption technique in comparison with the apically repositioned flap.²⁵

The timing of intervention has been suggested as being important, with several studies suggesting that the younger the age, the quicker the tooth erupts.⁵⁵ However, other studies have suggested that age of intervention has no effect. To some extent the differences can be explained by the small mean time difference of about three months in eruption, inadequate sample sizes and unmatched age groups.

SUMMARY AND RECOMMENDATIONS

1. Children up to nine years with incomplete root development of permanent incisor:
 - > Remove obstruction.
 - > Do not uncover bone from unerupted incisor – maintain integrity of follicle.
 - > Create space if required.
 - > Monitor eruption for 18 months – 80% erupt spontaneously
 - > If exposure required then expose minimally to eliminate soft tissue obstruction. If tooth is still high, expose and bond bracket.
 - > For best aesthetics:
 - i. avoid excision of attached gingivae; and
 - ii. avoid apically repositioned flaps.
2. Children above nine years with complete or nearly complete apex:
 - > Remove obstruction.
 - > Create space if required.
 - > If permanent incisor high then monitor eruption for 12 months.
 - > If tooth still unerupted at 12 months, expose and bond bracket as required.
3. If permanent incisor is impacted:
 - > Expose and bond bracket at first operation.
4. Children referred late (over 10 years):
 - > Remove obstruction, expose and bond bracket at first operation.

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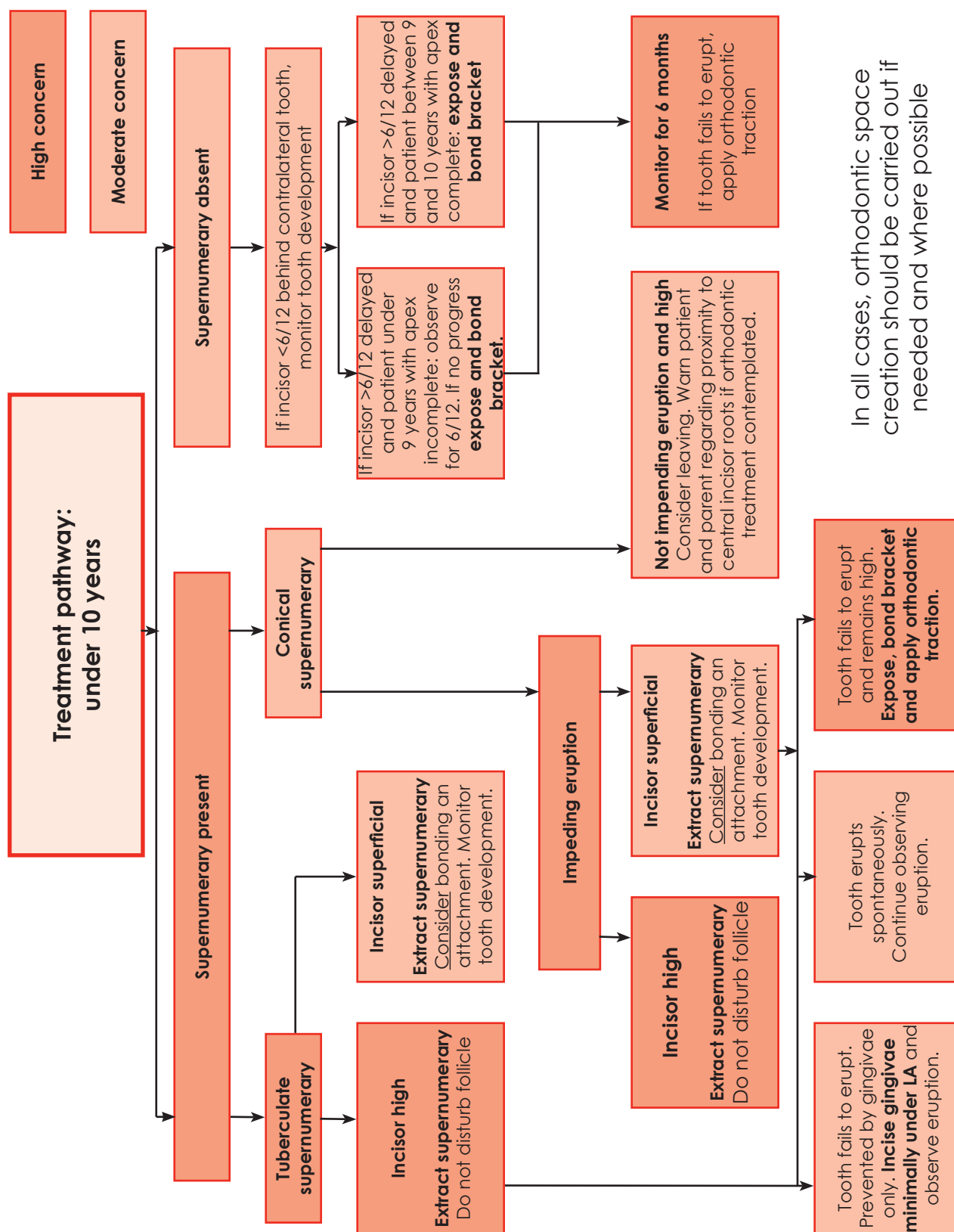
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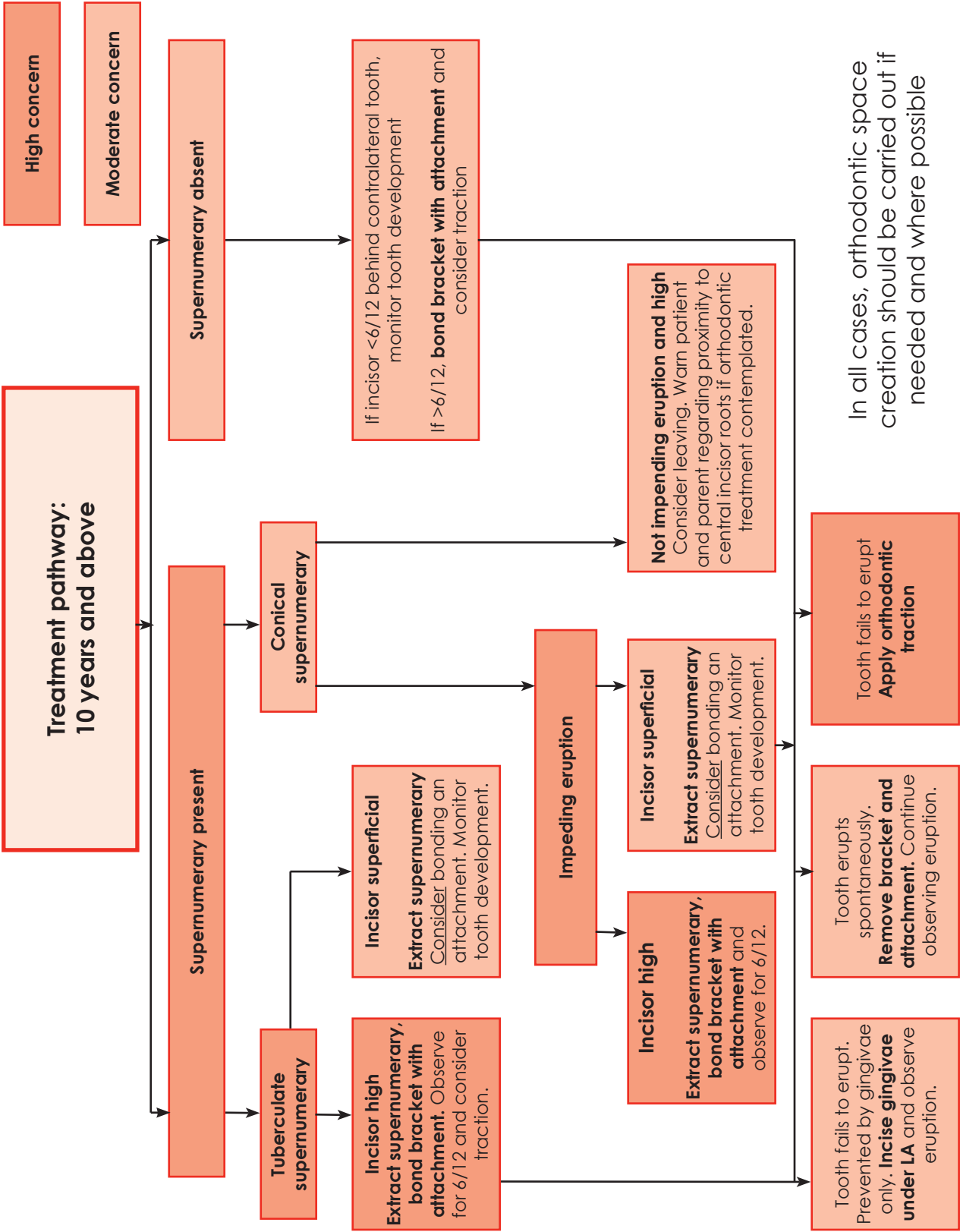
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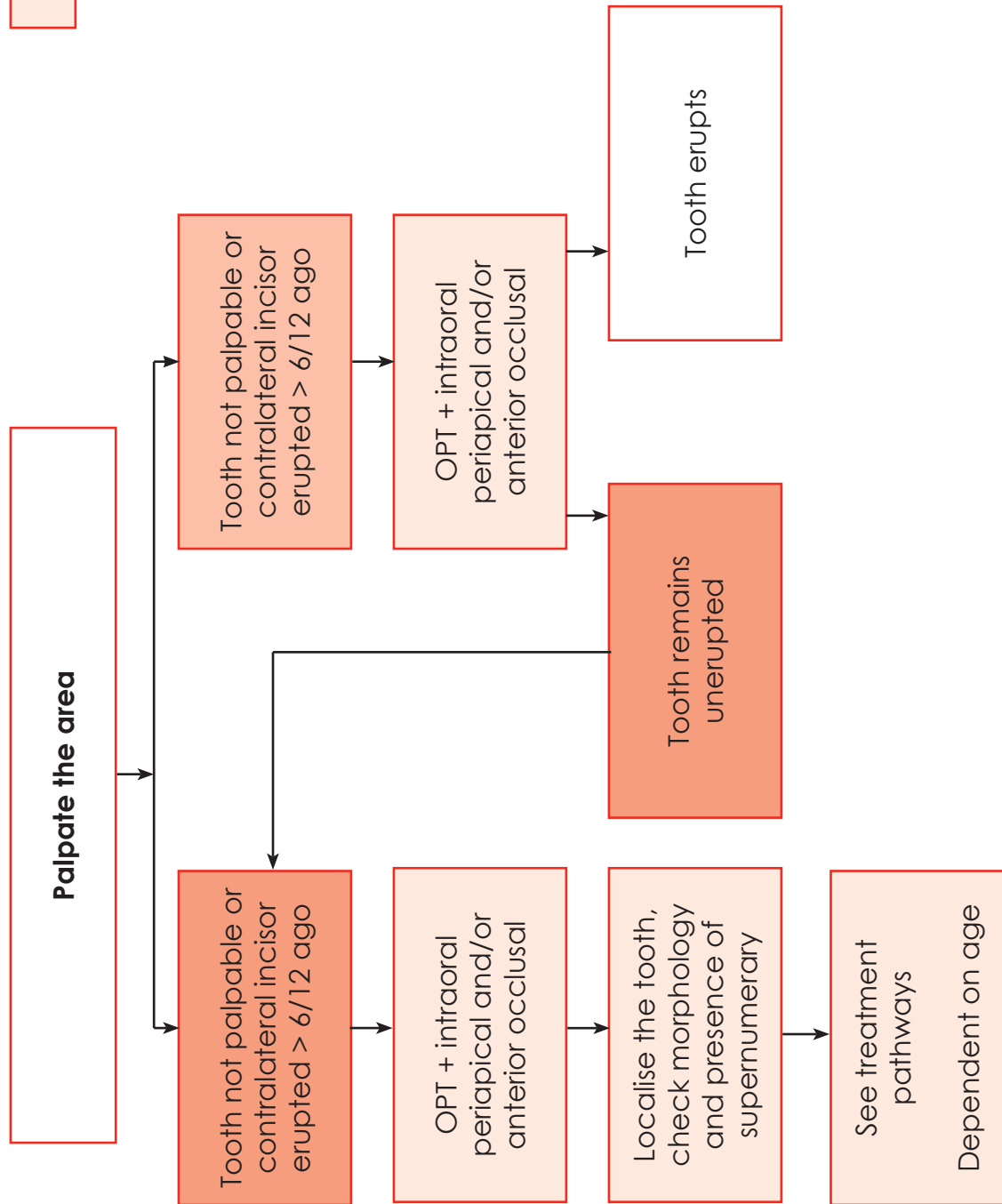
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Investigation of unerupted central incisor



High concern

Moderate concern

Treatment pathway