CLINICAL PRACTICE GUIDELINES

MANAGEMENT OF PALATALLY ECTOPIC CANINE

MINISTRY OF HEALTH MALAYSIA
Statement of Intent

These guidelines are meant to be a guide for clinical practice, based on the best available evidence at the time of development. Adherence to these guidelines may not necessarily ensure the best outcome in every case. Every health care provider is responsible for the management of his/her unique patient based on the clinical picture presented by the patient and the management options available locally.

Review of the Guidelines

These guidelines were issued in September 2004 and will be reviewed in September 2006 or sooner if new evidence becomes available.

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Available on the following website : http://www.moh.gov.my/
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ACKNOWLEDGEMENTS

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- The CPG Secretariat, Health Technology Assessment Unit, Medical Development Division, Ministry of Health Malaysia.
- Director, Oral Health Division, Ministry of Health Malaysia
- Datin Dr. Nooral Zeila Junid, Oral Health Division, Ministry Of Health, Malaysia
- Panel of independent experts who reviewed the draft
- All those who had provided valuable input and feedback
GUIDELINE DEVELOPMENT AND OBJECTIVES

Guideline Development

Timely intervention/referral is crucial for the effective management of palatally impacted maxillary canine. The current scenario is that most of the patients were seen by the dental practitioners or orthodontists after 13 years old (chronological eruption of maxillary canines is 10-13 years old). Early intervention / management is important to reduce treatment complexity and duration of treatment, thus rendering the management more cost effectiveness.

This clinical practice guideline has been compiled by a committee comprising of orthodontist, oral surgeon and dental practitioner from the public and private sectors to identify patients at the correct age for earlier management of the problem.

Objectives

The aim of the guideline is to present evidence based recommendations to assist dental personnel (staff nurse, dental surgeon, orthodontist, paediatric dental specialist, oral surgeon) in the timely detection and management of the palatally ectopic maxillary canine.

Clinical Question

The clinical questions of these guidelines are:

i) Could impacted maxillary canines be detected and managed early?
ii) What are the complications associated with an impacted maxillary canine?
iii) What is the management of a patient who presents with an impacted maxillary canine?
iv) Could the treatment time, complications and cost of management of the patients be minimised if there is a multidisciplinary approach as well as a structured organisation with facilities for referral?

Target Population

These guidelines are to be applied to individuals with non-palpable/unerupted maxillary canine by age 10 years old.

Target Group

These guidelines are developed for all dental professionals involved in the evaluation and management of cases with palatally ectopic maxillary canine. In addition, this guideline would increase patients’ awareness of the different management of palatally impacted maxillary canines.
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EXTERNAL REVIEWERS

The draft guideline was reviewed by a panel of independent expert referees, who were asked to comment primarily on the comprehensiveness and accuracy of interpretation of the evidence base supporting the recommendations in the guideline.

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The draft guideline was also available on the Ministry of Health Malaysia and Academy of Medicine websites to allow interested parties to submit opinions and comments of the guideline.
SUMMARY OF EVIDENCE

The initial search was carried out using Pubmed with “ectopic maxillary canine as the key word. This led to a few hundreds related articles of which 68 were considered. The related articles were then cross check with the references given CPG on this topic published by the Royal College of Surgeons of England. Further search on the treatment modalities using Pubmed and Google with “Auto transplantation” as the keyword.

Most of the articles are of reviewed papers and the level of evidence based on CAHTA scale is very low.

SUMMARY OF THE GUIDELINE

This clinical guideline seek to draw the attention of all dental health providers of the need to pick up potential cases of ectopic maxillary canine in a developing dentition of children age between 9 and 13 years. Each patient with a suspected canine ectopia must undergo a comprehensive investigation. The clinician should then consider the various treatment options available for the patient.

Early detection will allow interceptive measures to be carried. It has been shown that timely intervention can eliminate or significantly reduce the severity of the problem and hence reducing the morbidity as well as cost of the otherwise more complicated surgical and/or orthodontic treatment.

This guideline lay out the various treatment modalities available to deal with the varied problems of canine ectopia. All clinicians should be familiar with the various treatment options. As treatment of palatally ectopic maxillary canine is more complex than it seems, it is suggested that, wherever possible, the expert advice of an orthodontist be sought before any treatment is carried out.
### LEVELS OF EVIDENCE SCALE (CAHTA)

<table>
<thead>
<tr>
<th>Level</th>
<th>Strength of Evidence</th>
<th>Study Design</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Good</td>
<td>Meta-analysis of RCT, Systematic reviews.</td>
</tr>
<tr>
<td>2</td>
<td>Good</td>
<td>Large sample of RCT</td>
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<tr>
<td>3</td>
<td>Good to fair</td>
<td>Small sample of RCT</td>
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<tr>
<td>4</td>
<td></td>
<td>Non-randomised controlled prospective trial</td>
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<tr>
<td>5</td>
<td>Fair</td>
<td>Non-randomised controlled prospective trial with historical control</td>
</tr>
<tr>
<td>6</td>
<td>Fair</td>
<td>Cohort studies</td>
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<tr>
<td>7</td>
<td>Poor</td>
<td>Case-control studies</td>
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<tr>
<td>8</td>
<td>Poor</td>
<td>Non-controlled clinical series, descriptive studies multi-centre</td>
</tr>
<tr>
<td>9</td>
<td>Poor</td>
<td>Expert committees, consensus, case reports, anecdotes</td>
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**SOURCE:** ADAPTED FROM CATALONIAN AGENCY FOR HEALTH TECHNOLOGY ASSESSMENT (CAHTA), SPAIN
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1. **INTRODUCTION**

Impaction of teeth occurs in the permanent dentition. The most frequently impacted teeth are the third molars, followed by the maxillary permanent canines with an approximate value of 1.7% in Caucasians (Ericson & Kurol, 1986). Ectopic maxillary canines occur more often palatally (85%) than buccally (15%). The prevalence of palatally impacted canines is 5:1 (European: Asian) (Peck S, Peck L & Kataja, 1994). Currently, there is no available data on the prevalence of impacted canines in Malaysian population.

The aetiology of the canine ectopia remains unclear. However, the following are some of the factors leading to the impaction:-

a. spared arches (Jacob, 1983)
b. missing adjacent lateral incisor
c. anomalous / abnormal in shape, size of lateral incisor (Brin, Becker & Shalhav, 1986)
d. late developing dentition

There is some evidence that palatally ectopic canine occurs more often among family members.

The erupting maxillary canines should be palpable in the buccal sulcus from age 10 to 11 years. Eruption of maxillary after 12.3 years in girls and 13.1 years in boys may be considered late (Hurme, 1949).

**Sequelae of canine ectopia**

Possible sequelae of palatally impacted canine include root resorption of the adjacent incisors and the impacted canines (Ericson & Kurol, 1987; 1986), dentigerous cyst formation, infection and referred pain.

2. **DIAGNOSIS AND MANAGEMENT**

2.1 **History and Examination**

Canine ectopia should be suspected if the canine is not palpable in the buccal sulcus by the age 9–11 years or if any cuspid asymmetrical eruption pattern noted (Fig.1). The success rate associated with early diagnosis and treatment of palatally ectopic canine has been highlighted in recent years (McSherry, 1998; Ericson & Kurol, 1988)
Inspection and palpation in the canine region is recommended annually from age 8 years onwards (Ericson & Kurol, 1986. Level 8)

The patient with an ectopic maxillary canine must undergo a comprehensive assessment of the malocclusion including accurate localization of the ectopic canine. Localisation of the unerupted canine involves visual inspection, palpation and radiographic assessment.

2.1.1 Visual Inspection
The absence and abnormal position of both the canine bulge (Fig.2a and 2b) and lateral incisor can give an indication of canine ectopia.
2.1.2. **Palpation**

Palpation of the buccal and lingual mucosa is recommended to assess the position of the erupting maxillary canines. The absence of the canine bulge or presence of any eruption asymmetry after the age of 10 years may indicate that the canine is ectopic (Richardson & Russel, 2000. *Level 8*).

2.1.3 **Radiographic Examination**

Radiographs are indicated to confirm and localize the impacted canine and condition of the adjacent teeth.

Radiographic localization of impacted canine usually involves taking two radiographs and using the principle of vertical or horizontal parallax (Jacobs 1999. *Level 8*; Southall & Gravely, 1989. *Level 8*)

**Horizontal Parallax**

1. Anterior Occlusal and Periapical 
   or
2. Two Periapicals 
   or
3. Two Anterior Occlusals

**Vertical Parallax**

1. Anterior Occlusal + Orthopantomogram (OPT) 
   or
2. Periapical + OPT

Computed tomography (CT) is more accurate in localizing the position of the canine in 3 – dimensions and for diagnosing associated lesions such as root resorption of the adjacent teeth, and the width of the dental follicle (Jacoby, 1983. *Level 8*). However, high cost of equipment time and increased radiation exposure restricts its routine use (Jacoby, 1983. *Level 8*).

3. **Treatment**

There are various treatment modalities for palatally impacted canine. Patient and parent counseling on the various treatment options are essential.

3.1 **Interceptive Treatment by Extraction of Deciduous Canine**

Timely extraction of deciduous canine in patients aged 10-13 years with palatally ectopic canines has been found to normalize the eruptive path of canines within
12 months in 78% of cases (Ericson & Kurol, 1988. *Level 4*) and in 62% of cases (Powers & Short, 1993. *Level 5*).

Prevention of ectopic eruption of canine by this simple means will reduce the treatment complexity involved with impacted canine, the treatment time and cost. Complications like resorption of lateral incisor root usually associated with a more mesially position ectopic canine and occurring frequently at age of 12 years, can also be prevented.

3.1.1 **Indications** (Ericson & Kurol, 1988. *Level 4*)

a. Patients aged between 10-13 years  
b. Arches are spaced  
c. Ectopic canine root still developing  

A 91% success rate was reported if the crown of canine is distal to midline of lateral incisor. The success rate reduced to 64% when the crown is located mesial to midline of lateral incisor (Ericson & Kurol, 1988. *Level 9*).

Impacted canine tend to move more mesially with time. Therefore it is very important that the condition is detected early before the affected canine overlap the adjacent incisor by more than half and the success rate will be greater.

3.1.2 **Review**

Should be done at 6 monthly intervals with follow up radiographs until the permanent canine erupt. If there is no improvement after 1 year, other treatment options have to be considered (Ericson & Kurol, 1988. *Level 4*).

3.1.3 **Special considerations**

- Space maintenance / space gain with appliance or extraction in potentially crowded arches

  *Note: Irreversible decisions to extract permanent teeth to allow canine to erupt should be deferred as long as possible (Kuftinee, Stom & Shapira, 1995).*

- Bilateral extractions of deciduous canines where applicable to prevent midline shift
3.1.4 Prognosis
Prognosis should be explained to parents and patient before extraction is done.
It does not guarantee correction of problem. A gap may be left behind following
extraction of deciduous canine and the ectopic canine fails to erupt. They should
also be informed of various other options available in the event of an
unsuccessful outcome.

Prognosis is less favorable if:

a. arches are crowded which will most likely indicate complex appliance
   therapy (Powers & Short, 1993)

b. root of ectopic canine fully formed (Kokich & Mathews, 1993)

c. horizontal overlap of ectopic canine with lateral incisor mesial to midline of
   incisor

3.2. Surgical Exposure and Orthodontic Treatment

The purpose of surgical exposure is for alignment of the ectopic canine with fixed
orthodontic appliances. The following are the indications for the procedure:

a. Patient must be willing to wear fixed appliances

b. Since the treatment time is normally prolonged, the general dental
   health of the patient should be good

c. When interceptive extraction is not feasible

d. The success of orthodontic treatment depends on the degree of mal
   position of the ectopic canine, the rate of success is inversely
   proportional to the degree of mal position

The optimal time for surgical exposure and orthodontic treatment is during
adolescence (Galloway & Stirrup, 1989. Level 7). The success rate of the
treatment procedure is quite high.

One of the indications for surgical exposure and alignment of ectopic canine is
when there is severe root resorption of the incisors whereby it is necessary to
extract these teeth and align the canine into the arch.
3.3 Surgical Removal of Palatally Ectopic Permanent Canine

Due to prolonged treatment time with surgical exposure and alignment, surgical removal is another treatment of choice (Sagne & Thilander, 1990. Level 8). This procedure is carried out when:

a. The patient refuses orthodontic treatment
b. The contact between the lateral incisor and first premolar is acceptable
c. Pathological changes associated with the ectopic canine or radiographic evidence of early root resorption of the adjacent teeth
d. The ectopic canine is ankylosed and cannot be tract into the arch or transplanted.
e. The patient accepts substitution of first premolar for the canine and willing to undergo orthodontic treatment
f. Prognosis for the alignment of the ectopic canine depends on its 3 dimensional position. It is poor when (Southall & Gravely, 1989. Level 7):

- The canine crown is tilted towards the midline of the arch
- The position of the crown tip is less than one third of the incisor roots
- The inclination of the canine is more horizontal
- Canine root apex is away from its normal position.

Fig.3a Fig.3b
3.4 Autotransplantation
Orthodontic alignment is preferable whenever possible. Autotransplantation can be an alternative to orthodontic treatment and surgical removal of ectopic canines if:

a. The patient rejects orthodontic treatment because of social and aesthetics reasons.
b. The canine is severely malpositioned and cannot be aligned orthodontically.
c. Sufficient space and bucco-palatal bone must be provided for the transplant.

Prognosis is favourable for the canine to be transplanted provided the ectopic canine is removed with a meticulous atraumatic surgical technique and adequately stabilized. (Sagne & Thilander, 1990. Level 8; Thomas, Turner & Sandy, 1998. Level 8)

The long term (>5 years) prognosis for transplanted canine has yet to be evaluated. Approximately 95 – 98% of transplanted teeth are functional for 5 years (Anderson et al, 1990b).

3.5 No Intervention /Observation
a. The patient is not keen to undergo treatment
b. Occlusion is acceptable with satisfactory alignment of the lateral incisor and first premolar .( Fig.4a- 4b )
The retained deciduous canine has an acceptable appearance and good prognosis.

The clinician must ensure that the patient understands that the prognosis of the deciduous canine remains unknown and prosthetic replacement would be required if the deciduous canine is lost eventually.

Radiographic evaluation of ectopic canine which was left in situ is recommended to monitor for pathological changes. (Houston & Tulley, 1998. Level 9)

4. CONCLUSIONS

Early detection of ectopic canine eruption by inspection and palpation at the age of 8 or 9 years is very important as timely interceptive treatment may be initiated. This simple method of preventing canine ectopia by extraction of deciduous canine has been shown to be successful in suitable cases (Ericson & Kurol, 1998). It is very cost effective when compared with that of complex orthodontic treatment and surgical intervention required in palatal canine ectopia. However, inappropriate extraction of deciduous canine should be avoided to prevent arch collapse and crowding.

There is little correlation between chronological and dental age. Therefore, it is important that the overall dental development should be taken into consideration when a diagnosis for such cases is being done.

Parents and patient should be informed of the various treatment options available based on existing circumstances and possible outcomes / complications.

Treatment plan for palatally ectopic canine can be quite complex and a second opinion from orthodontic specialist should be sought before initiating any of treatment options.
5. ALGORITHM: MANAGEMENT OF THE PALATALLY ECTOPIC MAXILLARY CANINE

ERUPTION OF MAXILLARY CANINE

Canine bulge seen or palpable (section 1)

- **YES**
  - Bucaally
    - Good position (Along buccal alveolar / sulcus)
      - Monitor eruption
        - Canine emerge into Oral cavity after 1-11/4 Year bulge appears in Bucaal sulcus
  - Palatal Mucosa
    - Labial tipping of lateral crown
      - Canine position not ideal

- **NO**
  - Not erupted
    - Consider extraction of deciduous Maxillary canine in young patient (section 2.1)
      - Radiographic investigations in patients Who are 10 years and older
        - Refer for specialist consultation and Orthodontic treatment
  - Canine erupted
    - Definitive orthodontic treatment may be required Later in crowded permanent dentition

**NOTE: Number in the parenthesis refer to the text section for more**
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