CLINICAL PRACTICE GUIDELINES

JULY 2003

MOH/P/PAK/70.03(GU)

MANAGEMENT OF ANTERIOR CROSSBITE IN THE MIXED DENTITION

Ministry of Health Malaysia
Statement of Intent

This clinical practice guideline is 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

This guideline was issued in July 2003 and will be reviewed in 2005 or sooner if new evidence becomes available.

CPG Secretariat
c/o Health Technology Assessment Unit
Medical Development Division
Ministry of Health Malaysia
21st Floor, Bangunan PERKIM
Jalan Ipoh
51200 Kuala Lumpur.

Available on the following website : http://www.moh.gov.my/medical/cpg.htm
                                      : http://www.acadmed.org.my
FOREWORD

Anterior crossbites can occur in the early mixed dentition and is often left untreated. Proper management of anterior crossbites can avoid complicated fixed appliance therapy later and prevent damage to the dentition. However, the outcome and success of different modalities of treatment, depends on factors such as training of operators, experience and compliance of the patient. There are literatures stating that simple removable appliance are cost effective and able to provide stable results. It is hoped that the availability of these guidelines will create greater awareness among dental surgeons to appropriately treat and manage this condition.

Dato Dr. Wan Nasir Wan Othman
Director of Oral Health
Ministry of Health, Malaysia
PREFACE

One of the major responsibilities of dental practitioners is to intercept a developing malocclusion. To fulfill this goal the clinician should be able to recognise, diagnose and treat early, any occlusal irregularities that is potentially damaging to the dentition. An anterior crossbite is often observed in the mixed dentition and there is universal agreement that the condition should be treated early. The potential damage to the dentition if anterior crossbite is left untreated is considerable. This can range from alveolar bone loss, apical migration of periodontal ligament, damage and loss of the anterior teeth to temporomandibular joint disturbances.

There are various types of anterior crossbites in the mixed dentition. Their proper management depends on correct diagnosis and timing of treatment. This is sometimes difficult.

It is the intention of the committee in producing this guideline to assist the dental surgeons in diagnosing and recognising the types of anterior crossbite which can be treated by them and those to be referred to the orthodontist. Several treatment options currently available are suggested together with the design of appliances used.

The committee members have contributed a considerable amount of their time, expertise and valuable input for the creation of these guidelines. It is hoped that this guidelines will be useful for dental practitioners and help to improve the early management of patients with anterior crossbites.

Chairman.

Dr. Ariffien B. Ibrahim, AMS
BDS (Malaya), MSc (Lond.) Dorth. RCS (Eng).

Senior Consultant Orthodontist.
Klang Dental Clinic
Selangor.
GUIDELINES DEVELOPMENT AND OBJECTIVES

Guidelines Development

One of the major responsibilities of dental practitioners is to intercept a developing malocclusion. To fulfill this goal, the clinician should be able to recognize, diagnose and treat early, any occlusal irregularities that is potentially damaging to the dentition. An anterior crossbite is often observed in the mixed dentition and there is universal agreement that the condition should be treated early. The potential damage to the dentition if anterior crossbite is left untreated is considerable. This can range from alveolar bone loss, apical migration of periodontal ligament, damage and loss of the anterior teeth to temporomandibular joint disturbances.

Objectives

The aim of these guidelines is to assist dental practitioners in clinical decision making by providing well-balanced information on the management of anterior crossbite in mixed dentition. It is also hoped to standardize clinical management.

Clinical Question

The clinical questions of these guidelines are:

i. Could the various types of anterior crossbite be recognized and diagnosed early?

ii. When should the management of anterior crossbite referred to the orthodontist?

iii. What are the current modes of treatment available?

Target Population

These guidelines are developed to apply to all children with anterior crossbite in mixed dentition.

Target Group

These guidelines are developed for all Dental Surgeons.
CLINICAL PRACTICE GUIDELINE DEVELOPMENT TEAM

Dr. Ariffien Ibrahim

**Chairman**
Senior Consultant Orthodontist
Klang Dental Clinic, Selangor

Dr. Ruslan Sulaiman

**Secretary**
Consultant Orthodontist
Dental Clinic, Hospital Kajang, Selangor

**Committee Members**

Dr. Rashidah Burhanudin
Consultant Orthodontist
Dato Keramat Dental Clinic, Kuala Lumpur

Dr. Lim Lay Yong
Consultant Orthodontist
Klang Dental Clinic, Selangor

Dr. Sarah Hanizah Abdul Ghani
Consultant Orthodontist
Sarah Orthodontic Clinic
Taman Tun Dr. Ismail, Kuala Lumpur

Assoc. Prof Dr. Daw Mohamad Swesi
Consultant Orthodontist
Faculty of Dentistry, University Malaya

Dr. Mohd Shah Abu Hassan
Senior Consultant Oral Surgeon
Specialist Dental Clinic, Klang Hospital

Dr. Koay Chuan Lek
Private Dental Practitioner
Ooi and Koay Dental Clinic, Klang, Selangor

Dr. Ng Huang Lean
Dental Surgeon
Klang Dental Clinic, Selangor

Ms. Geevaretnam Sockalingam
Dental Staff Nurse
Klang Dental Clinic, Selangor

iv
# SPECIALIST REVIEWERS

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Ang Ghee Aik</td>
<td>Senior Consultant Orthodontist</td>
<td>Dental Clinic Jalan Perak, Pulau Pinang</td>
</tr>
<tr>
<td>Dr. Ismail Ngah</td>
<td>Senior Consultant Orthodontist</td>
<td>Dental Clinic Jalan Abdul Samad, Johor Bahru, Johor</td>
</tr>
<tr>
<td>Dr. Khoo Chooi See</td>
<td>Senior Consultant Orthodontist</td>
<td>Dental Clinic Mak Mandin, Pulau Pinang</td>
</tr>
<tr>
<td>Dr. Che Zaiton Mohd. Tahir</td>
<td>Consultant Orthodontist</td>
<td>Dental Clinic Kuala Terengganu, Terengganu</td>
</tr>
<tr>
<td>Dr. Zainatul Akmar Khalil</td>
<td>Consultant Orthodontist</td>
<td>Dental Clinic Jalan Abdul Samad, Johor Bahru, Johor</td>
</tr>
<tr>
<td>Dr. Chia Yang Soon</td>
<td>Consultant Orthodontist</td>
<td>Dental Clinic Jalan Gambut, Kuantan, Pahang</td>
</tr>
</tbody>
</table>

# EXTERNAL REVIEWERS

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Kelvin Foon</td>
<td>Associate Professor and Consultant Orthodontist</td>
<td>Faculty of Dentistry National University of Singapore</td>
</tr>
<tr>
<td>Dr. Tan Yee Yah</td>
<td>Consultant Orthodontist President Malaysian Association of Orthodontists</td>
<td></td>
</tr>
</tbody>
</table>
ACKNOWLEDGEMENTS

The committee of these guidelines would like to express their gratitude and appreciation to the following for their contribution:

- Director Oral Health Division, Ministry of Health Malaysia.
- Dr. Kelvin Foong, Associate Professor and Consultant Orthodontist
- Faculty of Dentistry, National University of Singapore.
- Dr. Tan Yee Yah, Consultant Orthodontist, President, Malaysian Association of Orthodontists.
- Datin Dr. Nooral Zeila Junid, Oral Health Division, Ministry of Health Malaysia.
- Panel of independent experts who reviewed the draft.
- All those who have provided valuable input and feedback.

The committee is also grateful and extends its sincere thanks to the following for providing expertise, support and services rendered in the development and publication of the guidelines.

- Dr. S. Sivalal, Deputy Director, Medical Development Division, Ministry of Health Malaysia
- CPG Secretariat, Health Technology Assessment Unit, Medical Development Division, Ministry of Health Malaysia.
**LEVELS OF EVIDENCE SCALE**

<table>
<thead>
<tr>
<th>Level</th>
<th>Strength of Evidence</th>
<th>Study Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Good</td>
<td>Meta-analysis of RCT, Systematic Review</td>
</tr>
<tr>
<td>2</td>
<td>Good</td>
<td>Large sample RCT</td>
</tr>
<tr>
<td>3</td>
<td>Good to Fair</td>
<td>Small sample RCT</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Non-randomized controlled prospective trial</td>
</tr>
<tr>
<td>5</td>
<td>Fair</td>
<td>Non-randomized controlled prospective trial with historical control</td>
</tr>
<tr>
<td>6</td>
<td>Fair</td>
<td>Cohort studies</td>
</tr>
<tr>
<td>7</td>
<td>Poor</td>
<td>Case-control studies</td>
</tr>
<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>
</tr>
</tbody>
</table>

*SOURCE: ADAPTED FROM CATALONIAN AGENCY FOR HEALTH TECHNOLOGY ASSESSMENT (CAHTA), SPAIN*
SUMMARY OF EVIDENCE

The evidence search was carried out using Pubmed with ‘anterior crossbite’ as the key word. This led to 165 related articles of which 43 were selected and out of these, 21 relevant articles were chosen to be graded using the CAHITA model.

A wide range of treatment techniques was suggested depending on the various types of anterior crossbites. Most of the studies in the literature were on functional treatment, chin cup and facemask treatment. Removable appliance studies were mainly confined to case reports or case studies. This however does not detract from the fact that removable appliance is taught in undergraduate training and in textbooks as the first choice of treatment. Removable appliance is a tried and tested modality of treatment in the management of anterior crossbite. The ease of use and its cost effectiveness make it the treatment of choice even in the advent of newer more technically demanding appliances.

Facemask and various types of functional appliances are part of postgraduate training. These types of treatment are usually more successful in the hands of more experienced clinicians.

Early treatment also has the benefit of preventing the malocclusion from getting worse. A contraindication to early treatment is when the crossbite is of skeletal origin and in these cases it is often best left until growth ceases.
SUMMARY OF THE GUIDELINES

These guidelines were formulated to standardise the treatment of anterior crossbite in the early mixed dentition.

Anterior crossbite is relatively common and if treated early can produce favourable results and prevent further deterioration of oral health. Misdiagnosis may occur if one is unaware of the aetiology of the various types of anterior crossbites. The proper diagnosis and management is essential to achieve good results.

For crossbites of dental or functional origin the treatment of choice is removable appliances. A dental practitioner with adequate training in removable appliances can treat the anterior crossbites successfully.

These guidelines cover the whole spectrum of managing anterior crossbite ranging from diagnosis, treatment options to different types of appliances available and their indications for use. Various designs of removable appliances are also suggested. This standardised protocol allows the practitioner to identify anterior crossbites at an early stage, arrive at a correct diagnosis, formulate a correct treatment plan and this may prevent the need for a more costly and complicated appliance therapy.
# TABLE OF CONTENTS

Foreword
Preface
Guidelines Development And Objectives
Clinical Practice Guideline Development Team
Specialist Reviewers
External Reviewers
Acknowledgements
Levels of Evidence Scale
Summary of Evidence
Summary of The Guidelines
1. Introduction
2. Types of anterior crossbites
3. Aetiology
4. Rationale for early treatment
5. Examination and investigation
6. Diagnosis
7. Treatment
8. Removable Appliances
9. Fixed Appliances
10. Functional Appliances
11. Face Mask – Protraction Headgear
12. Chin Cup and Cap
13. Algorithm of treatment modalities of anterior crossbite in the mixed dentition

14. References
15. Appendix 1
16. Appendix 2
1. INTRODUCTION

The occurrence of anterior crossbite in the mixed dentition is common with a prevalence of 7-10%. It is often not correctly managed. This condition can be treated by dental surgeons in the early mixed dentition with the use of simple appliances. This may prevent the development of malocclusion and its associated problems.

An Anterior crossbite occurs when the maxillary incisors occlude lingual to the mandibular incisors. This may involve one or more anterior teeth either in the deciduous or permanent dentition.

2. TYPES OF ANTERIOR CROSSBITE

Anterior crossbites can be classified into three groups:

I. Dental (Simple anterior crossbite)
Patients present with a normal (Class I) antero-posterior skeletal relationship and straight facial profile in centric occlusion with one or more teeth in crossbite. This case should be treated early.

II. Functional anterior crossbite (Pseudo Class III)
The incidence of pseudo Class III is estimated to be 2-3%. Patients present with a normal antero-posterior skeletal relationship in centric relation with either a straight or a concave facial profile. The presence of a premature contact results in a mandibular displacement. This case should be treated early (refer to rationale for treatment).

III. Skeletal (Class III)
The incidence of skeletal Class III is about 1%. Patients present with a straight or concave facial profile and often with a Class III molar relationship. A mandibular displacement on closure due to premature contact may be present. Early treatment may not be successful due to the uncertainty of growth and hence a referral to a specialist is necessary to monitor growth.
3. AETIOLOGY

The possible causes of anterior crossbite include:

- Inadequate upper arch length (crowding).
- Lingual eruption path of maxillary incisors.
- Delayed shedding of deciduous teeth.
- Trauma to deciduous teeth resulting in displacement of permanent tooth germs.
- Supernumerary teeth, odontomes or other pathological conditions leading to displacement of the teeth in anterior region.
- Early occlusal interference (dental). This results in a forward mandible displacement to achieve maximum intercuspation (functional anterior crossbite).
- Skeletal causes. There is discrepancy in the size or position of the maxilla and mandible.

4. RATIONALE FOR EARLY TREATMENT

Anterior crossbite if left untreated can lead to serious oral health problems and early orthodontic intervention is necessary\(^9,10\). A traumatic occlusion can occur, resulting in attrition of anterior teeth, mobility and apical migration of labial gingivae. A functional crossbite can also develop from cuspal interference, resulting in a mandibular shift. This may lead to an apparent mandibular asymmetry and may cause Temporo-mandibular Joint Dysfunction Syndrome. Hence, early treatment is important to reestablish proper muscle balance by elimination of occlusal interference\(^4\). Anterior crossbite will not usually self-correct.
5. EXAMINATION AND INVESTIGATION

The early management would encompass a complete examination and diagnosis to differentiate the different types of crossbite.

Patient Assessment

A detail assessment of the patient is essential for a proper diagnosis. This would involve:

a. Patient’s Complaint
Patient with anterior crossbite may complain of irregularity or crowding of the anterior teeth, invisibility of upper anterior teeth or mobility of the lower incisors. However most patients are unaware of their condition and are identified during a routine dental check up.

b. History
A relevant medical history should be taken and must be updated regularly. Specific illnesses such as HIV, hepatitis, epilepsy, any heart conditions, blood dyscrasias, patients on medications, chemotherapy and allergy to acrylic or nickel should be noted.

A general dental and family history should also be taken.

Extra - Oral Examination

Assessment of skeletal pattern:
- Antero-posterior relationship
- Vertical relationship
- Transverse relationship

Soft tissues:
- Soft tissue profile (straight, concave, convex)

Temporomandibular joint
- Tenderness
- Clicking
- Crepitus
- Mobility
Intra-Oral Examination

The general condition of the oral cavity should be assessed. Oral hygiene status and the gingival condition are recorded. The DMF status of all teeth is noted.

The presence of crowding, spacing and the number of teeth involved in the anterior crossbite is noted.

The inclination of the upper and lower incisors in relation to their respective bases is assessed.

With the teeth in occlusion, the measurements recorded are overjet (OJ), overbite (OB), centreline positions and buccal segment relationship.

Any mandibular displacement and the presence of premature contact should be noted. Attention should be given to any sign of attrition and gingival recession; this may involve periodontal breakdown and tooth mobility which are often the signs of traumatic occlusion.

Radiographic Examination

Radiographs are used to confirm the presence, absence, condition of teeth and to detect any pathology. This usually requires an Orthopantomograph. An anterior occlusal is necessary to detect supernumerary teeth in the anterior region. A lateral cephalogram is indicated where there is a skeletal discrepancy and to assess the inclinations of the incisors.

Study Models

Study models are taken before and after orthodontic treatment. It is useful for diagnosis and treatment planning and in monitoring treatment progress and for medico-legal purposes.
6. **DIAGNOSIS**

The correct diagnosis of the type of anterior crossbite is essential for successful treatment. Dental anterior crossbite can be treated early by use of simple appliances. Functional and skeletal anterior crossbite require more complex treatment modalities and should be managed by the orthodontist. Skeletal crossbite is best treated after growth has ceased\(^{11}\).

7. **TREATMENT**

**Treatment aims**

Early orthodontic intervention in the management of anterior crossbite can prevent its damaging effect and may eliminate further need of comprehensive orthodontic treatment\(^{5,12}\). The aims would be to eliminate mandibular displacement and any traumatic occlusion. This would restore function as well as allowing normal development of the occlusion and facial growth.

**Treatment Principles**

**Dental or functional anterior crossbites**

These types of anterior crossbites are best treated during early mixed dentition\(^{5,6}\).

An assessment of total space requirement is essential as lack of space is the most common factor for dental crossbite. Special consideration should include developmental position of canines especially in severely crowded cases.

Treatment would involve proclination of upper incisors, retroclination of lower incisors or combination of both\(^{4,13}\). These are dento-alveolar changes.
An example of Dental and Functional crossbite bite is shown in Fig. 1 and Fig. 2

![Figure 1: A Crossbite involving 11](image1)

Fig. 1. A Crossbite involving 11

![Figure 2: A Crossbite involving 11 and 21](image2)

Fig. 2. A Crossbite involving 11 and 21

**Skeletal Crossbites**

Skeletal Class III in the mixed dentition presents with a skeletal discrepancy where there is mandibular excess, maxillary deficiency or combination of both.

In cases with mild to moderate skeletal discrepancies, redirection of growth could be the treatment of choice. This should be managed by the orthodontist and would involve the use of functional appliance or protraction face mask. For these types of cases, constant review is essential to monitor facial growth.

In severe skeletal cases early intervention is inappropriate. A combination of orthodontic and surgical correction may be required later after growth has ceased.
An example of skeletal crossbite is shown Fig 3

Fig 3. A skeletal crossbite case

Treatment Modalities

Various options are available based on the severity and types of the crossbites. The competency of the operator has to be taken into consideration. These options are:

- Removable appliance
- Fixed appliance\(^ {16}\)
- Combination of Removable and Fixed Appliances\(^ {4}\)
- Functional Appliances\(^ {15}\)
- Face Mask\(^ {6}\)
- Chin – Cup / Cap
Orthognathic Surgery is not an option for the mixed dentition stage and is only considered when growth has ceased.

**Factors affecting outcome of treatment**

- Patient compliance\(^2\)
- Appliance design and usage
- Timing of treatment\(^3,12\)
- Inclination of incisors before treatment \(^3\)
- Adequate Overbite\(^3\)
- Periodontal breakdown\(^19\)
- Growth tendency\(^17\)
- Level of operator knowledge and training

8. **REMOVABLE APPLIANCES**

Removable appliances have been widely used in the treatment of anterior crossbite. They are simple and cost-effective. A properly designed and well managed removable appliance can produce successful results.

Treatment of anterior crossbite by dental surgeons without specialist orthodontic training should be confined to the usage of removable appliances only.

Successful correction of anterior crossbite should be achieved within six months. The creation of a positive overbite is essential for a stable result. No retainers are required; however, regular review should be carried out to monitor the development of the dentition.

**Components of Removable Appliances**

- Active components
- Retentive components
- Anchorage
- Baseplate
Active Components

The active components are springs, bows, expansion screws, and elastics. Activation of these components will provide the force to move teeth. The commonly used ones for correction of crossbites are Z-springs and expansion screws.

Z Springs

A Z spring made of 0.5 mm hard stainless steel wire is sufficient to correct a simple crossbite involving one tooth. The spring has an arm and two activation coils. The coils are of 3.0 mm in diameter. The arm of the spring is placed on the palatal surface of the tooth. Some cases may require more than one spring to be placed on different teeth so as to provide a differential tooth movement.

Activation

Activation of the spring is by opening of the coils. The recommended force is approximately 30 grams of force. The direction of activation is perpendicular to the tangent of the palatal surface of the tooth.

Expansion screws

Screws are used to procline two or more teeth. A screw applies a large intermittent force to the teeth. It is placed parallel to the intended tooth movement. Screw plates have an added advantage whereby the teeth to be moved can also be clasped simultaneously. This is particularly useful in cases where there is inadequate number of teeth to be clasped for example in partially erupted or badly carious teeth. However, screws are bulky and expensive.

Activation

Screws are activated by the patient in the direction of the arrow shown in the baseplate. The principle of the orthodontic screw is that its two ends are threaded in opposite directions and when it is turned the metal end plates move apart. The basic orthodontic screw is rigid, therefore it can only be adjusted by only a small amount at any one time, and otherwise the appliance cannot be inserted.
The activation is done one-quarter turn once weekly which separates the acrylic by about 0.25 mm. This would produce an optimal movement of 1.0 mm a month. More frequent adjustments, of up to one-quarter turn twice a week is sometimes possible but care must be taken not to overdo it as this can cause the appliance to be ill-fitting.

**Retentive Components**

Adequate retention is essential for compliance and efficiency of the appliance. If the appliance is loose, the patient may have difficulty in wearing it. Furthermore, the active components will not work effectively in a loosely fitted appliance. Common retentive components are Adams clasps and Southend clasps.

**Adams Clasps**

The clasps are commonly constructed on the first permanent molars using a hard stainless steel wire size of 0.7 mm.

The arrowhead is angled at 30-45 degrees to engage into the the mesiobuccal and distobuccal aspects undercuts. Ideally there should be a three-point retention, two posterior retention and one on the anterior aspect. Clasps should be adjusted only when necessary, not as a matter of routine at every visit.

**Southend Clasp**

The Southend clasp is preferred where incisors are to be used for retention. They are less obstructive and easily adaptable. The wire size is 0.7 mm hard stainless steel bent around the neck contour of the anterior tooth or teeth.

**Anchorage**

Anchorage is the source of resistance to the reaction from the active components. The active components in removable appliance are springs and expansion screws. Anchorage in removable appliance is provided by the baseplate and the retentive component.
Baseplate

The acrylic baseplate serves to hold together the other components of the appliance. A posterior bite plane should be incorporated to free the occlusion and allow the tooth in crossbite to move effectively.

Baseplate design is very important for patient comfort. A bulky baseplate is uncomfortable and often interfere with speech. This will reduce patient co-operation and tolerance to the appliance.

The following treatment options (9-12) should be carried out by the orthodontic specialists only.

9. FIXED APPLIANCE

Fixed appliances are complex appliances which are capable of three-dimensional control of tooth movements. The dental practitioner without specialist training should not attempt to use fixed appliances as their unskilled use may lead to extensive unwanted tooth movements.

10. FUNCTIONAL APPLIANCES

Functional appliance utilizes the forces of the orofacial musculature to move teeth and modify growth to correct a malocclusion. The major effect of functional appliance is mostly dento-alveolar\textsuperscript{15}. The possibility of orthopaedic changes is still debatable.

11. FACE MASK / PROTRACTION HEAD GEAR

The preferred treatment for skeletal maxillary retrusion is anterior movement of the maxilla using a protraction headgear\textsuperscript{5,14,16}. It has been suggested that for maximum skeletal effect, treatment should commence before 8 years (early mixed dentition)\textsuperscript{5,14,18}.

12. CHIN CUP or CHIN CAP

Chin cup or chin cap treatment can be used to treat mandibular prognathism in early mixed dentition. However success of this early intervention is limited and in cases with severe prognathism, no treatment is indicated. Treatment of choice would be orthognathic surgery after growth is complete.
13. ALGORITHM OF TREATMENT MODALITIES OF ANTERIOR CROSSBITE IN THE MIXED DENTITION

- DENTAL CROSSBITE
  - FUNCTIONAL CROSSBITE
    - REMOVABLE APPLIANCES
    - FIXED APPLIANCES

- SKELETAL CROSSBITE
  - MILD SKELETAL DISCREPANCY
  - SEVERE SKELETAL DISCREPANCY

- DEFICIENT MAXILLA
  - PROTRACTION FACE MASK
  - FUNCTIONAL APPLIANCE

- MILD / MODERATE MANDIBULAR PROGNATHISM
  - CHIN CUP / CHINCAP

- WAIT FOR GROWTH TO STOP
  - NO TREATMENT
  - SURGERY


**APPENDIX 1**

**CASE : SINGLE TOOTH IN CROSSBITE**

<table>
<thead>
<tr>
<th>DESIGN</th>
<th>SPRING (boxed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) ADAM CLASPS</td>
<td>64/46</td>
</tr>
<tr>
<td></td>
<td>0.7mm hard stainless steel wire</td>
</tr>
<tr>
<td>or</td>
<td></td>
</tr>
<tr>
<td>ADAM CLASPS</td>
<td>D/D</td>
</tr>
<tr>
<td>ADAM CLASPS</td>
<td>6/6</td>
</tr>
<tr>
<td></td>
<td>0.6mm hard stainless steel wire</td>
</tr>
<tr>
<td></td>
<td>0.7mm hard stainless steel wire</td>
</tr>
<tr>
<td>2) Z SPRING</td>
<td>1/4</td>
</tr>
<tr>
<td>(boxed)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.5mm hard stainless steel wire</td>
</tr>
<tr>
<td>3) POSTERIOR BITE PLANE</td>
<td>2 - 3mm thickness</td>
</tr>
</tbody>
</table>