

Proceeding



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Orthodontic Patient Examination And Analysis In Order To Establish The Correct Diagnosis

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ABSTRACT

The goal of orthodontic treatment is to create better occlusal relationship in terms of facial aesthetics frame¹. The success of orthodontic treatment is greatly influenced by the skills of the operator to perform the examination, analyze, diagnose and determine treatment plans. Diagnosis can be defined as a systematic flow in order to determine abnormalities, to find irregularities, to construct therapy planning as well as elaboration of indications, which would guide doctors to take necessary acts. Orthodontic diagnoses associated with abnormalities in terms of teeth, jaws and face (dentofacial), particularly in relation to dental abnormalities of the maxilla and mandible (malocclusion). Establishing an orthodontic analysis requires a careful examination of a patient as well as the selection of cases thoroughly in order to obtain a list of orthodontic problems. Necessary inspections include anamnesis, clinical examination extra-oral and intra-oral, radiographic examination and analysis of study models. The correct examination to establish diagnosis will assist operators in developing treatments that will be given to the patients.

Keywords: *Clinical examination, Orthodontic Diagnosis, treatment plan*

INTRODUCTION

The success of an orthodontic treatment is based on the ability of the operator to diagnose and the proper treatment plan.¹ Diagnosis are stipulated based on the results of systematic examination. The examinations which are needed include the patient's anamnesis, extra and intra oral clinical examinations, radiographic examinations, and model study analysis. At the end of this process, an orthodontist should play a role in a comprehensive data collection for each patient in order to formulate the appropriate treatment plan².

The Patient's Anamnesis

Anamnesis is the debriefing between the dentist and the patient or the patient's parents about anything that is related to the growth, development, habits, and others which

are related to abnormalities in patient's mouth and face. Important issues that should be asked by the operator to the patient in the patient's anamnesis are the main complaints, the patient's disease history, the teeth treatment history, and also the growth and development of the patient³.

Since the beginning, the operator should identify the main reason of why the patient wants an orthodontic treatment, the needs, and the expectation from the treatment. The question that can lead to the main complaint is "Why do you think you need to use a bracket?", or "What don't you like about your smile, or teeth, or your face?". From these questions we can acknowledge the patient's motivations and expectations from the orthodontic treatment. For the under age patients, the consultation can be done with the parents or the patient's guardian.³ The patient's disease and teeth treatment history is needed to know the background of the health status and also the dental hygiene which will affect the orthodontic treatment. It is needed to discuss whether the patient is consuming drugs or have consumed drugs because several conditions can influence the orthodontic treatment. For example, a patient with an uncontrolled diabetes can give power in the orthodontic treatment that can give bad effect on the periodontal tissues¹.

Bad oral habits such as biting or sucking objects (a finger or a pen), tongue thrusting, breathing from the mouth, etc. should be evaluated as these will be related to malocclusion etiology or direct effects on the prognosis of orthodontic treatments¹.

Orthodontic treatments with growth modification will gain benefit from the peak of growth in puberty period, this means the operator needs to enquire facts which are related to the patient's growth and development, such as the age of sexual maturity or *menarche* in women, and the change of voices in men. Based on these, the operator can predict whether the patient has passed the growth peak or not. Cervical vertebral assessment can be made from the patient's cephalometric X-ray. It is important to note that one's chronological age does not always coincide with skeletal or dental age. Serial cephalometric X-rays are the best way to determine whether growth has stopped or is still ongoing^{1,4}.

Extra oral examination

The extra oral examination include the facial examination, the facial median line examination, the profile, also the lip and TMJ.

Facial examination

The facial examination is started with the checking of proportions between the facial height and width. The types of face characteristics are divided into three categories which are *dolichofacial* (Facial height > facial width, long face), *mesofacial* (facial height is proportional with the facial width), and *brachyfacial* (Facial width > facial height, square face). The face proportion is obtained from dividing the face into three parts based on the space between the border of the hair (*trichion*) and the ridge prominent between eyebrows (*glabella*), *glabella* to *subnasal*, and *subnasal* to *menton*. The space should be the same in order to have the proportional face¹.



Fig 1. Facial thirds of The Face³.

Face Profile Examination

The face profile analysis is intended to determine the relation of the jaw in anteroposterior direction. In this stage the patient sits perpendicularly or stand with the straight ahead view. This also include the relation of 2 lines from the (*nasa*) to the bottom of upper lip and from the bottom point of upper lip to the chin. Normally, this line forms a straight line with a bit of inclination angle. Big angles ($> 10^0$) are indications of a convex profile (Upper jaw is in front of the chin), and a concave profile (upper jaw is behind the chin)⁵. Esthetic line (E-Line) from the ricketts can also help in analysing the patient's face profile. E line is obtained from drawing a line from the end of nose to the chin. Normally the upper lip is 4mm behind the E-line and the lower lip is 2mm behind the E-Line. The protrusive incisive can affect the patient's face profile³.

Median Line Examination

The shifting of upper jaw median line and lower jaw median line to the facial median line should be noted (in millimeters) with the information of the shifting direction of each jaw⁶. The facial median line is obtained by making an imaginer line from the sof tissue glabella by using a thread through the philtrum of the upper lip to the chin soft tissue. This line can also show that the face is asymmetric. Then, the facial median line becomes the benchmark to see whether there is a shifting of teeth median line or not.⁷.

Lips Examination

Ideally the upper and lower lips are touching or open for 3-4mm when the patient is in the relax position where there is not a coercion from the lips to close the mouth. The patients with short upper lip (*short philtrum*) will *strain* when they try to close the mouths and will open for 4mm when resting³. The opened lips relation can be caused by short upper lip (*short philtrum*), protrusive incisive teeth (upper and lower lips positions are in normal relations), normal teeth inclination with mandibular retrognati, normal teeth inclination with maksila prognati, combination of mandibular retrognati and maksila prognati, or one third of lower face that is longer than normal with or without *open bite*. The clinical description of tighten lips is deep *mentolabial sulcus* and hyperactive mentalist. The patient with hyperactive mentalist shows the image of orange skin on the soft tissue around the chin^{1,4}.

TMJ Examination

The TMJ examination is an important part of a diagnosis. If the mandibular is moving normal, the function is not disturbed, while limited movements indicate problems in functions. Thus, the important indicator from the TMJ function is the ability to open maximum. The palpation of mastication muscular and TMJ are routine parts in the teeth examination to record signs of problems in TMJ. For example pain in TMJ, the existence of sound, or the limitation of opening the mouth¹.

Intra Oral Examination

Oral Hygienes

A good oral hygiene is an important factor throughout the orthodontics treatment. Education and motivations should be given to patients before the treatment is started. The mouth hygiene evaluation needs to be done in the beginning of the examination, and the orthodontics treatment should be delayed until the patient can achieve a good mouth hygiene. All diseases (caries, periodontal diseases, pulp and sof tissues abnormalities) should be controlled before the orthodontics treatment begin¹.

Occlusion (Overjet, overbite, crossbite, openbite)

The deep occlusion examination in patients indicating orthodontics treatment includes overbite, overjet, crossbite or openbite examinations. Overbite is the vertical space from the *incisal edge* of lower jaw incisive teeth to the *incisal edge* of upper jaw incisive teeth. This can be measured by using a probe or a ruler. In *openbite* case the result is zero or negative in anterior *crossbite*. Overjet is the horizontal space from the facial surface of lower jaw anterior teeth to the lingual surface of upper jaw anterior teeth.

The image of *crossbite* can be evaluated by teeth occlusion. *Crossbite posterioris* when the position of upper molars is closer to the palatal than to the lower molars. *Crossbite* can be caused by dental or skeletal abnormalities. Crossbite skeletal happens because the width of the mandibular is less than the maxilla. Crossbite dental upper molars are tipping to palatal. When the teeth is occluded, the vertical problems such as *openbite* or *deepbite* can be evaluated³. *Deep bite* can also be evaluated by using the measurement of Spee Curve. The Spee Curve is a curvature formed by an imaginary line which is drawn from the incisal edge of anterior teeth and the peak of buccal mandibular posterior teeth, viewed from the sagittal plane¹³.

The depth of Spee Curve is measured as the perpendicular distance between the lowest peak and the flat plane through the upper end of mandibular teeth (touching the incisal end of incisivus central teeth and the distal cusp tip of the most posterior teeth). The depth of the spee curve is usually followed by *deep bite*.

Frenulum labii, Tongue, and Palatum

Frenulum is the folds of mucous membrane that connects the lips and cheeks in alveolar mucous, gingiva, and periosteum underneath. The examination of the frenulum is

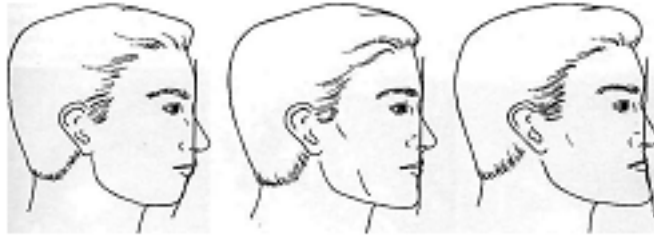


Fig 2.Convex and concave profiles obtained from disproportion of the jaw. (A) the indication of the Class II relationship is convex facial profile, where the upper jaw is too far forward or the lower jaw is too backward. (C) an indication of the Class III jaw relationship is concave profile in which the upper jaw is too backward or mandibularis forward¹.



Fig 3. Examination of midline shifting



Fig 4. overbite



Fig 5. Overje

needed to see the attachment or insertio. The Frenulum can endanger the gingiva hygiene when the attachment is too close with the edge of gingiva, this can disturb the plaque control and is caused by the muscle pull on gingiva. Frenulum labii superior can also cause aesthetic disruption or disrupt the stability of the orthodontics treatment in the case of *midline* diastema¹¹. To determine the role of frenulum as the cause of *midline* diastema, a *blanch testis* needed. This test can be conducted by pulling the lips up and front. The discoloration on region of interdental indicates the fibers of frenulum muscles has reached the peak of alveolar bones¹².

The tongue examination is conducted to know the existence of pathological lesions, the shape and size, and the relation to the curvature of mandibular teeth. The siting on the lateral edge of the toungue, with *general* diastema on teeth, indicates makroglossia. The tongueis composed of strong muscles that constantly gives pressures on the lingual surface of the teeth to compensate pressure from lips on the labial surface of the teeth. The tongue functional evaluation during talking and swallowing can help in determining the malocclusion etiology^{1,3}.

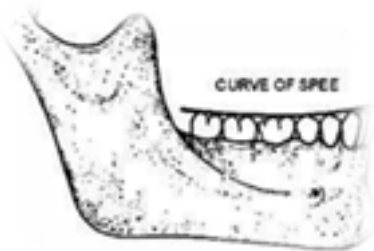


Fig 6. Curve of Spee

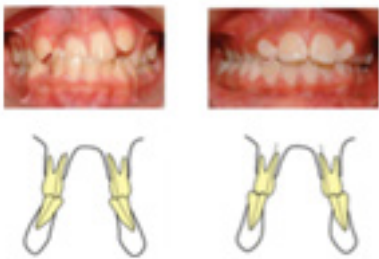


Fig 7. Anterior Crossbite and Posterior Crossbite³



Fig 8. Examination of Labii Frenulum with Blanch test¹.

The palate examination is conducted to see the depth. Of the palate can indicate habits such as *asymouth breathing* or finger sucking. The depth measurement and the constriction of palate can be done on a study model^{1,3}.

Model Analysis

Important data obtained through the teeth and mouth direct examination are of course can produce accurate data. However, practitioners are not able to analyse the teeth directly inside the patient's mouth. Thus extra examinations are conducted indirectly on a study model. A study model analysis is an assessment of three dimensions on maxilla and mandibular teeth, and also the assessment on the occlusal relation. The position of the teeth on the jaw and the relation with teeth on the opponent jaw are assessed in sagittal, transversal, and vertical directions⁸. There are several analysis that can be used, but which analysis that will be used very much depends on the case. Various analysis on permanent teeth are to see the relation of upper and lower teeth, and the curvature symmetry of teeth viewed from sagittal and transversal directions. The analysis to see the different size between the teeth curvature and the jaw are Nance, Lundstrom, Bolton, Howes, Pont, and *diagnostic setup*. The analysis for mixed dentition are radiographic image analysis, Moyers, and Tanaka-Johnston. Several results of analysis can be made and used simultaneously as considerations in compiling the treatment plans.

Radiographic Analysis

Cephalometric Analysis

Model analysis cannot give information to clinicians about the skeletal relation from the patient, thus radiographic cephalometric examinations are needed to help analysing the relation of jaw bones (between maxilla and mandible), the relation of jaw (basis kranii), and the relation of teeth and jaws. One of the analysis that is often used is Steiner analysis because it is quite easy and fast. This analysis is one of the most popular analysis to plan an orthodontics treatment and this method is a combination of Down's method, Wendell Wylie, Brodie, Rickett's, Thomson, Riedel and Holdaway¹⁴.

Panoramic Radiograph X-ray Analysis

Panoramic photos are common radiograph which can produce comprehensive images of the teeth, and bone structures that are adjacent to both jaws. Many information can be obtained from panoramic x-ray such as several dental abnormalities (cysts, fractures), abnormal numbers of teeth (supernumerer, *missing teeth*), impacted teeth location, and the condition of periodontal tissue. On a patient with mixed dentition, the panoramic x-ray can see the order of eruption of canine teeth, the first and second premolar of maxilla and mandible which are going to affect the structure of teeth in the jaw. The room differences can also be seen between the width of mesiodistal canine teeth, first molar, and the second primary teeth with canine, first premolar, and both permanent that are usually called *Lee Way Space*^{1,4}.

CONCLUSION

There are several examinations stages for orthodontics patients to have diagnosis such as anamnesa, extra and intra oral clinical examinations, model analysis, and radiographic examination. The whole examinations are used to formulate problem to help the operator in making treatment plans. A proper examination can produce accurate diagnosis that support the success of a treatment.

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