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College of Dentistry

Facial Harmony and Balance (Survey study)

A Project Submitted to
The College of Dentistry, University of Baghdad, Department of Orthodontics
in Partial Fulfillment for the Bachelor of Dental Surgery

BY

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Certification of the Supervisor

I certify that this project entitled "Facial Harmony and Balance" was prepared by fifth-year student Manar Ali Hameed Yousif under my supervision at the College of Dentistry/University of Baghdad in partial fulfilment of the graduation requirements for the Bachelor Degree in Dentistry.

Prof. Dr. Dhiaa Jaafar Nasir

Date

Dedication

To everyone who has supported, encouraged and inspired me, especially to my beloved parents, teachers and valued friends for all their guidance, love and concern that made it possible for me to reach this point as well as to my supervisor who gave me the courage, commitment and awareness to follow the best possible path, with incomparable style.

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NHP	Natural head position
DDP	Digital dental photography
Sn	Subnasale
Me	Menton
G	Glabella
Tr	Trichion
ICD	Inner canthus distance
IC	Inner canthus
OC	Outer canthus
CON	Condylion
No.	Number
Fig.	Figure
mm	Millimeter
MP	Mandibular plane
FH	Frankfort plane

Introduction

The definition of balance and harmony simply stated it is that position of the teeth, relative to themselves and their surrounding structures that results in a stable well-functioning dental mechanism, healthy investing tissues, and satisfactory facial esthetics **(Frantz, 1969).**

The attainment of facial esthetics and harmony is one of the main goals of orthodontic treatment, orthodontically treated patients expect the treatment to improve their dental and facial esthetics **(Kiekens *et al.*, 2006).**

The face is the most important individual factor determining the physical appearance of people; the mouth and teeth are considered fundamental in facial esthetics **(Shaw *et al.*, 1985; Peck and Peck, 1995).**

Facial attractiveness and beauty are determined quickly within the first few seconds of seeing the face **(Olson and Marshuetz, 2005).**

The aesthetic benefits of orthodontic treatment are recognized by both patients and practitioners, this information help the clinician to define treatment goals for a well-proportioned, balanced and harmonious soft tissue profile at the conclusion of treatment, the relationships of nose, lips, chin and facial soft tissue dynamics are important considerations **(Shaw *et al.*, 1985; Breece and Nieberg, 1986).**

Individual perception of facial esthetics and attractiveness is influenced by combined factors including psychosocial states such as self-esteem, cultural background, and age **(Cross and Cross, 1971; Korabik and Dorsey, 1977)**, **s**ex, education, socioeconomic status, and geographic location **(Mantzikos, 1998; Maganzini *et al*, 2000; Hwang *et al*, 2002).**

Over the years there were significant changes in facial esthetic standards, so orthodontists must be updated about what the population considers an ideal face **(Nguyen and Turley, 1998).**

Aims of the study

1- To assess facial balance and harmony of young adult Arab sample with age range 18-23 years.

2- To find sex difference regarding the studied sample

Chapter One

Review of Literature

1.1 Facial Assessment:

Accurate facial assessment is essential for diagnosis and preparation of a treatment plan for patients undergoing orthodontic treatment, orthognathic surgery, or facial plastic surgery; for diagnosis of genetic and acquired malformations; for the study of normal and abnormal growth; and for morphometric investigation **(Weinberg *et al.*, 2006; Ghoddousi *et al.*, 2007).**

Facial evaluation should begin with a systematic, three-dimensional assessment of the frontal and profile views in the vertical, sagittal and transverse planes, the goal of this assessment is to establish an accurate description of the aesthetic, skeletal and occlusal abnormalities, as well as functional disorders **(Sassouni and Nanda, 1964).**

According to **Singh (2007)**, assessment of face includes:

1.1.1 Frontal facial assessment:

When describing a patient from the frontal view, an overall assessment of the patient's symmetry is made, attractiveness and pleasing facial esthetics have been linked to certain proportions and symmetry **(Thronill and Gangestad, 1999; Scheib *et al*, 1999).**

Symmetry is defined as correspondence in size, shape and relative position of parts on opposite sides of a median plane. A degree of facial asymmetry is normal and acceptable across this line. It can be caused by an asymmetry in the facial skeleton and/or soft tissue drape. The point at which an asymmetry becomes unacceptable is when an individual begins to have aesthetic concerns and/or functional limitations **(Gill, 2008).**

In a patient with harmonious facial morphology, the height of the upper face determined by the distance between the hairline and the glabella (supraorbital ridges) should equal the height of the mid-face (measured between

the supraorbital ridges to the base of the nose) and should also equal the height of the lower face (distance between the base of the nose and the chin) **(Proffit, 1986).**

The facial midline is an important component of facial aesthetics, and its proper clinical evaluation must become an integral part of the clinical examination, for this reason, the philtrum is considered to be a reliable midline structure, and in most instances, can be used as the basis for midline assessment **(Karad, 2010)**

According to **Gill (2008)**, Facial asymmetry classified into:

1- Developmental like hemifacial microsomia **(Fig. 1.1).**

2- Pathological like infection and tumor.

3- Traumatic like maxillary/mandibular fracture.

4- Functional like mandibular displacement.

Figure 1.1 Patient with left sided hemifacial microsomia (Gill, 2008).

A- Vertical facial assessment:

In a patient with harmonious facial morphology, the height of the upper face determined by the distance between the hairline and the glabella (supraorbital ridges) should equal the height of the mid-face (measured between the supraorbital ridges to the base of the nose) and should also equal the height of the lower face (distance between the base of the nose and the chin) **(Proffit, 1986) (Fig 1.2).**

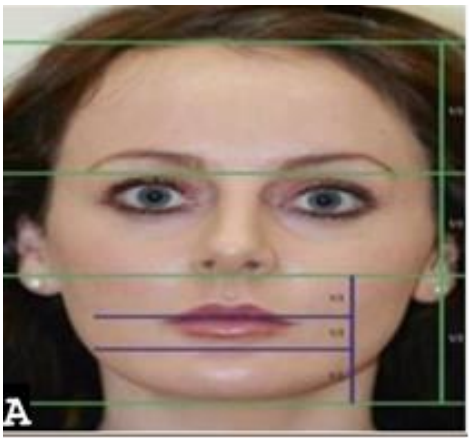

Fig. 1.2 Horizontal facial thirds (Anic-Milosevic et al., 2010).

B- The Rule of fifths:

It is a practical and convenient guideline used to analyze transverse proportional facial relationships. According to this rule, the ideal face can be divided transversely into five equal parts, each approximately equal to the width of the eye, and the width of the base of the nose is approximately equal to the intercanthal width **(Farkas, 1994; Bueller, 2018) (Fig. 1.3).**

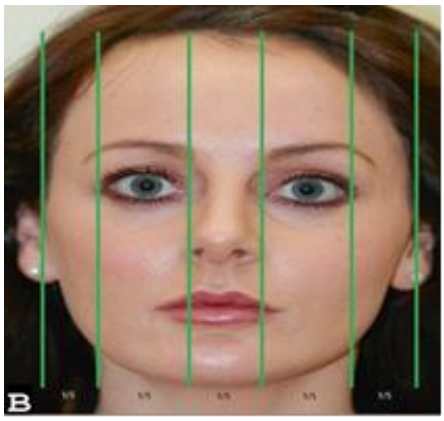

Fig. 1.3 vertical Fifths (Anic-Milosevic et al., 2010).

1.1.2 Profile:

Examination of the facial profile of the patient is carried out to assess the jaw relationships and soft tissue drape, it is imperative that the patient is relaxed with the head oriented in the NHP (natural head position), The lateral contour of the forehead can be flat, protruding or oblique, Patients with steep forehead generally tend to have more prognathic dental bases than those with flat forehead **(Karad, 2010).**

According to **Nanda (2015)** profile assessment usually includes**:**

A- Anterior-posterior Assessment:

In this dimension the soft tissue convexity is initially assessed by observing the spatial relationship between the forehead, maxilla, and mandible, these are separate but interrelated anatomic structures with independent timings in development, each structure provides feedback to the others to maintain a normal facial growth pattern **(Petrovic and Stutzmann, 1980).**

It is important to note that at the end of growth there are also gender differences in the convexity of the profiles, on average the female profile is more convex due to a smaller chin projection **(Nanda *et al.*, 1990).**

Once the magnitude of the facial profile convexity is assessed, the next step is to evaluate which of the three structures is contributing to the abnormality, with an increased angle of convexity or concavity, the question to be answered is which structure is causing the deformity **(McNamara, 1981).**

According to **Singh (2007)**, the profile is examined from the side by making the patient view at a distant object, with the FH plane parallel to the floor. Clinically or in extraoral photographs, the profile can be obtained by joining two reference lines:

A- Line joining forehead and soft tissue point A.

B- Line joining point A and soft tissue pogonion.

Three types of profiles are seen: **(Fig. 1.4)**

1- Straight/ orthognathic profile: The two lines form an almost straight line.

2- Convex profile: The two lines form an acute angle with the concavity facing the tissues. This type of profile is seen is seen in Class II div 1 patients due to either a protruded maxilla or a retruded mandible

3- Concave profile: The two lines form an obtuse angle with the convexity facing the tissues. This type of profile is seen in Class III patients due to either a protruded mandible or a retruded maxilla

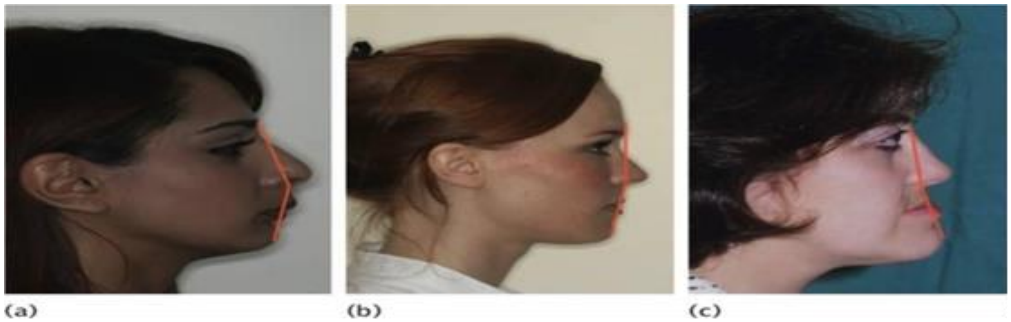

Fig 1.4 (a) Convex profile indicating a Class II skeletal pattern. (b) Straight profile indicating a Class I skeletal pattern. (c) Concave profile indicating a Class III (Mitchell, 2013).

B- Vertical assessment:

The face can be divided into three equal thirds: upper, middle, and lower facial heights, the true upper facial height is seldom used, as it is measured from the trichion to the glabella , More commonly, the middle facial height is referred to as the upper facial height, The normal upper to lower facial height ratio is 1 : 1 (glabella to subnasale and subnasale to soft tissue menton), The lower facial third is very important since the effects of orthodontic treatment are most profound in this third **(Horn, 1992).**

1.1.3 Facial Divergence:

Is determined by the inclination of the lower face relative to the forehead, an inclination of MP (mandibular plane) should be clinically assessed by placing a scale or any instrument handle along the lower border of the mandible **(Karad, 2010).**

According to **Singh (2007),** a line is drawn from the forehead to the chin to determine whether the face is: **(Fig. 1.5)**

A- Anterior divergent, line inclined anteriorly.

B- Posterior divergent, line inclined posteriorly.

C- Straight/orthognathic, straight line, no slant seen.

It may be influenced by the patient's ethnic or racial background.

Figure 1.5: A- Anterior divergent, B- Posteriorly divergent, C- Straight/orthognathic profile (Singh, 2007).

1.2 Types of facial assessment:

1.2.1 Direct assessment:

For each subject the set of 14 landmarks were located **(Fig. 1.4).** The instruments used to record the manual anthropometry measurements were sliding and spreading calipers and measuring tape **(Kolar and Saletr, 1997) (Fig. 1.5)**.

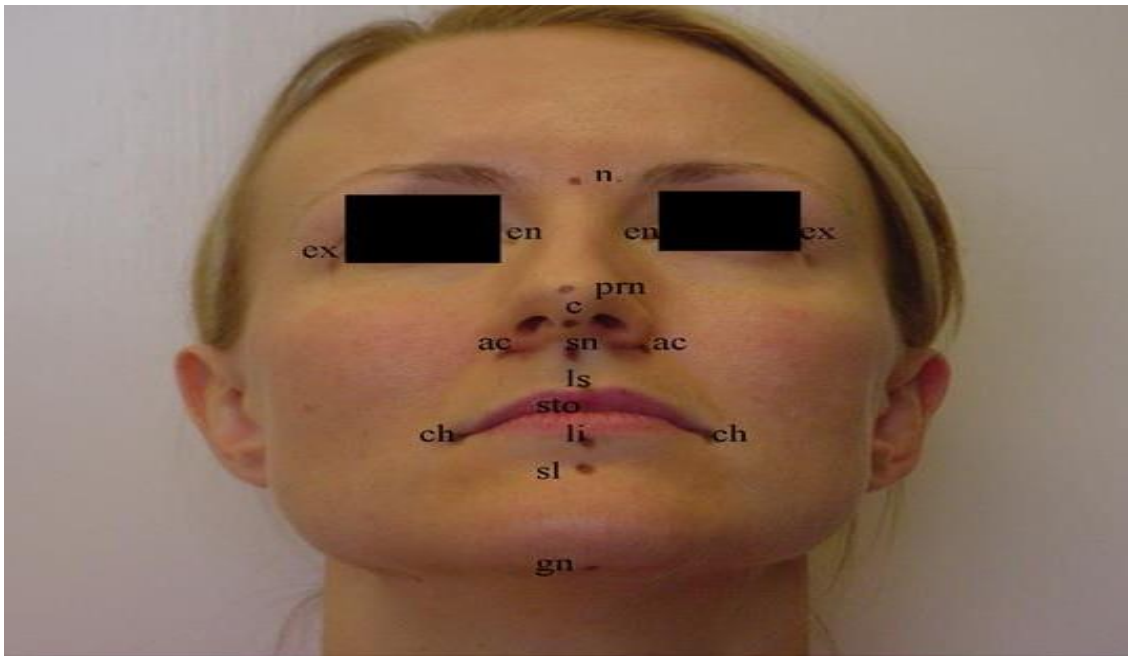

Fig. 1.6 facial landmarks n: nasion; Ls: labiale superioris; en: endocanthion; li: labiale inferioris; ex: exocanthion; sto: stomion; prn: pronasale; ch: cheilion; c: columella; sl: sublabiale; sn: subnasale; gn: gnathion; ac: alar curvature point; tr: tragion (Ghoddousi *et al.*, 2007).

The landmarks located by inspection and/or palpation, and marked on the skin using an eyeliner, during landmarking, the subjects sat in a relaxed position, with the Frankfort plane horizontal to the floor with their teeth slightly apart **(Ghoddousi *et al.*, 2007).**

Manual anthropometry takes direct measurements from the subject. The main advantages of this method are that it is non-invasive and low cost. However, despite being considered the gold standard for facial measurement, it has some disadvantages; for example, it is time consuming and it depends on the participant's compliance for reliable results **(Du *et al.*, 2008; Zhuang *et al.*, 2010).**

It requires direct contact with the subject, sometimes with sharp instruments. This can be inappropriate for small children or subjects who may not prefer direct contact due to personal or cultural reasons **(Allanson, 1997).**

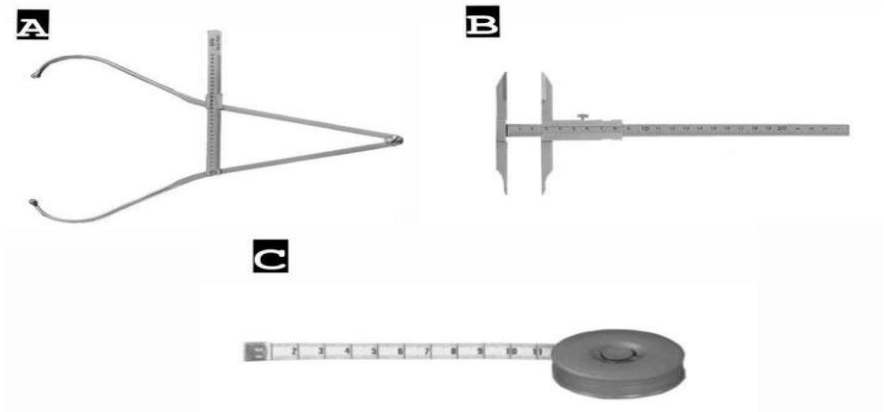

Fig. 1.7 Instruments for manual anthropometry. A- Spreading caliber. B- Sliding caliber. C- Flexible measuring tape (Jayaratne and Zwahlen, 2014).

1.2.2 Photographic assessment

Photographs are the easiest to store, occupy the least amount of space and provide immense information to the clinician as well as the patient **(Singh, 2007).**

Photographs allow the observation of harmonious relation between soft and hard facial tissues, besides not exposing the patient to radiation and having a very low cost **(Ferrario *et al.*, 1993).**

There is no "standard" set that has been universally accepted as a general rule, but it is generally accepted based that the complete "clinical set" of any orthodontic patient at any stage of treatment, which would enable the clinician to obtain the maximum benefit and information, should include at least nine photographs; Four extraoral images and five intraoral images **(Samawi, 2008).**

For proper treatment planning and documentation, the extraoral photographs should show the patient's correct appearance, especially the natural smile; the intraoral photographs should show the complete dentition and occlusion **(Sandler *et al.*, 2009).**

1.2.2.1 Types of photographic records:

A- Extraoral photograph:

Clinical pictures outside the mouth are the easiest pictures to take. It only requires determination of the appropriate location of the patient and the doctor, as well as, of course, setting up the digital camera itself **(Sandler and Murray, 2002).**

They are usually the first and simplest photographs to take **(Sandler and Murray, 2002; Terry et al, 2008).** Moreover extra-oraI photographs should be taken before starting treatment and after completion of treatment.

The information provided by these photographs is invaluable and this is one record that the patient can really relate to **(Singh, 2007).**

Uses:

1- Proportional facial analysis and/or photographic analysis and detecting facial asymmetry, identifying patients and medicolegal concern, they allow us to study the patient in so called social setting and all that without patient will ever being present **(Singh, 2007).**

2- Overcome potential discrepancies between the dentist and patient **(Mladenovic *et al*., 2010).**

3- A pre-treatment/post-treatment series of photographs is imperative **(Ward, 2007)**.

4- It is useful in archiving, remote scoring, allowing multiple scorers to evaluate images and enabling longitudinal analysis **(Boye *et al.*, 2013).**

5- Useful in the course of treatment and control checkups in order to monitor pathological changes on osseous and soft oral tissues, The results of investigations, furthermore, may be documented with the help of images in order to define preliminary diagnoses **(Reynolds and Mason, 2002)**.

Requirements:

1- It is recommended to use a plain-white or dark-blue background or alternatively a large wall-mounted light box behind the patient's head **(Sandler and Murray, 2002; Terry *et al*, 2008).**

2- All photographs intended as evidence should be labelled with the location date, time, subject, and photographer's **(Bernstein, 1983).**

3- Taking extraoral photograph with patient setting on dental chair or with multiple objects in the background should be avoided **(Samawi, 2008).**

4- Quality, standardized facial photographs either black and white or color print. Patient head oriented accurately in three planes of space and in FH plane, ears exposed for purpose of orientation, eyes open and looking straight ahead and glasses removed **(Singh, 2007).**

5- Both patient and the clinician need to be positioned correctly in a standardized manner, **(McKeown *et al*, 2005).**

6- It is important to get permission from the patient before taking photograph. Patient should be seated, leaning back **(Sreesan *et al*, 2016).**

Different photographic images from the profile and frontal views are recommended Initially, a picture of the patient with relaxed lips and lips lightly touching each other are taken from the frontal as well as the profile view. A 45° angle image between the profile and the frontal view provides information related to the amount of malar prominence and lower jaw shape (mandibular plane angle and gonial angle), frontal view depicting a full smile should be taken **(Nanda, 2015) (Fig. 1.6).** In addition to lateral smile **(Yang et al, 2015) (Fig. 1.7).**

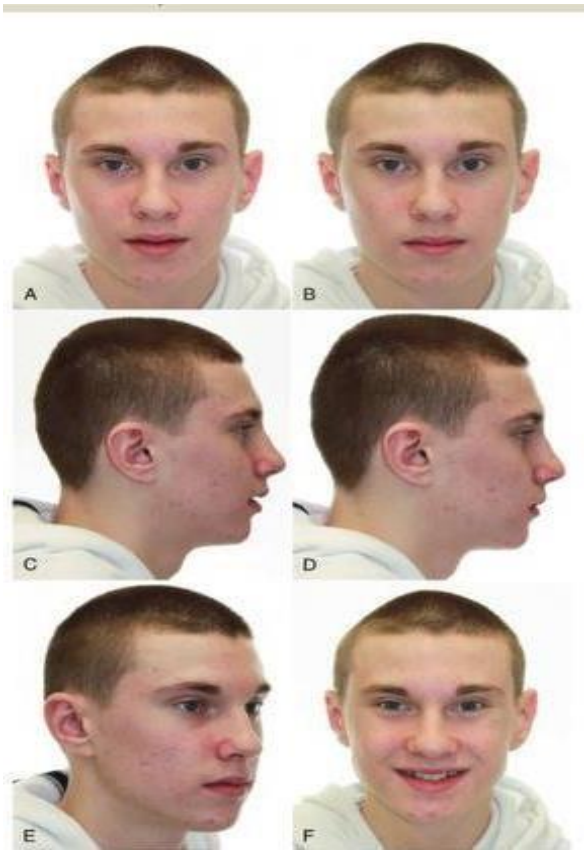

Fig. 1.8 Extraoral photographs for the records. Frontal view (A) with lips at rest and (B) with lips lightly touching each other. Profile view (C) with lips at rest and (D) with lips lightly touching each other. (E) 45° angle photograph. (F) Frontal smiling photograph (Nanda, 2015).

Fig. 1.9 Lateral smile (Yang *et al*, 2015).

B- Intra-Oral Photographs:

They are simple to take, maintain and store and of course useful, they are neither standardized nor three-dimensional. These are helpful in explaining and motivating the patient. They are also used to monitor treatment progress and results, they are also helpful in medico-legal cases involving the texture and color of teeth **(Singh, 2007).**

A total of five views of the dentition and the occlusion are taken in maximum intercuspation, these pictures include **(Nanda, 2015):**
Two buccal (right and left), two occlusal (upper and lower arch) and one frontal intraoral view **(Fig. 1.7)**

Fig. 1.10 Intraoral records. A- Right buccal view. B- Frontal view. C- Left buccal view. D- Upper occlusal view. E- Lower occlusal view (Nanda, 2015).

According to **Singh (2007),** the uses of intraoral photograph are:

1- Helpful in explaining and motivating the patient

2- Helpful in medicolegal cases involving the texture and color of teeth.

3- Assessing and recording health or disease of the teeth and soft tissue structures.

4- Monitoring of treatment progress, study of relationships before, immediately following and several years after treatment, to improve treatment planning.

Requirements of intraoral photograph:

1- Quality, standardized intraoral color prints, patient dentition oriented accurately in all three planes of space, free of distraction **(Sreesan *et al,* 2016).**

2- Utilize occlusal mirrors and cheek retractors to manipulate lighting and avoid shadowing **(Karad, 2010).**

1.2.2.2 Digital photograph

The effects of advances in digital recording technologies are visible in different sectors, dentistry is an important example of digital dental photography (DDP), which has become an essential part of orthodontic treatments **(Sandler and Murray, 2001).**

DDP enables clinicians to record key stages of treatment, it also contributes to the orthodontic discipline in aspects including communication with patients, self- check of specialists, treatment planning, and provision of the treatment for clinical research, education, and marketing purposes to increase the patient's motivation and cooperation during the process **(Yilmaz et al, 2016).**

Medicolegal concerns are another aspect, and protects both patient's and dentist's rights in possibly difficult circumstances **(Wander, 2014).**

According to **Sandler and Murry (2001),** the advantages of digital photographs over traditional film are:

1- The ability to take countless photos at no extra cost

2- Immediate viewing of the images with an option for deletion. The image integrity not compromised with age, dust or scratches

3- Zero film processing costs and easy storage, retrieval, duplication and transmission.

A typical digital imaging system for standard clinical photography consists of a camera, computer, image management software and a color printer **(Wang, 2005) (Fig. 1.8)**

Fig. 1.11 Modern digital imaging system includes a digital camera, a computer, a colour printer and an image management software (Karad, 2010).

1.3 Components of a Balanced Smile (Smile Analysis):

1.3.1 lip line:

Is the amount of vertical tooth exposure in smiling, the height of the upper lip relative to the maxillary central incisors. As a general guideline, the lip line is optimal when the upper lip reaches the gingival margin, displaying the total cervicoincisal length of the maxillary central incisors, along with the interproximal gingivae **(Hulsey, 1970; Mackley, 1993).**

1.3.2 Smile Arc:

Is the relationship between a hypothetical curve drawn along the edges of the maxillary anterior teeth and the inner contour of the lower lip in the posed smile **(Sarver and Ackerman, 2003).**

The curvature of the incisal edges appears to be more pronounced for women than for men, and tends to flatten with age. The curvature of the lower lip is usually more pronounced in younger smiles **(Sabri, 2005).**

Smile arcs were found to be flatter in orthodontically treated patients than in an untreated group with normal occlusions, resulting in a "denture mouth" appearance **(Hulsey, 1970; Lombardi, 1973) (Fig. 1.9).**

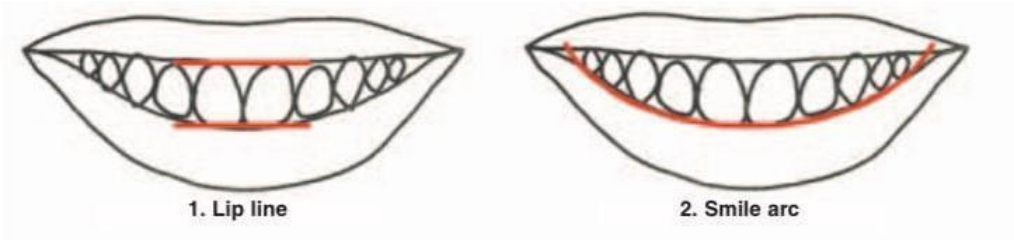

Fig. 1.12 Components of balanced smile (Sabri, 2005).

1.3.3 Upper Lip Curvature:

Is assessed from the central position to the corner of the mouth in smiling, It is upward when the corner of the mouth is higher than the central position, straight when the corner of the mouth and the central position are at the same level, and downward when the corner of the mouth is lower than the central position **(Dong *et al.*, 1999).** Upward and straight lip curvatures are considered more esthetic than downward lip curvatures **(Dong *et al.*, 1999) (Fig. 1.10).**

Fig. 1.13 Upper lip curvature. A. Upward. B. Straight. C. Downward (Sabri, 2005).

1.3.4 Lateral Negative Space:

During a smile, bilateral spaces appear between the buccal surface of the most visible maxillary posterior teeth and the lip commisure, called negative spaces (NSs), black spaces, or buccal corridor **(Ackerman and Ackerman, 2002) (Fig. 1.11)**

Fig. 1.14: A. Patient with lateral negative space. B. After rapid palatal expansion (Sabri, 2005).

1.3.5 Smile Symmetry

The relative positioning of the corners of the mouth in the vertical plane **(Hulsey, 1970; Janzen, 1977).** It can be assessed by the parallelism of the commissural and pupillary lines. Although the commissures move up and laterally in smiling, studies have shown a difference in the amount and direction of movement between the right and left sides **(Benson and Laskin, 2001) (Fig. 1.12)**

Fig. 1.15 Patient with asymmetrical smile due to deficiency of muscle tonus (Sabri, 2005).

1.3.6 Dental Components:

A pleasant smile also depends on the quality and beauty of the dental elements it contains and their harmonious integration. Dental components of the smile include the size, shape, color, alignment, and crown angulation (tip) of the teeth; the midline; and arch symmetry. **(Moskowitz and Nayyar, 1995) (Fig. 1.13)**

Fig. 1.16 Proper tooth proportions and shape (Chiche and Pinault, 1994).

1.3.7 Gingival Components:

Are the color, contour, texture, and height of the gingivae. Inflammation, blunted papillae, open gingival embrasures, and uneven gingival margins detract from the esthetic quality of the smile **(Morley and Eubank, 2001).**

The gingival margins the central incisors are normally at the same level or slightly lower than those of the canines, while the gingival margins of the lateral incisors are lower than those of the central incisors **(Sabri, 2002). (Fig. 1.14)**

Fig. 1.17 Proper gingival heights. The upper central incisors and canines have the same gingival height; the lateral incisors'gingiva is 1 mm below the canines and central incisors (Nanda, 2005).

Chapter Two
Materials and Methods

2.1 Materials

2.1.1 The sample

Thirty young adult students (15 males and 15 females) in the college of dentistry, university of Baghdad were selected. After the research purpose was explained to the students and an agreement was obtained from them to participate in this study.

2.1.2 Criteria of Sample Selection:

a. Inclusion criteria:

1- Young adult Iraqi people with age range 18-23 years

2- Skeletal Class I relationship (depending on profile assessment)

3- Dental class I occlusion.

b. Exclusion criteria:

1- History of facial trauma, congenital dentofacial deformities like cleft lip and palate, facial plastic surgeries

2- Developmental or/and pathological asymmetries.

2.1.3 Instruments and Equipment:

1- Camera (DSC-W830 SONY, 20.1 megapixel, optical zoom x8) **(Fig.2.1)**

2- Disposable dental mirror, gloves, mask, disinfectant **(Fig. 2.2)**

3- Personal Computer (Lenovo, intel core i7).

4- Apple iphone photos application and inshot-video editor application.

5- Millimeter (mm) scale **(Fig. 2.3)**

Fig. 2.1 Sony camera

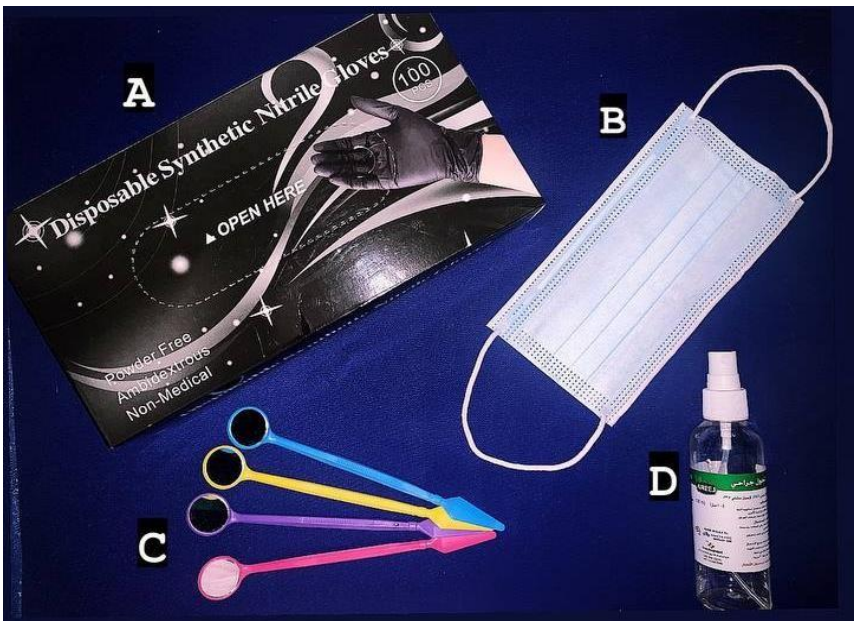

Fig. 2.2 Diagnostic instruments. A- Disposable gloves. B- Mask. C- Disposable dental mirror. D- Disinfectant.

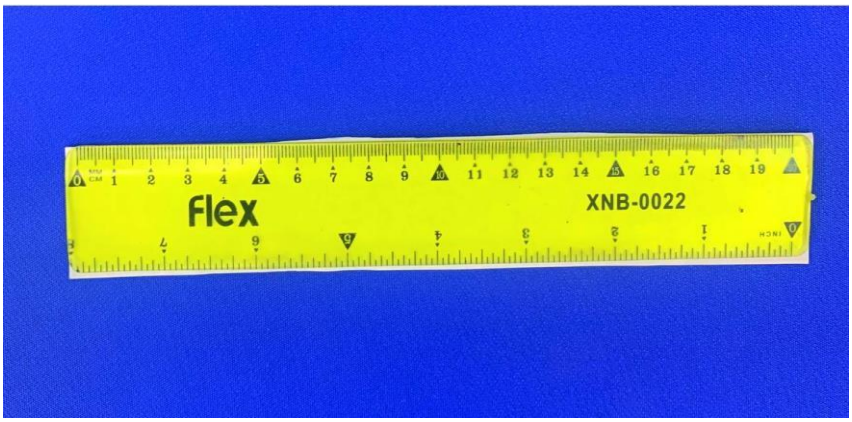

Fig. 2.3 Millimeter scale.

Fig. 2.4 Disposable mask

2.2 The Method:

The participant seated on a chair in upright position, with head oriented in Natural head position (NHP) which is a standardized and reproducible position of the head in an upright posture, their eyes focused on a point in the distance at eye level, which implies that the visual axis is horizontal.

Frankfort plane should be parallel to the floor, the lens of camera was positioned parallel to the participant's face.

Each participant asked to hold a millimeter scale in the level of their face to manage magnification that may occur during photography.

A stable position of photographer is mandatory (since camera is handled and not placed on a tripod) **(Sreesan *et al*, 2016).**

Ears exposed for purpose of orientation, eyes open and looking straight ahead and glasses removed **(Singh, 2007).**

The participant's hair should not cover any part of the face **(Varjão et al., 2006).**

2.2.1 Photographic landmarks: (Fig. 2.4)

1- Trichion (Tr): On the hairline in the middle of the forehead **(Ferrario et al., 2003).**

2- Subnasale (sn): The point at which columella merge with upper lip

in midsagittal plane **(Choi, 2015).**

3- Condylion (Con): The most lateral point on the surface of the condyle of the mandible, this is can be palpated when the jaw is opened, when the mandible is closed this point is usually just anterior to the upper margin of the tragus of the ear **(Gosman, 1950).**

4- Outer (lateral) canthi of the eyes (OC): located at the extreme lateral commissures of the eyelids **(Anand *et al.*, 2015).**

5- Inner (medial) canthus of the eye (IC): is the inner corner of the eye containing the lacrimal duct **(Graber et al, 2016).**

6- Menton (M): lower border of soft-tissue chin (**Ricketts, 1982).**

7- Glabella (G): The most prominent midline point between eyebrows **(Ferrario et al., 2003).**

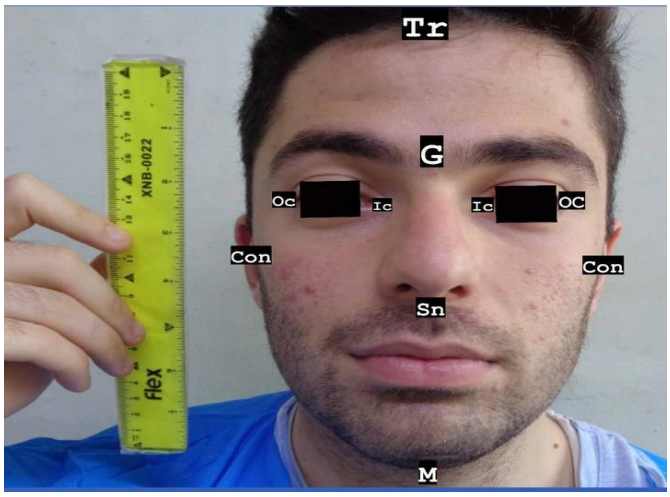

Fig. 2.5 Standardized photograph show photographic facial landmarks in NHP.

2.2.2 Measuring procedure:

The digital photographs are transferred from the camera to the mobile for editing. All photographs were made by the same investigator to ensure standardization of the procedure. The photos divided into horizontal thirds and vertical fifth by ruler in Apple iPhone photos application and then transferred to the computer for facial measurement. The expected magnification in the linear measurements was corrected by using a scale for each photo with appropriate equation.

2.2.3 Facial Assessment:

A- Vertical Facial Assessment:

The face is divided into horizontal thirds, the upper third extends from the hairline to the G, the middle third from the glabella to the SN, and the lower third from the SN to the M, these facial thirds are rarely equal. In Caucasians, the middle third is often less than the upper third, and the middle and upper thirds are less than the lower third of the face **(Farkas *et al.*, 1985).**

B- The Rule of the fifth:

The central fifth of the face (ICD): is delineated by the inner canthi of the eyes. A vertical line from the inner canthus should be coincident with the ala of the base of the nose **(Graber et al, 2016).**

Medial Two-Fifths of the Face: The medial parts of the face that is delineated by the inner and the lateral canthus of the eye **(Naini, 2011).**

A vertical line from the outer canthi of the eyes should be coincident with the gonial angles of the mandible **(Graber et al, 2016).**

Outer two fifths of the face (OC-CON): is measured from the outer canthus of the eye to condylion **(Nasir, 1996).**

Chapter Three

Results

The measurement of horizontal thirds and vertical fifth of the face for 30 adult Iraqis through statistical analysis of the data, the following results are obtained:

3.1 Vertical measurement:

Table (3.1) shows means and standard deviations of vertical measurements in millimeter for male and female, means of all vertical measurements were higher in males than in females, however the larger third in males was the lower, while in females was the middle one.

Table 3.1: Comparison of vertical facial measurements in both sexes.

Vertical Facial measurement	**Female**		Male		**Total**	
	Mean	S.D	Mean	S.D	Mean	S.D
Upper Third	49.84	±8.7	58.30	±10.77	54.07	±10.54
Middle Third	61.32	±6.19	66.08	±10.74	62.4	±8.94
Lower Third	54.41	±6.41	68.84	±10.48	61.63	±11.26

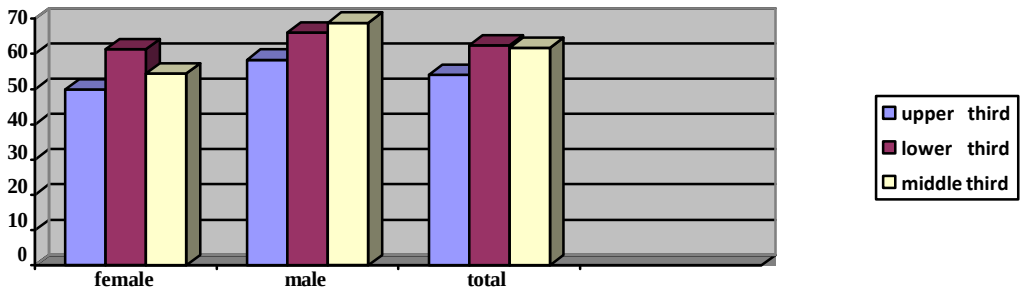

Figure 3.1 Comparison of vertical facial measurements between male and female and the total measurement.

3.1 The "Rule of the fifths"

Table (3.2) shows means and standard deviations of "Rule of the fifths" measurements for male and female, means of all fifths were higher in males than in females, however comparable results showed regarding right and left OC-IC and OC-CON in both sexes

Table 3.2 means and standard deviations of "Rule of the fifths" measurements for male and female.

The Rule of fifth measurement	Female		Male		Total	
	Mean	S.D.	Mean	S.D.	Mean	S.D
ICD	32.12	± 4.26	33.42	± 5.32	32.77	± 4.78
OC-IC (Right)	26.64	± 2.34	27.68	± 3.95	27.16	± 3.23
OC-IC (left)	26.55	± 2.7	27.85	± 4.22	27.21	± 3.55
OC-CON (right)	15.86	± 2.73	17.92	± 2.78	16.89	± 2.9
OC-CON (left)	16.1	± 2.95	16.86	± 3.5	16.36	± 3.19

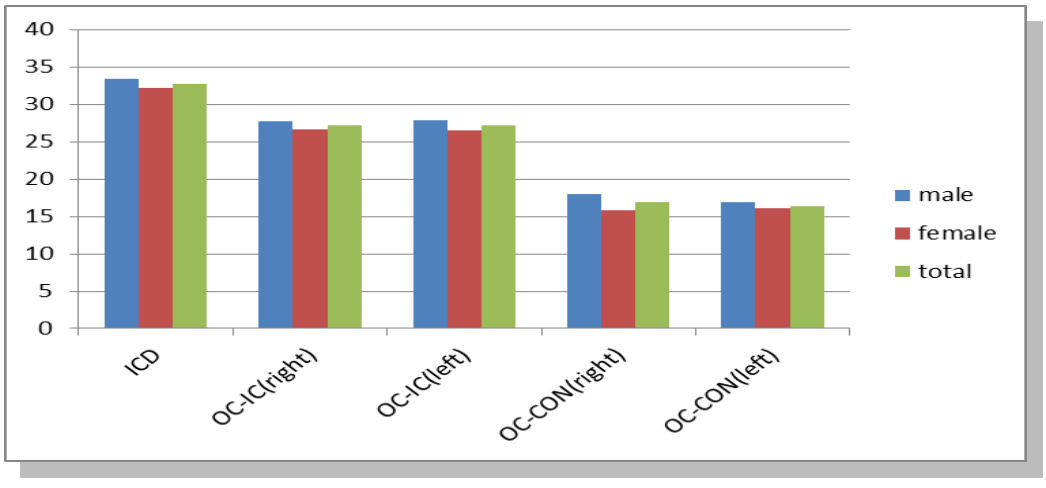

Figure 3.2 Comparison in the Rule of fifths between male and female and the total measurement.

Chapter Four
Discussion

4.1 The sample:

The sample in this study was selected at age between (18-25) years because the individuals maintain the same facial pattern till 25 years **(Bishara et al, 1998)** and to minimize the effect of any remaining skeletal growth since the majority of facial growth is usually completed by the age of 16-17 years, as well as the occlusion at this age has been established regardless of the third molars **(Jones and Oliver, 2000).**

4.2 The differences in facial measurements between the males and females:

The mean values for most of facial measurements were higher in males than females, this came in agreement with **Ibrahimagić-Šeper *et al.*, (2006),** because males have longer growth period than females, hence they have larger measurements than females **(Genecov et al., 1990).**

On the other hand, the lower mean values in facial measurements of females have been positively associated with improved facial beauty compared to males **(Edler *et al.*, 2006).**

4.3 Vertical facial measurements:

Males showed larger lower facial third than upper and middle thirds, this came in agreement with **Farkas et al., (1985),** while females showed that the middle facial third is larger than other thirds, coincided with the finding of **(Sim et al, 2000).**

4.4 The "Rule of the fifths":

The transverse facial proportions are important in orthodontics, especially in the correction of bilateral asymmetries to improve facial aesthetics, or in orthognathic surgeries to alter the shape of the jaws to improve the dental occlusion stability and to improve the temporomandibular joint function **(Anand *et al.*, 2015).**

All the means of horizontal measurements in males are larger than those of females. This finding agrees with **Nasir (1996)** who found that all the horizontal measurements in males are larger than those of females in class I occlusion. In both sexes, the vertical fifths were not equal, however there were comparable results regarding right and left sides, this is may be attributed selection criteria of the sample which exclude any subject with obvious asymmetry, disagreed with **Powell and Humphreys (1984)**, who mentioned that the sagittal view of a well-balanced and symmetrical face can be divided into approximately 5 equal vertical sections, this is may be due to racial differences.

Chapter Five
Conclusion and suggestion

5.1 Conclusion:

1- Although, direct anthropometry is more precise method in the assessment of facial measurements, photographic method can be accepted as an alternative method which save time and efforts

2- In the orthodontically normal subjects (normal class I occlusion) the facial measurements in males are larger than females which indicates the presence of sexual dimorphism in facial measurements.

3- Both eye widths (IC-OC) and OC-CON are approximately equal confirming the relative symmetry (normal transverse facial proportions) of the face in young adult Iraqis.

5.2 Suggestion:

1- Conducting the same study in other classes of malocclusion (II and III).

2- Conducting the same study in another ethnic group.

3- Conducting this study in another age group for example in adolescent.

4- Conducting this study in different facial types.

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