DEVELOPING A STANDARD MESH DIAGRAM FOR FILIPINO

A Thesis

Presented to

The Faculty of the Graduate School

Centro Escolar University

In Partial Fulfillment

of the Requirements for the Degree

Master of Science in Dentistry

Major in Orthodontics

by

Dr. Brian E. Esporlas

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God Almighty who makes everything in this world possible.

B.E.E

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The Problem and Its Background

Introduction

When radiographic cephalometrics was first introduced by Hofrath in Germany and Broadbent in the United State during 1934 it provides both research and a clinical tool for the study of malocclusion and underlying skeletal disproportion.[1] Since then, several cephalometric analysis was develop by different investigators to guide the clinicians in characterizing the nature of the underlying skeletal problem and formulating treatment plan for individual patients, including growth analysis and prediction of probable outcome of the treatment.

The importance of cephalometric analysis is to guide clinician to evaluate the relationships of both sagittal and vertical parameters of the face. Basically, there are two ways to evaluate the patient's data. First is to compare the patient's linear and angular measurements to the tabulated population standard. Comparing the patients to a selected group so that deviations between the patient's result and ethnic group can be observed. However, doing so could make the investigator worship the abstract numbers and lose sight of the problems it may represent.[2]

Another problem with this approach is that, linear and angular measurements cannot measure proportionality.

The second way to evaluate the patient's data is to use a template. These means, the data will be expressed in a graphical illustration and will be compared to a template of a standard value which is also in graphical format, by superimposition. With this approach it would be easier to see the discrepancy and imbalances can be asses without doing measurements. Therefore, facilitating interpretation of the patient's condition in both vertical and sagittal parameters simultaneously.

Since orthodontics nowadays is of much concern with proportion rather than measurements comparison, the latter graphical approach (template) is a great aid to recognize underlying pattern relationship or proportion.

Background of the Study

With the development of cephalometry, a broad possibilities has been offered such as growth analysis, growth prediction and airway analysis. However, cephalometry also presented a new problem. Cephalometry offers a variety of norms and measurements, leaving the

investigators the difficulty of developing a suitable mental picture of a sizeable table of figures.[3] This simply means that it is not easy to compare individual result to a multiple tabulated norms.

In addition, Orthodontic trend before follows the Angle paradigm in which the main concern is more on the ideal skeletal and dental relationship. Soft tissue proportion is not of a primary concern. But as the trend shifted to soft tissue paradigm, orthodontics is now supporting harmonious and proportional relationship of all the parameters involved in both vertical and horizontal, including the soft tissue. However, proportional analysis cannot be done by just using linear and angular measurements taken from cephalometry. This is the reason why a standard mesh diagram is needed.

For many years, even during the time of Leonardo da Vinci, Human proportion is of a great interest. His famous drawing, the vitruvian man to prove the interest of early scientist and or artist to human proportion. Several methods had been use in an attempt to study the facial proportion. Then Albert Durer, a German painter introduced mesh diagram as a classic system for studying and evaluating proportion in art during sixteenth century. The mesh diagram that he proposed is constructed in a series of vertical and horizontal coordinates

that would show proportionality of an object in horizontal and vertical plane. And this method, the mesh diagram, was first incorporated to Cephalometry during 1960s by Dr. Coenraad Moorreess, hence the term mesh diagram analysis.

Dr. Moorrees' purpose of incorporating mesh diagram to cephalometry is to compare the facial resemblance of a child to the other family members.[4] These method is suitable for that purpose because the findings are plotted graphically and not in tabulated form. Since then, several investigator of different racial origin adopted the system of mesh diagram analysis. But there is no adaptation of this system here in the Philippines till now.

Upon adaptation of mesh diagram analysis, studying facial imbalance and harmony together with proportional analysis has become a major concept in orthodontics. A number of researchers from different parts of the globe tried and successfully created a normative mess diagram that would represent their ethnic specific numerical norms, allowing them to visually compare individual features to those of accepted standard.

In connection with the discussion above, there are plenty of clinicians here in the Philippines who are having difficulties in gathering, interpreting and analyzing cephalometric data. Also, these clinicians are experiencing problems in terms of presentation of data and proposing treatment plan to a patients because they lack visual aid to let the patient understand the underlying problem.

With this, it is of a great importance to develop a mesh diagram using Filipino specific norms.

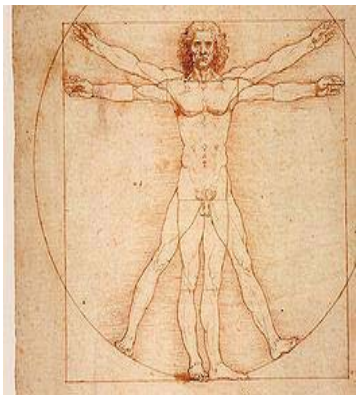

Figure 1

The virtuvian man

The virtuvian man, one of the famous drawing by Leonardo Da Vinci that talk about human proportion. It described the human figure as being the principal source of proportion among the Classical orders of architecture.[5]

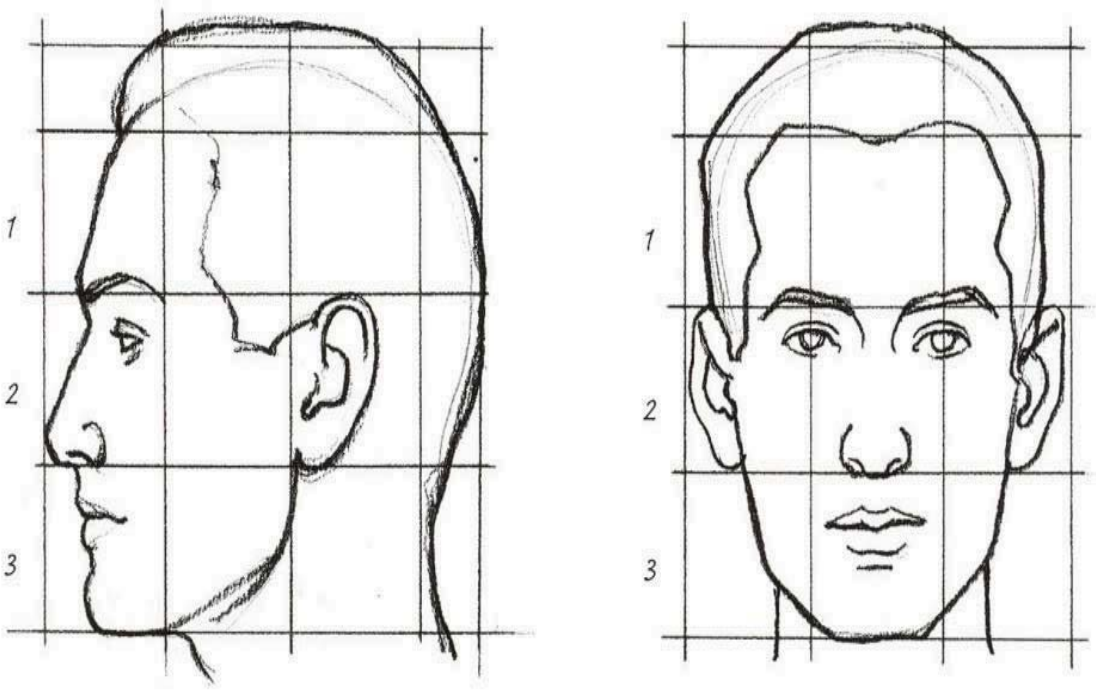

Figure 2

Mesh illustration of facial proportion[6]

This illustration is showing the approach of Albert Durer of studying face proportion. Series of vertical and horizontal coordinates were use to check the proportion of the face.

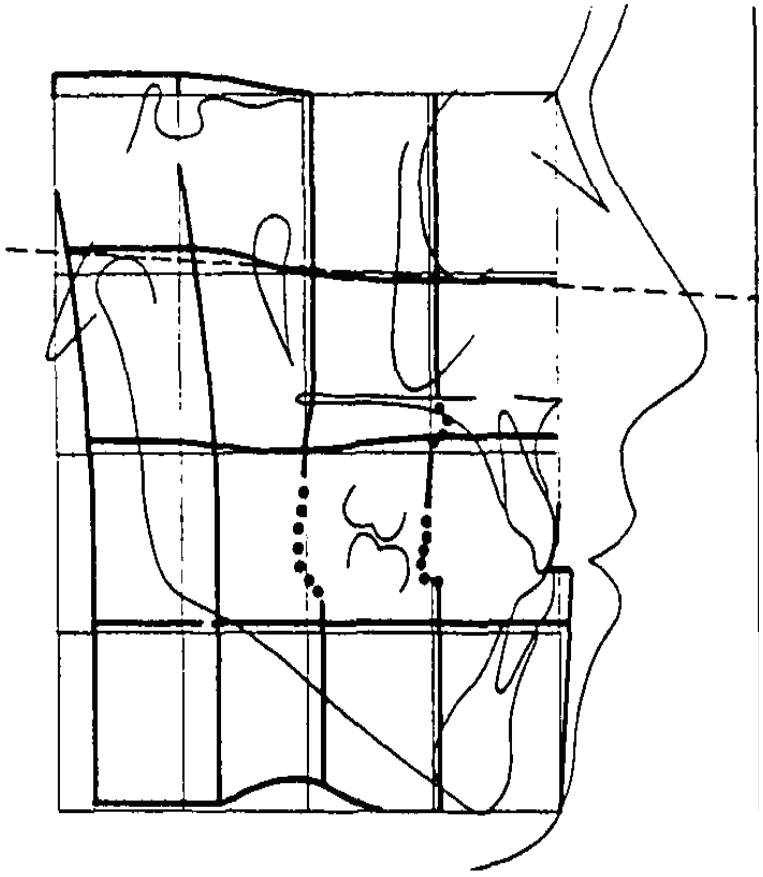

Figure 3[7]

This illustration is the first attempt of Dr. Moorrees of incorporating mesh analysis to cephalometric analysis. Different landmark from lateral cephalogram were properly indentified and planes are constructed by connecting one land mark to another.

Setting of the Study

This study was conducted at Centro Escolar University Manila, Philippines in Advance Orthodontic department. Clinical examination of the selected Escolarians that participated in this study was conducted inside the infirmary of the Advance orthodontic department. Radiographic procedure was done in the radiology section located in the second floor of FGH annex building. CEU is located in the heart of the university belt, bounded by Mendiola, Legarda, Concepcion Aguila and San Raphael street (figure 4).

It was June 3, 1907 when Dona Librada Avelino together with Dona Carmen de Luna established Centro Escolar de Senoritas with a dream of making a nationalistic center of learning for Filipino women.[5] Today, the school is known as Centro Escolar University. The two founders established the first college, that of Pharmacy in 1921. On a later date, the College of Liberal Arts, Education and Dentistry was also founded. Then three years later, College of Optometry was also established

Currently, Centro Escolar University has Three Campuses; situated in Manila, Malolos, and Makati. Today, Centro Escolar

University offers over fifty academic programs, that are all approved by the Commision on Higher Education. One of the new academic programs that is currently being offered is the Master of Science in Dentistry major in Orthodontics which was first offered in 2008 at the Manila campus.

Figure 4[8]

Map of the Philippines

The Philippines is located in south-east Asia, with Manila as the capital.

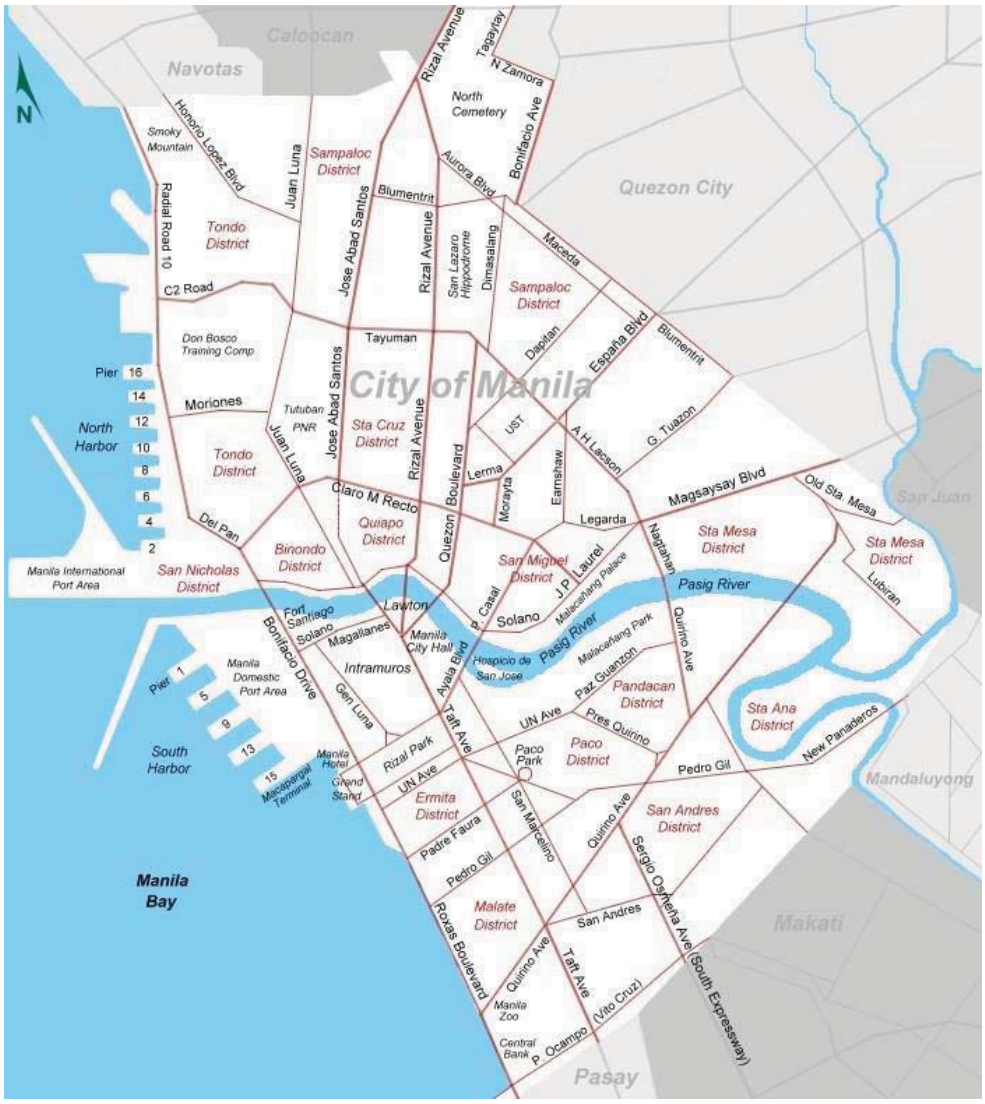

Fig 5.[9]

Map of Manila

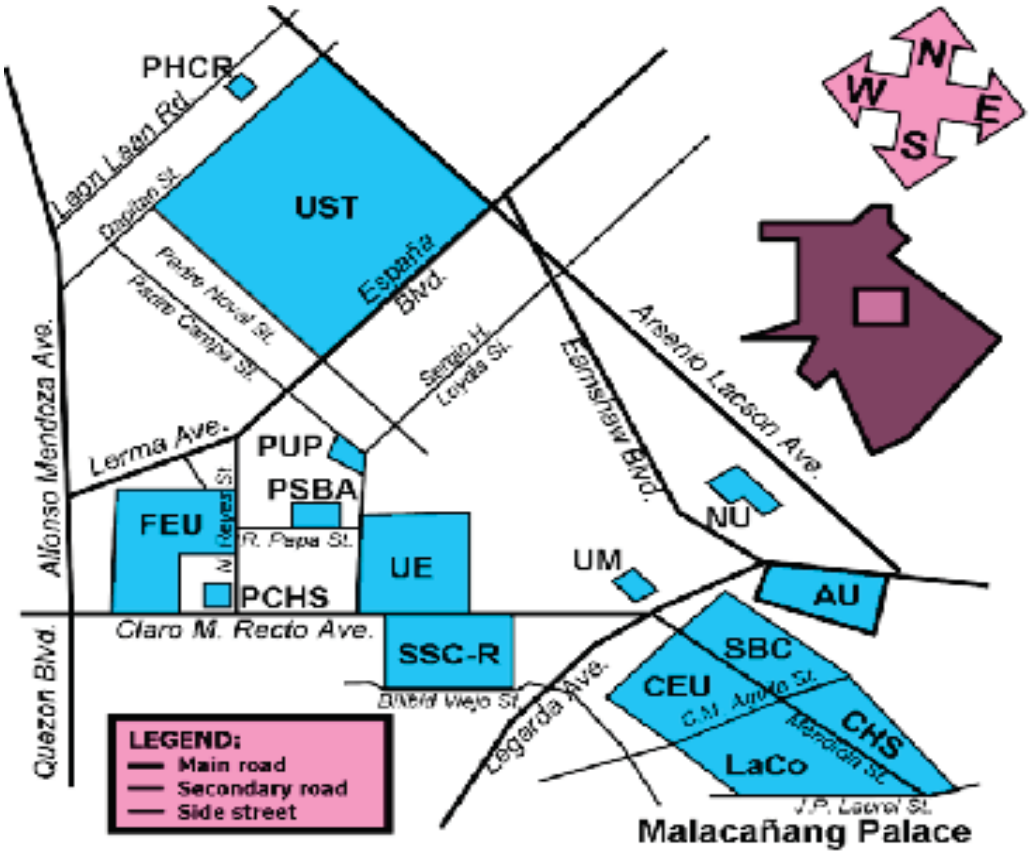

Figure 6[10]

Vicinity map of Centro Escolar University

This map is showing that Centro Escolar University Manila campus is bounded by Mendiola, Legarda, San Raphael and Concepcion Aguila streets. Also the map is showing neighboring school like San Beda and La Consolacion College.

Conceptual Framework

Beauty and proportionality idealism can be trace back from the early Egyptian civilization. This concept was also adapted during renaissance period. Today, with the modern civilization, the idea of beauty also comes with a good proportion.

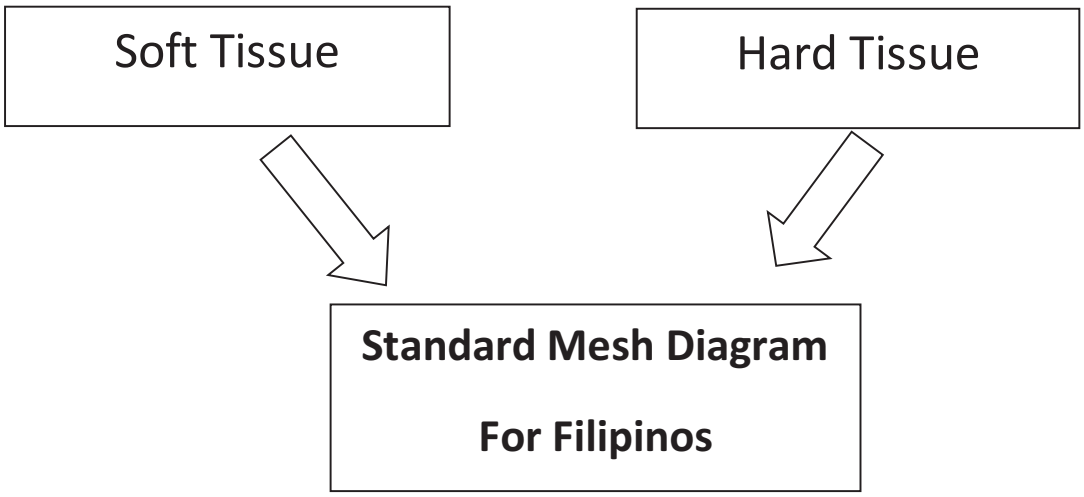

Figure 7
Schematic Diagram of Development of Standard Mesh Diagram for Filipino

This paradigm illustrates a conceptual framework of this study on how can objective and subjective evaluation be incorporated to analyze and interpret data to be able to come up with an acceptable standard.

In order to come up with an acceptable standard, one should select a sample or a group of subject that would be studied upon. The group of a population should meet a certain criteria. If selected samples can be a representative of a whole population, evaluation can be made.

For this study, a clinical examination was performed to determine if the subject can be part of the study according to the criteria set by the author. Then the subject was further evaluated by three panelist according to their soft tissue profile. With this, only those with proportional profile was chosen as part of the study.

The third step was to evaluate the cephalometric parameters of the respondents. Each landmarks in reference from the nasion in the cephalogram of all the respondent were located and measured.

Once both objective and subjective elements had been properly evaluated, getting the mean was determined as the fourth stage. Then finally combining the result of soft and hard tissue evaluation in a mesh diagram.

Statement of the Problem

This study aim to develop a standard template of a normative mesh diagram for Filipinos.

Specifically, it sought to answer the following question:

1. What is the profile of the respondents according to:
    1.1 age,
    1.2 gender?
2. What are the mean values of the cephalometric planes and angles needed in constructing the mesh diagram for both male and female subjects in terms of the following:
    2.1. Soft tissue ,
    2.2 hard tissue and
    2.3. dental tissue?
3. . How do the mesh diagram of male and female subjects differ when grouped according to:
    3.1.Upper facial height (N-ans),
    3.2 Anterior cranial base (n-sella),
    3.3 Soft tissue profile and
    3.4 Maxilla, mandible and dentition

4. Based on the findings, what is the standard mesh diagram for Filipinos?

Hypotheses

This study will test the hypothesis that there is no significant difference in the mesh diagram of the male and female subjects when grouped according to the following measurements:

1. Upper facial height (N-Ans),
2. Anterior cranial base (N-Sella),
3. Soft tissue profile and
4. Maxilla, mandible and dentition

Assumption of the Study

In this study, the researcher assumes that the cephalograms used were properly taken, following a standard procedure. Also, the researcher assumed that the cephalometric landmarks, lines and angles were properly labeled and measured accurately. The researcher also assumed that the patients answered all questions that were given to them honestly.

In addition, the researcher will assume that the statistical assistance that was given by the university statistician was correct and accurate. Also, it is assumed that all instruments to be used were properly calibrated.

Significance of the Study

Since this study will develop a standard normative mesh diagram for Filipino, this study will be beneficial to all practicing orthodontist here in the Philippines, as well as the practicing foreign orthodontist, Filipino Oromaxillofacial surgeon, to the future post graduate students of Centro Escolar University Advance Orthodontic Department, to the future dental students, and to the future orthodontic patients.

To all practicing Filipino orthodontist: This study will be beneficial to them because the output of this investigation could give them a standard normative mesh diagram that would enable them to simultaneously analyze vertical and sagittal parameters of their patient's cephalometric findings, then any differences can be observed without making measurements. Also, a mesh diagram could give them visual appraisal for their patient's finding because they can easily see how much the patient' data deviated from normal.

To the practicing orthodontist in other countries. This study would be beneficial for them for they might have a future patients who might be a Filipino. With this study they would have a template that they can use to assess their future Filipino patient's orthodontic concerns.

To the practicing Filipino Oromaxillofacial surgeon: They will also benefit from this study, since this study aim to develop a standard mesh diagram that could guide them visualize how much should they reposition the jaws surgically to give the patient a well balance face.

To the future post graduate student of Centro Escolar University Advance Orthodontic Department: The study will benefit them because they would have a template that would help them to identify what is causing the disharmony in their patient's profile easily. And of course, this study will let them appreciate the importance of cephalometry and the findings that it could give them.

To the future dental student: This study can make them interested to orthodontics by simplifying cephalometric analysis with the aid of a standard template. With this method, a graphical presentation would guide and help them understand the importance of cephalometry in orthodontics.

To the future orthodontic patients: Presentation of numerical cephalometric analysis to a lay person is not comprehensible especially if the lay person is not medically trained. Therefore, with this study, a standard normative mesh diagram will be developed and it would provide a direct visual comparison between patient's data to the acceptable standard. And using this approach, future orthodontic patient will have a better understanding and solid comprehension of the situation.

Scope, Delimitation and Limitation of the Study

The primary objective of this study will be to develop a standard mesh diagram for Filipino that would serve as a graphical guide for the cephalometric analysis interpretation. The study will focus in developing standard mesh diagram out of the mean value or average measurements of the cephalometric parameters of a patients with a well balance face and harmonious skeletal and dental pattern. The study will include skeletal, dental and soft tissue parameters from an orthognathic face only, in constructing the standard mesh diagram for Filipino.

The study will not cover the graphical representation of the measurements that would represent the higher and lower limit of a range for every measurement. Also, the study will not include comparison

between growing and non-growing Filipino patients. There will be no comparison also to the other ethnic mesh diagram.

Definition of Terms

In order to have a better understanding of this study, the following terms are defined operationally and some are defined conceptually:

Cephalometry. Cephalometry is a scientific study of the measurement of the head with relation to specific reference points to assess facial growth and development.[6]

Mandible. This is pertaining to the only movable bone on the head. This is most commonly termed as the lower jaw.

Maxilla. The maxilla is the upper jaw.

Mesh diagram. The mesh diagram is classic approach for studying facial proportion in art. [12]

Standard. This refers to a commonly accepted sets of values.

Template. This refers to a standard pattern that is traditionally used as a guide.

Upper facial height. This is pertaining to the distance from the junction of the forehead bone and nasal bone to the most anterior lying point on the anterior nasal spine.

NOTES

[1]William R. Proffit, Henry Fields and David M. Sarver, Comtemporary Orthodontics 4th ed., (Canada: Mosby, Inc. 2007), 201.

[2]Athanasios E. Athanasiou, Orthodontic Caphalometry (Mosby-Wolfe, 1995) 172

[3]Jack M. Vorhies and J. Williams Adam, Polygonic Interpretation of Cephalometric findings (Indiana, Indiana Vol. XX1 No.4 1951) 195

[4]Coenraad Moorrees et al., The Mesh Diagram and Cephalometric, (Angle Orthodontics, Vol 32, No.4 1962)214

[5]Wikipedia, the Free encyclopedia http://en.wikipedia.org/wiki/virtruvian_Man., June 16, 2011

[6]http://media.photobucket.com/image/facial%20proportion/innisart/Blog%20Images/Beauty/gc_1.jpg October ., June 16, 2011

[7]Coenraad Moorrees, 218

[8]http://sceniccities.web.infoseek.co.jp/asia/manila/images/maps2/ph_000.jpg., June 16, 2011

[9]http://upload.wikimedia.org/wikipedia/commons/3/3a/Metro_manila_map.png., June 18, 2011

[10]http://upload.wikimedia.org/wikipedia/commons/1/16/Ph_map_manila_large.png., June 18, 2011

[11]http://en.wikipilipinas.org/index.php?title=University_Belt., June 19, 2011

[12]Coenraad Moorrees, 214

CHAPTER 2

Review of Related Literature

This chapter discusses the literatures and studies related to the current study. This would give ideas on how the researcher comes out how to furnish this study.

Foreign Literature

At first glance appraisal of physiognomy help to determine the variety of human relations that exist between people.[1] More often than not, appraisal does involves emotional attachment especially when appreciating proportionality and beauty or when rejecting negative traits of an object.

For many centuries, even from the earliest civilization, Human form is already a subject of interest, especially in terms of measurement and proportion for many different reasons. The reasons include study of relationship to health, physiques and traits. The collections of sculptures, drawings and paintings throughout history will serve as evidence.

Through the years, many factors have been acknowledged that are contributory to facial disharmonies, such as accidents, developmental defects and malocclusion. In order to give solutions to this problem, many orthodontist and Maxillofacial surgeons exerted efforts in establishing guidelines for reconstruction of facial and occlusal defects.

Physique classification started when Hippocrates designated two physical types. The Habitus Phthisicus that is referring to an individual with a thin body who is susceptible to tuberculosis. And the Habitus Apoplecticus, a short but thick individual who are considered to be prone to vascular disease. This physical types are still being recognize in the modern patients. Classification of physiques continues to the time of Aristotle, the father of philosophy, Galen during 200 AD to Roston during 1828.

During the early 20th century, study of classification of physique continues. That is the time when early researches like Sheldon, introduces Somatotyping that is referring to uneven distribution of a body component. Basically talking about proportion on a quantitative over all appraisal of body mass and form.

It has been already established that measurement and proportion is already a controversy during the early civilization. From the early population of Egyptians, Greeks and Indians, a colorful culture are recorded and it includes measurements and propotional analysis in portrayal of the human form. And to properly make a portrayal of their deity or royalty, they combine their artistic talent, technical ability, and disciplines with consistent style.[2]

The early Egyptians are always wanted to please their royalties and their gods. So they offer them work of arts like, painting, drawings and sculptures. To ensure proportion to their art, they created a quantitative system that would help them make a proportional work of art, and they call it Canon. This system draws the subject on a specific position. The head, feet and legs are in profile view but the torso is in frontal view. A horizontal line will be drawn to the hairline, shoulder, axle, trunk, knee and sole with a vertical line drawn to the midmost part that would divide the figure into right and left. After which, the drawing will be enclose to grid system composed of 18 equal squares which was later on revised to became 22 equal squares.

In Indian iconometry, they have the same system that would entail proportion . They call it sariputra. It is a proportional analysis that they do to draw an image of the god Buddha as a sign of worshiping him.

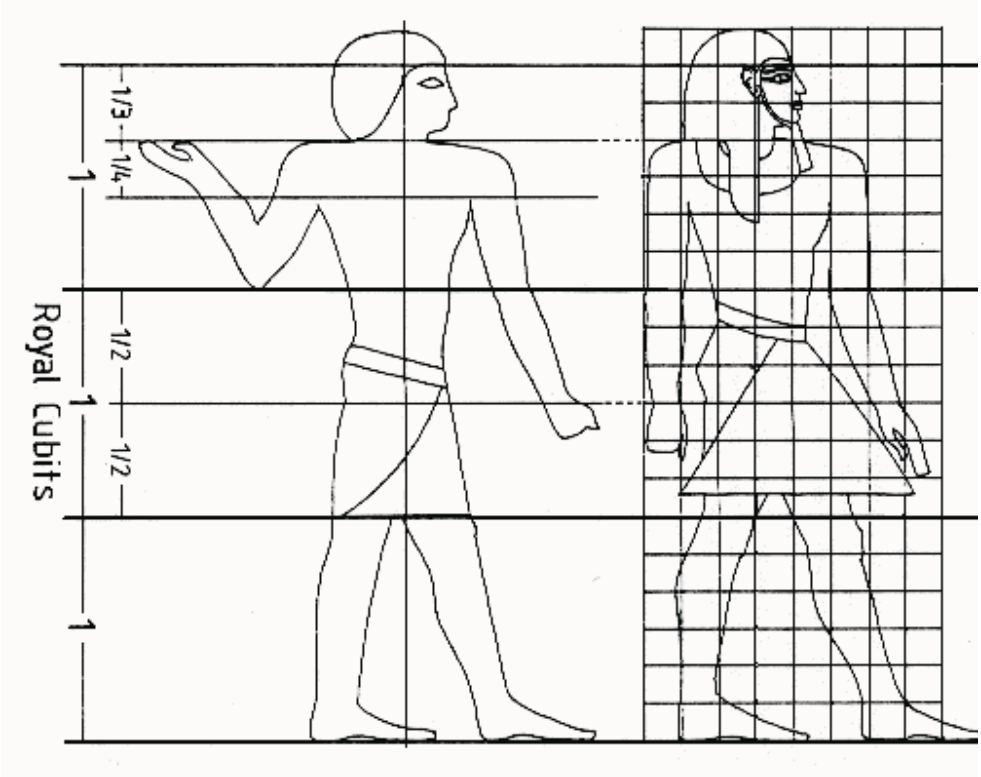

Fig 8

The Egyptian canon[3]

Unfortunately, all these knowledge were lost during the dark ages. But during the time of the revival of learning, or the era of renaissance,

Leonardo Da Vinci and Albercht Durer made an impressive contribution on proportional observation. Their drawing involves coordinate grid systems that includes proportional analysis and is somehow similar to the grid system of the early civilization.

It was albercht Durer who really made a big impact for facial proportional analysis. His contributions on the perspective study of human proportion are unequaled to date.[4] He also noted that placing a face inside a grid system or the mesh is a classic way to study proportion in art. It was his drawings that define facial morphology which became a key to the development of cephalometric analysis and facial analysis. With this system, orthodontist can now express the difference in facial form between two individual.

History records shows that human have been aware of beauty, facial esthetics and facial proportion. The work of Abercht Durer made it clear that beauty comes in proportion and he showed it using the mesh diagram. This became the starting point for early orthodontist to always aim for esthetics and ideal function. Orthodontist now does facial analysis to check the soft tissue characteristic and determine the good and bad traits, the soft tissue paradigm.

Cephalometry was introduced during 1930s; since then, it offers a good diagnosis for every orthodontist. Many investigators formulated standard norms for a given population that would serve as a guide on how to interpret the data from the tracing of the patient's cephalogram. However, lines and angles does not offer proportional analysis.

In the study of Vorhies and Adams they concluded that it has been a practice to present cephalomentric analysis findings into a graphical representation. Many orthodontist prefer graphical expression of cephalometric findings because it is easier and quicker to analyze. Also, this graphical approach will let other medical field to understand the problem easily; and the most important is that, lay person can appreciate the findings better that they can almost always have a better understanding of the underlying problems that would be presented to them.

However, even graphical representation of the numerical finding is somehow confusing for some individual. Therefore, a non-numerical presentation is much preferred.

Non-numerical cephalometry aimed of easier presentation of the morphological deviation of an individual from the norm by an adequate

visual illustration. The classic example of this analysis is the Mesh Diagram analysis and the Template Analysis.

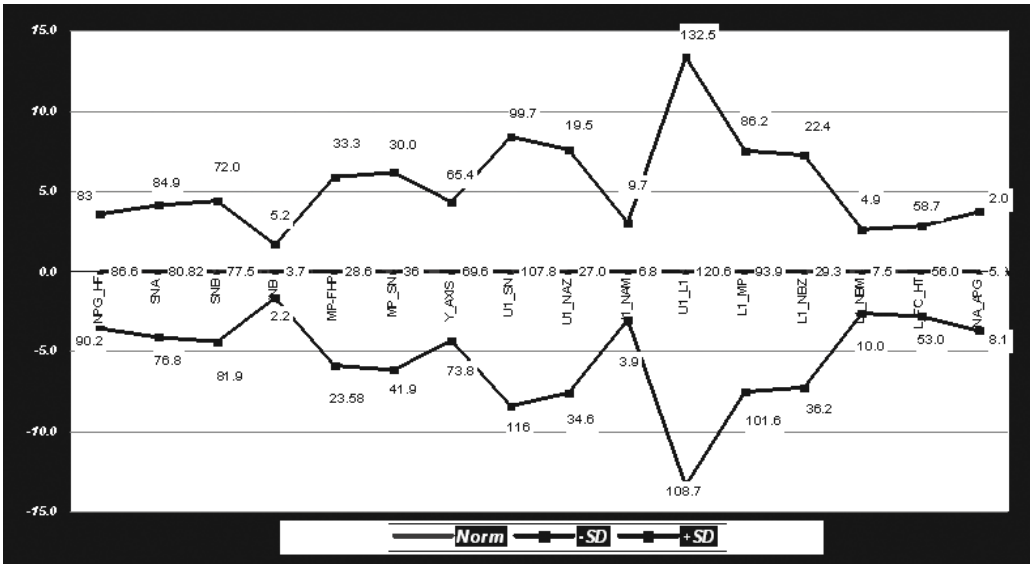

Fig 9

Wiggle chart for Saudi national.

An example of numerical analysis in a graphical form

It was Moorrees who incorporated the mesh diagram of Abercht Durer into cephalometry. Where in Moorrees enclosed the cephalogram tracing of a patient to series of 24 equal rectangles. This grid system is

almost of the same with the canon of the early Egyptians. Hence the birth of Mesh diagram analysis.

In constructing a mesh diagram for cephalometric analysis, it is a must to position the head of the patient in an upright or in a natural head position. Then the nasion will serve as the key landmark to create the mesh system. The first vertical line will be drawn that would pass thourgh nasion to spina prime and it would serve as the true vertical. After that, a second line will be drawn again in a horizontal direction from nasion to sella prime, representing true horizontal line. Then make a rectangle out of the first two lines. The distance between nasion and spina prime will then be measured and divided by 2 to get the distance of the next 3 horizontal lines below the spina prime and then additional horizontal line above nasion. After that, the distance between nasion to sella prime will then be measured and divided into 2 to divide the core rectangle into left and right. Then this distance will be the guide to add 1 more vertical line per side of the core rectangle. Then connect all lines to create 24 equal rectangles.

This mesh analysis is not advisable to be a routine for the orthodontic diagnosis due to its difficulty to produce and that it requires too much time and skill.

The second non-numerical representation of cephalometric finding is the Template analysis proposed by many investigators like, Broadbent and bolton. This Templates can be use to directly super impose on the tracing or on the actual cephalogram of the patient. And this visual comparison is a more practical and convenient method of identifying dental and skeletal disharmonies[5] these is actually the goal of the current study to develop a template that would aid in a direct comparison of patients data to that of illustrated standard norm.

Broadbent and his associated made a template also of 4 different sizes. Small, average, large and extra large template that will be use for the individual with the same measurement and this template only have the mean or average of each measurement. In the current study, there will be only 3 template. One for the standard that would represent the male standard, one for the females and the 3rd is for the combination of both sexes. But, orthodontics is not relying on mean value, but with average, so each template will include extreme limits (both highest and the lowest limit).

The interpretation of a descriptive analysis using template involves a dimension by dimension comparison with standards.[6] to do these, a reference point should be established in a close approximation of the

references by super imposition. As for the current study, the NSL will be use to facilitate standard cephalogram orientation and to facilitate direct super imposition.

The problem with this template approach is it is regional. It would not allow simultaneous analysis of both vertical and sagittal parameters. In this case, it would also take time before a clinician can relate the vertical problem to the horizontal problem. Also, this template does not offer proportionate analysis.

Remember the goal of cephalometric analysis: it is to evaluate the relationship of both horizontally and vertically of the five major functional components of the face: the cranium and basicraniun, maxilla, mandible, maxillary teeth and the mandibular teeth.[7] Regional template analysis cannot do this simultaneously. With the weaknesses presented by the mesh diagram analysis and the template analysis as well as the graphical presentation of the cephalometric findings, this study will incorporate numerical finding into a non-numerical illustration or an schematic illustration that would offer quicker and better understanding of the problem in both vertical and sagittal dimension of the patients while interpreting proportionality.

With these it would be advantageous for beginners in the field of cephalometry for communication with oromaxillofacial surgeon, with the patients and also to get an immediate overview about the major problems of the patients.[8] this will be possible without doing measurements, but only direct visual comparison.

Foreign Study

Natural head position is a standardized and reproducible position, of the head in an upright posture, the eyes focused on a point in the distance at eye level, which implies that the visual axis is horizontal.[9] Orienting the Head to this position will play a crucial role in cephalometric analysis. This is the reason why for every kind of cephalometric analysis, numerical or not, it is a must to established a vertical and horizontal reference to orient the head into the natural head position.

Coenraad Moorrees also believed that using planes by connecting two points of landmarks as a vertical or horizontal reference is not stable, because the cenphalometric landmarks itself is not stable due to its variation in location for every individual. Registration of the head in

its natural position has the advantage that an extracranial vertical or a horizontal perpendicular to the vertical can be used as a reference line.[10]

These statement of Moorrees will be applied to the current study. One land mark will be chosen as a key point to where extracranial vertical and horizontal line will be oriented. And that key point will be the nasion.

Orientation of the head to natural head position is not enough to give a conclusive diagnosis for patients seeking orthodontic treatment. A cephalogram should be analyze and interpreted. Traditionally, the cephalogram will be traced and then a linear and angular measurements will be performed.

Conventionally, a superimposition of a patient's tracing will be performed for further study. Superimposition facilitated knowledge about craniofacial growth and development, and treatment effect produced by various procedures such as orthodontics and surgery.[11]

Bjork technique of using implant as a guide to superimposition has long been acknowledge as the best and reliable method for doing superimposition in cephalometry. However, doing so as a routine, to

monitor changes during active orthodontic treatment will be invasive and very expensive.

Some investigator proposed the use of the palatal line as a reference line for superimposition. But in this study, the extracranial vertical and horizontal line that would pass through nasion will serve as the reference for superimposition. Since the nasion and this lines will also serve as a starting reference area in constructing the mesh diagram for this study.

In the study of Liebgott, he introduced Template cephalometric analysis which is faster and easy to perform. This is the same goal that the current study wishes to achieve. In his study, He devised a template that would inevitably asses the distance of A-point and B-point to determine skeletal classification. But his template cannot be a representation of a standard or ideal norm. these is because, his sample are mix of subjects with different occlusion.

To overcome such weakness, the current study will only includes subject that would poses characteristics that the researcher will set. With this approach, any data can represent standard.

In the study of Anderson et al they believe that cephalometry and its analysis is a necessary diagnostic tool as the American Board of Orthodontist prescribed. Base on their study, a using a subject with a well balance face and occlusion can provide a “cut point” for each types of classification. The researcher of the current study interpreted the “cut point” as the extreme limits to determine one classification.

Furthermore, in their study, they made it clear that parameters should be always re-evaluated to formulate a proper diagnosis. Evaluation is done by confirming the result of one parameters to other parameters that can be use to evaluate the same condition. They even included 6 external orthodontist to re-evaluate their landmark identification.

In the advancement of cephalometry, computer aided landmark identification and measurement has been introduced. However, in the study of Hutton and a separate study of Kamoen concluded that inconsistency in landmark identification is still an important random error for both automated and manual procedure. But according to the study of Rosalia Leonardi, automated landmark detection errors is greater than manual identification.

This system of Anderson will be use to the current study. Landmarks and measurements will be re-evaluated by other investigator so that landmark identification and measurement errors will be lessen.

In contemporary orthodontics, cephalometric analysis is no longer limited to hard or skeletal tissue components of the face. This is due to the trend that shifted from Angle's paradigm to soft tissue paradigm, which gives equal or even more importance to soft tissue parameters. For this current study, the main objective is to create a normative mesh diagram for Filipino population and it would include both hard (skeletal and dental components) and soft tissue parameters on it.

In order to come up with a sound diagnosis and proper treatment plan in orthodontics the patient's soft tissue should also be evaluated also. Hwang et al strongly agreed to the finding of burrstone, and Bowker et al, that proper evaluation of soft tissue should be taken into consideration for proper evaluation of underlying skeletal problem.

Within the inane system of human value symmetry and balance are easily recognized and appreciated.[12] Same with proportional condition. Disproportion can easily identified on the patient profile view, disproportion can be assess clinically. However it would be best if it

would be done sub clinically. In the harmonic analysis of the human face by Lu, K.H. he mention that, if skeletal asymmetry is greater than 3% if would clinically imprinted. This is the reason why soft tissue and hard tissue components should be included in proportional analysis. Moving the hard tissue could produce pleasing and or detrimental effect to the soft tissue.

In the study of Incrapera et al, they mentioned that lateral cephalometric analysis of the soft tissue profile is a 2D representation of a 3D face. They also concluded that using lateral cephalogram is a good tool to monitor changes during active treatment.

In their study, they included 5 major soft tissue parameters. Soft tissue Nasion, Pronasale, Superior Labrale, Inferior labrale and the Soft tissue pogonion. But this is not enough to quantify soft tissue profile. For the current study, the researcher feels the need of including soft tissue glabella, subnasale and soft tissue B-point. The researcher strongly believe that it is a must to include all 8 basic land marks of the soft tissue so that the 3 concavities of the face can be properly evaluated.

Nonetheless, the researcher agrees that in orthodontics, if surgery is not involve, only soft tissue of the lower face can be altered.

Many researchers tried to quantify the soft tissue profile. However, most result does not coincide with the findings of one another. This is due to the different method that the researchers have used. One method is the Anatomic point method, where in, there will be specific landmarks to use to construct planes and angle to be measured. And the tangent line method, which is drawing a line tangent to the curve surface of the soft tissue.

Study had found that anatomic point method has greater reproducibility in interobserver and intraobeserver comparison than the tangent line method.[13] As for the current study, this method will be use to quantify soft tissue parameters that would be included in the mesh diagram.

After quantifying soft tissue characteristics, it is a must to interpret the data so that diagnosis and treatment planning can be well planned. It is a common agreement that every group or population has their own distinct facial morphology.

In order to treat the patient according to their racial features, Soft Tissue Cephalometry Analysis is developed to relate to the overlying

skeletal and dental components. This STCA is now a formulated guideline for soft tissue evaluation.

The same as the skeletal Cephalometric analysis, the value of standard of one specific ethnic group cannot be use as a reference for a patient who belongs to another ethnic group. This is due to facial morphology variation. Racial group should be treated according to their characteristic.[14] This statement is true and also applicable not only to hard tissue morphology but to soft tissue characteristics as well.

Cephalometric Analysis involves tracing the cephalogram of the patient to in order to locate all the landmarks needed to construct the planes and angles needed to be measure for patient's evaluation. The nature of these techniques is that it is time consuming.

When down published set of values for cephalometric analysis. It has become a routine in orthodontic clinics to analyzed patient cephalogram using population standard. But the difficulty of doing so and the time consuming nature of the procedure make this analysis a dilemma to most clinician.

Baum from California, device a template that would make Downs analysis simpler and tracing is not necessary. However, these present the same weakness of the traditional method of cephalometric analysis.

The quantitative assessment of the divergence of the facial size and shape of a patient from a established norm should always be the first step in orthodontic diagnosis and treatment planning.[15] Cephalometric analysis are quantitative in nature. This analysis is base on linear distances as well as angle and ratio. This system is a good way of determining skeletal problem that radiates to soft tissue of the patients. However, this analysis offer a fragmented information that sometimes gives confusion and erroneous interpretation because this fragmented data need to be integrated first to obtain an important details.

In addition, this kind of analysis cannot offer simultaneous analysis of the patient's vertical and horizontal parameters as well as it cannot give proportional analysis.

The attainment of harmonious and proportional craniofacial aesthetics is one of desired result of orthodontic treatment. And the proportional analysis of craniofacial relationship in both hard and soft

tissues furnishes a valuable guide in orthodontic diagnosis and treatment planning. [16]

The mesh diagram of Moorrees can overcome the weaknesses of the traditional cephalometric analysis and it can guide clinician in achieving aesthetic result by helping the clinician formulate a sound diagnosis and treatment plan. It allows quantitative and qualitative analysis at the same time for both horizontal and vertical parameters. It also allows visual comparison of the patient facial structure to the standard facial proportion. Because it gives a readily identifiable schematic illustration that would help the clinician to determine approaches needed to correct facial dysmorphology and malocclusion. But most of the mesh diagram analysis available today is a semi-quantitative analysis. Because it only shows the condition if there is deviation from normal or not. With this, for the current study, extreme limit will be included.

Local Studies

Here in the Philippines, cephalometric analysis is a routine for each practicing orthodontist. And everyone agrees that thorough analysis

of the facial and cephalometric characteristic of an individual could lead them to a proper diagnosis and it would allow them formulate a good treatment plan.

Since 1954, ceplometric analysis has been an aid for diagnosis in a surgical-orthodontic cases planning in treating of facial malformation, and currently being widely use for this purpose.[18]

A straight profile has long been the classic example of beauty, particularly those of Apollo de Belvedere and Jesus Christ.[19] However, straight profile is not applicable to every group. Facial variation exist, and orthodontist are aware of these variation.

In the study of landrito et al., they limited their investigation to the proportion of upper and lower face height of Filipino, then suggested a further study about mesh diagram for Filipino. These mesh diagram will include both vertical and sagittal proportion.

Establishing a harmonious face is one of the basic goal in orthodontics. Positioning the teeth to its proper and esthetically position can give a big impact on facial balance and harmony. It has been fully accepted that teeth alignment can provide changes on the soft tissue profile.

There is a definite pattern in terms of the dentoskeletal framework and the soft tissue for the Filipino compare to other ethnic groups such as Caucasian, Japanese, Negro and others.[20] with an aid of a mesh diagram, this pattern can be further evaluated. Many studies pointed out that there seem to be a definite relationship between dentoskeltal and soft tissue profile around the mouth.[21] This can be further explained by using a mesh diagram. Since this mesh diagram does not just allow simultaneous analysis for vertical and sagittal parameters but also with the relationship between soft tissue and dentoskeletal features.

NOTES

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[5]Proportionate template by Alexander Jacobson, Radiographic Cephalometry from basic to videoimaging. Edited by Alexander Jacobson, Quintenssence Publishing co, inc. 1995, page 228

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[21]Leonor C. Lago, DMD, A cephalometric study of incisor Axial Inclination and lip Posture in Filipino, The journal of Philippine dental association

CHAPTER 3

Methods and Procedure

This chapter discusses of the methods of research and the procedure that is to be used by the investigator in order to answer the problems which was stated in the first chapter of this study. Specifically, this chapter covers discussion of the methods of the research used, the respondents of the study, the sampling technique, the different instruments needed for this research, along with the validation of instruments used as well as the statistical treatment of data to arrive at a valid and reliable interpretation of the results of the study.

Methods of Research Used

In this study, the method of research used was descriptive method type. It will be practice for developing a standard normative mesh diagram that would be useful in orthodontic diagnosis, by creating a standard template that would give visual comparison from what is normal and not. With this research design, it helps to illustrate the most common location of the landmarks use in lateral cephalometric analysis for skeletal, dental and soft tissue parameters among the selected students of Centro Escolar University, Manila.

Furthermore, utilizing the descriptive type of research for this study will be helpful in evaluating the comparison between different cephalometric dimensions.

Subjects of the Study

This study focuses on development of standard normative mesh diagram for Filipino.

The study was limited to sixty subjects. Thirty males and thirty females who would meet the criteria that will be set by the researcher. This patients were filtered from a larger group by a group of panelist. Then cephalometric radiography were taken for each of them. The subjects are limited in numbers due to the financial constraint of the researcher.

Sampling Technique

For this current study purposive sampling technique was used in dertermining the target population. This is because the researcher set criteria that the participants met to be able to participate to this study.

Basically, the subjects will came from the students of Centro Escolar University, Manila. To enable the researcher obtain his main subjects, a set of criteria must be met by these patients: the respondent should be currently enrolled in Centro Escolar University, Manila ages 18 to 24 years old, with

esthetically accepted soft tissue profile, no history of orthodontic treatment, with complete set of teeth up second molar, 3rd molar may or may not be present, with 6mm or less dental crowding, with class I (angle) molar relationship and of Filipino decent up to 3rd generation. The subjects are limited in numbers due to the financial constraint of the researcher.

From the large target population, only 60 individuals are to be selected. The profile of the subjects were taken by using questionnaire.

Data Gathering Instruments Used

Questionaires. Questionaire was one of the techniques used in this study for collecting and analyzing the data. Important details such as profile in terms of name, age and sex was obtained and recorded at the same time using this approach. Part 1 of the questionnaire was answered by the patients. And the other half was filled up by the researcher. These questionnaires were filed for future reference.

Lateral facial photographs. The facial photographs of each individual served as a tool to derive the main subjects of 60 individual who will participate in this study. These photographs were ssessed by the group of selected panelist to decide whether the respondent has a esthetically accepted soft tissue profile.

Lateral Cephalometric x-rays. This lateral cephalometric xrays served as the main tool to identify and locate the average location of every cephalometric landmanks (for skeletal, dental and soft tissue) needed to create the mesh diagram.

Panel. A group of selected individual was formed to help the researcher decide if the respondent has a well balance face or an esthetically accepted soft tissue profile. The panelist was consist of two external Filipino orthodontist, two Filipino artist and two foreigners.

Validation of the Instrument Used

The primary procedure in gathering data for this study is the questionnaire, facial photographs and the lateral cephalometric x-ray. Following initial preparation of these instruments, these were submitted to the researcher's adviser and was by validated by the expert, the clinical instructors in the advance orthodontic department for this case for any correction, suggestion and recommendation.

When correction have been incorporated, and suggestion and recommendations from the experts are integrated, the approved schema for measuring and evaluating the records, photos and x-rays, a dry-run of the study was performed. A trial that made use of the 3 instruments were executed

to ten (10) patients of the same status, those who met the criteria set by the researcher, but not included in the proposed respondents of the study.

The data collected from the conducted dry-run were then subjected for further evaluation. After assessment, the modified schema for measuring and assessing the data of the subjects was utilized for the research proper.

Data Gathering Procedure

1. **Use of Questionaires.** The researcher gathered information of the subjects using these instruments to obtain the patient's profile regarding age, gender and citizenship.

2. Facial photographs. This instrument will served as a record for the researcher to profile or facial analysis. The researcher can scrutinize the photo so that decision can be made if the respondents can be included in the research.

3. Panelist. Others opinion about facial esthetics is a valuable diagnostic tool for this research. To help determine if the soft tissue or facial esthetics of the respondent is acceptable. Six panelist were tapped for this research. Two external orthodontist who were knowledgeable about soft tissue proportion, two artist who can best describe beauty objectively and two foreign nationals to

allow variety of esthetics point of view to be properly represented. Each panelist rated every respondent accordingly: 3 for esthetically accepted profile, 2 for average profile and 1 for esthetically not acceptable. A medial score of 2 is needed for a respondent to be included in the research.

4. Evaluation of Lateral Cephalometric x-ray tracings. This instrument was a valuable tool to gather measurements of the location of the different landmarks (skeletal, dental and soft tissue landmarks) needed to produce a mesh diagram. These cephalographs were traced in the natural head position by one examiner, using 0.5mm mechanical lead pencil on cephalometric tracing paper. After tracing, landmarks were properly identify.

Figure 10 showed the basic soft tissue land marks for cephalometric tracing needed in constructing the mesh diagram. Red dots represent the location of each soft tissue land marks in a lateral cephalogram.

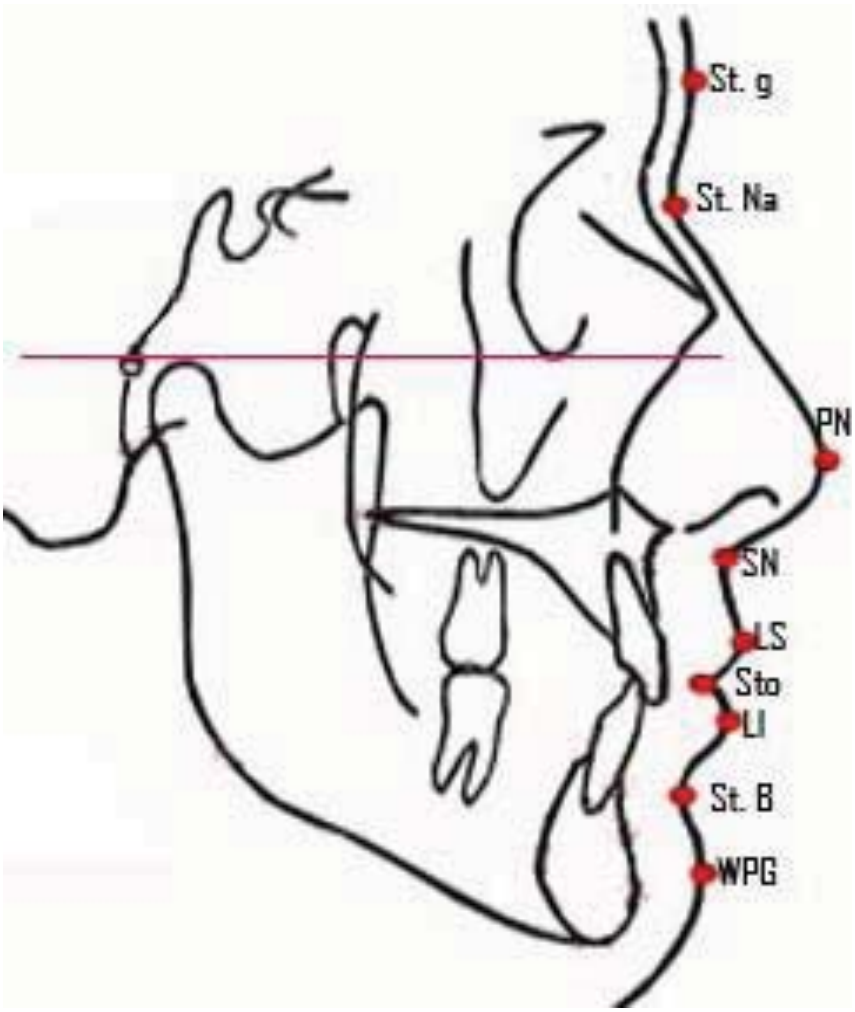


Figure 10
Cephalometric tracing and location of basic
Soft tissue land marks

The following landmarks were identified and properly labeled.

Soft tissue landmarks:

1 Soft tissue Glabella (StG). [1]soft tissue glabella is the most prominent point in the midsagittal plane of the forehead.

2 Soft tissue Nasion (StNa)

3 Pronasion (PN). [2]Pronasion is the most prominent point on the tip of the nose when the head is placed in the eye-ear plane.

4 Subnasale (SN). [3]Subnasale is an anthropometric landmark situated at the point where the nasal septum merges with the upper lip in the midsagittal plane.

5 Labrale Superius (LS). [4]Labrela Superius is the median point in the upper margin of the upper membranous lip.

6 Stomonion (Sto). [5]Stomonion is a cephalometric landmark, being the midpoint of the oral fissure when the mouth is closed.

7 Labialis Inferioris (LI). Labialis Inferioris is pertaining to the lower lip.

8 Soft Tissue point B (StB). Soft tissue point B is pertaining to the deepest portion of the metal sulcus.

9 Soft tissue Pogonion (WPG). Soft tissue Pogonion is the most prominent part of the soft tissue chin.

Figure 11 showed the basic Hard tissue land marks for cephalometric tracing needed in constructing the mesh diagram. Red dots represent the location of each Hard tissue land marks in a lateral cephalogram

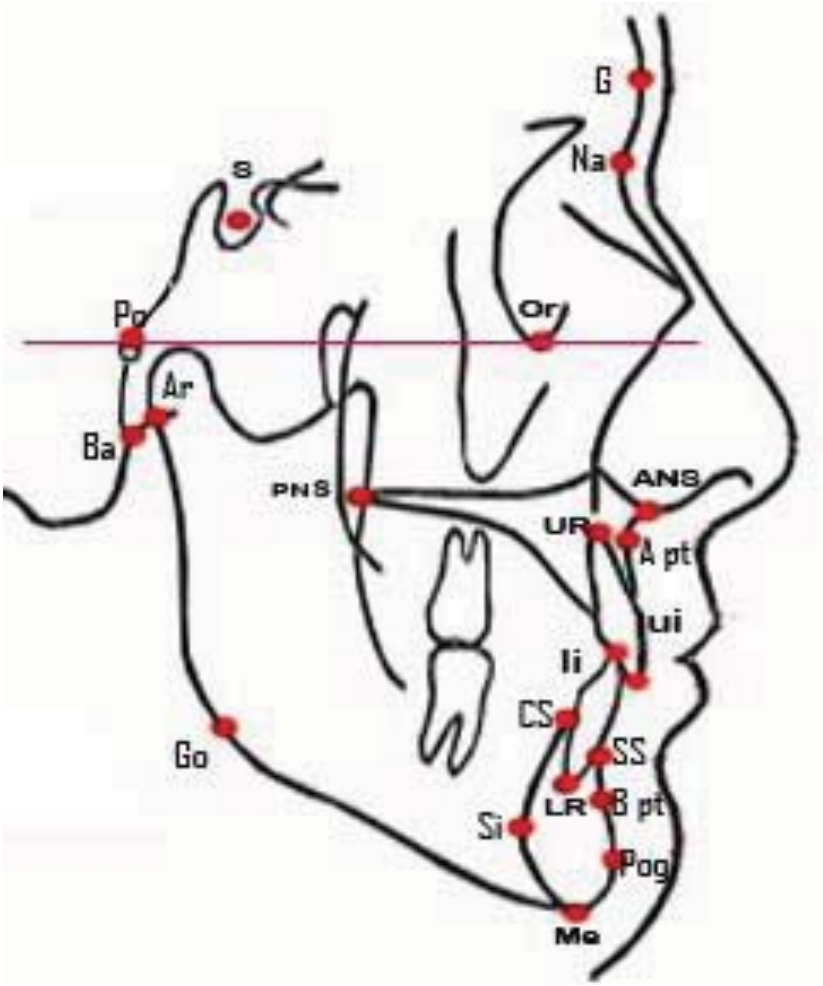


Figure 11
Cephalometric tracing and location of basic
Hard tissue land marks

Hard Tissue Landmarks:

10 Glabella (G). The most prominent part of the frontal bone in midsagittal plane.

11 Nasion (Na). [6]Nasion is the most anterior point of the frontonasal suture in the median plane.

12 Sella (S). [7]Sella is the point representing the midpoint of the pituritary fossa; it is a constructed point in the median plane.

13 Basion (Ba). Basion is the tip of the bony clivus of the cranial base.

14 Spina (Sp). Spina is the tip of the bony nasal spine in the midline

15 Point A (A). [8]Point A is the deepest point on the curved profile of the maxilla between the anterior nsal spine and alveolar crest.

16 Posterior Nasal Spine (PNS). [9]Posterior Nasal spine is the tip of the posterior nasal spine in the midline located as a continuation of the base of the pterygopalatine fossa where it intersects withs the nasal floor.

17 Upper Incisor (UI). Incisal edge of the most anterior maxillary central incisor.

18 Upper Root (UR). Upper root is the root apex of the most anterior maxillary central incisor.

19 Lower Incisor (LI). Lower incisor is the incisal edge of the most anterior lower central incisor.

20 Lower Root (LR). Lower root is prepresented by the root apex of the most anterior lower central incisor.

21 Point B (B). [10]Point B is located at the most posterior point on the shadow of the anterior boarder of the mandible.

22 Symphysis Superior (SS). This is the most supero-anterior part of the mandibular symphisis

23 Pogonion (POG). [11]Pogonion is the most anterior point on the shadow of the chin.

24 Menton (Me). The most inferior portion of the bony chin

25 Symphysis Inferior (SI)

26 Gonion (GO). Gonior is the angle of the mandible.

27 Articulare (Ar). Articulare is the intersection of the bony clivus and the mandibular condyle.

28 Molar point (Mpt). Represented by the contact of upper and lower first molar.

29 Corpus Superioris

Mesh diagram was constructed for each subject by using the extracranial true vertical line passing through nasion.

Procedure in Constructing Mesh Diagram

Step 1. True vertical line was drawn extracanialy perpendicular to the FH plane and passed through nasion point.

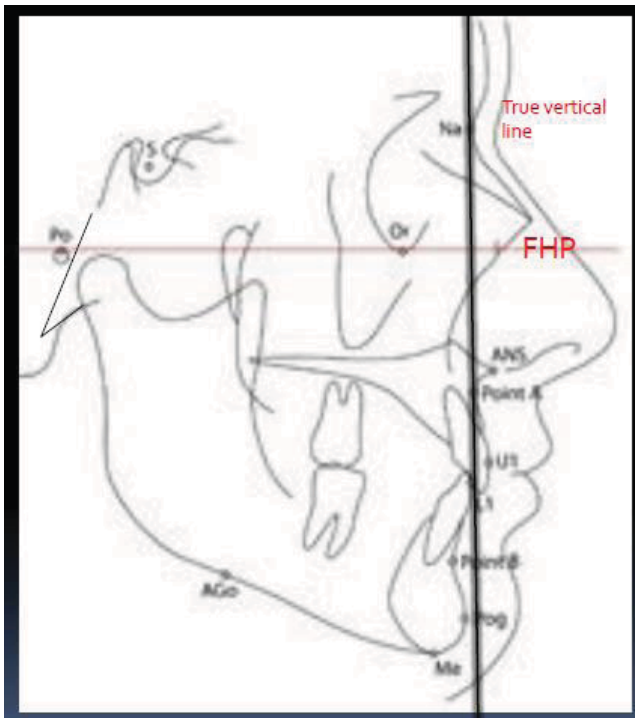


Figure 12

The True vertical line Passing Nasion perpendicular to FHP

Step 2. Two horizontal lines perpendicular to the true vertical line. First line were plotted passing through nasion, and second line is passing through ANS. The first line was termed as x- axis

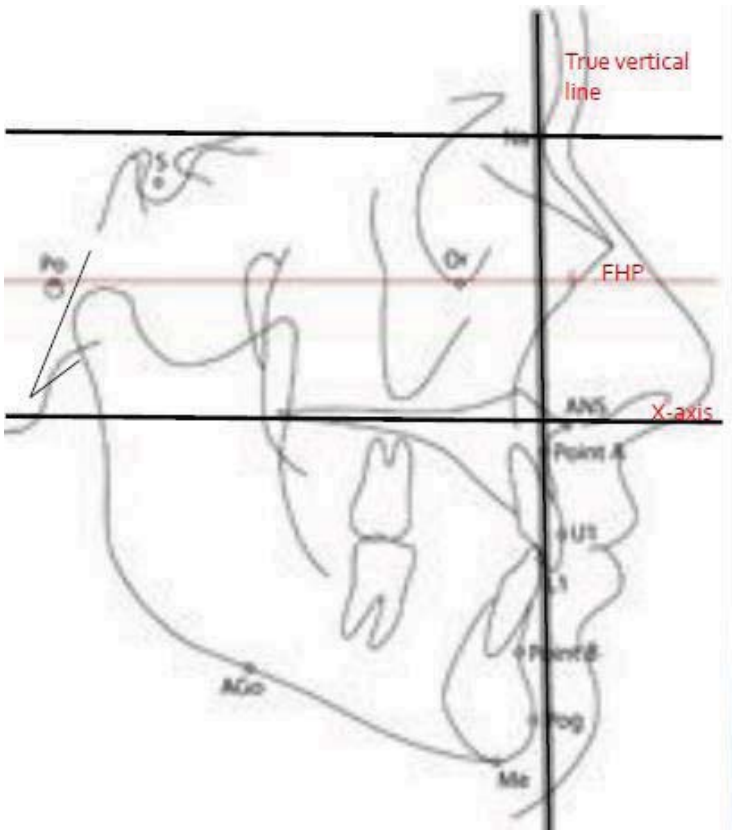


Fig13

X-axis passing plane perpendicular to the True vertical plane

Step 3. Second vertical line was drawn that passed through sella, it was parallel to the true vertical line. Core rectangle was now identified.

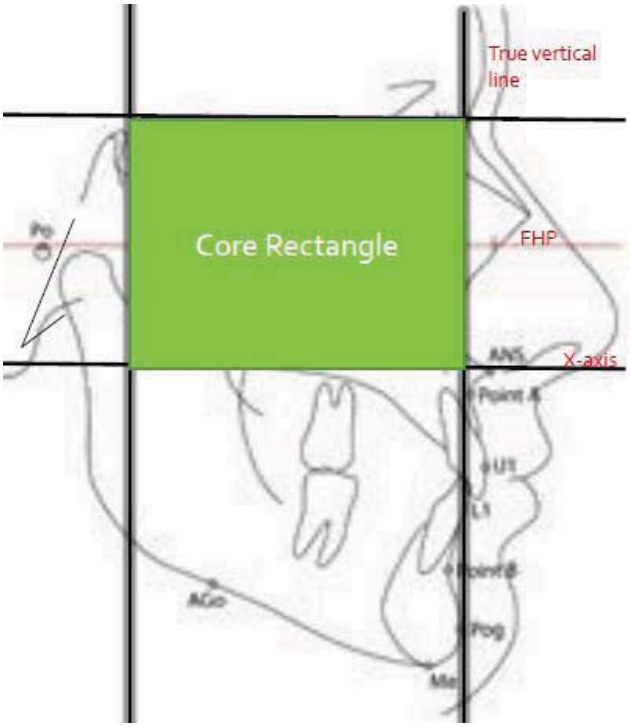


Fig 14
The core rectangle of the Mesh diagram

Step 4. The third vertical line between the first and second vertical line was plotted, this served as the y-axis. The distance of the third vertical line to the first vertical was measured. This served as the horizontal scale.

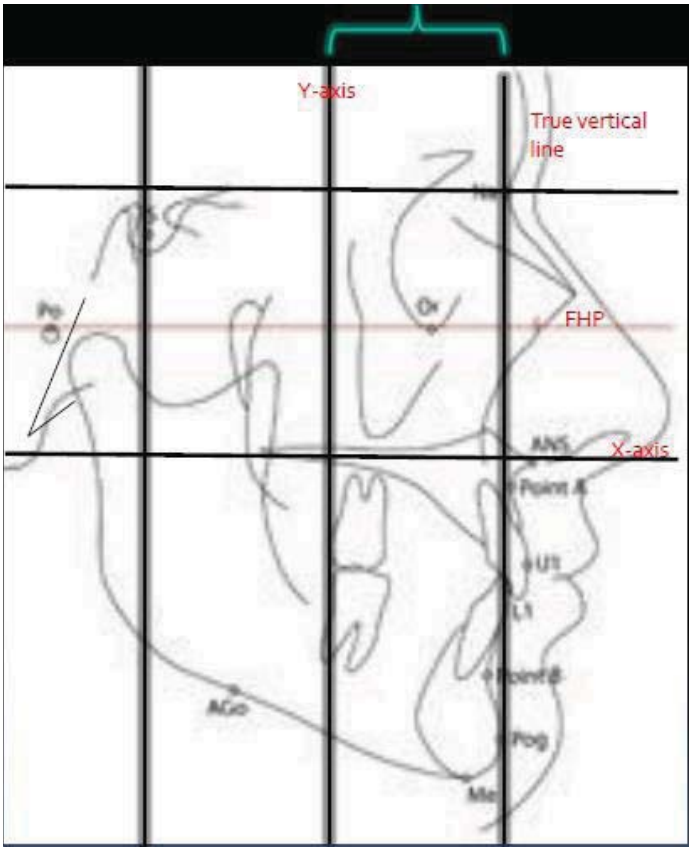


Fig 15
Showing the y –axis as the guide for the horizontal scale

Step 5. One more vertical line in front of the first and behind the second vertical line was drawn.

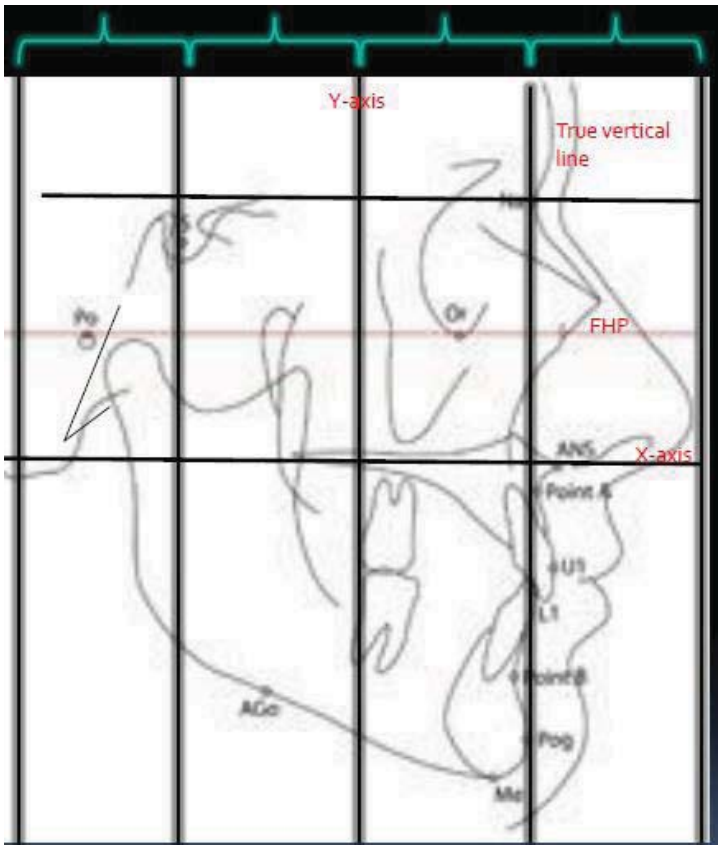


Fig16

Showing the 5 vertical lines.

Step 6. The 3rd horizontal line between the first and the second horizontal line was drawn. The distance between the first and the 3rd vertical line was measured. This served as the vertical scale.

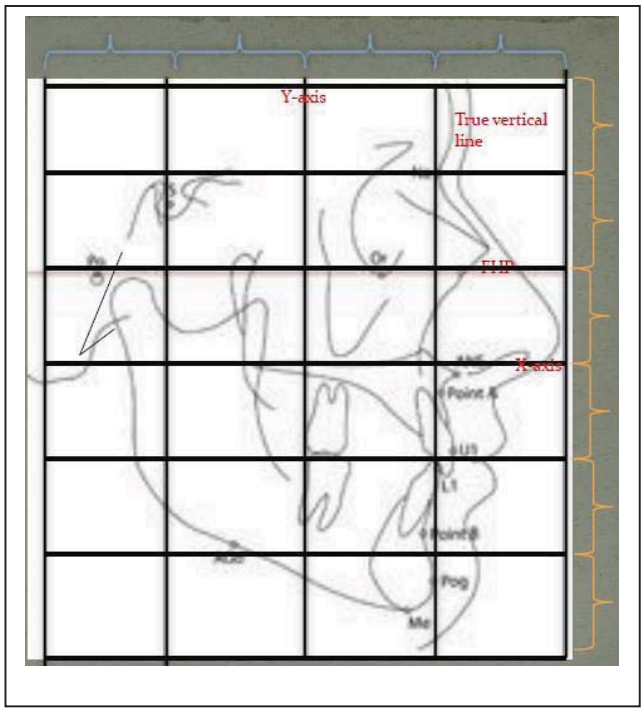


Fig 17
Showing how to construct the vertical scale

Step 7. Plot One more horizontal line above the first horizontal line, then 3 more below the second horizontal line were drawn. The 24 rectangle of a mesh diagram were created.

Fig 18
Individual mesh diagram. Showing 24 rectagles

Step 8. The average measurement of the core rectangle of all the subjects were gathered.

Step 9. The standard mesh base on the scale provided by the average core rectangle were identified.

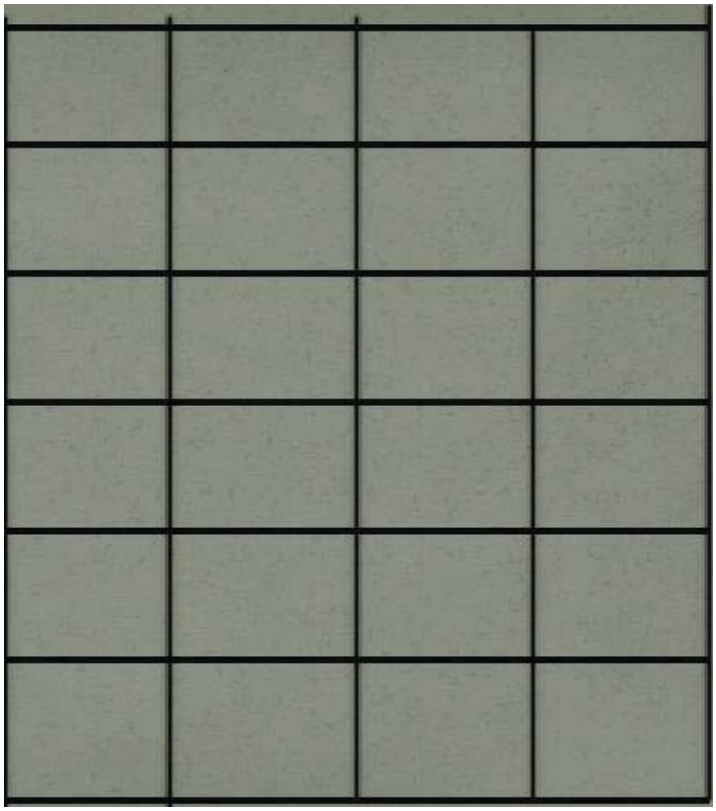


Figure 19

The standard mesh gridlines for filipino

Step 10. The average location of the landmarks using the nasion as reference point was determined.

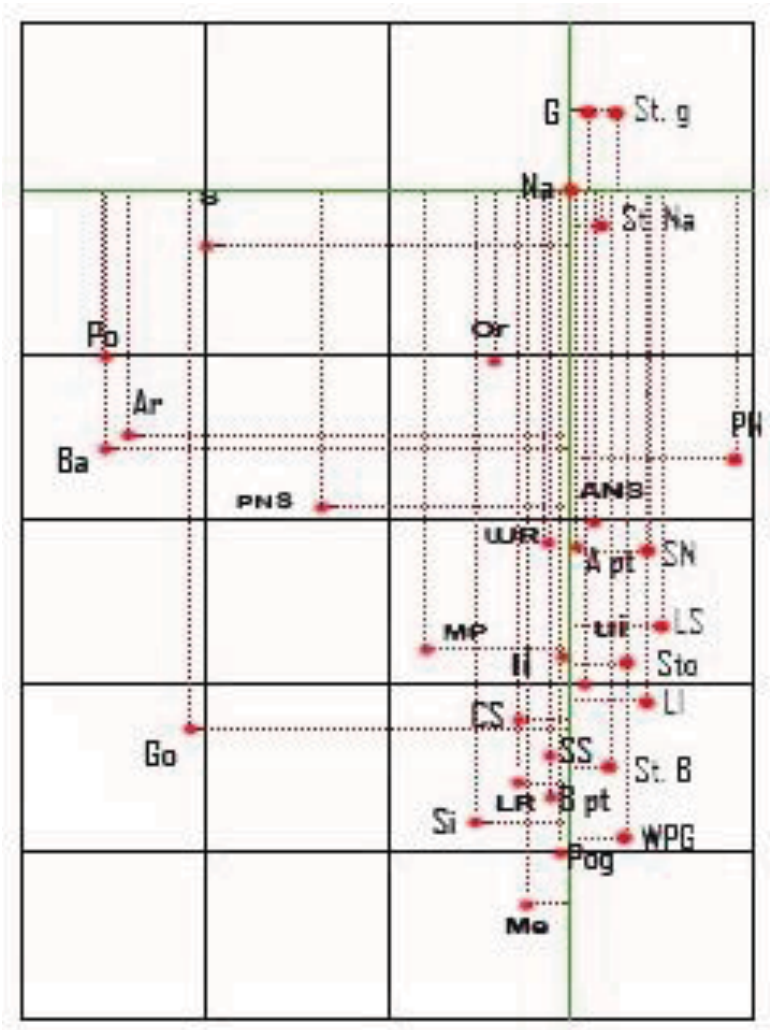


Fig 20:
showing the mean x axis and y axis
distance of sella from nasion

Step 11.The following land marks were connected.

a. StG – StNa
b. StNa – PN
c. PN – SN
d. Sn- UL
e. LS- Sto
f. Sto – LI
g. LL – StB
h. StB- WPG

Hard tissue

a. G – Na
b. Na – S
c. S- Ba
d. Sp – PNS
e. A – PNS
f. UI – UR
g. LI – LR
h. Sp – A
i. SS – Pog
j. Pog – Me
k. Me – SI
l. SI – CS

Step 12. The standard Mesh diagram template.

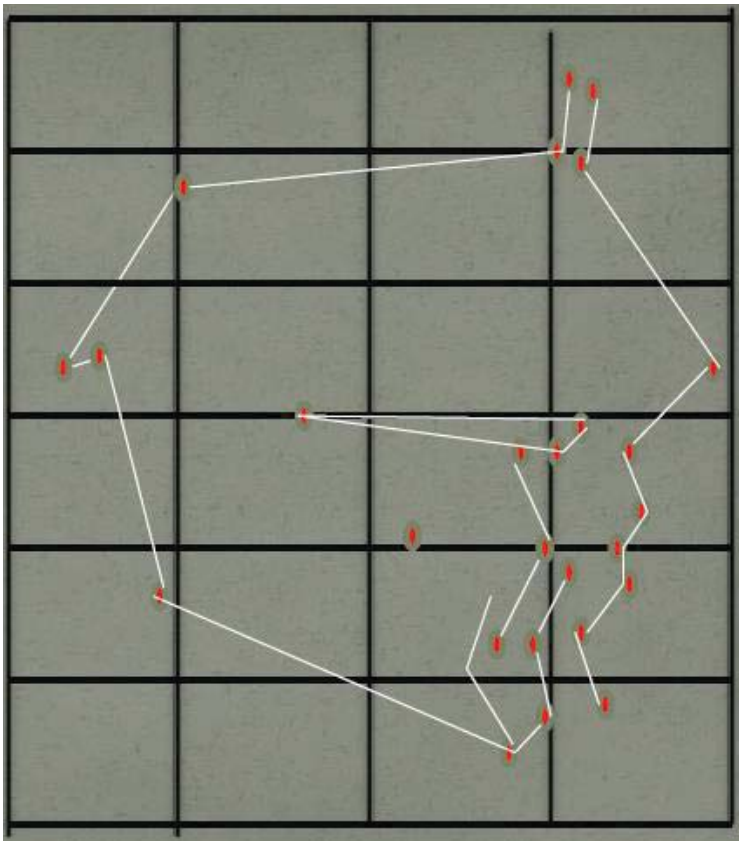


Fig 21:
Standard Mesh diagram of the Filipino

Core rectangle for each patients was measured according to length and width. The measurement for all subjects was done to get the average then a separate averaging was made for male and female subjects. Distance of each land marks to their respective grids were measured and the average was determined. Same procedure will be done separately for the male and female

subjects. Each result were plotted accordingly to their specific standard grids allowing the construction of the standard mesh diagrams.

Statistical Treatment of Data

For accurate interpretation of result, the researcher used the following statistical techniques:

Problem 1. In order to determine the profile of the subjects according to age, gender, the researcher used the percentage statistical treatment.

Problems 2. To assess the most common location of the cephalometric points involve in construction of mesh diagram the researcher will use two statistical treatments. The Mean ($\bar{x}$) and the Standard Deviation (SD).

Problems 3. To verify any significance in the mesh diagram of male and female samples in terms of cranial base length, upper face height, and lower face height, the researcher used the T- test.

This statistical treatment was used for hypothesis testing to find out if the mean difference is statistically significant or not. T-test was utilized in this method.

Statistical computation of the data to be gathered was done at Centro Escolar University Center for Data Analysis.

NOTES

[1]Athanasios E. Athanasiou, Orthodontic Caphalometry (Mosby-Wolfe, 1995) 172

[2]Stanley Jablonski, Illustrated Dictionary of Dentistry (M W Publishing Inc. Quezon Avenue, Quezon city, M.M) 641

[3]Jablonski, 749

[4]Samir E. Bishara, Textbook of Orthodontics (Elsevier 2005, India) 115

[5]Jablonski, 743

[6]Athanasiou, 23

[7]Athanasiou, 47

[8]Martyn T. Cobourne and Andrew T. DiBiase, Handbook of Orthodontics (Mosby – Elsevier, 2010) 155

[9]Cobourne and DiBiase, 155

[10]Samir E. Bishara, 115

[11]Samir E. Bishara, 115

CHAPTER 4

Presentation, Analysis and Interpretation of Data

This chapter deals with the presentation, analysis and interpretation of data gathered to evaluate the Mesh diagram for both male and female samples.

The statistics being interpreted and discussed were presented in tabular form.

1. Profile of the Patients

The profile of the subjects was determined in order to provide the necessary background for the interpretation of the data gathered. The age and gender were considered.

1.1 Age Table 1 shows the frequency and percentage distribution of the subjects grouped according to age. The age of the subjects ranged from 17 years old as the youngest to 22 years old as the oldest subject who participated in this study. The 2 most frequent age were 19 and 18 with a frequency of 17 and 13 respectively. The age bracket would signify that this is the age where one exhibits high consciousness of his or her physical appearance. It is the age where one seeks social acceptance and acceptance is met by being esthetically pleasing with his or her smile and even the profile of their face.[1-2]

Table 1

Age of the Patients

Age	Frequency	Percentage
17	7	11.7
18	13	21.7
19	17	28.3
20	6	10
21	9	15
22	8	13.3
TOTAL	60	100.00%

1. 2 Gender. Table 2 shows the frequency and percentage distribution of the subjects grouped according to gender.

Table 2

Gender of the Patients

Gender	Frequency	Percentage
Male	30	50
Female	30	50
TOTAL	60	100.00%

Table 2 basically reveal that equal number of male and female subjects participated in this study.

2. The most common location of the cephalometric points involve in construction of mesh diagram

In the contemporary orthodontics, it follows the principle of soft tissue paradigm wherein soft tissue parameters play a major role in formulating a treatment plan for each orthodontic patients.

Table 3 shows the mean and standard deviation of the soft tissue parameters in x-axis for male respondents. It reveals that mean measurement for soft tissue glabella in x-axis is 9.9mm with a standard deviation of 1.58. the soft tissue nasion mean measurement is 5.48mm with standard deviation of 1.31mm. the pronasion mean measurement in x –axis is 27.76mm with standard deviation of 4.24mm. The mean measurement of point subnasale in x-axis is 15.86mm with standard deviation of 4.01mm. The mean measurement for the LS or Labrale superioris is 20.76mm with standard deviation of 5.09. Stomonion mean measurement is 14.94mm with standard deviation of 5.05mm. The labialis Inferioris has a mean measurement of 18.72mm and a standard deviation of 5.35mm. The Soft tissue B point has a mean measurement of 11.05mm with standard deviation of 5.64mm. And finally the mean measurement for WPG or the soft tissue pogonion point is 11.18mm with the standard deviation of 6.50mm (fig 22).

Table 3

Mean and Standard Deviation of Soft Tissue Parameters in X-axis for male subjects

Soft Tissue Parameters in X-axis	Mean in millimeter	SD
St. Glabella	9.90	1.58
St. Nasion	5.48	1.31
Pronasion	27.76	4.24
Subnasale	15.86	4.01
Labialis Superioris	20.76	5.09
Stomonion	14.94	5.05
Labialis Inferioris	18.72	5.35
St. B point	11.05	5.64
WPG	11.18	6.50

Table 4 shows the mean and standard deviation of the soft tissue parameters in y-axis for male respondents. It reveals that mean measurement for soft tissue glabella in x-axis is 10.98mm with a standard deviation of 2.21mm. The soft tissue nasion mean measurement is -5.43mm with standard deviation of 2.55mm. the pronasion mean measurement in y –axis is -45.89mm with standard deviation of 3.86mm. The mean measurement of point subnasale in y-axis is -57.33mm with standard deviation of 4.01mm. The mean

measurement for the LS or Labrale superioris is -74.01mm with standard deviation of 3.31. Stomion mean measurement is -81.56mm with standard deviation of 4.47mm. The labrale Inferioris has a mean measurement of -88.96mm and a standard deviation of 4.76mm. The Soft tissue B point has a mean measurement of -98.61mm with standard deviation of 5.07mm. And finally the mean measurement for WPG or the soft tissue pogonion point is -112.05mm with the standard deviation of 5.38. all this are properly plotted in figure 21.

Table 4
Mean and Standard Deviation of Soft Tissue Parameters in Y-axis for male subjects

Soft Tissue Parameters in y-axis	Mean in millimeter	SD
St. Glabella	10.98	2.21
St. Nasion	-5.43	2.55
Pronasion	-45.89	3.86
Subnasale	-57.33	4.01
Labrale Superioris	-74.01	3.31
Stomonion	-81.56	4.47
Labrale Inferioris	-88.96	4.76
St. B point	-98.61	5.07
WPG	-112.05	5.38

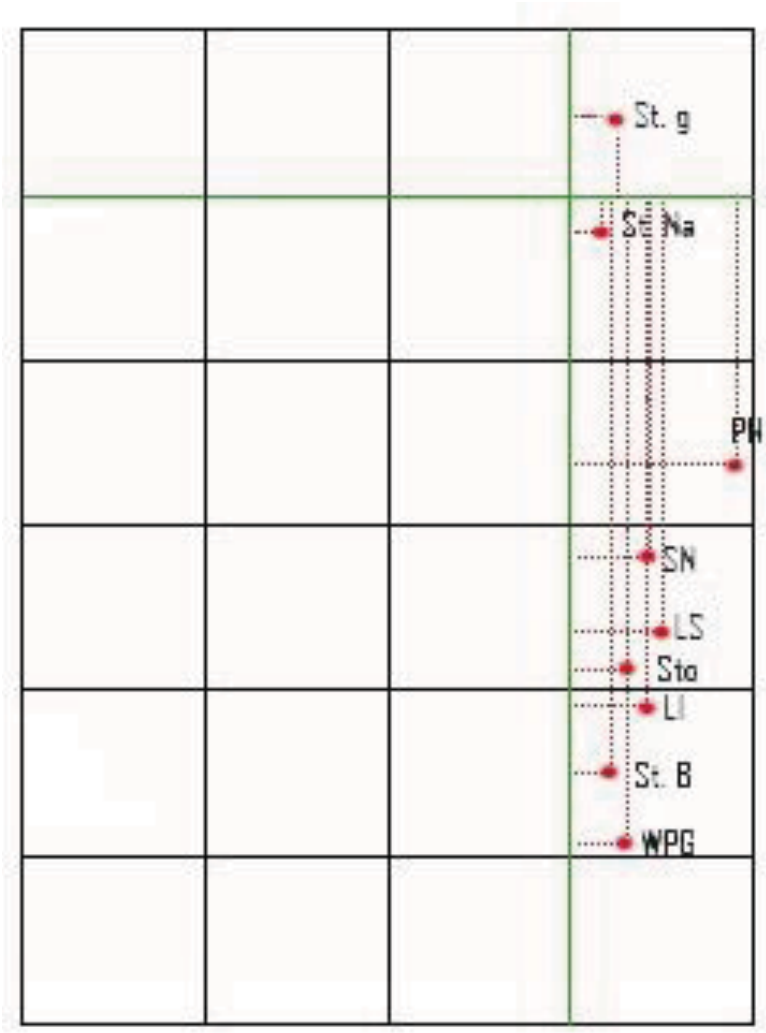


Figure 21

Mean measurement of the location of

Each soft tissue landmarks in x and y coordinates

For Male subjects

In order to assess the sexual dimorphism that exist between male respondent and female respondent, soft tissue measurement was also performed for the female subjects.

Table 5 shows the mean and standard deviation of the soft tissue parameters in x-axis for female respondents. It reveals that mean measurement for soft tissue glabella in y-axis is 8.97mm with a standard deviation of 1.62mm. The soft tissue nasion mean measurement is 5.16mm with standard deviation of 1.06mm. the pronasion mean measurement in x –axis is 25.18mm with standard deviation of 3.63mm. The mean measurement of point subnasale in x-axis is 13.86mm with standard deviation of 3.91mm. The mean measurement for the LS or Labrale superioris is 20.16mm with standard deviation of 4.01. Stomion mean measurement is 14.68mm with standard deviation of 4.53mm. The labialis Inferioris has a mean measurement of 18.11mm and a standard deviation of 4.94. The Soft tissue B point has a mean measurement of 11.86mm with standard deviation of 5.20mm. And finally the mean measurement for WPG or the soft tissue pogonion point is 12.56mm with the standard deviation of 5.70mm. To better understand, refer to figure 22.

Table 5

Mean and Standard Deviation of Soft Tissue Parameters in x-axis for female subjects

Soft Tissue Parameters in X-axis	Mean in millimeter	SD
St. Glabella	8.97	1.62
St. Nasion	5.16	1.06
Pronasion	25.18	3.63
Subnasale	13.86	3.91
Labrale Superioris	20.16	4.01
Stomion	14.68	4.53
Labrale Inferioris	18.11	4.94
St. B point	11.86	5.02
WPG	12.56	5.70

Table 6 shows the mean and standard deviation of the soft tissue parameters in y-axis for female respondents. It shows that mean measurement for soft tissue glabella in y-axis is 10.85mm with a standard deviation of 2.10. The soft tissue nasion mean measurement is -4.71mm with standard deviation of 2.09mm. The pronasion mean measurement in y –axis is -41.06mm with standard deviation of 3.08mm. The mean measurement of point subnasale in y-

axis is -53.15mm with standard deviation of 3.22mm. The mean measurement for the LS or Labialis superioris is –67.45mm with standard deviation of 3.06. Stomonion mean measurement is -74.71mm with standard deviation of 3.16mm. The labialis Inferioris has a mean measurement of -81mm and a standard deviation of 3.78mm. The Soft tissue B point has a mean measurement of -90.01mm with standard deviation of 3.96mm. And finally the mean measurement for WPG or the soft tissue pogonion point is 101.88mm with the standard deviation of 3.99mm. Refer to figure 22 for visual presentation

Table 6

Mean and Standard Deviation of Soft Tissue Parameters in y-axis for female subjects

Soft Tissue Parameters in Y-axis	Mean in millimeter	SD
St. Glabella	10.85	2.10
St. Nasion	-4.71	2.09
Pronasion	-41.06	3.08
Subnasale	-53.15	3.22
Labrale Superioris	-67.45	3.06
Stomonion	-74.71	3.16
Labale Inferioris	-81.00	3.78
St. B point	-90.01	3.96
WPG	-101.88	3.99

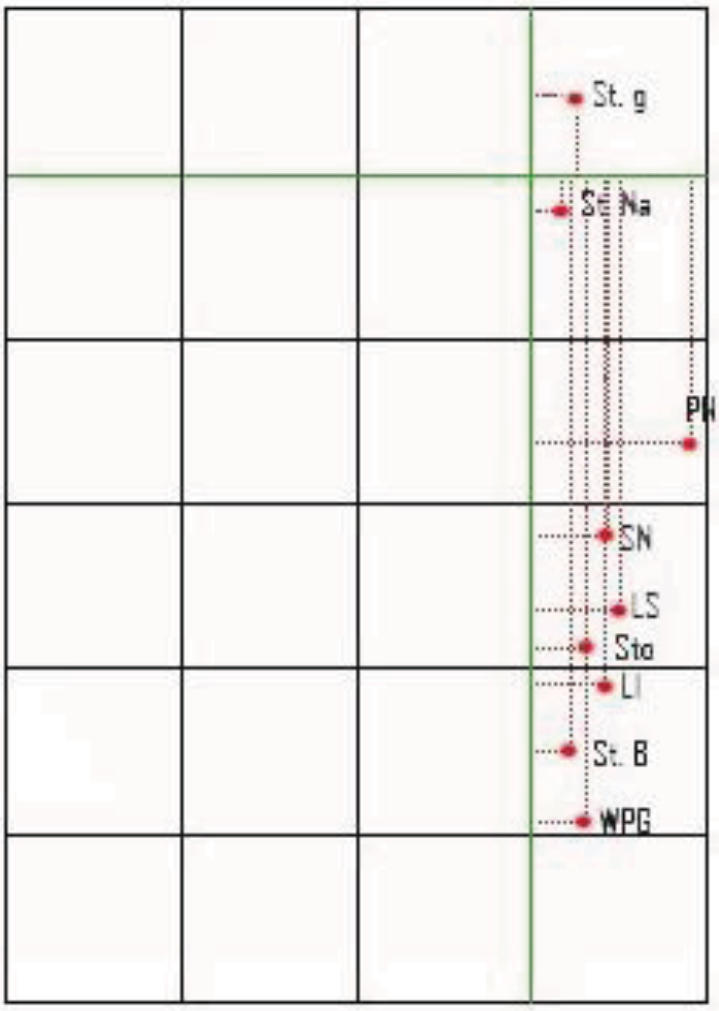


Figure 22

Mean measurement of the location of

Each soft tissue landmarks in x and y coordinates

For Female subjects

Base on the data presented above, from table 3 to 6, there is a very small difference between male and female soft tissue. Nose and chin prominence between sexes are quite statistically insignificant. Then both male and female samples showed a slight protrusion of lips.

In order to come up with a standard value for the most common location of the soft tissue parameters for both male and female respondents, mean measurement of both gender were also computed.

Table 7 shows the mean and standard deviation of the soft tissue cephalometric landmarks in x-axis for all respondents. It shows that mean measurement for soft tissue glabella in x-axis is 9.43mm with a standard deviation of 1.66. The soft tissue nasion mean measurement is 5.32mm with standard deviation of 1.19mm. The pronasion mean measurement in x –axis is 26.47mm with standard deviation of 4.12mm. The mean measurement of point subnasale in x-axis is 14.86mm with standard deviation of 4.05mm. The mean measurement for the LS or Labrale superioris is 20.46mm with standard deviation of 4.55. Stomonion mean measurement is 14.81mm with standard deviation of 4.76mm. The labrale Inferioris has a mean measurement of 18.42mm and a standard deviation of 5.12mm. The Soft tissue B point has a mean measurement of 11.45mm with standard deviation of 5.31mm. And finally the mean measurement for WPG or the soft tissue pogonion point is 11.87mm with the standard deviation of 6.10mm.

Table 7

Mean and Standard Deviation of Soft Tissue Parameters in x-axis for all subjects

Soft Tissue Parameters in X-axis	Mean in millimeter	SD
St. Glabella	9.43	1.65
St. Nasion	5.32	1.19
Pronasion	26.47	4.12
Subnasale	14.86	4.05
Labrale Superioris	20.46	4.55
Stomion	14.81	4.76
Labialis Inferioris	18.42	5.12
St. B point	11.45	5.31
WPG	11.87	6.10

Table 8 shows the mean and standard deviation of the soft tissue parameters in y-axis for all respondents. It shows that mean measurement for soft tissue glabella in y-axis is 10.91mm with a standard deviation of 2.14. The soft tissue nasion mean measurement is -5.07mm with standard deviation of 2.34mm. The pronasion mean measurement in y –axis is -43.48mm with standard deviation of 4.23 mm. The mean measurement of point subnasale in

y-axis is -55.22mm with standard deviation of 4.17mm. The mean measurement for the LS or Labrale superioris is -70.73mm with standard deviation of 4.58. Stomion mean measurement is -78.14mm with standard deviation of 5.17mm. The labialis Inferioris has a mean measurement of -84.98mm and a standard deviation of 5.85mm. The Soft tissue B point has a mean measurement of -94.31mm with standard deviation of 6.26mm. And finally the mean measurement for WPG or the soft tissue pogonion point is -106.96mm with the standard deviation of 6.95mm (figure 23).

Table 8

Mean and Standard Deviation of Soft Tissue Parameters in y-axis for of all subjects

Soft Tissue Parameters in Y-axis	Mean in millimeter	SD
St. Glabella	10.91	2.14
St. Nasion	-5.075	2.34
Pronasion	-43.48	4.23
Subnasale	-55.22	4.17
Labrale Superioris	-70.73	4.58
Stomion	-78.14	5.17
Labrale Inferioris	-84.98	5.85
St. B point	-94.31	6.26
WPG	-106.96	6.95

Mesh diagram permits evaluation not only of soft tissue but of skeletal and dental parameters as well. And evaluation of both vertical parameters and sagittal parameters can be easily done. In order to plot common location of skeletal and dental landmarks the mean with its standard deviation of x and y axis for male and are tabulated in table 9.

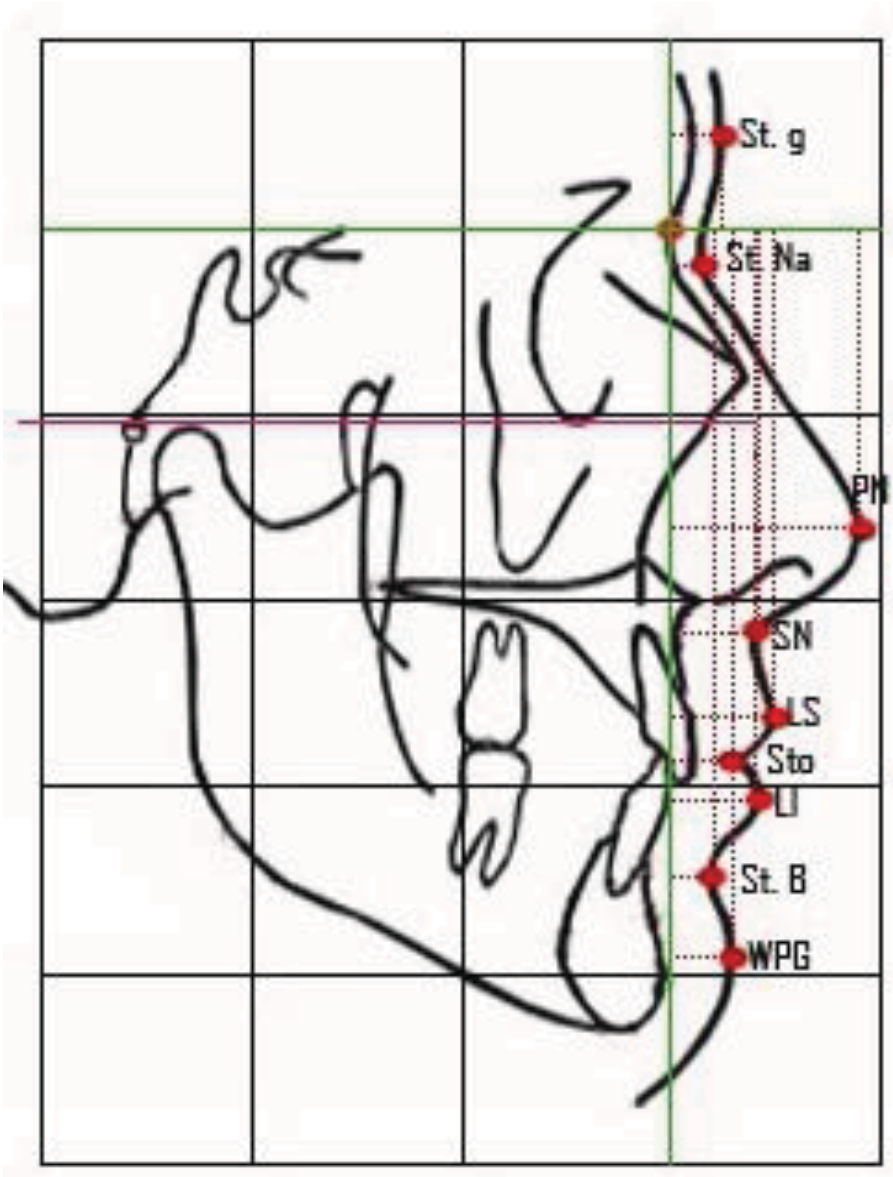


Figure 23

Mean location of the soft tissue landmark

In X and Y axis for all of the subjects

Table 9 show the mean measurement and standard deviation of the location of the Hard tissue landmarks in X and Y Axes for the male subjects. Glabella has a mean measurement of 3.53mm in an x axis with standard deviation of 1.40. For the y axis the mean measurement for glabella is 12.76 with standard deviation of 2.23. Sella has a mean measurement of -67.96 for the x axis and -9.40 for y axis. The standard deviation for sella is 3.73 and 5.16 for x and y axis respectively. The mean measurement for basion in x axis is -91.23mm with standard deviation of 6.30. As for the mean measurement of basion in y axis, the mean is -49.26mm with standard deviation of 4.54. The spina has a mean measurement of 4.95mm with standard deviation of 3.32 for the x axis. And for the Y axis, spina mean measurement is -53.40 with standard deviation of 4.0. Point A has a mean measurement of 2.61mm for x axis and a standard deviation of 3.44, a mean measurement of -60.18 for y axis with standard deviation of 4.76. The PNS have a mean measurement of -46.68mm for x axis with a standard deviation of 3.51. as for the y axis, PNS has a mean measurement of -54.00 with standard deviation of 4.22. For the SS or symphisis superioris the mean measurement in x axis is 3.15mm with standard deviation of 5.5. In the Y axis, SS has a mean measurement of -90.63mm with standard deviation of 5.04.

For the Point B, the mean measurement in x axis is -1.85mm with standard deviation of 4.96. And for the Y axis, Point B has a mean measurement of -99.58mm with standard deviation of 5.86. For Pog or

Pogonion, the mean measurement in x axis is -1.41mm with standard deviation of 6.27. It has a mean measurement of -112.46mm for the y axis with standard deviation of 6.11. The Menton or Me has a mean measurement of -7.63 in x axis with standard deviation of 7.04. As for the Y axis, the Me has a mean measurement of -120.93mm with standard deviation of 5.82.

For Symphysis Inferioris or SI, the mean measurement in x axis is -15.5mm with standard deviation of 5.73. It has a mean measurement of -107.38mm for the y axis with standard deviation of 4.30. The Gonion or Go has a mean measurement of -75.59mm in x axis with standard deviation of 6.96. As for the Y axis, the Go has a mean measurement of –91.03mm with standard deviation of 5.81. For Articulare or Ar, the mean measurement in x axis is -92.77mm with standard deviation of 0.23. And for the Y axis, Ar has a mean measurement of -43.30mm with standard deviation of 3.93.

For Molar point or Mpt, the mean measurement in x axis is -23.06mm with standard deviation of 4.6. It has a mean measurement of -79.55mm for the y axis with standard deviation of 3.76. The Corpus Superioris or CS has a mean measurement of -2.05mm in x axis with standard deviation of 5.11. As for the Y axis, the CS has a mean measurement of -87.68mm with standard deviation of 4.6

Table 9
Mean and Standard Deviation of Hard Tissue Landmarks
In X and Y axis of Male

Land marks	X		Y	
Glabella	3.53	1.40	12.76	2.23
Sella	-67.96	3.73	-9.40	5.16
Basion	-91.23	6.30	-49.26	4.54
Spina	5.15	2.99	-53.40	4.05
Point A	2.61	3.44	-60.18	4.76
PNS	-46.68	3.51	-54.00	4.22
SS	3.15	5.42	-90.63	5.04
Point B	-1.85	4.96	-99.58	5.86
Pog	-1.41	6.27	-112.46	6.11
Me	-7.63	7.04	-120.93	5.82
Si	-15.5	5.73	-107.383	6.38
Go	-75.59	6.96	-91.03	5.81
Ar	-84.18	5.53	-43.30	3.93
Mpt	-23.06	4.65	-79.55	3.76
Cs	-2.05	5.11	-87.68	4.64

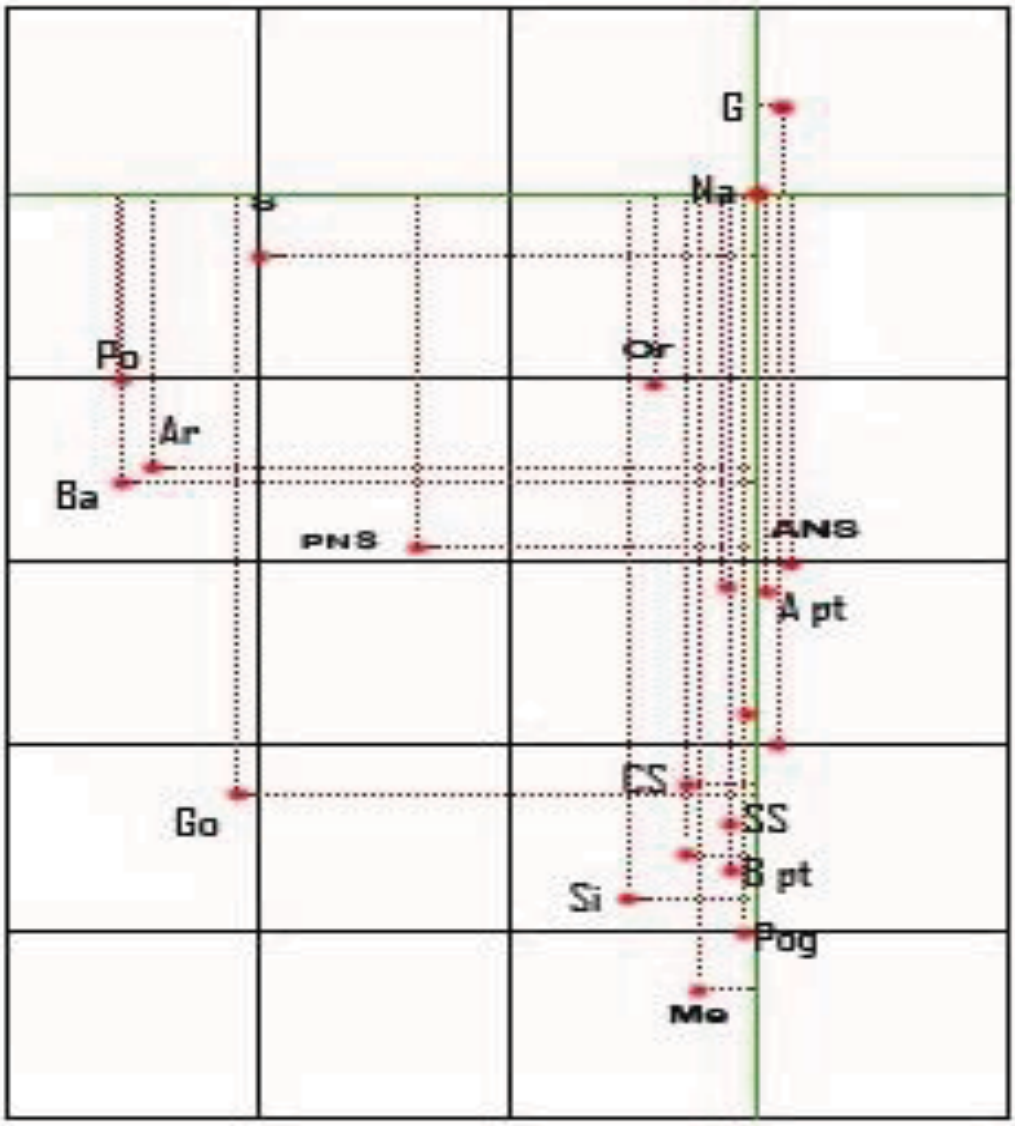


Figure 24

Mean measurement of the location of

Each Hard tissue landmarks in x and y coordinates

For Male subjects

Table 10 show the mean measurement and standard deviation for the location of the Hard tissue landmarks in X and Y Axes for the female subjects. Glabella has a mean measurement of 2.83 mm in an x axis with standard deviation of 1.22. For the y axis the mean measurement for glabella is 13.33mm with standard deviation of 2.48. Sella has a mean measurement of -64.73mm for the x axis and -9.95mm for y axis. The standard deviation for sella is 3.02 and 3.69 for x and y axis respectively. The mean measurement for basion in x axis is -86.93mm with standard deviation of 5.16. As for the mean measurement of basion in y axis, the mean is -45.01mm with standard deviation of 4.16. The spina has a mean measurement of 5.13mm with standard deviation of 2.84 for the x axis. And for the Y axis, spina mean measurement is -50.0 with standard deviation of 2.52. Point A has a mean measurement of 3.50mm for x axis and a standard deviation of 3.32, a mean measurement of -55.73mm for y axis with standard deviation of 3.89. The PNS have a mean measurement of -42.12mm for x axis with a standard deviation of 8.08. As for the y axis, PNS has a mean measurement of -49.10 with standard deviation of 3.37. For the SS or symphisis superioris the mean measurement in x axis is 3.00mm with standard deviation of 5.20. In the Y axis, SS has a mean measurement of -83.73mm with standard deviation of 4.57.

For the Point B, the mean measurement in x axis is -0.55mm with standard deviation of 5.51. And for the Y axis, Point B has a mean

measurement of -92.03mm with standard deviation of 4.57. For Pog or Pogonion, the mean measurement in x axis is -0.28mm with standard deviation of 6.02. It has a mean measurement of -102.96mm for the y axis with standard deviation of 4.68. The Menton or Me has a mean measurement of -5.21 in x axis with standard deviation of 6.85. As for the Y axis, the Me has a mean measurement of -110.60mm with standard deviation of 4.97.

For Symphysis Inferioris or SI, the mean measurement in x axis is -12.65mm with standard deviation of 5.18. It has a mean measurement of -97.53mm for the y axis with standard deviation of 5.44. The Gonion or Go has a mean measurement of -70.68mm in x axis with standard deviation of 4.47. As for the Y axis, the Go has a mean measurement of –81.43mm with standard deviation of 4.58. For Articulare or Ar, the mean measurement in x axis is -78.58mm with standard deviation of 6.86. And for the Y axis, Ar has a mean measurement of -38.68mm with standard deviation of 3.56.

For Molar point or Mpt, the mean measurement in x axis is -20.91mm with standard deviation of 4.67. It has a mean measurement of -72.35mm for the y axis with standard deviation of 3.54. The Corpus Superioris or CS has a mean measurement of -1.16mm in x axis with standard deviation of 4.69. As for the Y axis, the CS has a mean measurement of –81.03mm with standard deviation of 4.16 (figure 24)

Table 10

Mean and Standard Deviation of Hard Tissue Landmarks

In X and Y axis of Female

Land marks	X		Y	
Glabella	2.83	1.22	13.33	2.48
Sella	-64.73	3.02	-9.95	3.69
Basion	-86.93	5.16	-45.01	4.16
Spina	5.13	2.84	-50.00	2.52
Point A	3.5	3.32	-55.73	3.89
PNS	-42.12	8.08	-49.10	3.37
SS	3.00	5.20	-83.73	4.57
Point B	-0.55	5.5	-92.03	4.56
Pog	-0.28	6.02	-102.96	4.68
Me	-5.21	6.85	-110.60	4.97
Si	-12.65	5.18	-97.53	5.44
Go	-70.68	4.47	-81.43	4.58
Ar	-78.58	6.86	-38.68	3.56
Mpt	-20.91	4.67	-72.35	3.54
Cs	-1.16	4.69	-81.03	4.16

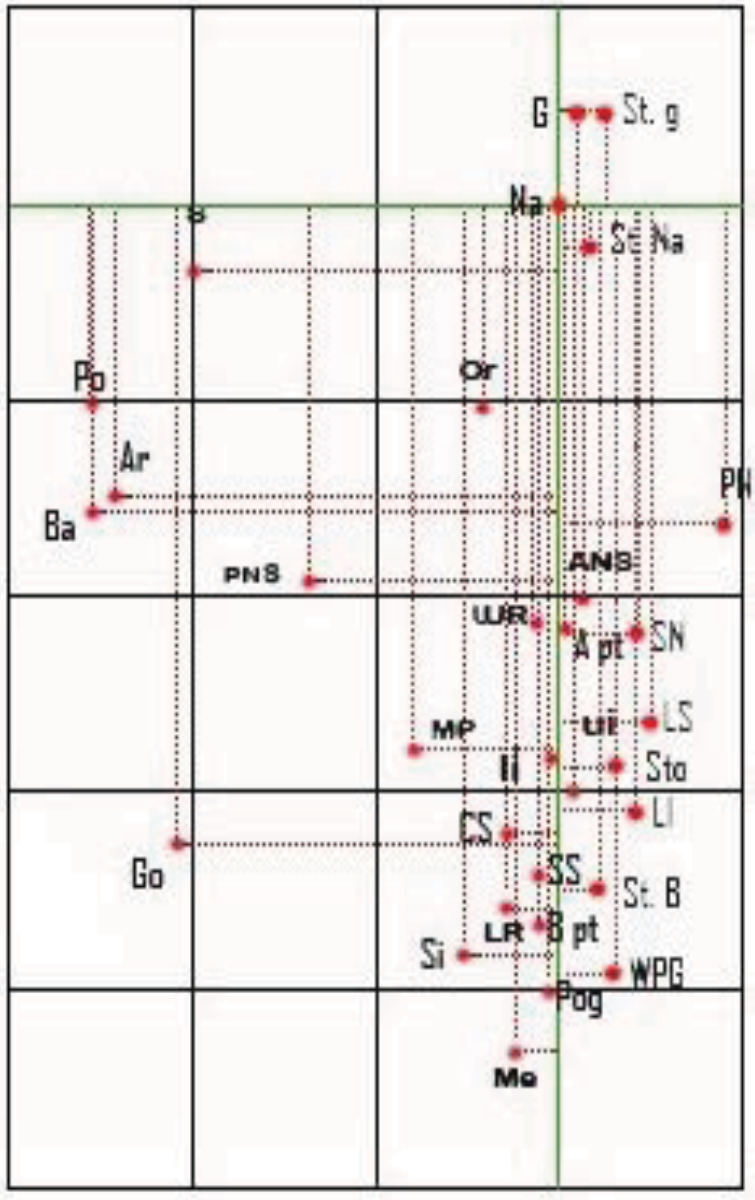


Figure 25
Mean measurement of the location of
Each hard tissue landmarks in x and y coordinates
For Female subjects

Table 11 show the mean measurement and standard deviation of the location of the Hard tissue landmarks in X and Y Axes for all of the subjects. Glabella has a mean measurement of 3.18mm in an x axis with standard deviation of 1.35. For the y axis the mean measurement for glabella is 13.05 with standard deviation of 2.36. Sella has a mean measurement of -66.35mm for the x axis and -9.67 for y axis. The standard deviation for sella is 1.3500 and 4.45 for x and y axis respectively. The mean measurement for basion in x axis is -89.08mm with standard deviation of 6.11. As for the mean measurement of basion in y axis, the mean is -47.14mm with standard deviation of 4.82. The spina has a mean measurement of 5.14mm with standard deviation of 2.89 for the x axis. And for the Y axis, spina mean measurement is -51.70 with standard deviation of 3.76. Point A has a mean measurement of 3.05mm for x axis and a standard deviation of 3.38, a mean measurement of -57.75 for y axis with standard deviation of 4.86. The PNS have a mean measurement of -44.40mm for x axis with a standard deviation of 6.5. as for the y axis, PNS has a mean measurement of -51.55 with standard deviation of 4.48. For the SS or symphisis superioris the mean measurement in x axis is 3.07mm with standard deviation of 5.27. In the Y axis, SS has a mean measurement of -87.18mm with standard deviation of 5.90.

For the Point B, the mean measurement in x axis is -1.20mm with standard deviation of 5.24. And for the Y axis, Point B has a mean measurement of -95.80mm with standard deviation of 6.45. For Pog or

Pogonion, the mean measurement in x axis is -0.85mm with standard deviation of 6.12. It has a mean measurement of -107.71mm for the y axis with standard deviation of 7.22. The Menton or Me has a mean measurement of -6.11mm in x axis with standard deviation of 7.02. As for the Y axis, the Me has a mean measurement of -115.76mm with standard deviation of 7.48.

For Symphysis Inferioris or SI, the mean measurement in x axis is -14.07mm with standard deviation of 5.60. It has a mean measurement of -96.01mm for the y axis with standard deviation of 3.68. The Gonion or Go has a mean measurement of -71.89mm in x axis with standard deviation of 11.27. As for the Y axis, the Go has a mean measurement of –86.23mm with standard deviation of 7.09. For Articulare or Ar, the mean measurement in x axis is -81.38mm with standard deviation of 6.79. And for the Y axis, Ar has a mean measurement of -340.99mm with standard deviation of 4.39.

For Molar point or Mpt, the mean measurement in x axis is -21.99mm with standard deviation of 4.75. It has a mean measurement of -75.95mm for the y axis with standard deviation of 5.13. The Corpus Superioris or CS has a mean measurement of -1.60mm in x axis with standard deviation of 4.88. As for the Y axis, the CS has a mean measurement of –84.35mm with standard deviation of 5.51.

Table 11
Mean and Standard Deviation of Hard Tissue Landmarks
For all the Subject

Land marks	X		Y	
Glabella	3.18	1.35	13.01	2.36
Sella	-66.35	1.35	-9.67	4.45
Basion	-89.08	6.11	-47.14	4.82
Spina	5.14	2.89	-51.70	3.76
Point A	3.05	3.38	-57.95	4.86
PNS	-44.40	6.5	-51.55	4.48
SS	3.07	5.27	-87.18	5.90
Point B	-1.20	5.24	-95.80	6.45
Pog	-0.85	6.12	-107.71	1.52
Me	-6.11	7.02	-115.76	7.48
Si	-14.07	5.60	-102.46	7.70
Go	-71.87	11.14	-86.23	7.09
Ar	-81.38	6.79	-40.99	4.39
Mpt	-21.99	4.75	-75.95	5.13
Cs	-1.60	4.88	-84.35	5.51

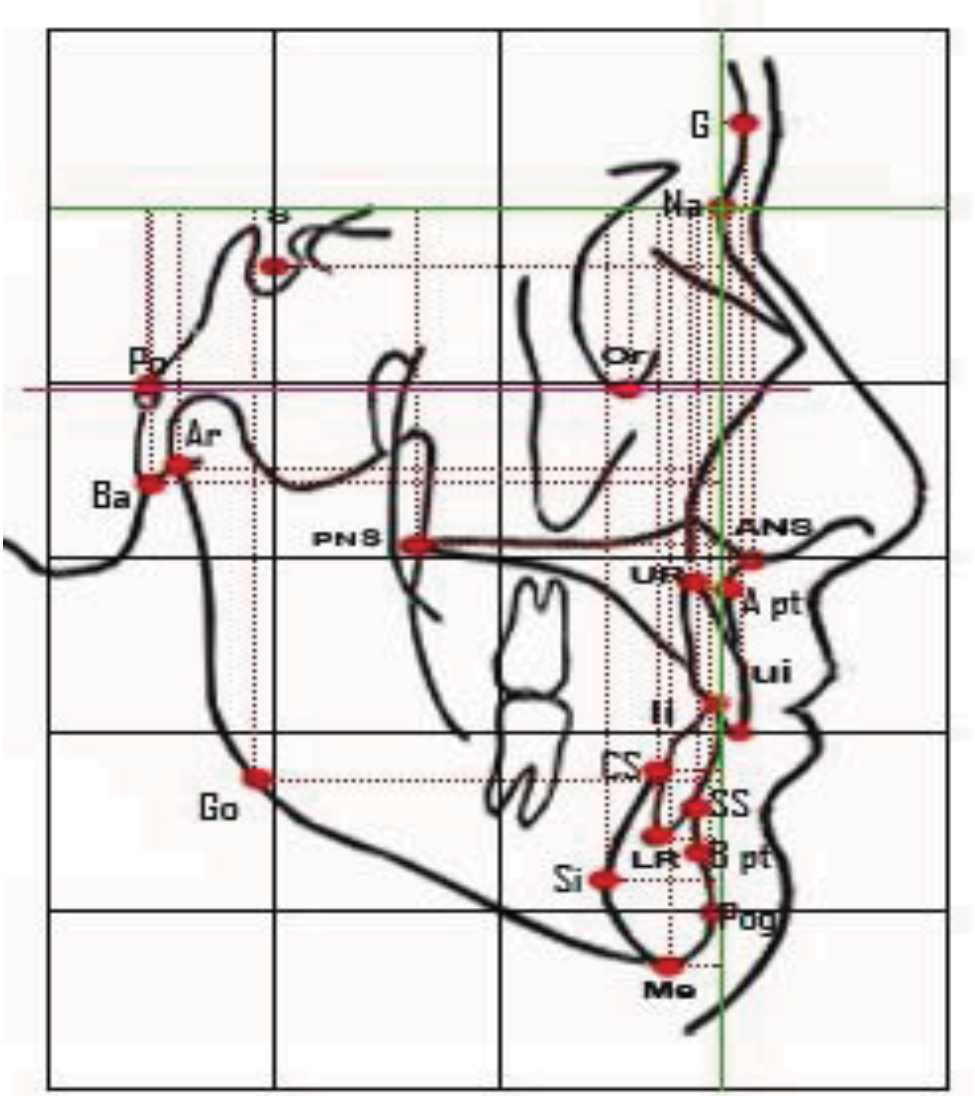


Figure 26

Mean location of Hard tissue Landmark

In x and y axis for all of the subjects

The position and angulations of the upper and lower incisors is of great importance in diagnosis and subsequently in formulating a treatment plan. In order to identify the standard position of upper and lower incisors among this selected Filipino for mesh diagram plotting, mean measurements of cephalometric landmarks of upper and lower incisor is also a must.

Table 12 tabulates the mean measurement with the standard deviation for the common location of the dental landmark in x and y axis needed in constructing the dental parameter for the mesh diagram of male subjects. It shows that Upper Incisor or UI has a mean measurement of 9.11 for x axis with standard deviation of 5.01. The UI also has a mean measurement of -82.76 in y axis with standard deviation of 4.74. Lower Incisor or LI has a mean measurement of 6mm and -80.53 for x and y axis respectively. And LI has a standard deviation of 5.02 for the x axis and 4.57 for the y axis. Upper root or UR has a mean measurement of -2.58 with standard deviation of 4.12 for the x axis. Also, the UR has a mean measurement of -62.18mm with standard deviation of 3.94 in the y axis. Lower root or LR has a mean measurement of -6.6 with standard deviation of 5.27 for the x axis. Also, the LR has a mean measurement of -99.21mm with standard deviation of 4.66 in the y axis (figure 27).

Table 12

Mean and Standard Deviation of Dental Landmarks in X and Y Axis for Male Subjects

Land marks	X		Y	
	Mean	Std deviation	Mean	Std. deviation
UI	9.11	5.01	-82.76	4.74
LI	6.00	5.02	-80.53	4.57
UR	-2.58	4.12	-62.18	3.94
LR	-6.60	5.27	-99.21	4.66

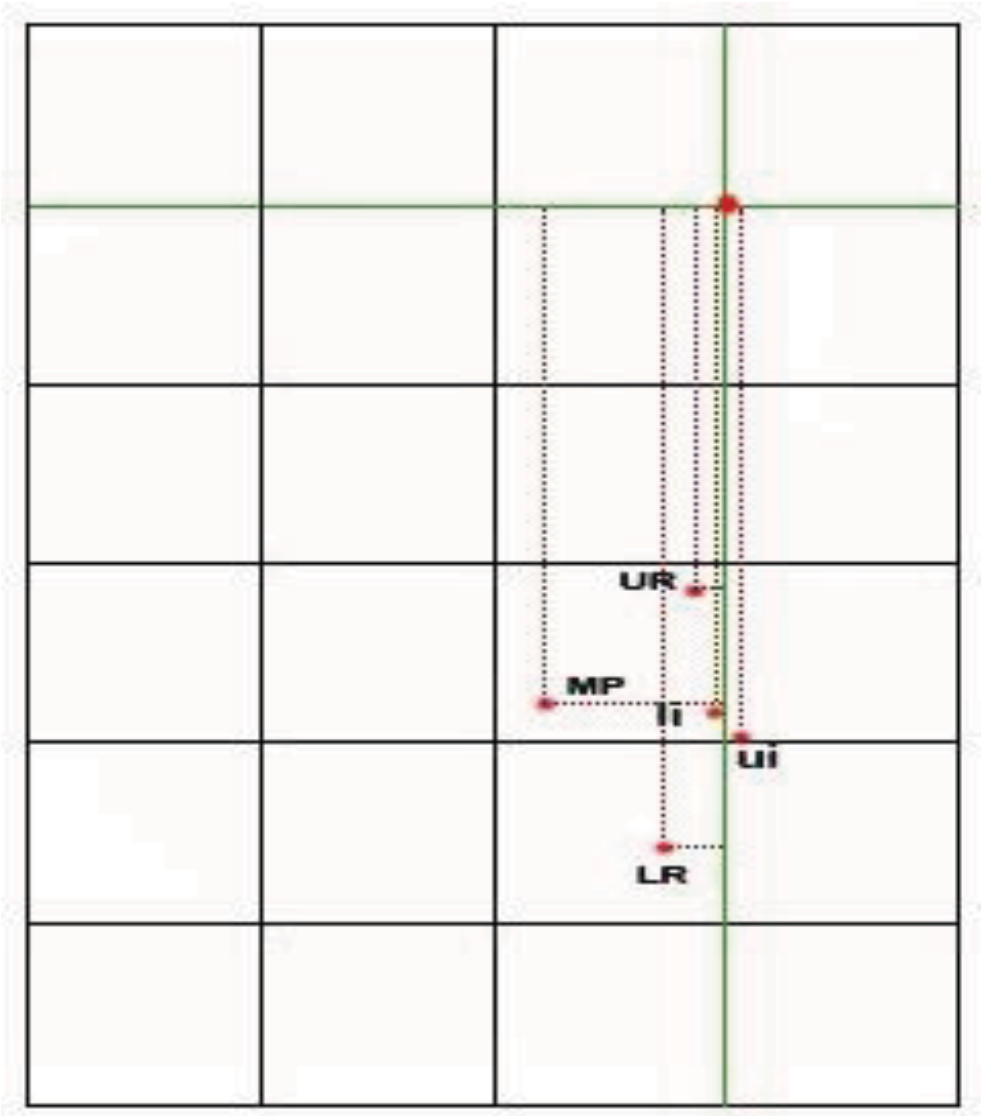


Figure 27

Mean measurement of the location of

Each dental tissue landmarks in x and y coordinates

For Male subjects

Table 13 present the mean measurement with the standard deviation for the common location of the dental landmard in x and y axis needed for plotting the dental parameter of a mesh diagram for female subjects. It shows that Upper Incisor or UI has a mean measurement of 9.48mm for x axis with standard deviation of 4.58. The UI also has a mean measurement of -75.82 in y axis with standard deviation of 4.74. Lower Incisor or LI has a mean measurement of 6.03mm and -73.58 for x and y axis respectively. And LI has a standard deviation of 4.87 for the x axis and 3.56 for the y axis. Upper root or UR has a mean measurement of -1.43 with standard deviation of 3.41 for the x axis. Also, the UR has a mean measurement of -57.5mm with standard deviation of 6.99 in the y axis. Lower root or LR has a mean measurement of -5.15 with standard deviation of 5.22 for the x axis. Also, the LR has a mean measurement of -92.3mm with standard deviation of 4.48 in the y axis (figure 28).

Table 13

Mean and Standard Deviation of Dental Landmarks in X and Y Axis for Female Subjects

Land marks	X		Y	
	Mean in millimeter	Std deviation	Mean	Std. deviation
UI	9.48	4.58	-75.82	4.74
LI	6.03	4.87	-73.58	3.56
UR	-1.43	3.41	-57.50	6.9
LR	-5.15	5.22	-92.3	4.48

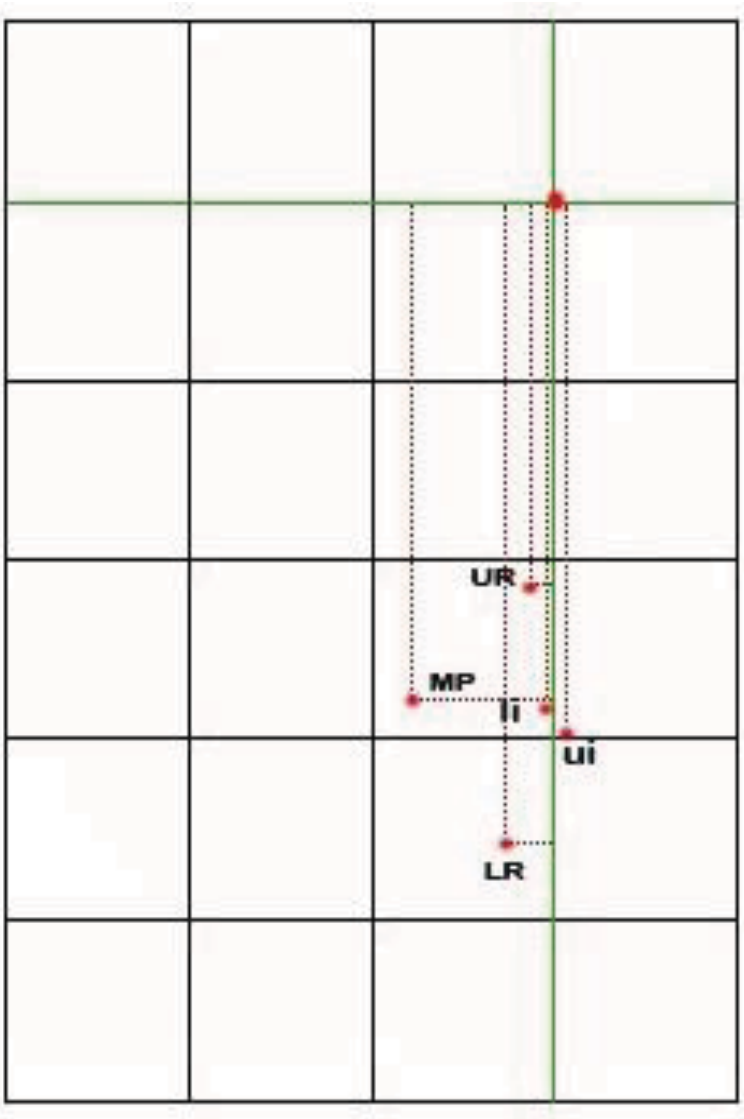


Figure 28

Mean measurement of the location of

Each dental tissue landmarks in x and y coordinates

For Female subjects

Table 14 show the mean measurement with the standard deviation of the common location of the dental landmark in x and y axis in order to plot the dental parameter of a mesh diagram for the combine male and female subjects. It shows that Upper Incisor or UI has a mean measurement of 9.3mm for x axis with standard deviation of 4.76. The UI also has a mean measurement of -79.29 in y axis with standard deviation of 5.86. Lower Incisor or LI has a mean measurement of 6mm and -77.05 for x and y axis respectively. And LI has a standard deviation of 4.90 for the x axis and 5.36 for the y axis. Upper root or UR has a mean measurement of -2.00 with standard deviation of 3.80 for the x axis. Also, the UR has a mean measurement of -59.84mm with standard deviation of 6.10 in the y axis. Lower root or LR has a mean measurement of -5.87mm with standard deviation of 5.25 for the x axis. Also, the LR has a mean measurement of -95.75mm with standard deviation of 5.72 in the y axis (figure 29)

Table 14
Mean and Standard Deviation of Dental Landmarks in X and Y Axis for All Subjects

Land marks	X		Y	
	Mean in millimeter	Std deviation	Mean	Std. deviation
UI	9.3	4.76	-79.29	5.86
LI	6.01	4.90	-77.05	5.36
UR	-2.00	3.80	-59.84	6.10
LR	-5.87	5.25	-95.75	5.72

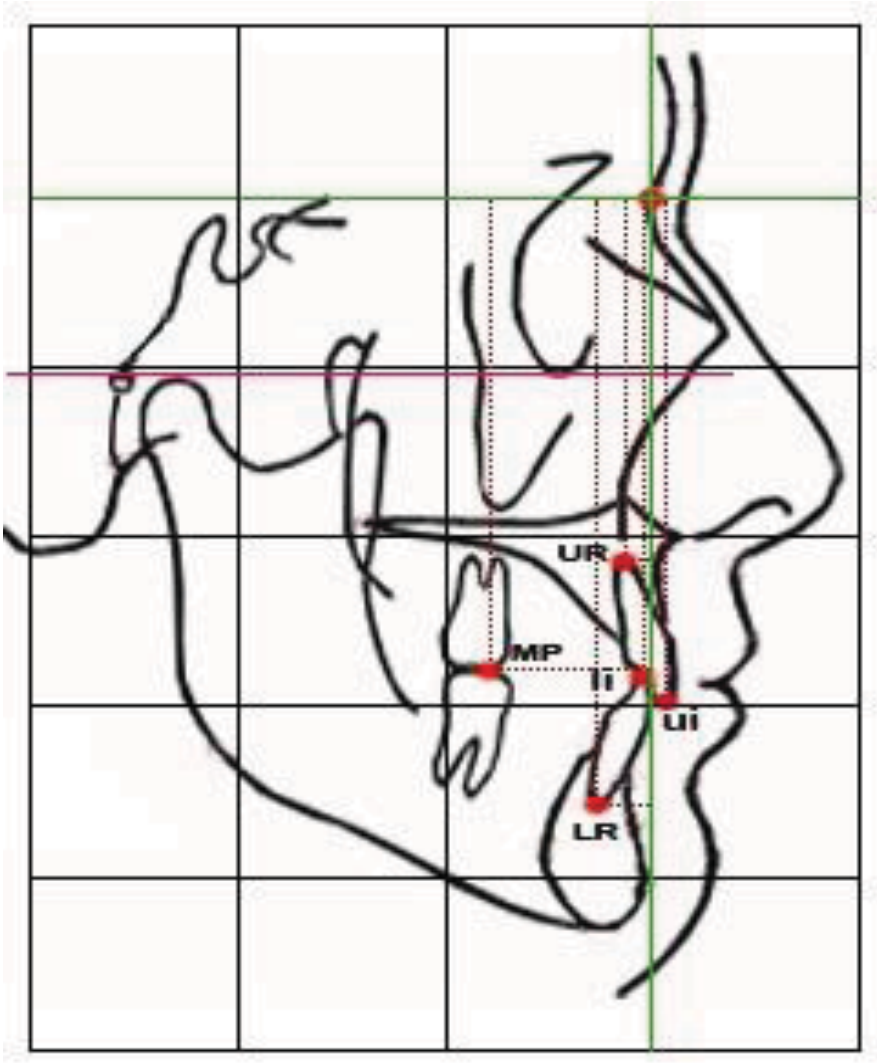


Figure 29

Diagram presentation of the mean location

Of Cephalometric dental landmarks for all the subjects

Table 3 to table 14 are very difficult to interpret. This is because readers tends to worship this number. All the data presented from table 3 to table 13 are best interpreted if they are plotted in a diagram.

In order to plot the diagram that would best help in interpreting all of this data, vertical scale and horizontal scale should be properly define.

Table 14 present the tabulated data of the mean and standard measurement for the vertical and horizontal scales needed in constructing the mesh diagram. Vertical scale mean measurement for male is 27.33mm and 25.12 for the female with standard deviation of 1.55 and 1.45 respectively. Also, table 14 revealed that horizontal scale mean measurement for male is 34mm with standard deviation of 2.08. the horizontal scale for female is 32.16 with standard deviation of 1.22.

Table 15

Mean and Standard deviation of the Vertical and Horizontal Scale
For Male, Female and Combination Mesh diagram

Scale	Male		Female		Combination	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Vertical	27.33	1.55	25.12	1.45	26.22	1.45
Horizontal	34	2.08	32.16	1.22	32.16	1.22

Mesh diagram consist of 24 rectangles with grids that are drawn guided by specific vertical and horizontal scale. All land marks from soft tissue, skeletal tissue and dental tissues are properly plotted according to the mean location in an x and y axis. After locating the mean location of all the landmarks, they will be connected to a specific landmark in order to create the mesh diagram.

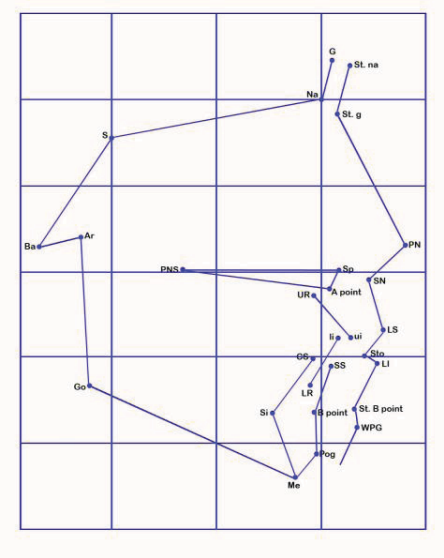


Figure 30

Standard Grid lines for

Filipino Male with the cephalometric

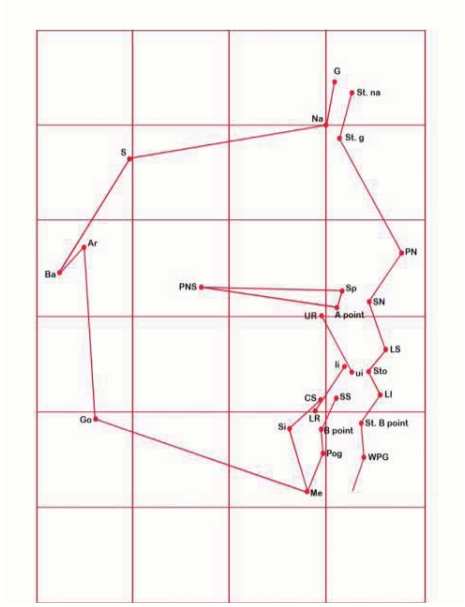


Figure 31

Standard Grid lines for Filipino Female with the cephalometric

Land marks plotted on its mean location

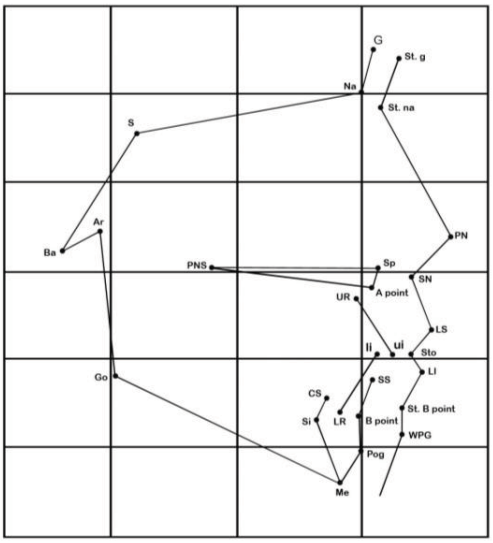


Figure 32
Standard Grid lines for Filipinos with the cephalometric
Land marks plotted on its mean location

3. Significant Difference in the Measurements from Mesh diagram between male and female.

Table 15 shows the comparison of the different parameters in a mesh between male and female.

Table 16
The difference between Male and Female

Parameters from mesh diagram	Mean	SD	P- value	Significance
Upper facial height	Male 53.68 Female 49.93	3.20 2.55	5.014	P= 0.000 VS
Lower facial height	Male 66.23 Female 60.70	4.58 4.28	4.828	P=0.000 VS
Cranial base length	Male 68.43 Female 65.01	3.68 3.27	3.795	P=0.000 VS
Maxillary length	Male 49.80 Female 47.21	2.95 1.75	4.116	P=0.000 VS
Mandibular length	Male 99.53 Female 95.38	5.78 4.22	3.175	P=0.002 VS
Over Jet	Male 2.83 Female 2.48	1.06 1.02	1.302	P=0.198 NS
Upper lip Length	Male 16.90 Female 15.2	2.85 2.41	2.389	P=0.020 S

It can be observed that male group has a longer upper facial height, lower facial height, cranial base length, maxillary length mandibular length and upper lip length measurement compare to the female group. This only signifies that the male has a longer face tendency than female.

Table 17
T-test Result Between Male Subject and the Total Population

Parameters from mesh diagram	Mean	SD	P- value	Significance
Upper facial height	Male 53.68 Population 51.80	3.20 3.43	2.493	P= 0.015 S
Lower facial height	Male 66.23 Population 63.46	4.58 5.20	2.469	P=0.015 S
Cranial base length	Male 68.43 Population 66.72	3.68 3.86	2.008	P=0.048 S
Maxillary length Mandibular length	Male 49.80 Population 48.50	2.95 2.73	2.053	P=0.043 S
Over Jet	Male 99.53 Population 97.45	5.78 5.43	1.671	P=0.098 NS
Upper lip Length	Male 2.83 Population 2.65	1.06 1.04	0.744	P=0.1750 NS
	Male 16.90 Population 16.08	2.85 2.75	1.310	P=0.194 NS

It can be observe that the male group tends to have a larger measurement compare to the population standard. However these measurements are quite small that it became irrelevant

Table 18
T-test Result Between Female and The Total Population

Parameters from mesh diagram	Mean	SD	P- value	Significance
Upper facial height	female 49.93 Population 51.80	2.55 3.43	-2.642	P= 0.010 S
Lower facial height	female 60.70 Population 63.46	4.28 5.20	-2.512	P=0.014 S
Cranial base length	Female 65.01 Population 66.72	3.27 3.86	-2.076	P=0.041 S
Maxillary length Mandibular length	Female 47.21 Population 48.50	1.75 2.73	-2.350	P=0.021 S
Over Jet	Female 95.38 Population 97.45	4.22 5.43	-1.830	P=0.071 NS
Upper lip Length	Female 2.48 Population 2.65	1.02 1.04	-.753	P=0.453 NS
	Female 15.26 Population 16.08	2.41 2.75	-1.380	P=0.171 NS

Female group measurement is significantly shorter than the entire population. This strongly suggest that female exhibit shorter facial dimension than the male group. It also expresses the condition that female facial structure is comparatively smaller when compare to the population measurement. However the difference in the measurement is so small that it makes the difference insignificant.

All data from table 3 to 18 can be easily to understand when it is presented in a diagram form. Plotting the mesh diagram for the male and female group can make this data more appealing and understandable.

Fig 33 show the plotted mesh diagram for Filipno male. This male diagram is constructed using the data gathered and presented from tables above.

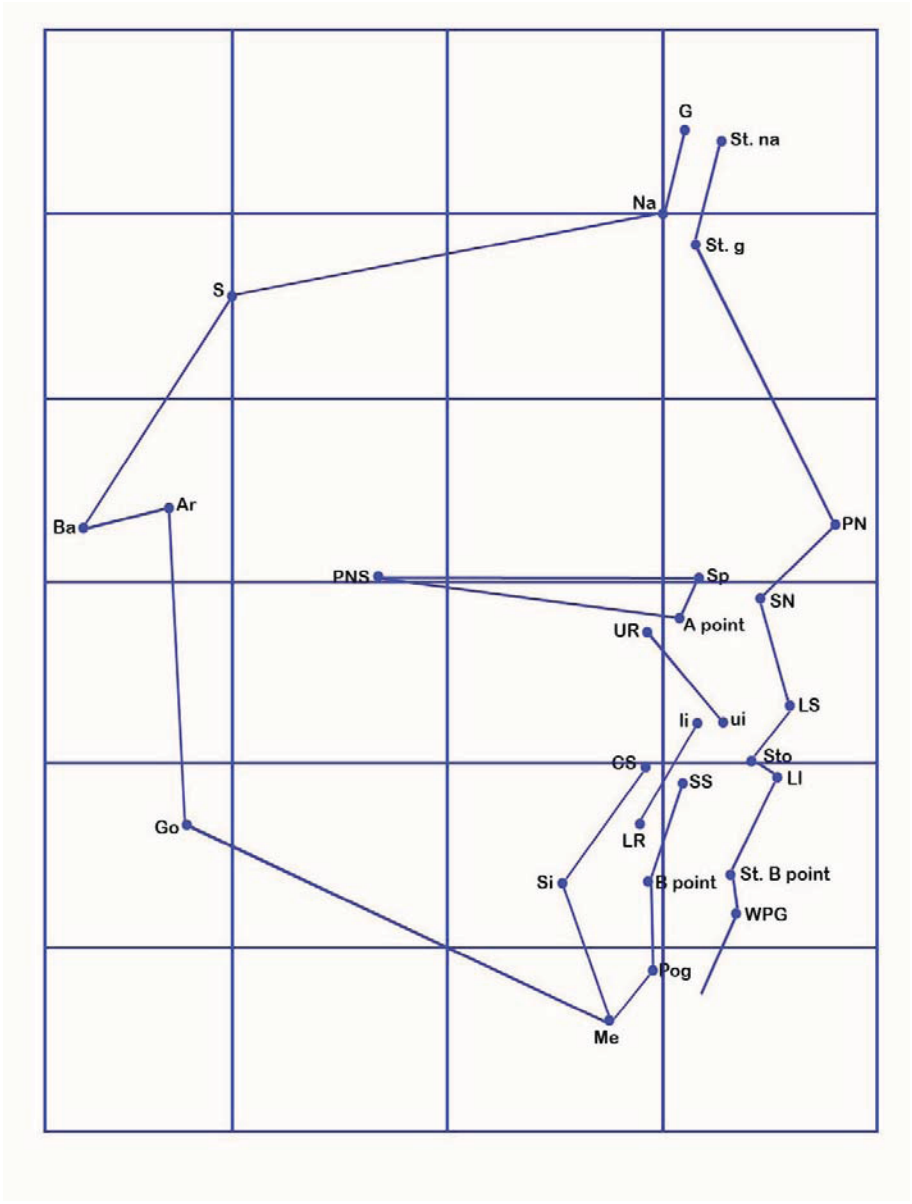


Figure 33

Filipino Male Mesh diagram

Figure 34 shows the plotted mesh diagram for female. The mesh diagram was constructed according the data gathered and presented from table 3 to 17.

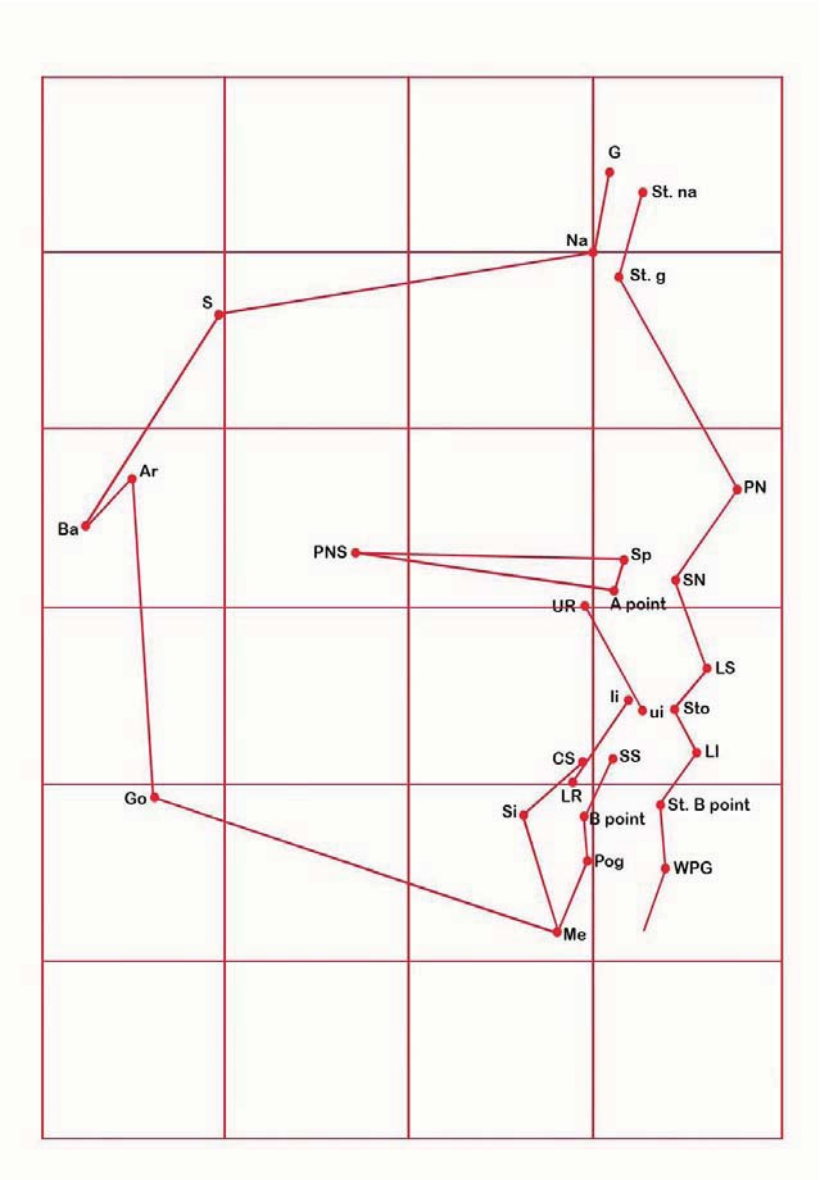


Figure 34
Filipino Female Mesh Diagram

4. Based on the findings, what is the Standard mesh diagram for Filipinos?

figure 30 is representing the standard mesh diagram for ilipinos.

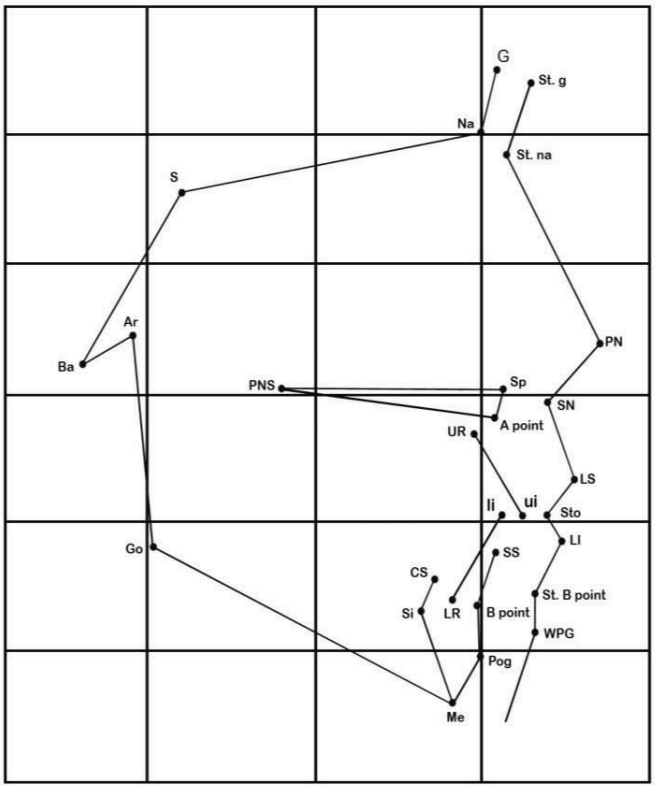


Figure 35

Standard Mesh Diagram for Filipinos

Application

There are two ways to use the mesh diagram template when analyzing our patient's cephalogram.

First is to trace the patient's cephalogram then super impose the tracing to the mesh diagram template in the Nasion – Sella Plane.

E.g. Patient A: A case of a 16 years old female patient.

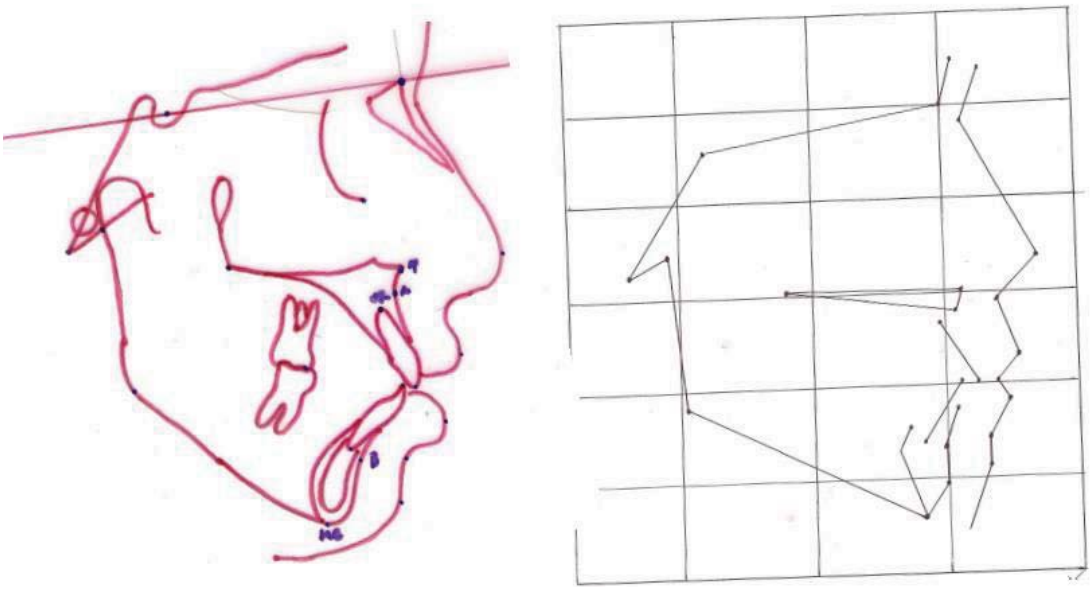


Figure 36
The patient's A cephalogram tracing and the Standard Mesh diagram for Filipinos

After tracing the patient' cephalogram, super impose it over the standard mesh diagram to analyze the overall skeletal, soft tissue and dental parameters of the patient in a vertical and horizontal dimension simultaneously.

In figure 31, the red marking corresponds to the actual tracing of the patient's cephalogram and heavy black are those from the standard mesh diagram template. With this super imposition, it is clearly revealed that the patients has facial disharmony. The patient cranial base length or the sella-nasion plane is in a normal length. The inclination of the bony clivus is normal. However, both maxilla and mandible show deviation within the normal or within the acceptable position and condition.

The Maxilla is in normal range position in relation to the cranial base, base on the location of the A Point., but the inclination exhibit little anterior rotation that contribute to an skeletal open bite tendency. Basing on the position and location of the patient's point B that is downward and backward than that of from the mesh, it simply states that the mandible is retruded and is posteriorly rotated. Increasing therefore, the skeletal open bite tendency, giving a steep mandibular plane angle, with long anterior facial height. Since the mandible is retruded and the maxilla is in normal range, the patient there for is skeletal class II due to retrusive mandible.

The Upper facial height of the patient is comparably normal to the standard because the mesh and the patient's distance of Nasion to Spina is

almost the same. But the patient lower face definitely increased because the menton of the patient is located inferiorly than the menton in the mesh template, signifying increase anterior facial height because of an excessive lower face height.

As for the dental condition of the patient, the upper central incisor exhibit normal inclination but is a little lingually position. The incisor of the patient when compare to the mesh template exhibit excessive labial flaring. This upper and lower incisor position might be cause of a dental compensation due to a retruded mandible.

With regards to the soft tissue, the upper and lower lip protrusion is acceptable but there is a lip incompetency. Also, the nose is a little larger than those of a normal.

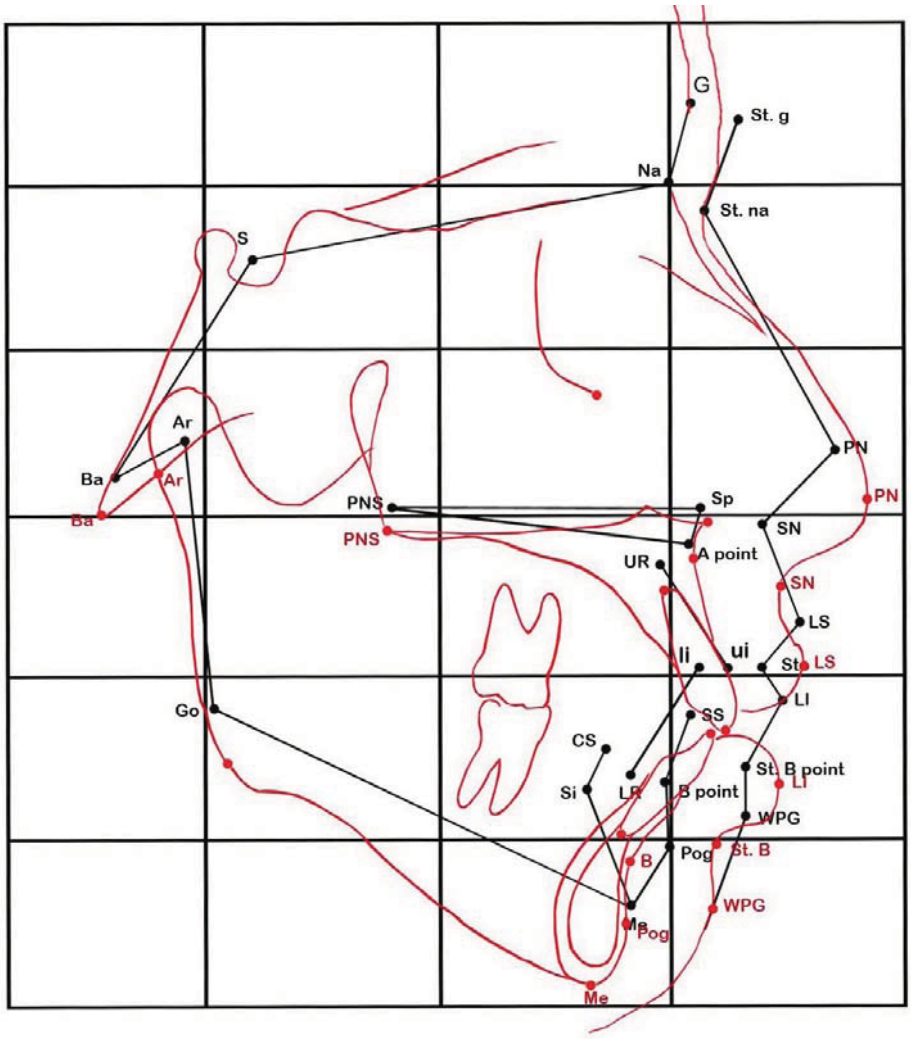


Figure 37

Super imposition of the cephalometric
Tracing to the Mesh template in Sella –Nasion plane

Table 18 confirmed all of the findings from the mesh diagram analysis. The red data indicates findings that are outside the normal values of a measurement.

Measurement	Norm	Patient
SNA	83.3 ± 3.3	81 normal
SNB	79.9 ± 2.8	74 retrusive
ANB	3.5 ±2.0	7 class II
SNPg	79.6 ±2.9	75 retrusive
NSBa	130.6 ±4.9	126.5
Gn-tgo-Ar	121.3 ±6.2	131 steep
Nordeval angle	68.4 ±5.5	76 not prominent
Pg-NB (mm)	-0.4 ±1.6	0
NL-NSL	9.4 ±3.0	6 ant rot.
ML-NSL	33.4 ±4.8	43post rot
ML-NL	24.0 ±4.8	31
N'- Sp' (mm)	56.4 ±3.4	56
Sp'- Gn (mm)	69.3 ±5.7	78
N'-Sp'/Sp'-Gn x 100	81.2 ±6.4	71.7 long face
UI-NA (°)	26.6 ±5.5	21
UI-NA (mm)	6.6 ±2.4	3.5 linguverted
LI-NB (°)	31.8 ±5.0	37 labially inclined
LI-NB (mm)	8.6 ±2.2	11.5 labioverted
UI-LI	118 ±7.0	118
Holdaway angle	15.4 ±3.8	16

Table18
Cephalometric reading and interpretation of patient A
According to the Norms published by Dr. Naranjilla.

Second way to use the mesh diagram template is to super impose it directly on top of the cephalogram of the patient. But the template should be in a transparent format. Land marks are located directly in the cephalogram prior to mesh super imposition (figure 32).

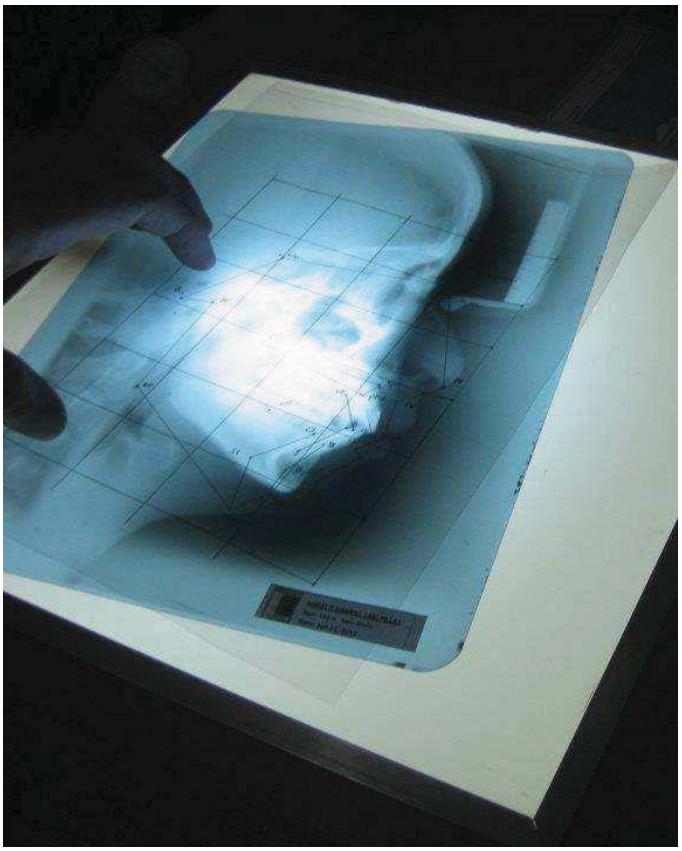


Figure 38
Mesh diagram template direct superimposition
On top of the actual patient's cephalogram

With the advent of the mesh diagram template, the numerical values that represent the standard or normal is now in a template form that would make cepahlometric analysis easier to perform and understand for both dental and non dental practitioners.

The mesh digram template does not make cephalometric tracing and measurement obsolete. It just give the practitioner (dentists, surgeons) an over view of the patients cranio-facial morphology. Cephalometric measurement is still a must because it gives numerical data and a firm foundation for treatment planning and strategy.

CHAPTER 5

Summary, Conclusion and Recommendations

This chapter presents the results of the study according on the findings. The general aim of this research was to develop a standard mesh diagram among Filipinos.

Specifically, it sought to answer the following questions:

4. What is the profile of the respondents according to:
    4.1 age,
    4.2 gender
5. What are the mean values of the cephalometric planes and angles needed in constructing the mesh diagram for both male and female subjects in terms of the following:
    2.1. Soft tissue ,
    2.2 hard tissue and
    2.3. dental tissue?
6. . How do the mesh diagram of male and female the subjects differ when grouped according to:

3.1.Upper facial height (N-ans),

3.2 Anterior cranial base (n-sella),

3.3 Soft tissue profile and

3.4 Maxilla, mandible and dentition

4. Based on the findings, what is the standard mesh diagram for Filipinos?

Summary of Findings

The gathered data were presented according to the problems stated in Chapter 1.

1. Profile of the Patients.

1.1 Age

The profile of the patients in terms of age and gender, were determined. The age of the subjects ranged from the 17 years old as the youngest to 22 years old. The 2 most frequent age were 19 and 18 years old.

1.2 Gender

Gender distribution is equal as set by the researcher. 30 male subjects and 30 female subjects.

2. The most common location of the cephalometric points involve in construction of mesh diagram

The most common location of all the parameters and landmarks involves in a mesh diagram construction is plotted in a 24 rectagle with a dimention of 26.22mm by 33.08mm vertical and horizontal respectively.

3. How do the mesh diagram of male and female the subjects differ when grouped according to:

Fig 25 expresses the differences of male and female when group according to upper facial height, anterior cranial base, soft tissue, maxilla, mandible and dental inclination.

3.1 Upper facial height (N-ans), male subjects tends to have a longer upper facial height compare with the female subjects.

3.2 Anterior cranial base (n-sella), male subjects measured with a longer cranial base length compare with the female subjects. However, t –test showed that the discrepancy is insignificant.

3.3 Soft tissue profile both soft tissue profile of the two group showed minimal protrusion. Super imposition revealed that the male subject's soft tissue is a little protrusive than the female's. yet, t-test revealed that the difference is insignificant. The study also proves that the male tends to have a longer facial height compare to female.

3.4 Maxilla, mandible and dentition

Maxillary length of the male subjects is longer compare to the female group. However both maxilla of the two group shows almost the same degree of inclination.

The mandibular length of female when compared to the male subjects is the same. But the inclination of the mandible of the male group is steeper compare to that of the female group.

Upper incisors for male showed more labial tipping than the female. While lower incisors of the male group is position in almost the same manner as that of the female group.

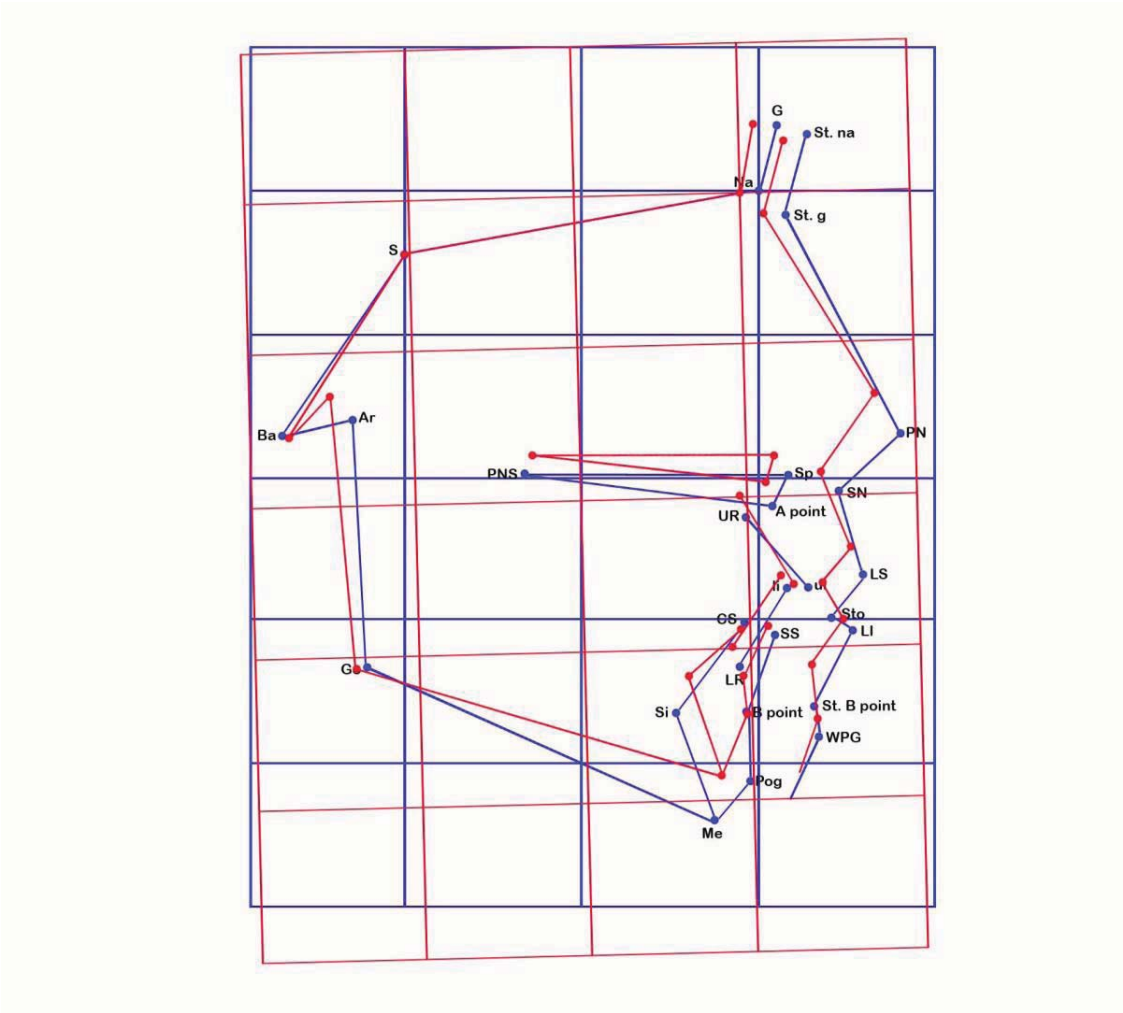


Fig 33

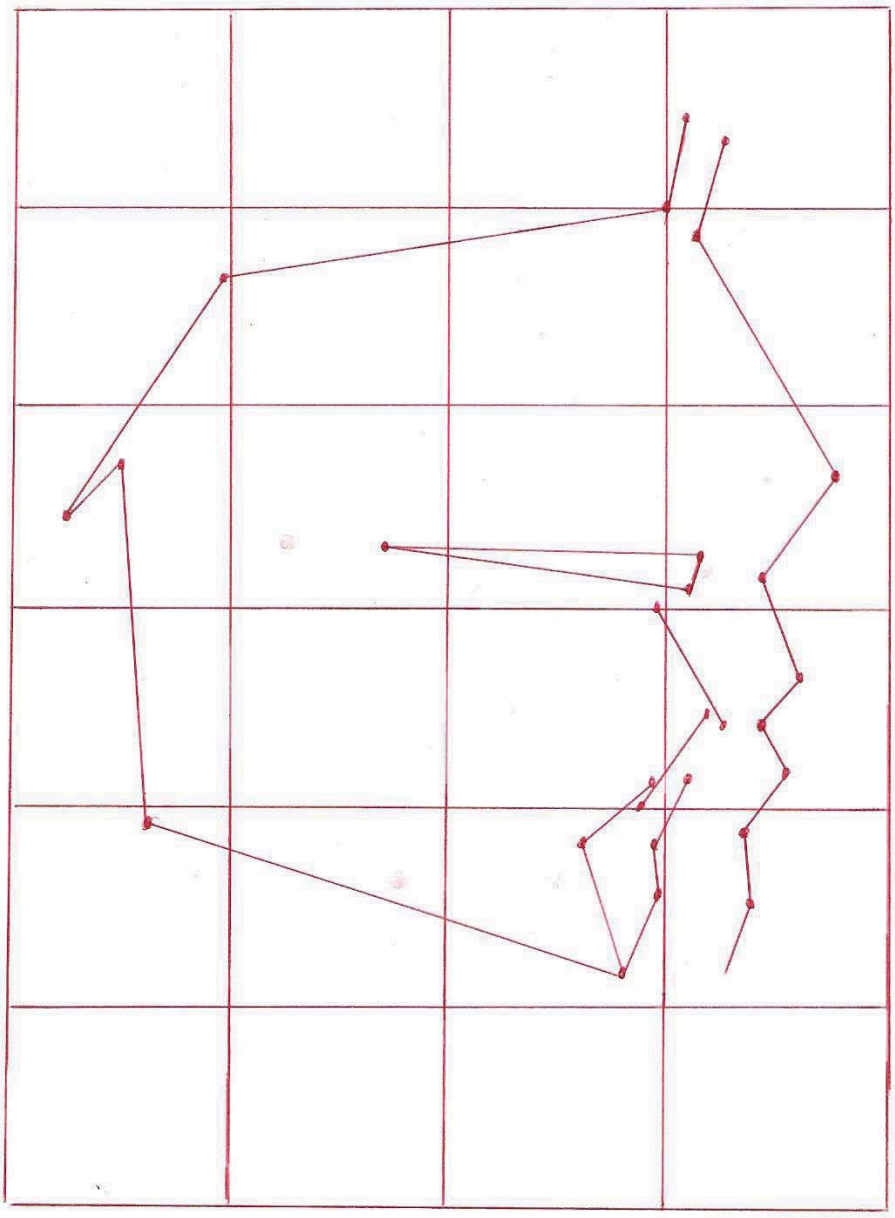
Superimposition comparison of Male and Female

Mesh diagram in the Sella – Nasion

plane orientation

4. Base on the finding, what is the standard mesh diagram for Filipinos

Base on the finding, figure 31 represent the standard mesh diagram among selected Filipino.



Although, there were no significant differences among soft tissue, and insignificant difference with skeletal and dental tissue parameters for male and female subject when compared statistically, different characteristic still exist if sexual dimorphism is considered when plotted in a mesh diagram.

Conclusions

The following conclusions were drawn in the revelation of the findings:

1. The study rejected the null hypothesis that there is no significant difference in the mesh diagram of the male and female subjects.

Recommendations

Based on the findings and conclusions derived from the gathered data, the following recommendations are hereby given:

1. **For the Graduate School of Orthodontics**

1.1 The department should include the use of mesh diagram to give the clinician a visual comparison of what is normal from deviation.

1.2 The department must encourage their clinicians to present their cephalometric finding to their patients in a mesh graphical form. With this, the patient will easily understand why they need such procedure.

2. **For the future researchers**

The future researchers are encouraged to:

2.1 Perform the same study but increase the number of subjects who will participate in the study to make the study more significant for the population of the Filipinos.

2.2 Make a study that would enable comparison with other ethnic groups.

2.3 Perform similar study using more cephalometric landmarks to cover more parameters.

2.4 Perfom similar study that would separate orthognathic from prognathic and retrognathic faces.

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Curriculum Vitae

I. PERSONAL

Name:	**Date of Birth:** November 8, 1981
DR. BRIAN E. ESPORLAS	**Citizenship:** Filipino
	Religious Sect. Roman Catholic
Civil Status: Married	**Institution:** UPHSD Asst. Professor 3
	Institution: Fabro-Esporlas Dental Clinic : Head dentist

II. ACADEMIC AND PROFESSIONAL PREPARATION

1. Undergraduate:

Institution	Degree Earned	Date	Specialization
Centro Escolar University Manila	Doctor of Dental Medicine	March 2004	Gen. Dentistry
Universal Colleges of Paranaque	Teaching Certificate Program	ongoing	Biological science

2. Graduate:

Institution	Degree Earned	Date	Specialization
Centro Escolar University	Master of Science in Dentistry	March 2012	Orthodontics
Phil. Christian University	PhD in Development Administration	On going with 54 units	DEV AD

3. Research/Publication/Articles (after the title, write the date and name of publication)

1. Average Upper Lip Length, Nasolabial, and Mentolabial Angle Among Selcted Filipinos With Harmonious Facial Profiles **BIOMEDICAL SCIENCE AND OPERATIONAL RESEARCH VOL 5 NO. 1**

2. Upper and Lower Pharyngeal width among Filipino with skeletal and Dental relationship. **Poster board** Association Philippine Orthodontist 2010

3. Correction of Mandibular Lateral Deviation Using Loop Mechanics. **Poster board** Association Philippine Orthodontist 2011

4. School Experience:

Position	School	Date
Faculty	University of Perpetual Help system Dalta	Present
Chief of Clinics	Manila Central University	2013 to 2014
Faculty	Centro Escolar University	2011 to 2013

5. Non-School Experience:

Position	School	Date
Resident Lecturer	Academy of Orthodontics	2010 up to present
Resident Lecturer	Light Orthodontics	2010 up to present

6. Membership in Professional Organizations:

Name of Organization	Position	Date
Philippine Dental Association	Member	Since 2004
Angeles Dental Chapter	Member	2015
OPAP	Member	Since 2011


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