



بسم الله الرحمن الرحيم

∞∞∞∞

تم رفع هذه الرسالة بواسطة / سامية زكى يوسف

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى

مسئولية عن محتوى هذه الرسالة.

ملاحظات: لا يوجد



Evaluation of Facial Soft Tissue Changes Following Chin Augmentation Using Hyaluronic-Acid Dermal Filler Injection Using Laser Face Scan

A Thesis

*Submitted to Faculty of Dentistry, Ain Shams University in
Partial Fulfillment of the requirements for the
Masters Degree in Orthodontics*

Submitted by

Lama Amr Ayyad

BDS, 2013

Ain Shams University

Email: lama_ayyad@hotmail.com

Mobile no: 01096012742

*Faculty of Dentistry
Ain Shams University
2022*

Supervisors

Dr. Noha Ezzat Sabet

*Professor of Orthodontics
Faculty of Dentistry, Ain Shams University*

Dr. Islam Tarek Hassan

*Professor of Orthodontics
Head of Orthodontic Department
Faculty of Dentistry, Ain Shams University*

Dr. Noha Ibrahim Abdelrahman

*Associate Professor of Orthodontics
Faculty of Dentistry, Ain Shams University*

Dr. Dalia Mohamed Al Boghdady

*Lecturer of Orthodontics
Faculty of Dentistry, Cairo University*

Acknowledgments

I wish to express my deepest thanks, gratitude and appreciation to Dr. Noha Ezzat Sabet, Professor of Orthodontics, Vice Dean for Post Graduate Affairs, Faculty of Dentistry, Ain Shams University, for her meticulous supervision, kind guidance, valuable instructions and generous help.

Special thanks are due to Dr. Islam Tarek Hassan, Professor of Orthodontics, Head of Orthodontic Department, Faculty of Dentistry, Ain Shams University, for his sincere efforts, fruitful encouragement.

I am deeply thankful to Dr. Noha Ibrahim Abdelrahman, Associate Professor of Orthodontics, Faculty of Dentistry, Ain Shams University, for her great help, outstanding support, active participation and guidance.

Really I can hardly find the words to express my gratitude to Dr. Dalia Mohamed Al Boghdady, Lecturer of Orthodontics, Faculty of Dentistry, Cairo University, for her supervision, continuous help, encouragement throughout this work.

Lama Amr Ayyad

List of Contents

Title	Page No.
List of Tables.....	i
List of Figures	iii
Introduction.....	1
Review of Literature	3
Aim of the Study	34
Materials and Methods	35
Results.....	62
Discussion	97
Summary and Conclusions.....	113
Recommendations.....	115
References	116
Appendix	126
– Appendix I.....	126
– Appendix II	130
– Appendix III.....	134
Arabic Summary	

List of Tables

Table No.	Title	Page No.
Table 1:	Hard Tissue Landmarks	50
Table 2:	Soft Tissue Landmarks	52
Table 3:	Planes of Reference.....	54
Table 4:	Sagittal Assessment of Lateral Cephalometric Radiographs.....	54
Table 5:	Vertical Assessment of Lateral Cephalometric Radiographs.....	55
Table 6:	Soft Tissue Landmarks identified and located on 3D Facial Scan	57
Table 7:	Mean±SD and P-value for angle of facial convexity (G'-Sn'-Pog') at different follow-up periods.....	64
Table 8:	Mean±SD and P-value for H angle (Pog'UL-Pog'Na') at different follow-up periods.....	66
Table 9:	Mean±SD and P-value for soft tissue facial angle (FH-N'Pog') at different follow-up periods.....	68
Table 10:	Mean±SD and P-value for chin prominence arnett (TV through Sn-Pog') at different follow-up periods.	70
Table 11:	Mean±SD and P-value for menton thickness (Me-Me') at different follow-up periods.....	72
Table 12:	Mean±SD and P-value for soft tissue chin thickness at different follow-up periods.....	74
Table 13:	Mean±SD and P-value for lower face throat angle (Sn-Gn'-C) at different follow-up periods.....	76
Table 14:	Mean±SD and P-value for inferior sulcus to H-line at different follow-up periods.....	78
Table 15:	Mean±SD and P-value for lower lip to H-line at different follow-up periods.....	80
Table 16:	Mean±SD and P-value for facial height analysis (Na'-Me') at different follow-up periods.....	82
Table 17:	Mean±SD and P-value for lower 1/3 of face analysis (Sn'-Me') at different follow-up periods.	84

List of Tables cont...

Table No.	Title	Page No.
-----------	-------	----------

Table 18:	Mean±SD and P-value for interlabial gap at different follow-up periods.....	86
Table 19:	Mean±SD and P-value for pogonion at different time intervals.....	88
Table 20:	Mean±SD and P-value for menton at different time intervals.....	89
Table 21:	Mean±SD and P-value for soft tissue B at different time intervals.	90
Table 22:	Mean±SD and P-value for labiale inferius at different time intervals.	91
Table 23:	Mean±SD and P-value for labiale superius at different time intervals.	92
Table 24:	Mean±SD and P-value for pronasale at different time intervals.....	93
Table 25:	Mean±SD and P-value for subnasale at different time intervals.....	94
Table 26:	Mean±SD and P-value for alar base width at different time intervals.	95
Table 27:	Mean±SD and P-value for intercommisural width at different time intervals.....	96

List of Figures

Fig. No.	Title	Page No.
Fig. 1:	Lateral cephalometry radiograph.....	40
Fig. 2:	3D facial scan	40
Fig. 3:	Restylane® Defyne.....	41
Fig. 4:	Restylane® Defyne pre-filled syringe with needles.....	42
Fig. 5:	Topical anesthetic cream, Pridocaine	42
Fig. 6:	Topical anesthetic cream application	43
Fig. 7:	Surgical marker pen.....	43
Fig. 8:	Injection area. Horizontal lines (red), veritcal lines (green).....	44
Fig. 9:	Marking of injection area	44
Fig. 10:	Prepared syringe with needle attached	44
Fig. 11:	Anatomy of chin.....	45
Fig. 12:	Aspiration before injection	46
Fig. 13:	Deposition of filler into chin area	47
Fig. 14:	Disposal of used syringe.....	48
Fig. 15:	Hyaluronidase injection	49
Fig. 16:	Hard tissue landmarks.....	51
Fig. 17:	Soft tissue landmarks	53
Fig. 18:	Sagittal Assessment.....	55
Fig. 19:	Vertical Assessment.....	56
Fig. 20:	Planmeca ProMax Interface	56
Fig. 21:	Soft tissue landmarks on 3D scan.....	58
Fig. 22:	3D scans at different follow up times selected for superimposition	58
Fig. 23:	Highlighted areas used for fitting of 3D scans.....	59

List of Figures cont...

Fig. No.	Title	Page No.
Fig. 24:	Color Deviation map using 3D scans	59
Fig. 25:	Measure changes in midline landmarks on color deviation map.....	60
Fig. 26:	Measurement of transverse changes on 3D scan	61
Fig. 27:	Mean $\pm$ SD for angle of facial convexity (G'-Sn'-Pog') at different follow-up periods.....	65
Fig. 28:	Mean change for angle of facial convexity (G'-Sn'-Pog') at different follow-up periods.....	65
Fig. 29:	Mean $\pm$ SD for H angle (Pog'UL-Pog'Na') at different follow-up periods.....	67
Fig. 30:	Mean change for H angle (Pog'UL-Pog'Na') at different follow-up periods.....	67
Fig. 31:	Mean $\pm$ SD for soft tissue facial angle (FH-N'Pog') at different follow-up periods.....	69
Fig. 32:	Mean change for soft tissue facial angle (FH-N'Pog') at different follow-up periods.....	69
Fig. 33:	Mean $\pm$ SD for chin prominence arnett (TV through Sn-Pog') at different follow-up periods	71
Fig. 34:	Mean change for chin prominence arnett (TV through Sn-Pog') at different follow-up periods.....	71
Fig. 35:	Mean $\pm$ SD for menton thickness (Me-Me') at different follow-up periods.....	73
Fig. 36:	Mean change for menton thickness (Me-Me') at different follow-up periods.....	73
Fig. 37:	Mean $\pm$ SD for soft tissue chin thickness at different follow-up periods.....	75
Fig. 38:	Mean change for soft tissue chin thickness at different follow-up periods.....	75

List of Figures cont...

Fig. No.	Title	Page No.
Fig. 39:	Mean $\pm$ SD for lower face throat angle (Sn-Gn'-C) at different follow-up periods.....	77
Fig. 40:	Mean change for lower face throat angle (Sn-Gn'-C) at different follow-up periods.....	77
Fig. 41:	Mean $\pm$ SD for inferior sulcus to H-line at different follow-up periods.....	79
Fig. 42:	Mean change for inferior sulcus to H-line at different follow-up periods.....	79
Fig. 43:	Mean $\pm$ SD for lower lip to H-line at different follow-up periods	81
Fig. 44:	Mean change for lower lip to H-line at different follow-up periods.....	81
Fig. 45:	Mean $\pm$ SD for facial height analysis (Na'-Me') at different follow-up periods.....	83
Fig. 46:	Mean change for facial height analysis (Na'-Me') at different follow-up periods.....	83
Fig. 47:	Mean $\pm$ SD for lower 1/3 of face analysis (Sn'-Me') at different follow-up periods.....	85
Fig. 48:	Mean change for lower 1/3 of face analysis (Sn'-Me') at different follow-up periods.....	85
Fig. 49:	Mean $\pm$ SD for interlabial gap at different follow-up periods	87
Fig. 50:	Mean change for interlabial gap at different follow-up periods	87
Fig. 51:	Mean $\pm$ SD for pogonion at different time intervals.	88
Fig. 52:	Mean $\pm$ SD for menton at different time intervals.....	89
Fig. 53:	Mean $\pm$ SD for soft tissue B at different time intervals.....	90

List of Figures cont...

Fig. No.	Title	Page No.
Fig. 54:	Mean±SD for labiale inferius at different time intervals	91
Fig. 55:	Mean±SD for labiale superius at different time intervals	92
Fig. 56:	Mean±SD for pronasale at different time intervals	93
Fig. 57:	Mean±SD for subnasale at different time intervals	94
Fig. 58:	Mean±SD for alar base width at different time intervals	95
Fig. 59:	Mean±SD for intercommisural width at different time intervals.....	96

Introduction

It is no secret how much facial attractiveness can influence one's life. It has an effect on all aspects relating to quality of life including social interactions, professional advancement and even marital success. Since the beginning of time, man have always strived to improve one's appearance employing ancient procedures to bring forward one's best self. In fact, facial aesthetics remain the main cause that drive patients to seek orthodontic treatment. Therefore, orthodontists must aim to match their goals with those of their patients and strive to enhance their patient's facial harmony, balance and overall aesthetics. Moreover, patient satisfaction must always be a crucial element in any successful orthodontic treatment.

Over the recent years, there has been a major paradigm shift in orthodontics where facial soft tissues and smile esthetics have been prioritized over ideal dental and skeletal relationships. Facial areas previously neglected during orthodontic therapy such as the chin have proven to have a strong effect on facial balance and harmony. This necessitates the need for precise evaluation of facial soft tissue relationships and treatment planning that aims to improve discrepancies in such tissues.

There are many limitations to orthodontic therapy that relies on moving the dentition alone which no longer results in satisfactory esthetic outcome. These shortcomings put forward the need of many adjunctive procedures to help address these shortcomings and enhance the aesthetic outcome of treatment.

Among these procedures is the use of dermal fillers to augment mild to moderate deficiencies in the skeletal component of the chin that will result in changes in the overlying soft tissue mask and in turn improve facial

harmony and balance. This simple, non-invasive procedure can be used effectively to improve chin projection and facial convexity. A major advantage of using this technique for chin augmentation is the ability to get instant results. Nowadays, patients have fast-paced lives where social media plays a dominant role, treatment approaches that yield immediate results are in high demand. These procedures should also offer stable, comparable results with more established invasive treatment alternatives.

In fact, this technique helps patients presenting with mild to moderate chin deficiency, whom otherwise would have no alternative to surgical chin augmentation, reach a more comprehensive and holistic treatment result.

Review of Literature

For easier navigation within this chapter, the following is an outline of the main topics to be discussed

I. Facial Soft Tissue

- a. Soft tissue landmarks and proportions**
- b. Role of chin in profile balance**
- c. Assessment of chin deformities**

II. Chin Augmentation

- a. Surgical Genioplasty**
- b. Injectable dermal filler**
 - i. History of soft tissue injectables**
 - ii. Chin Augmentation using Hyaluronic acid filler**

III. Methods of assessment

- a. Evolution of imaging techniques**
- b. Three dimensional imaging techniques**
- c. Planmeca Proface® system**

I. Facial Soft Tissue

a. Soft tissue landmarks and proportions

Burstone (1958)¹ developed a method of integumental profile measurement and studied a group of good or acceptable young adult faces to establish this method. He also demonstrated changes in soft tissues resulting from orthodontic treatment or plastic surgery and how these can be calibrated and assessed. He identified integumental landmarks like Frontal point, Subnasale, Superior labial sulcus, Labrale Superius, Labrale Inferius, Inferior labial sulcus and Menton. He regarded the angle formed by Glabella-Subnasale-Pogonion as the most critical reading in the study of soft tissue of the facial profile and that as Subnasale falls back, facial convexity is improved towards a more class II facial pattern but at the expense of increasing nasal prominence.

Later in 1959, Burstone continued his work by studying two caucasian face samples with good or excellent facial profiles (adolescent and young adult) and distributed each sample based on gender. He created integumental extensions measuring the distance between a dental or skeletal landmark and an integumental. He established the common plane of reference for horizontal extension measurements as the nasal floor and that for vertical extension measurements a perpendicular to the nasal floor. Seven integumental extensions were measured like Glabella, Subnasale, Labrale Superius, Labrale Inferius, Supramentale, Menton, and Pogonion. He noted that the soft tissue mass with least thickness in the lower facial region was beneath the inferior labial sulcus and Menton. He also found that significant differences were found in different gender groups especially in the young adult sample. Soft tissue mass of all areas from Subnasale to Menton was