Abstract—Skeletal anomalies of the face have a negative effect on many aspects of life. These include social interactions, opportunities, choice of profession, choice of partner, and personality characteristics. The purpose of our study was to analyse by esthetic parameters, the changes that are taking place following surgical/orthodontic treatment.

Keywords—skeletal anomalies, orthognathic surgery, esthetic parameters, facial balance.

I. INTRODUCTION

Smile is a highly relevant parameter for a beautiful face. Currently, a pleasant smile, mainly influenced by the beauty standards imposed by the media, is characterized by the presence of perfectly aligned and leveled teeth in the dental arches.

The aim of orthodontic surgical treatment of patients with dentofacial deformities is to achieve a harmonious skeletal, dental and soft tissue relationship for the improvement of facial esthetics and function.

The soft tissue change as a result of orthognathic surgery is very important to the patient, and dental professionals must bear that in mind when planning treatment. Added to the complexity of assessing orthognathic surgical treatment outcome is the differing definition of beauty and facial attractiveness by laypersons and clinicians.

Studies(Maple) have shown that the perception of facial profile esthetics differs between patients, peers, and dental professionals. The aim of our study was to evaluate the changes in the esthetic parameters following surgical/orthodontic treatment.

II SUBJECTS AND METHODS

The study took place in the University of Medicine and Pharmacy „Victor Babes” Timisoara, Departments of Orthodontics and Cranio-Maxillo-Facial Surgery. 10 patients who underwent orthognathic surgery were analysed by facial/smile esthetic parameters in order to evaluate the treatment outcome. Frontal, lateral and intraoral parameters were analysed.

Facial analysis

Facial form – The facial height Trichion(Tr) – soft tissue menton(Me)/Bizygomatic width(Za-Za) should be 1.3:1(females) and 1.35:1(males). The bigonial width should be about 30% less than the bizygomatic distance.

Vertical height - It has been well described that vertical height can be evaluated by dividing the face into equal thirds. Third superior (trichion-ophrion), third medium (ophrion-subnasale) and third bottom (subnasale-menton). For a harmonious appearance, the three floors should be equal.

Symmetry - A midsagittal line is drawn and the symmetry of the various points: cutaneous glabela, pronasale, labiale upper and lower and cutaneous pogonion. The left/right half should be equal.

Width - The easiest way to evaluate the relative width of facial structures is to divide the face into vertical fifths with each fifth being equal to one eye width. Also transverse distances at bitemporal and bigonial lines should be equal and approximately ten percent shorter than the bizygomatic line drawn through the malar eminences.

To assess the nose, a nose plot angle projection is measured between a dorsal portion of the contact nose and perpendicular to the horizontal cutaneous Frankfurt in nasion. The amount of the angle is 36 degrees for men of 34 degrees for women. The nasolabial angle usually varies between between 85 and 105 degrees. The nasofrontal angle is formed at the nasion by
lines that extend from this point to the glabella and to the nasal tip. This angle should ideally be 120 to 135 degrees.

Evaluation of the **upper and lower labial projections** should be assessed relative to a line drawn from the subnasal point to the prominence of the chin. The upper lip should extend approximately 3 to 3.5 mm anterior to this line, while the lower lip should extend by only 1.5 to 2 mm. As a result, the upper lip should project approximately 2 mm anterior to the lower lip. However, the lower lip is fuller than the upper lip by a ratio of 1.6:1.

**Nose-Lips-Chin Position** - At this point the relationship of the nose, lips and chin to each other is evaluated using Rickett's E (esthetic) line. This line is drawn from the nasal tip to the pogonion. The lips should lie just posterior to this line with the upper lip approximately twice as far from the line as the lower lip. If this is the case, no further evaluation of these structures is indicated at this time. If not, one of the three structures is malpositioned.

III. RESULTS

The analysis of facial parameters in the surgical cases is shown below.

**Case 1**

This 19 year old patient with severe openbite and class III was treated with surgical/orthodontic approach. The surgery consisted of a Le Fort I osteotomy impaction of the posterior maxilla and bilateral sagittal split ramus osteotomy setback of the mandible (Obwegeser DalPont). In a second phase, genioplasty and rhinoplasty were performed in order to obtain a good facial balance.

The evaluation of esthetic characteristics is shown below.

**Fig. 2 Facial symmetry evaluation. Pre-surgical lower third of the face showed frontal facial asymetry.** Post-surgical situation: a decreased inferior floor height.

The esthetic analysis of the initial frontal photo shows an increased inferior floor and a facial midline slightly tilted to the left. After the surgery, the dimension of the lower third of the vertical height decreased.(fig.2).

**Fig. 3 Profile evaluation. Pre-surgery-Chin proeminence-the Menton is situated on the naso-frontal line, the lips are situated anteriorly to the facial plane. Post-surgery: the Menton is situated posteriorly to the nasofrontal line, the upper lip is anterior to the lower lip.**

Pre-surgery esthetic analysis of the profile photo revealed a concave profile angle and a nasolabial angle of 80°. After the surgery the profile angle improved and the nasolabial angle increased to a normal value of 95°.(fig.2,3).

The distance of the lower lip to the esthetic lie of Ricketts increased from 3 mm at the beginning to 6,2 mm post-surgery. The upper lip moved backwards from 5,1 mm pre-surgery to 7 mm post-surgery.

**Fig. 4 Labio-nasal angle: pre-surgery 80°, post-surgery 100°.**

**Fig. 5 Labiomental fold: pre-surgery 145°, post-surgery 135°.**
The frontal esthetic analysis of the initial photo (Fig. 7) showed bipupillary and bicomisural lines tilted to the right and a frontal asymmetry due to the facial midline tilted to the left. The final photo presenting the post-surgical situation showed a decreased inferior third of the vertical dimension.

Case 2
This 28 year old female patient was subjected to surgical/orthodontic approach for the severe class III malocclusion. The facial parameters significantly changed following the surgical treatment.

Profile analysis of the pre-surgical esthetic parameters revealed a concave angle of the profile and a decreased nasolabial angle of 87°.

The post-surgical situation presented in the second photo showed a decreased value of the profile angle, a nasolabial angle of 98° and an improved position of the upper and lower lips to the esthetic line of Ricketts.
IV CONCLUSIONS

Facial esthetic parameters significantly changed following surgical therapy. The esthetic outcome of the orthognatic procedure has always been an important aspect in the judgment of treatment success by both the clinician and the patient.

Acknowledgement: This work was supported by CNCSIS–UEFISCUS, project number PNII – IDEI 1738/2008-2011.

V. REFERENCES


Dr. Camelia Szuhanek was born in Timisoara, Romania, on 25th of November 1975. She is a specialist in Orthodontics and Dentofacial Orthopedics and received her DDS, MSc and PhD degrees at the Faculty of Dental Medicine, University of Medicine and Pharmacy “Victor Babes” Timisoara. She is currently an Assistant Professor at the Department of Orthodontics and the director of a research project on orthodontic biomechanics at the University of Medicine and Pharmacy “Victor Babes” Timisoara. She published over 140 articles in the field of orthodontics. Dr. Szuhanek maintains a private practice limited to orthodontics in Timisoara, Romania. Her main research interests are biomechanics, numerical analysis, lingual orthodontics, multidisciplinary treatment and skeletal anchorage.
Consultant Dr. Gidea Parashivescu  
Eduard, PhD - born in Bucharest, Romania, on 27th of September 1970. Specialist in Cranio-Maxillo-Facial Surgery, with 17 years of experience, currently employed as Assistant Professor at the "Victor Babes" University of Medicine and Pharmacy, Timisoara, Romania and part time at the Municipal Hospital Timisoara, as consultant CMF Surgeon. 
Author and co-author of several books and articles, published in Romania and abroad and over 50 papers in oral presentation at national and international conferences and congresses. Chief surgeon of the Cleft Children International Humanitarian Mission in Niger, Africa, where he founded a Center of Excellence in Cleft Lip and Palate Surgery. Main fields of interest - orthognathic surgery, cleft surgery, plastic surgery, oncology.
eduard_parashivescu@yahoo.com

Dr. Adriana Muntean was born in Râmnicu Vîlcea, Romania, on 4th of June 1981. She is a postgraduate student in the Department of Orthodontics and works as an Assistant Professor in the Department of Esthetic Dentistry from the University of Medicine and Pharmacy Victor Babeș Timișoara. She is author and coauthor of several articles published in Romania and abroad. Main fields of interest are esthetic dentistry, multidisciplinary treatment, orthodontics and skeletal anchorage.
adriana_munti@yahoo.com

Dr. Roxana Rugina was born in Timisoara, Romania, on the 15th of June, 1986. She graduated the Faculty of Dental Medicine, University of Medicine and Pharmacy “Victor Babes” Timisoara. She did an internship for three months at a dental clinic in Rotterdam, Netherlands, in 2008. She published articles about interdisciplinary treatment, severe malocclusions and aesthetic analysis. She speaks fluently german, dutch, english and french.
rocsi1986@yahoo.com