

The association between the psychological status and the severity of facial deformity in orthognathic patients

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ABSTRACT

Objective: To evaluate the psychological status and correlate it with the severity of facial deformities of patients with skeletal malocclusions before orthognathic treatment.

Materials and Methods: A total of 96 patients aged 15 to 47 with skeletal malocclusions were examined before orthognathic treatment was provided. A photographic analysis was carried out to determine the severity of facial deformity according to the Facial Aesthetic Index (FAI). All patients were divided into three groups according to the FAI score: light (0 to 9), moderate (10 to 19), and severe (>19) facial deformities. Thirty subjects aged 17 to 39 with normal occlusion and attractive harmonious faces without previous orthodontic and/or surgical history were taken as controls. Psychological testing of controls and patients in the study group was performed before orthognathic treatment was provided.

Results: Psychological testing showed no statistically significant differences among groups with light and moderate facial deformity and subjects in the control group. Significant differences were encountered among patients with severe facial deformities compared with controls in a series of personality traits, including introversion, neuroticism, trait anxiety, dependency, unsociability, and leadership.

Conclusions: Orthognathic patients with different degrees of facial deformity have different psychological profiles. Patients with light and moderate facial deformity have no significant psychological problems. Patients with severe facial deformity show a significantly higher prevalence of emotional instability, introversion, anxiety, and unsociability. Such psychological profiles make orthognathic patients with severe facial deformity prone to psychological distress, depression, and adverse psychological reactions. (*Angle Orthod.* 2012;82:396–402.)

KEY WORDS: Orthognathic treatment; Facial Aesthetic Index; Facial aesthetics; Psychological status

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INTRODUCTION

Our face is the part of our body that mostly determines our physical attractiveness. It is the main means of identification and nonverbal communication. Facial esthetics have a big influence on our social life.^{1–3} According to some authors, 63% of patients think that their facial appearance problems have negatively affected their personal life, and 44% their social life.⁴ Skeletal malocclusions often worsen facial esthetics that may negatively influence a patient's quality of life. This is one of the reasons why orthognathic treatment nowadays is requested more and more frequently; in a short period of time, it allows a person to gain considerable improvement in facial esthetics. Because of this, it is logical to expect that such changes might have a psychological impact on a patient.

The psychological status of patients with skeletal malocclusion prior to orthognathic treatment has been

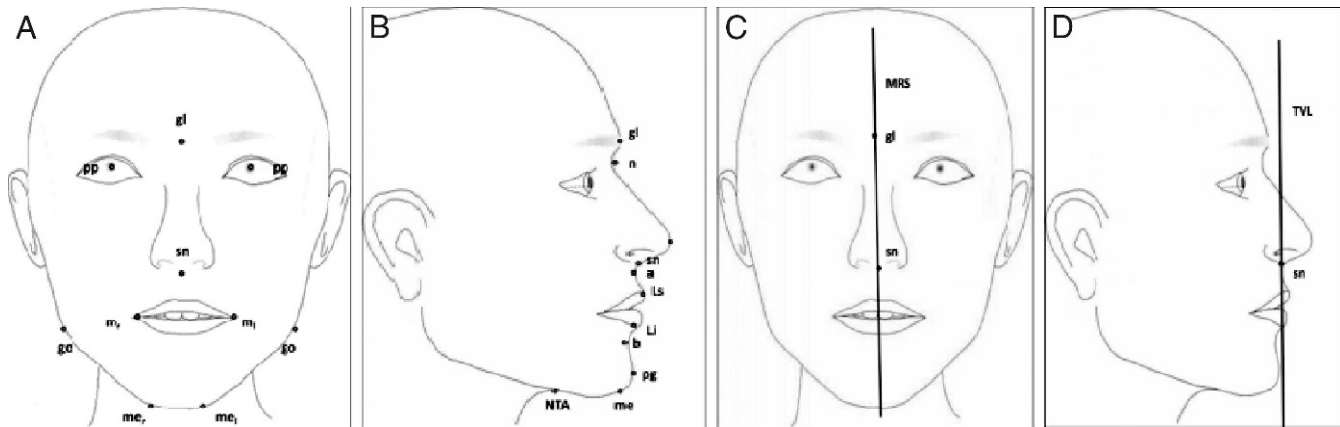


Figure 1. Landmarks used for photographic analysis. (A) Frontal landmarks. (B) Profile landmarks. (C) facial midline (MRS). (D) true vertical line (TVL).

the topic of many studies since 1970. However, results of these studies have been contradictory. Some authors conclude that orthognathic patients do not have particular psychological problems compared with controls without skeletal malocclusions.^{5–10} Results of other studies showed instead that a high percentage of patients with skeletal malocclusion have psychological problems of varying extent, and many of them need professional psychological support.^{11–13} It was established that orthognathic patients displayed higher levels of anxiety, higher numbers of individuals in their social support network, and lower body image and facial body image and self-esteem.^{14,15} In all, 15% to 37% of orthognathic patients experience psychological distress.¹⁶

Such controversial results can be attributed to many factors, such as different study protocols, different tools used for psychological evaluation, social and cultural differences among samples, and so forth. It is logical to think that the degree of psychological discomfort can be correlated with the severity of facial deformity. The aim of the present study was to evaluate psychological status and correlate it with the severity of facial deformities of patients with skeletal malocclusion before orthognathic treatment.

MATERIALS AND METHODS

Ninety-six patients aged 15 to 47 (72 females and 24 males) with skeletal malocclusion (50 patients with skeletal Class III malocclusion, 31 patients with skeletal Class II malocclusion, and 15 patients with skeletal cross-bite) were examined before orthognathic treatment. In addition, 30 subjects aged 17 to 39 with normal occlusion and attractive harmonious faces without previous orthodontic and/or surgical history were taken as controls.

A photographic analysis was carried out to determine the severity of facial deformity according to the Facial

Aesthetic Index (FAI).¹⁷ This tool allows us to evaluate facial esthetics on frontal and profile photographs in the sagittal, vertical, and horizontal plane. All photographs were taken in a standardized way with the patient's head in a natural head position (NHP). To ensure a reproducible NHP, a mirror technique was used. To eliminate a calibration error, all linear measurements were excluded from the analysis, and only angular measurements and ratios were used. In some cases, to facilitate identification of anatomic landmarks on the photograph, landmarks were palpated and marked with a lipstick on a patient's face before a photo was taken. Landmarks and reference lines utilized for FAI are presented in Figure 1.

As an express method of facial esthetics, analysis FAI includes only those parameters that have a major impact on overall facial esthetics. Normal values for these parameters were calculated by photographic analysis of subjects in the control group. Description, normal values, and standard deviation of the 13 parameters of the FAI are presented in Table 1 and Figure 2. Deviation of each parameter by one SD scored one point for FAI calculation. To facilitate an FAI score calculation, a preformed FAI table was used (Figure 3).

All patients were divided into three groups according to FAI score: light (0 to 9 points, 27 patients), moderate (10 to 19 points, 40 patients), and severe (>19 points, 29 patients) facial deformities. Age and gender distribution among the three groups was homogeneous.

Psychological testing of controls and patients in the study group was performed before treatment (at the bond-up appointment). Psychological testing included Eysenck Personality Inventory (EPI),¹⁸ Spilberger's State-Trait Anxiety Inventory (STAI),¹⁹ and the Q-sort testing technique by Stephenson²⁰ to determine dependence/independence, sociability/unsociability, and leadership traits.

Table 1. Facial Aesthetic Index (FAI) Parameters and Its Normal Values

Parameter	Description	Mean	SD
gl-sn/sn-me ratio	Medium to lower facial height ratio (Figure 2A)	1.00	0.03
sn-st/st-me ratio	Upper and lower thirds ratio of the lower facial height (Figure 2B)	0.50	0.02
<p-p/MRS	Inclination of the pupilar plane to the facial midline (Figure 2C-1), degrees	90	2
<st-st/MRS	Inclination of the stomion plane to the facial midline (Figure 2C-2), degrees	90	2
<go-go/MRS	Inclination of the gonion plane to the facial midline (Figure 2C-3), degrees	90	2
<me-me/MRS	Inclination of the mentum plane to the facial midline (Figure 2C-4), degrees	90	2
<MRS-me	Chin deviation angle to the facial midline (Figure 2D), degrees	0	1
<gl-sn-pg	Profile angle (Figure 2E), degrees	168	2
<anb	Modified soft tissue ANB angle (Figure 2F), degrees	8	1
<col-sn-Ls	Nasolabial angle (Figure 2G), degrees	105	4
<Li-sn-pg	Mentolabial angle (Figure 2G), degrees	136	8
sn-me:NTA-pg ratio	Ratio between lower facial height and throat depth (Figure 2H)	1.2	0.1
<NTA/TVL	Inclination of the throat line to the true vertical line (Figure 2I), degrees	90	2

Descriptive statistics (mean values and standard deviations) were calculated for each group. A paired sample *t*-test was used to determine significant differences among groups. Statistical significance was set at $P < .05$. The percentage distribution of psychological data was calculated for study and control groups and for the three study groups separately. Ethical approval and patients' informed consent were obtained.

RESULTS

Psychological testing showed statistically significant differences among the groups in a series of personality traits, including introversion, neuroticism, trait anxiety, dependency, unsociability, and leadership. Analysis of

EPI (Figure 4) showed that 24.18% of orthognathic patients were introverts and 19.44% had an increased level of neuroticism. Results of STAI indicated that 27.50% of all orthognathic patients had high levels of trait anxiety (Figure 5).

After analysis of EPI and STAI scores—taking into consideration the severity of facial deformity—it was established that patients with light and moderate facial deformity showed no statistically significant differences compared with controls, whereas patients with severe facial deformity displayed a higher prevalence of introversion and neuroticism (31.58% and 21.5%, respectively, compared with 20.00% and 16.67% in the control group), and the prevalence of high levels of trait anxiety was almost doubled in this group (42.11% vs. 23.33% in the control group).

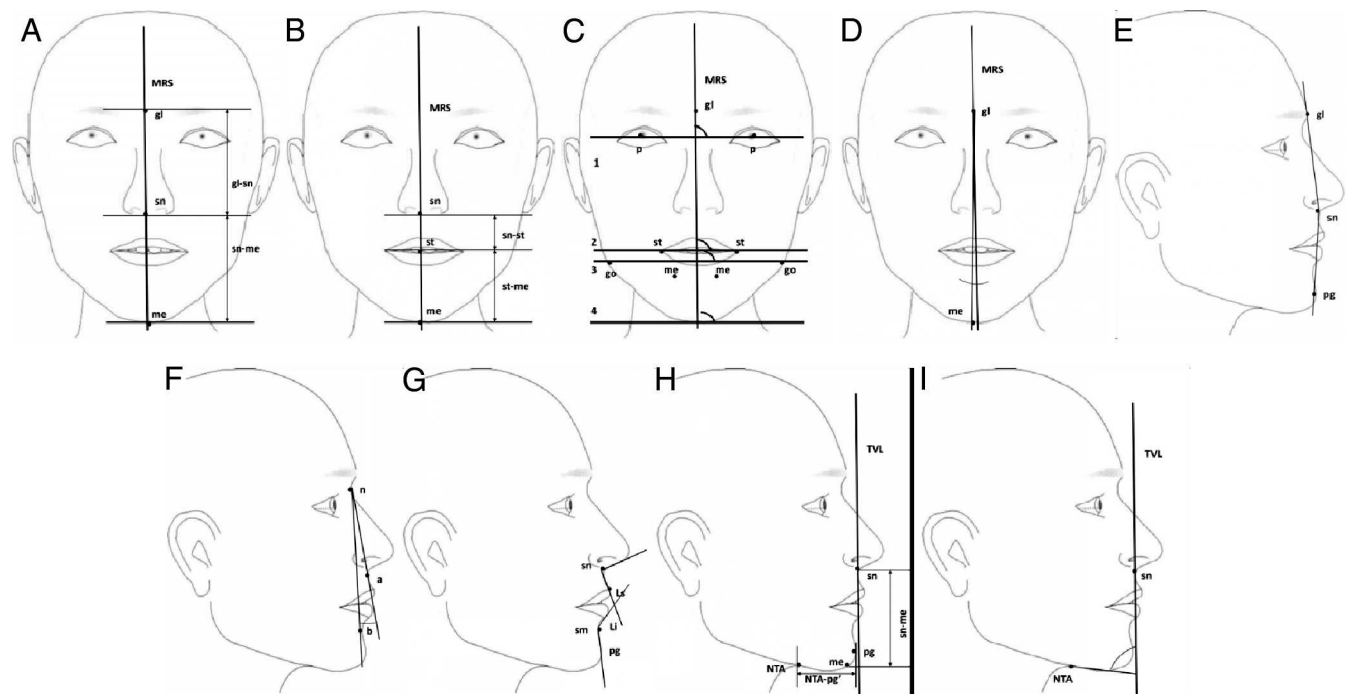


Figure 2. Parameters for calculation of the Facial Aesthetic Index. (A) gl-sn/sn-me. (B) sn-st/st-me. (C) 1: p-p/MRS, 2: st-st/MRS, 3: go-go/MRS, 4: me-me/MRS. (D) MRS-me. (E) gl-sn-pg. (F) anb. (G) col-sn-Ls & Li-sn-pg. (H) sn-me:NTA-pg. (I) NTA/TVL.

Patient	Facial Aesthetic Index:																							
	SCORE:	10	9	8	7	6	5	4	3	2	1	0												
ORTHOGNATHIC	p-g/MRS	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112
	st-st/MRS	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112
	g-g/MRS	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112
	me-me/MRS	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112
	MRS-me	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11
PROFILE	gl-sn/sn-me	0.67	0.70	0.73	0.76	0.79	0.82	0.85	0.88	0.91	0.94	0.97	1.00	1.03	1.06	1.09	1.12	1.15	1.18	1.21	1.24	1.27	1.30	1.33
	sn-st/st-me	0.28	0.30	0.32	0.34	0.36	0.38	0.40	0.42	0.44	0.46	0.48	0.50	0.52	0.54	0.56	0.58	0.60	0.62	0.64	0.66	0.68	0.70	0.72
SACCTUAL	NTA/TVL	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112
	gl-sn-pog	146	148	150	152	154	156	158	160	162	164	166	168	170	172	174	176	178	179	-1	-3	-5	-7	-9
	anb	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	col-sn-UL	61	65	69	73	77	81	85	89	93	97	101	105	109	113	117	121	125	129	133	137	141	145	149
	LL-sn-pog	47	55	63	71	79	87	95	103	111	119	127	135	143	151	159	167	175	183	191	199	207	215	223
sn-me NTA-pg	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50	1.60	1.70	1.80	1.90	2.00	2.10	2.20	2.30	

Figure 3. Table for Facial Aesthetic Index calculation.

Similar dynamics were seen in the results of Q-sort testing. "Negative" tendencies such as dependency, unsociability, and leadership avoidance were more prevalent in the study group, with an apparent predomination in patients with severe facial deformity (68.42% for dependency and 84.21% for leadership avoidance) (Figure 6). The unsociability trait was 8 times more frequent in patients with severe facial deformity than in controls (26.32% and 3.33%, respectively). "Positive" tendencies such as independency, sociability, and leadership, on the contrary, were a lot less frequent in orthognathic patients than in the control group (Figure 7). The independency trait was encountered in 20.68% of patients; this is half of what was found in the control group (40.00%). The leadership trait was seen in just 12.68% of orthognathic patients compared with 50.00% of controls.

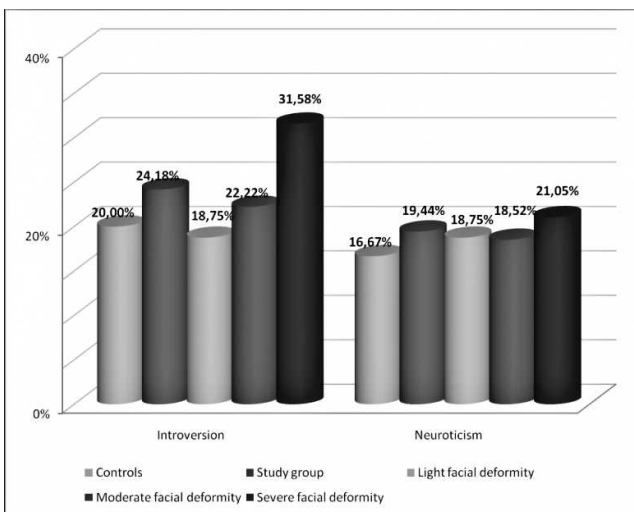


Figure 4. Prevalence of introversion and neuroticism in the study group as a whole and in patients with light, moderate, and severe facial deformity compared with controls.

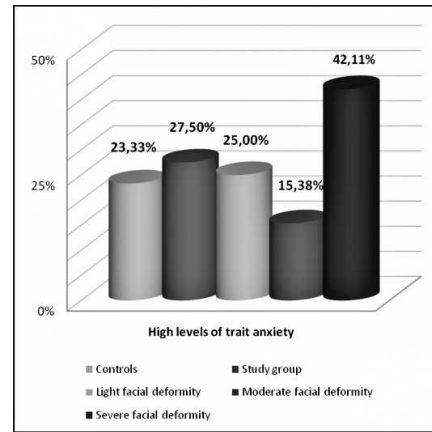


Figure 5. Prevalence of high levels of trait anxiety in the study group as a whole and in patients with light, moderate, and severe facial deformity compared with controls.

DISCUSSION

Understanding the psychological profile of patients before orthognathic treatment might be very important in that certain psychological traits can be associated with difficulties and discomfort during treatment, adverse reactions to postsurgical facial changes, and long rehabilitation periods. According to some authors, patients experiencing psychological distress expect more problems and discomfort in the postsurgical period compared with patients without psychological problems.²¹ Patients with high neuroticism scores experience more difficulties in the postsurgical rehabilitation period^{22,23} and more often remain unsatisfied with treatment results.^{7,24} Therefore, the psychological evaluation of patients before orthognathic treatment allows revelation of potential problems at early stages and identifies patients who need professional psychological care.²⁵

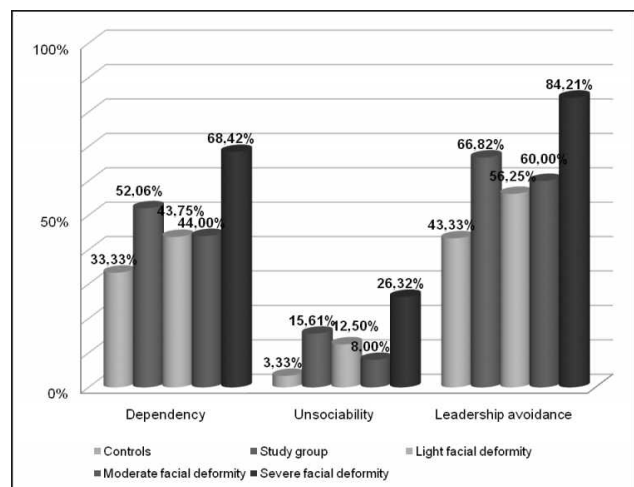


Figure 6. Prevalence of dependency, unsociability, and leadership avoidance traits in the study group as a whole and in patients with light, moderate, and severe facial deformities compared with controls.

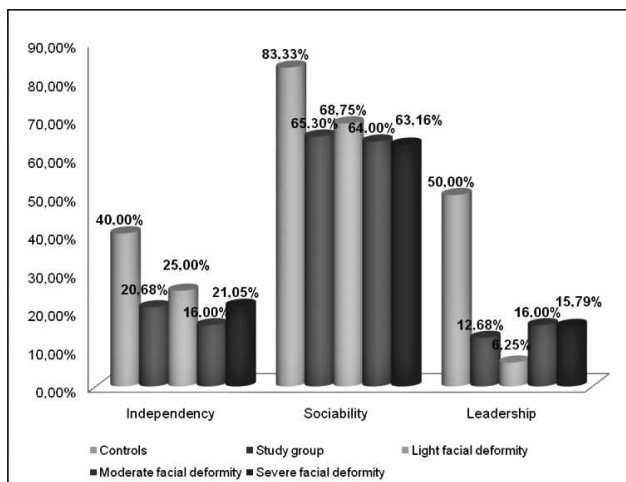


Figure 7. Prevalence of independency, sociability, and leadership traits in the study group as a whole and in patients with light, moderate, and severe facial deformities compared with controls.

Psychological tests used in the present study (EPI, STAI, and Q-sort) have been widely utilized to assess the psychological status of patients in all fields of clinical medicine: oncology, congenital deformities, psychology, trauma and rehabilitation, reconstructive and cosmetic surgery, etc. Their reliability and validity were proved by many studies. EPI was previously used to evaluate the psychological characteristics of orthognathic patients in major works of Kiyak et al.^{22,26,27} and Scott et al.^{28,29} STAI was utilized to determine state and trait anxiety in patients with maxillofacial deformities before and after orthognathic treatment in the studies of Cunningham^{30,31} and Rispoli et al.³²

According to the results of our study considering the orthognathic group as a whole, 19% to 27% of patients revealed psychological problems similar to those in the control group (20% to 23%) as evaluated by EPI and STAI. These findings are concordant with the results of recent studies^{9,10} that reported psychological problems in 25% to 27% of orthognathic patients and in 26% of controls. Therefore, the authors conclude that orthognathic patients are not different from control subjects in their psychological status.¹⁰

However, if we take into consideration the severity of the facial deformity, we can see that the prevalence of psychological problems in patients with light and moderate facial deformity remains more or less the same (19% to 25%) but increases significantly (42% in patients with severe facial deformity). This suggests that the severity of facial deformity is correlated with psychological status and increases substantially the probability of psychological problems in patients with severe facial deformity.

About 20% of all orthognathic patients in this study showed high levels of neuroticism—a personality trait

characterized by instability, anxiety, and aggression. Moreover, 27% of all patients and 42% of patients with severe facial deformity displayed high levels of trait anxiety. It is an enduring tendency to experience negative emotional states. Individuals who score high on neuroticism are more likely than the average individual to experience such feelings as anxiety, anger, guilt, and depressed mood. They respond more poorly to environmental stress and are more likely to interpret ordinary situations as threatening and minor frustrations as hopelessly difficult. High neuroticism and trait anxiety levels are also a risk factor for phobia, depression, panic disorder, and other anxiety disorders.

The use of Q-sort testing enabled us to analyze social behavior and interpersonal relationships of orthognathic patients, and it was established that orthognathic patients, especially those with severe facial deformity, experience difficulties in interpersonal relations. They showed low scores on self-confidence and self-esteem and a high percentage of unsociability and dependency. More than 80% of patients with severe facial deformity had a strong tendency to avoid leadership and to try to escape from social interactions, thus the quality of life of these patients is affected.

It must be noted that in the present study, only patients who agreed to orthognathic treatment were included. This could have influenced the results of the study and should be taken into consideration, although study results did not show statistically significant differences in the psychological profile of patients who accepted orthognathic surgery and those who refused it.³³

Patients undergoing orthognathic treatment must receive appropriate psychological support^{7,34,35} and should be informed about a possible psychological impact of treatment.^{36–39} As is seen in the results of many studies,^{40,41} orthognathic treatment should start with psychological testing of patients. Psychological evaluation in orthognathic treatment planning has the same importance as that in soft tissue and skeletal analysis.⁴² Psychomorphologic evaluation of patients before orthognathic treatment enables us to gain a better understanding of patients' psychological needs and decreases the probability of patients' dissatisfaction with treatment results.⁴³

Patients with severe facial deformity show a significantly higher prevalence of emotional instability, introversion, anxiety, and unsociability. This makes them reserved, insecure, and lacking in self-confidence and self-esteem. Frequently, the adaptive capability of such patients is reduced and they experience difficulties in social life, causing them to avoid leadership behaviors and social contacts. Such psychological profiles make orthognathic patients with severe facial deformity prone to psychological distress, depression, and adverse

psychological reactions that might bring complications in orthognathic treatment. This is why these patients need a more careful approach such as a psychological evaluation before treatment and professional psychological support before, during, and after orthognathic therapy.

CONCLUSIONS

- Orthognathic patients with different degrees of facial deformity have different psychological profiles.
- Patients with light and moderate facial deformities have no significant psychological problems.
- Patients with severe facial deformity show a significantly higher prevalence of emotional instability, introversion, anxiety, and unsociability.

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