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Psychiatric morbidity is common in orthognathic surgery patients—a retrospective study

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Objective. The study aimed to clarify psychiatric morbidity in patients who underwent orthognathic surgery (OS) pre- and postoperatively.

Study Design. Patients ≥18 years undergoing OS were included in this retrospective study. The outcome variable was the incidence of new mild, moderate, or severe psychiatric morbidity or exacerbation of preexisting psychiatric morbidity postoperatively. Surgery and patient-related background variables for outcome were analyzed (SPSS for Macintosh, version 27; IBM SPSS, Inc., Armonk, NY, USA).

Results. Of 182 patients, 44 (24%) had preceding psychiatric morbidity. It was associated significantly with history of alcohol abuse ($P < .001$) and smoking ($P = .046$) and was more common in older patients ($P = .042$). During the postoperative phase, new psychiatric morbidity or exacerbation of a preexisting psychiatric condition was found in 12 patients (7%). Preceding psychiatric history (OR 8.88, $P = .004$) and high-dose perioperative dexamethasone (OR 9.81, $P = .036$) were independent predictors for postoperative psychiatric morbidity. No other evaluated variables were associated with outcome.

Conclusions. Psychiatric conditions are common among OS patients. Treatment planning should consider the patient's mental health to minimize the risk of exacerbating psychiatric conditions, and collaboration with psychiatric professionals is recommended. Perioperative high-dose dexamethasone should be used with caution considering possible adverse psychiatric effects. (Oral Surg Oral Med Oral Pathol Oral Radiol 2023;135:716−723)

Orthognathic surgery (OS) alters the patient's facial profile, and it warrants discussion whether these alterations in facial structures can occasionally contribute negatively to the patient's mental health. Little is known about whether this burden can exacerbate previous psychiatric conditions or lead to new psychiatric morbidity. The lengthy treatment process,[1] risks entailed by the surgery, peri- and postoperative complications, and adjustment to changes in physical appearance can strain the patient mentally during treatment.

It has previously been proposed that OS patients have a unique psychiatric profile relative to the general population. A study by Phillips et al.[2] suggested that 25% of OS patients qualify for a psychiatric diagnosis at the beginning of treatment. It is unclear which factors contribute to this phenomenon. One factor could be that patients seeking OS are predisposed to bullying during childhood and adolescence due to deviations in dentofacial features and not fitting the general standards of normal occlusion.[3] Studies focusing on the connection between psychological profiles and severity of maxillofacial deformity have suggested that a subgroup of patients with severe facial deformities is more prone to psychological distress than patients whose deformities are classified as mild or moderate.[4,5] These severe facial deformities might affect psychiatric health, predisposing the patients to distress, depression, and adverse psychological reactions,[4] and patients with more severe deformities may be more aware of their own facial and dental appearance.[6]

The findings regarding psychiatric epidemiology in OS populations are somewhat contradictory. Some previous studies have shown that overall OS patients do not suffer more often from psychiatric symptoms than the general population.[7,8] Cunningham et al.[9] reported that patients in the preoperative treatment phase do not meet the criteria for depression more often than controls when screened using the Beck Depression Index scale. However, opposite results have also been presented. OS patients seem to show more depressive symptoms[10-12] and post-traumatic stress disorder symptoms than controls,[13] and high levels of social anxiety[14] and trait anxiety on stress[15] during the preoperative treatment phase. In addition, the rates of such

Statement of Clinical Relevance

Patients and professionals would benefit from collaboration between clinicians and mental health teams. Psychiatric illnesses can be exacerbated by orthognathic surgery, thus emphasizing the need to carry out a thorough evaluation of current and past psychiatric history preceding the surgery.

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psychiatric disorders as obsessive-compulsive disorder[11] and body dysmorphic disorder[11,16] may be high among OS patients. Recently, Sebastiani et al.[12] made the alarming discovery that the occurrence of severe depression is 5 times higher in individuals seeking OS than in controls.

The purpose of our study was to investigate psychiatric morbidity in OS patients during phases preceding surgery and postoperatively. We hypothesized that patients with psychiatric morbidity during the postoperative treatment phase could be identified based on background variables, such as preceding psychiatric morbidity, allowing us to improve comprehensive patient care processes.

MATERIALS AND METHODS

Study design

A retrospective, single-center study of patients undergoing OS was designed and implemented at the Department of Oral and Maxillofacial Diseases, Helsinki University Hospital, Helsinki, Finland. The electronic medical records of all patients undergoing OS from 2017 to 2019 were reviewed from the hospital database.

Inclusion and exclusion criteria

Patients ≥18 years who received bilateral sagittal split osteotomy (BSSO), Le Fort I, or bimaxillary-osteotomy with postoperative follow-up of ≥6 months were included in the study. Patients with oral cancer, developmental disability, mental retardation, or secondary surgery for previous facial fracture, BSSO, or Le Fort osteotomy were excluded.

Study variables

The main outcome variable was incidence of new psychiatric morbidity or exacerbation of preexisting psychiatric conditions within a 12-month follow-up after surgery.

The primary predictor variable was psychiatric morbidity before surgery (i.e., the history of morbidity or current morbidity during preoperative orthodontic treatment).

Surgery-related predictor variables were perioperative dexamethasone administration grouped as ≤10 mg or no dexamethasone and >10 mg of dexamethasone and major surgery-related complications, including reoperations for surgical complications and severe complications requiring intensive care.

Explanatory variables were age, sex, smoking, history of alcohol and/or substance abuse, skeletal type categorized as I, II, or III, surgically assisted rapid maxillary expansion preceding surgery, surgical procedures classified as BSSO, Le Fort I, or a combination of the two, and preoperative psychiatric consultation. Alcohol abuse history was determined according to the Finnish Current Care Guidelines.[17]

Ethical considerations

The study protocol was approved by the Internal Review Board of the Head and Neck Center, Helsinki University Hospital, Finland (HUS/141/2020). Principles outlined in the Declaration of Helsinki were followed.

Statistical analysis

All statistical analyses were performed with a statistical software package (SPSS for Macintosh, version 27; IBM SPSS, Inc., Armonk, NY, USA). Categorical explanatory and predictor variables were cross tabulated with the outcome variables and analyzed with Pearson Chi-square test to determine levels of association. Student t test was used to compare differences between study groups in continuous variables. Effect sizes were estimated with ϕ for the Chi-square test and with Cohen d for the t test. Binary logistic regression was selected for multivariate analysis of the main outcome variable. P values $< .05$ were considered significant throughout the study.

RESULTS

Of the 232 patients evaluated, 182 (42% men, 58% women) were included in the final analyses. Patients' perioperative age ranged from 19 to 61 years (mean 33 years) (Table I). The most common surgery type was BSSO exclusively (42%), followed by Le Fort I (35%) and bimaxillary surgery (23%).

A major surgical or surgery-related complication was observed in 6 patients (3%). Reoperation was required in 5 patients. Indications for the reoperation were suboptimal primary surgery, relapse during healing, and mobility of the maxilla with inadequate osteosynthesis during long-term follow-up. In 1 patient, increased septum deviation after Le Fort I osteotomy required surgical treatment. In addition, 1 patient had severe aspiration pneumonia and pulmonary embolism, requiring intensive care.

Variations in psychiatric diagnoses and the severity of morbidity during treatment phases are presented in Table II. Morbidity was determined by psychiatric history and psychiatric medication documented by medical professionals and self-reported mental health status. Severity of the psychiatric disorder was evaluated based on the functional limitation of the mental illness.[18] The ICD-10 classification of mental and behavioral disorders was used to further categorize the diseases.[19]

Patients with psychiatric morbidity before surgery were slightly older than those without ($P = .042$, Cohen d = .354) (Table III). History of smoking was more

Table I. Descriptive characteristics of 182 patients receiving orthognathic surgery

Characteristic	*All, N = 182 (100%)*
Age	
Range	19-61
Mean	33
Median	30
Sex	
Male	76 (42%)
Female	106 (58%)
Smoking	
Yes	35 (19%)
No	147 (81%)
Alcohol abuse history	
Yes	5 (3%)
No	177 (97%)
Substance abuse history	
Yes	3 (2%)
No	179 (98%)
Skeletal class	
I	10 (6%)
II	93 (51%)
III	79 (43%)
Preoperative psychiatric consultation	
Yes	17 (9%)
No	165 (91%)
Major surgery related complication	
Yes	6 (3%)
No	176 (97%)
Perioperative dexamethasone administration	
≤10 mg or no dexamethasone	85 (47%)
0 mg	7 (4%)
5 mg	4 (2%)
7.5 mg	7 (4%)
10 mg	67 (37%)
>10 mg of dexamethasone	97 (53%)
15 mg	12 (7%)
20 mg	20 (11%)
25 mg	47 (26%)
30 mg	17 (9%)
40 mg	1 (<1%)
New or exacerbated psychiatric morbidity after orthognathic surgery	
Yes	12 (7%)
No	170 (93%)
Surgery type	
Bilateral sagittal split osteotomy	77 (42%)
Le Fort I	63 (35%)
Bimaxillary	42 (23%)
SARME as preceding surgery	
Yes	9 (5%)
No	173 (95%)

SARME, surgically assisted rapid maxillary expansion.

frequent in patients with preceding psychiatric morbidity ($P = .046$). In total, 17 patients (9%) had a psychiatric consultation during the preoperative treatment phase. Psychiatric consultations concentrated significantly on patients with preceding psychiatric morbidity ($P < .001$).

New psychiatric morbidity or exacerbation of preexisting psychiatric conditions during the postoperative treatment phase occurred in 12 patients (7%) (Table IV). Preceding psychiatric morbidity was associated significantly with exacerbation of preexisting or new postoperative psychiatric morbidity ($P < .001$). Nine of 12 patients with new or exacerbated psychiatric morbidity had a preceding psychiatric condition. Six of 12 patients underwent a preoperative psychiatric consultation. History of smoking ($P = .041$) and alcohol abuse ($P = .002$) were also significantly more frequent in patients with postoperative psychiatric morbidity. In addition, high perioperative dexamethasone administration was associated significantly with postoperative psychiatric morbidity ($P = .006$).

A new or exacerbated postoperative psychiatric morbidity was 9 times more likely to occur in patients with a previous psychiatric history than in those without (odds ratio 8.88, $P = .004$ [CI 2.023-38.966]) in logistic regression analyses (Table V). In addition, high-dose perioperative dexamethasone predicted postoperative psychiatric outcome independently (odds ratio 4.411, $P = .036$ [CI 1.165-82.680]).

DISCUSSION

This study aimed to clarify psychiatric morbidity in OS patients during phases preceding surgery and postoperatively. We hypothesized that patients with new or exacerbated psychiatric morbidity during the postoperative treatment phase could be identified based on background variables. The results supported our hypothesis. Preceding psychiatric conditions strongly predicted patients' postoperative morbidity. Psychiatric illness worsened postoperatively in 21% of patients with a preceding psychiatric condition (Table IV).

Previous studies have reported that 20% to 25% of patients seeking OS might meet the criteria for a psychiatric condition.[2,20,21] The findings herein were consistent with earlier research because 24% of our patients had a history of a psychiatric condition or current morbidity during preoperative orthodontic treatment (Table III). Although it has been stated that OS patients do not experience psychological symptoms to a greater degree than others[22] and that they do not seem to suffer from psychological distress in general,[7] our findings indicated that preceding psychiatric morbidity must be carefully considered in OS patients. These diseases may be exacerbated by surgery, although signs of mental distress and psychiatric episodes were also seen in patients with no preceding psychiatric history.

To be able to identify patients in need of more intensive psychiatric evaluation and treatment, it is appropriate to recognize the severity of psychiatric illnesses.

Table II. Descriptive statistics of psychiatric morbidity in 182 patients: ICD-10 classification of mental and behavioral disorders

N = no. of patients	*Psychiatric morbidity before orthodontic treatment, N = 32*		*Current psychiatric morbidity during orthodontic treatment N = 32*		*Postoperative new or exacerbated psychiatric morbidity N = 12*	
*n = number of diagnoses**†	*n*	*% of 182*	*n*	*% of 182*	*n*	*% of 182*
F00-F09 Organic, including symptomatic, mental disorders	0	0%	0	0%	2	1%
F10-F19 Mental and behavioral disorders due to psychoactive substance use	3	2%	2	1%	2	1%
F20-F29 Schizophrenia, schizotypal, delusional, and other non-mood psychotic disorders	1	<1%	0	0%	0	0%
F30-F39 Mood (affective) disorders	20	11%	28	15%	7	4%
F40-F48 Neurotic, stress-related and somatoform disorders	15	8%	12	7%	6	3%
F50-F59 Behavioral syndromes associated with physiologic disturbances and physical factors	0	0%	1	<1%	1	<1%
F60-F69 Disorders of adult personality and behavior	2	1%	1	<1%	0	0%
F80-F89 Pervasive and specific developmental disorders	2	1%	0	<1%	0	0%
F90-F98 Behavioral and emotional disorders with onset usually occurring in childhood and adolescence	2	1%	1	<1%	3	2%
Psychiatric morbidity†						
Mild or moderate psychiatric morbidity	22	12%	32	18%	8	4%
Neuropsychiatric disorder	2	1%	2	1%	3	1%
Severe psychiatric morbidity	9	5%	2	1%	3	1%
Suicidal ideation	9	5%	4	2%	2	1%
Suicide attempts	4	2%	2	1%	1	<1%

*None of the patients had intellectual disabilities (F70-F79) or other unspecified mental disorders (F99).
†Patients can have simultaneous comorbidities (for instance mood disorders and behavioral disorders) in the table, and the severity of the disorder may vary during the treatment phase. This causes the total number of diagnoses not to match the total number of patients with psychiatric morbidity.
ICD, International Classification of Diseases.

In the present study, severe morbidity was observed both before and after surgery (Table II). These severe conditions included suicidal ideation and attempts, severe depression, and psychosis. Of the patients, 5% had severe morbidity before orthodontic treatment. This percentage is less than previously reported by Sebastiani et al.,[12] who found that 18% of patients seeking OS had severe depression. Despite the lower prevalence of severe psychiatric diseases in our study, these conditions must not be disregarded and should be evaluated accordingly.

Recognition of the spectrum of psychiatric disorders is also important in treatment processes because mental health conditions are known to have a negative impact on postoperative oral health-related quality of life.[23] According to our results, specifically mood disorders (ICD-10 clinical modification code range F30-F39), such as depressive disorders and bipolar disorder, were common (Table II). Up to 15% of patients had an affective mood disorder during orthodontic treatment. Exacerbations of these affective disorders were also common postoperatively, so special attention should be paid to patients with these disorders.

Preceding psychiatric morbidity was associated significantly with postoperative morbidity ($P < .001$), and 12 patients (7%) had a new or an exacerbation of a previous psychiatric disease after surgery (Table IV). Earlier research has reported varying results for postoperative symptoms in OS patients. Psychiatric symptoms have been reported to improve when comparing preoperative with postoperative symptoms in anxiety,[10,15,24] depression,[10] obsessive-compulsive disorder,[10,25] and psychoticism.[10] However, the evolution of symptoms at an individual level could be dependent on the severity of the psychiatric disease. Brunault et al.[1] demonstrated a decrease in depressive symptoms, although more than two-thirds of patients who were depressed at the start of the study still had substantial depression 12 months after surgery. Häberle et al.[25] found no changes in anxiety and depressive symptoms when comparing pre- and postoperative symptom scores.

In addition to exacerbations of preceding diseases, we also observed an increase in neuropsychiatric conditions (Table II). Although these disorders can be detected and diagnosed in adults, note that neuropsychiatric disorders such as attention-deficit/

Table III. Associations between explanatory variables, surgery-related predictor variables, and preceding psychiatric morbidity

N = No. of patients	*Patients with preceding psychiatric morbidity N = 44 (24% of 182)*			*Patients without preceding psychiatric morbidity N = 138 (76% of 182)*			*P value**
Age:							.042
Range	19-61			20-61			
Mean	37			33			
Median	35			30			
Characteristic	n	% of n†	% of 44	n	% of n†	% of 138	
Sex							n.s.
Male	15	20%	34%	61	80%	44%	
Female	29	27%	66%	77	73%	56%	
Smoking							.046
Yes	13	37%	29.5%	22	63%	16%	
No	31	21%	70.5%	116	79%	84%	
Alcohol abuse history							<.001
Yes	5	100%	11%	0	0%	0%	
No	39	22%	89%	138	78%	100%	
Substance abuse history							n.s.
Yes	2	67%	4.5%	1	33%	1%	
No	42	23.5%	95.5%	137	76.5%	99%	
Skeletal class							n.s.
I	3	30%	7%	7	70%	5%	
II	24	26%	54.5%	69	74%	50%	
III	17	21.5%	38.5%	62	78.5%	45%	
Preoperative psychiatric consultation							<.001
Yes	16	94%	36%	1	6%	1%	
No	28	17%	64%	137	83%	99%	
Major surgery-related complication							n.s.
Yes	1	17%	2%	5	83%	4%	
No	43	24%	98%	133	76%	96%	
Perioperative dexamethasone administration							n.s.
≤10 mg or no dexamethasone	18	21%	41%	67	79%	49%	
>10 mg of dexamethasone	26	27%	59%	71	73%	51%	
Surgery type							n.s.
Bilateral sagittal split osteotomy	18	23%	41%	59	77%	43%	
Le Fort I	15	24%	34%	48	76%	35%	
Bimaxillary	11	26%	25%	31	74%	23%	
SARME as preceding surgery							n.s.
Yes	1	11%	2%	8	89%	6%	
No	43	25%	98%	130	75%	94%	

*To ascertain the degrees of independence, categorical variables were tested with Pearson chi-square analysis. Student *t* test was used to compare differences between study groups in age.
†Such as all patients receiving LeFort I-surgery.
N.s., nonsignificant; *SARME*, surgically assisted rapid maxillary expansion.*P* value > .05

hyperactivity disorder have an onset in childhood.[26] Patients' increased interest in general health after surgery could explain the rising occurrence of these conditions.

Patients with different malocclusions[27] and dentofacial deformities[25] have been described to have significantly different psychiatric profiles. Here, we found no association between skeletal class discrepancies and preceding or postoperative morbidity, postoperative major complications, or type of surgery. Previous prospective research supports these findings, with patients who received bimaxillary, Le Fort I, or BSSO surgery feeling similarly about their postoperative recovery 1 month after surgery.[28] Additionally, it appears that there is no difference in treatment lengths between patients with and without self-reported mental health problems.[29] However, we found that high dexamethasone administration was associated significantly with postoperative psychiatric morbidity (Table IV).

Glucocorticoid use is common in OS,[30] and the benefits on peri- and postoperative recovery include the prevention of nausea[31] and reduction of pain and swelling specifically in OS patients.[32] However, glucocorticoids have side effects,[32] and research regarding OS is incomplete.[33] Here, the overall distribution between low (10 mg or less or no dexamethasone) and high (>10 mg of dexamethasone) total glucocorticoid dose was equal in the studied patients (Table I). Up to 92%

Table IV. Associations between explanatory variables, surgery related predictors, and new or exacerbated psychiatric morbidity after orthognathic surgery

	Patients with new or exacerbated psychiatric morbidity, N = 12 (7% of 182): mild or moderate n = 8, severe n = 3			*Patients without new or exacerbated psychiatric morbidity, N = 170 (93% of 182)*			*P value**
Age							n.s.
Range	21-52			19-61			
Mean	34			33			
Median	38			30			
Characteristic	n	% of n†	% of 12	n	% of n†	% of 170	
Sex							n.s.
Male	4	5%	33%	72	95%	42%	
Female	8	7.5%	67%	98	92.5%	58%	
Smoking							.041
Yes	5	14%	42%	30	86%	18%	
No	7	5%	58%	140	95%	82%	
Alcohol abuse history							.002
Yes	2	40%	17%	3	60%	2%	
No	10	6%	83%	167	94%	98%	
Substance abuse history							n.s.
Yes	1	33%	8%	2	67%	1%	
No	11	6%	92%	168	94%	99%	
Skeletal class							n.s.
I	1	10%	8%	9	90%	5%	
II	5	5%	42%	88	95%	52%	
III	6	8%	50%	73	92%	43%	
Preceding psychiatric disorder: severe n = 5, mild or moderate n = 4							< .001
Yes	9	20.5%	75%	35	79.5%	21%	
No	3	2%	25%	135	98%	79%	
Preoperative psychiatric consultation							< .001
Yes	6	35%	50%	11	65%	6.5%	
No	6	4%	50%	159	96%	93.5%	
Major surgery related complication							n.s.
Yes	1	17%	8%	5	83%	3%	
No	11	6%	92%	165	94%	97%	
Perioperative dexamethasone administration							.006
≤10 mg or no dexamethasone	1	1%	8%	84	99%	49%	
>10 mg of dexamethasone	11	11%	92%	86	89%	51%	
Surgery type							n.s.
Bilateral sagittal split osteotomy	4	5%	33%	73	95%	43%	
Le Fort I	4	6%	33%	59	94%	35%	
Bimaxillary	4	9.5%	33%	38	90.5%	22%	
SARME as preceding surgery							n.s.
Yes	0	0%	0%	9	100%	5%	
No	12	7%	100%	161	93%	95%	

*To ascertain the degrees of independence, the categorical variables were tested with Pearson's chi-square analysis. Student *t* test was used to compare differences between study groups in age.
†Such as all patients receiving Le Fort I−surgery.
n.s., nonsignificant; *SARME*, surgically assisted rapid maxillary expansion.
P value > .05.

Table V. Multivariate logistic regression for postoperative new or exacerbated psychiatric morbidity after orthognathic surgery

Predictor	*B*	*SE*	*Wald*	*P value*	*Odds ratio*	*95% CI*
Age	0.007	0.034	0.042	.838	1.007	0.942 to 1.076
Smoking	0.639	0.747	0.731	.393	1.894	0.438 to 8.192
History of alcohol and/or substance abuse	0.550	1.130	0.236	.627	1.732	0.189 to 15.886
Preceding psychiatric morbidity	2.184	0.755	8.372	.004	8.878	2.023 to 38.966
>10 mg of dexamethasone	2.284	1.087	4.411	.036	9.813	1.165 to 82.680
Constant	−5.822	1.663	12.251	< .001	<0.003	

of patients with an exacerbation or a new psychiatric disorder received a high dose of dexamethasone during surgery. Dexamethasone is known to have adverse psychiatric effects on mood changes, including depression, anxiety, mania, and psychosis.[34] However, due to the small sample size of our study and the lack of previous research on psychiatric effects in OS patients, further investigations are required to confirm this association. Based on the present finding, caution should be exercised in the use of high-dose dexamethasone in this patient group. It must be emphasized that the benefits of glucocorticoids can be achieved with small single doses.[31,35]

Only 16 (36%) of the 44 patients with a previous history of psychiatric morbidity (Table III) had a psychiatric consultation before surgery. Again, no psychiatric evaluation was performed in 50% of the patients with a new or exacerbated postoperative psychiatric disorder. This highlights the need for structured evaluation of OS patients in all units providing orthognathic treatment. Preventing psychiatric morbidity in patients receiving OS care and bringing psychiatric care closer to the patients should be the main objectives. Before beginning OS treatment, it would be optimal if patients were evaluated by a mental health professional who can identify and assess patients with severe psychiatric morbidities or unstable mental health. These patients are more likely to require psychiatric support throughout their OS care, so close psychiatric support must also be allocated to these patients pre- and postoperatively. In addition, patients whose mental health is regarded as good could also benefit from a structured discussion that considers the impact of OS on the psyche to prepare them for extensive surgery. As suggested by earlier studies by Kiyak et al.,[36,37] OS patients should have realistic expectations regarding OS and be aware of potential negative psychiatric and physiologic side effects.

Due to the retrospective nature of this study, some variables might have been incompletely reported in patient records. Some psychiatric diseases or exacerbations may not have been registered due to the lack of systematic evaluation of psychiatric status, which could cause an underestimation of these diseases. The 12-month follow-up period has been in standard use in previous studies investigating the psychological and psychiatric status of OS patients. However, longer effects of OS were not reported. The use of standardized questionnaires to evaluate the psychiatric status of patients during pre- and postoperative treatment phases could bring additional value to OS care and research.

Our findings emphasized the importance of evaluation of current and past psychiatric health during overall OS care. As shown in this study (Table II), a wide range of psychiatric diseases should be considered in this patient population. Orthodontists and surgeons should understand the fundamentals of mental health disorders to be able to provide proper orthognathic treatment. As stated by Juggins et al.,[38] both professionals and OS patients would benefit from collaboration between clinicians and mental health teams.

PRESENTATION

This study was accepted and presented in the session "Free Papers – Orthognathic surgery / TMJ disorders" as an oral presentation in the Face Ahead Summit held in Barcelona, Spain, 5-7 May 2022.

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DISCLOSURE

None.

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