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A prospective study of psychological adjustment during and after forehead flap nasal reconstruction

Fang-Yu Hsu [a], Yen-Chang Hsiao [b], Yi-Jen Su [c], Chun-Shin Chang [b], Cheng-I Yen [d,*]

[a] Department of Plastic and Reconstructive Surgery, Chang Gung University, Chiayi, Taiwan
[b] Elysée Aesthetic Medical Center, Taipei, Taiwan
[c] Graduate Institute of Behavioral Sciences, Chang Gung University and Department of Psychiatry, Linkou Chang Gung Memorial Hospital, Taoyuan, Taiwan
[d] Department of Plastic and Reconstructive Surgery, Aesthetic Medical Center of Chang Gung Memorial Hospital, College of Medicine, Chang Gung University, Taipei, Taiwan

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ABSTRACT

The psychological effects of staged nasal reconstruction with a forehead flap were prospectively investigated.

Thirty-three patients underwent nasal reconstruction with forehead flaps between March 2017 and July 2020. Three questionnaires were used to assess psychosocial functioning before surgery (time 1), 1 week after forehead flap transfer (time 2), 1 week after forehead flap division (time 3), and after refinement procedures (time 4). The patients were categorized into three groups according to the severity of nasal defects. Between- and within-group comparisons were conducted.

All patients reported increased satisfaction with their appearance during nasal reconstruction. For most patients, levels of distress and social avoidance were highest before reconstruction (time 1). Both levels decreased as reconstruction advanced, and were significantly improved by times 3 and 4. The stage of reconstruction had a greater effect on these levels than did severity of nasal defect.

Nasal reconstruction with forehead flap is beneficial physically and psychologically. Psychological evaluation before and after surgery facilitates patient–surgeon interactions and further enhances outcomes.

1. Introduction

One of the most important but commonly neglected functions of the face is social communication (Jack, 2015). Facial deformities, both congenital and acquired, adversely affect social functionality regardless of age, gender, and educational level (Rankin, 2003). Studies have revealed that facial disfigurement causes depression, anxiety, low self-esteem, interpersonal tension, and social avoidance (Partridge, 1993; Ye, 1998; Butler, 2000). The nose, being in the center of the face, plays a vital role in body image and has psychological importance (Goin, 1991; Amodeo, 2007). According to the literature, appearance-related social dysfunction has roots in anxiety and depression, and may lead to social avoidance (Partridge, 1993; Ye, 1998; Tebble et al., 2006). To more comprehensively understand the psychological adjustment of patients with nasal defects, patient-report questionnaires have been used to study appearance satisfaction, anxiety, depression, and social avoidance.

To achieve ideal nasal reconstruction outcomes in patients with nasal defects, the forehead flap is the preferred method because the pedicle is reliable, the soft tissue is ample, and the skin texture match is excellent (Brodland, 2005; Menick, 2009; Correa et al., 2013; Shokri et al., 2019). However, it is a staged procedure, and patients endure the inconvenience of facial deformities and healing for 2–4 weeks before flap division. This lengthy process may increase patients' psychological distress, but this aspect of reconstruction has not been thoroughly studied. Previous studies have been largely retrospective and focused on psychological effects after rhinoplasty, whereas nasal reconstruction with a forehead flap has been barely studied. Therefore, our purpose was to prospectively investigate patients' psychological adjustment and the effect of nasal reconstruction with a forehead flap on social functioning.

2. Materials and methods

This prospective study was conducted at Chang Gung Memorial Hospital, Taipei, Taiwan after approval by the Institutional Review Board of Chang Gung Medical Foundation (no. 201700397B0). Between

* Corresponding author.
E-mail address: a9281@cgmh.org.tw (C.-I. Yen).

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March 2017 and July 2021, 33 patients underwent standard two- or three-stage nasal reconstruction with a forehead flap, performed according to basic aesthetic subunit principles (Burget, 1985). The three-stage technique was performed in cases involving deeper layers and more complex defects that necessitated cartilage grafts or inner lining reconstruction. The two-stage technique is typically reserved for patients with comorbidities rather than those seeking solely aesthetic improvement.

Patients younger than 18 years and those with known preoperative psychological problems were excluded. In total, 33 patients were enrolled, and 23 (15 men and 8 women) completed all questionnaires. The patients' average age was 46 ± 17.82 years (range 19–85 years). Patients' working status, marital status, level of education, and number of nasal subunits involved were recorded for analysis. Defects were classified into three categories according to the aesthetic subunit principles described by Burget and Menick: single subunit ($n = 7$); subtotal (nasal defects involving two to eight nasal subunits, $n = 12$); and total (nasal defects involving all nine nasal subunits, $n = 4$). In one patient the nasal deformity was congenital, and in another the deformity involved a congenital melanocytic nevus; the other nasal deformities were caused by basal cell carcinoma ($n = 5$), squamous cell carcinoma ($n = 3$), traumatic injury ($n = 1$), benign tumor ($n = 3$), burn ($n = 7$), and post-rhinoplasty complications ($n = 2$) (Fig. 1).

Thorough preoperative counseling and education were provided to patients routinely before the operation. To evaluate the outcomes, patients filled out validated questionnaires at four time points: before the operation (time 1), 1 week after the first stage of forehead flap transfer (time 2), 1 week after forehead flap division (time 3), and after refinement procedures (time 4), which were performed, on average, 23.6 ± 13.7 months (range 4–48 months) after the initial reconstruction. Patients completed questionnaires at the time of their preoperative consultation and at the postoperative follow-up in the clinic or, at the outbreak of coronavirus disease 2019 (COVID-19), by phone because patients were discouraged from going to the hospital unless absolutely necessary.

2.1. Questionnaires

2.1.1. General Appearance Satisfaction

The patients' overall satisfaction with their facial appearances and nasal appearances, and how normal they considered their appearances, were assessed with the five-question General Appearance Satisfaction (GAS) questionnaire: (1) 'How satisfied are you with your overall appearance?'; (2) 'How satisfied are you with your nasal appearance?'; (3) 'How attractive do you think you are?'; (4) 'To what extent do you think your nose is different from normal?'; and (5) 'To what extent do you think your overall appearance is different from normal?' Patients responded on a seven-point Likert scale from 1 (questions 1–3: 'very unsatisfied'; questions 4 and 5: 'not at all') to 7 (questions 1–3: 'very satisfied'; questions 4 and 5: 'very different'). Higher scores indicate greater satisfaction with facial or nasal appearance.

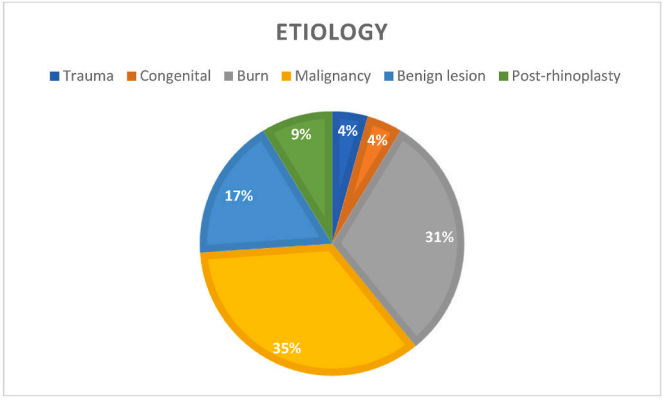

Fig. 1. Etiologies of nasal deformity.

2.1.2. Taiwanese Derriford Appearance Scale

The Derriford Appearance Scale (DAS) is a well-established self-report measure of appearance-related distress and psychosocial dysfunction, which has been validated in clinical and research settings (Harris and Carr, 2001; Cogliandro et al., 2020). Two versions of the DAS, the DAS59 and DAS24, were originally developed; Moss and Liu subsequently revised the DAS24 and translated it into the Taiwanese 19-item version (DAS19) to address cultural differences between Western and East Asian populations (Moss and Liu, 2015). The DAS19 reflects three factors: appearance-related social avoidance (five items), social distress (nine items), and negative affect (five items). Participants rate 15 items on a 5-point scale of frequency and severity (0 = 'not applicable' to 4 = 'very/almost always'); the other four items are rated on a 4-point scale (1–4). The total score ranges from 0 to 76, and higher scores indicate higher levels of appearance-related distress and psychosocial dysfunction. The DAS19 has satisfactory reliability and good convergent validity in Taiwanese communities, and in visibly different populations of patients (those with burns and those with cleft lip/palate).

2.1.3. Depression, anxiety, and Stress Scale-21

The Depression, Anxiety, and Stress Scale-21 (DASS-21) is a 21-item self-reported assessment of the severity of negative emotional syndrome. This assessment consists of three subscales: Depression, Anxiety, and Stress, each with seven items. The Depression and Anxiety subscales were used in this study; the Depression subscale reflects symptoms such as dysphoria and low self-esteem, and the Anxiety subscale reflects symptoms such as subjective and somatic symptoms of anxiety (Lovibond, 1995). Items are rated on a 4-point severity or frequency scale; the total score ranges from 0 to 42, and higher scores indicate greater emotional disturbance. The internal consistencies for these subscales in a normative sample were satisfactory (0.91 for the Depression subscale and 0.84 for the Anxiety subscale). (Lovibond, 1995).

2.1.4. Statistical analysis

IBM SPSS Statistics version 20.0 (IBM Corporation, Armonk, NY, USA; released 2011) was used to perform all analyses. The Friedman test with a post-hoc Bonferroni test was performed to compare the outcomes of interest across time points; one-way analysis of variance and independent-samples *t*-tests for intergroup comparisons according to defect severity; and generalized estimating equations (GEEs) to examine the effects of time points and the severity of nasal defects on the outcomes of interest. Statistical significance was assumed for p values < 0.05.

3. Results

Among the 23 patients in the study, the major causes of nasal defect — in 61% of cases — were malignancy and burn (Fig. 1). Table 1 lists the four sets of scores on the three questionnaires (GAS, DAS19, and DASS21) by cause of defect. The GAS score increased gradually, from 15.27 to 27.78; in contrast, the DAS19 and DASS21 scores decreased from 34 to 24.57 and 8.57 to 2.7, respectively (Fig. 2). For patients with single-subunit defects and subtotal nasal defects, the GAS scores increased as reconstruction proceeded, whereas the patients with total nasal defects had greater appearance satisfaction only at time 4 (Fig. 3). The DAS19 scores for patients with subtotal defects increased at time 2 but later decreased, while those for patients with single-unit defects and of those with total nasal defects decreased constantly (Fig. 4). For patients with single-unit defects and those with subtotal defects, the DASS21 scores were increased at time 2 and then decreased; for the patients with total defects, however, the DASS21 scores decreased as

Table 1
All outcome measures among groups and across time points.

Measures	Time point	Single subunit ($N = 7$)	Subtotal defect ($N = 12$)	Total defect ($N = 4$)	All ($N = 23$)
GAS	Time 1	13.71 ± 8.69 (5–31)	14.68 ± 6.5 (5–25)	16.6 ± 9.27 (5–29)	15.26 ± 7.7 (5–31)
	Time 2	17.43 ± 12.29 (5–35)	16.17 ± 8.32 (15–32)	16.8 ± 8.68 (5–29)	16.74 ± 9.5 (5–35)
	Time 3	21.14 ± 7.73 (13–35)	20.94 ± 6.92 (14–32)	16.8 ± 7.81 (10–23)	21.17 ± 7.14 (13–35)
	Time 4	28.43 ± 4.31 (22–35)	26.84 ± 3.92 (22–32)	22.6 ± 3.33 (25–31)	27.78 ± 3.67 (22–35)
DAS-19	Time 1	35.86 ± 14.86 (18–60)	32.29 ± 8.14 (22–44)	37.25 ± 5.93 (32–47)	34 ± 10.26 (18–60)
	Time 2	30.85 ± 16.16 (16–57)	35 ± 12.81 (17–56)	29.5 ± 8.2 (21–40)	33.91 ± 13.33 (16–57)
	Time 3	23.14 ± 8.03 (15–35)	26.64 ± 6.53 (18–39)	28.5 ± 9.34 (30–53)	26.91 ± 7.83 (15–53)
	Time 4	21.43 ± 9.16 (15–41)	24.68 ± 6.63 (20–41)	24.5 ± 6.84 (18–36)	24.57 ± 7.64 (15–41)
DASS-21	Time 1	6.57 ± 6.16 (0–17)	7.78 ± 6.31 (0–24)	12.75 ± 10.78 (3–31)	8.52 ± 7.48 (0–31)
	Time 2	8 ± 10.91 (0–30)	8.69 ± 7.27 (0–25)	10.75 ± 11.48 (2–30)	8.91 ± 9.15 (0–30)
	Time 3	1.43 ± 1.81 (0–5)	2.64 ± 2.78 (1–11)	1.75 ± 0.83 (1–3)	2.38 ± 2.38 (0–11)
	Time 4	1.43 ± 2.15 (0–5)	3.44 ± 6.58 (0–21)	0.5 ± 0.88 (0–2)	2.7 ± 5.1 (0–21)

Note: time 1: preoperative; time 2: 1 week after forehead flap transfer; time 3: 1 week after forehead flap division; time 4: final outcome after refinement procedures.
GAS = General Appearance Satisfaction; DAS-19 = Derriford Appearance Scale 19-item version; DASS-21 = Depression, Anxiety, and Stress Scale-21.

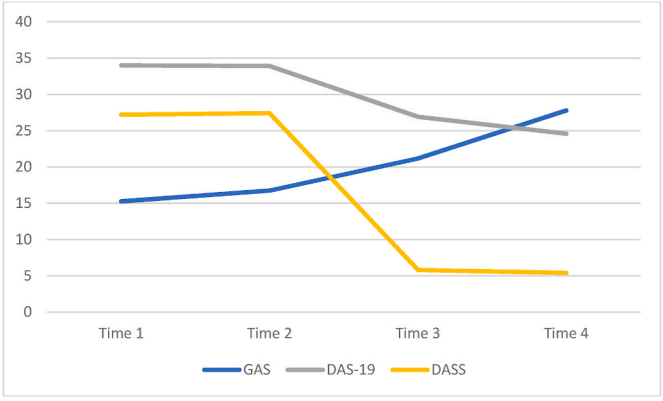

Fig. 2. The trends of the three questionnaires across time points for the total sample. GAS = General Appearance Satisfaction; DAS19 = Derriford Appearance Scale 19-item version; DASS21 = Depression, Anxiety, and Stress Scale-21.

reconstruction progressed (Fig. 5).

Nonparametric tests revealed that patients' satisfaction with their appearances had improved significantly by times 3 and 4 ($p < 0.05$). The forehead flap transfer did not adversely affect patients' satisfaction with nasal appearance. The DAS19 and DASS21 scores indicated that patients' psychological distress was lessened significantly at times 3 and 4 ($p < 0.05$). The differences between times 1 and 2 did not reach

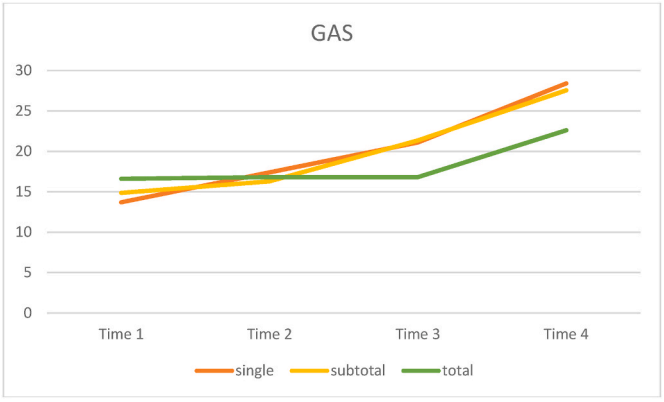

Fig. 3. The trend of the GAS score among subgroups across time points. GAS = General Appearance Satisfaction.

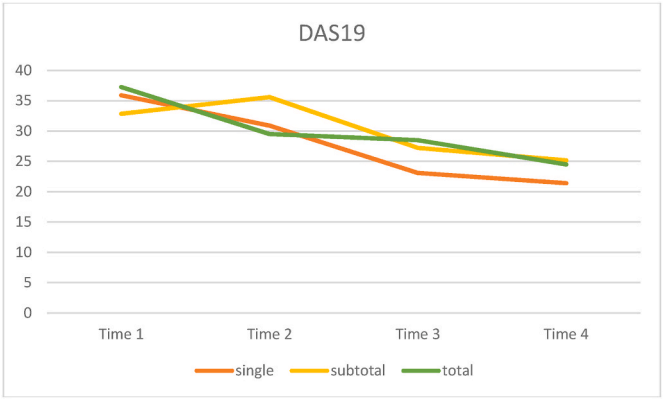

Fig. 4. The trend for DAS19 scores among subgroups across time points. DAS19 = Derriford Appearance Scale 19-item version.

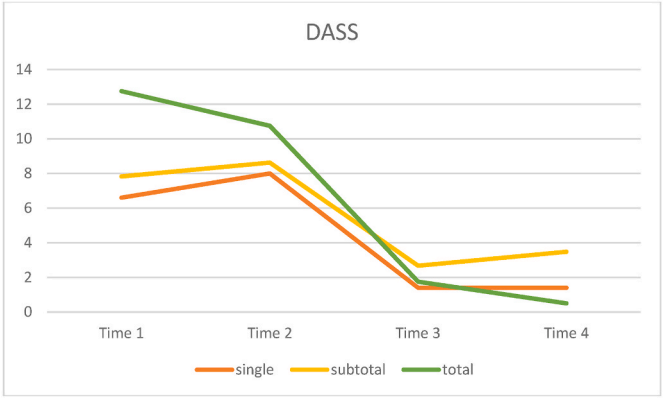

Fig. 5. The trend for DASS21 scores among subgroups across time points. DASS21 = Depression, Anxiety, and Stress Scale-21 (note: only depression and anxiety items were adopted).

statistical significance across the outcome measures.

GEEs were also used to examine the effects of time points and defect severity on patients' satisfaction and distress. There was a significant difference for time points but not for defect severity: patients' satisfaction with appearance improved and psychological distress lessened significantly at later stages of reconstruction ($p < 0.05$) (Table 2).

Table 2
Results for GEE analysis.

GEEs (p-value)	GAS	DAS-19	DASS
Defect severity	0.936	0.697	0.5
Time point	0.000*	0.000*	0.004*

*$p < 0.05$.

4. Discussion

Nasal appearance is important because of its central position in the face (Amodeo, 2007), and the structure of the nose significantly affects body image and psychological well-being (Babuccu et al., 2003; Amodeo, 2007; Moolenburgh et al., 2009). In the field of facial plastic surgery, the quality of outcomes is often judged according to the subjective impressions of the patients, which might more precisely reflect patient satisfaction and psychological adjustment (Kosowski et al., 2009; Pepper et al., 2012; van den Elzen et al., 2012; van Zijl et al., 2019). Hence, in this study, patient-reported questionnaires were used to assess the patients' psychological adjustment and social functionality.

Previous studies have demonstrated that the severity of nasal defects was not correlated with patients' satisfaction, and subjective satisfaction was the only confirmed predictor of patients' social functioning (Moolenburgh and Hofer, 2008; van den Elzen et al., 2012). Therefore, the patient-reported GAS questionnaire was used to measure subjective perception. Scores on the DASS21 Depression and Anxiety subscales have been shown to be highly correlated with scores on the Beck Depression Inventory and various anxiety inventories, and thus those subscales were utilized to investigate anxiety and depression (Lovibond, 1995). To better examine the effect of facial disfigurement on psychosocial adjustment, the DAS scale was introduced — a widely used and validated measure in the field of appearance psychology (Kütük, 2019; Lin et al., 2022; Nikita and Kumar, 2022). To account for cultural differences, the Taiwanese DAS19, developed by Moss and Liu, was used to investigate appearance adjustment in a Taiwanese population (Moss and Liu, 2015).

In our study, patients' satisfaction with their appearances increased as reconstruction proceeded, and was significantly improved by times 3 and 4, in contrast to some disappointment about nasal appearance at time 2. The results of the DASS21 and DAS19 scores also demonstrated that psychological distress did not increase at time 2, and was in fact significantly improved by times 3 and 4, which followed the pattern of the GAS scores. One subgroup analysis revealed a trend of increased DASS21 scores among patients with single-unit and subtotal deformities at time 2, and increased DAS19 scores among the latter group at time 2; however, these increases were not statistically significant. GEE analysis revealed that differences between scores at different time points were statistically significant, whereas differences in scores among patients with different degrees of defect severity were not.

These results suggest that, in contrast to defect severity, reconstruction stage has a greater effect on patients' satisfaction with appearance and their psychological distress. These findings also highlight the importance of explaining the details of the procedure to patients, to help them be prepared mentally for difficulties during the reconstruction process.

Literature regarding the associations among psychological distress, appearance anxiety, and surgical treatment is sparse (Ye, 1998; Moolenburgh et al., 2009; Clarke et al., 2012; Kütük, 2019). Only a few studies have focused on psychological morbidity in relation to facial deformity (Partridge, 1993; Ye, 1998; Tebble et al., 2006). According to our results, all steps of forehead flap reconstruction of nasal defects could result in better satisfaction with appearance and significantly decrease anxiety, depression, and social avoidance in the meantime. Physicians should monitor patients' conditions closely, provide emotional support, and offer timely psychiatric intervention as required. Nonetheless, understanding how surgery might help address psychological issues requires further study.

Our study had several limitations. First, different causes of nasal deformity may have had different psychological effects on participants. The focus of this study was on the psychological effects of nasal reconstruction with forehead flap; therefore, all origins of nasal deformity were included. Second, the sample size was relatively small, and the power to detect differences between groups may have been insufficient. Finally, selection bias may have resulted from loss of certain patients to follow-up, which might have been attributable the overwhelming distress resulting from further treatment and follow-up.

5. Conclusions

Forehead flap nasal reconstruction not only improves patients' satisfaction about their nasal appearances, but also helps relieve their psychological distress and increase social confidence. The process, albeit tedious, is beneficial and rewarding, both physically and mentally.

Disclosure

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Declaration of competing interest

None.

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