

PATIENT SATISFACTION AFTER SANDWICHED DOUBLE-BAR REPAIR FOR PECTUS EXCAVATUM

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ABSTRACT

Background: Pectus excavatum may affect body appearance, psychosocial well-being, and quality of life. Data on patient satisfaction after double-bar repair in Vietnam remain limited. Objective: To evaluate satisfaction with quality of life after sandwiched double-bar repair for pectus excavatum and identify associated factors.

Methods: This analytical cross-sectional study combined retrospective medical record review with postoperative patient interviews. A total of 111 patients with congenital pectus excavatum who underwent sandwiched double-bar repair at the University Medical Center Ho Chi Minh City from November 2022 to November 2024 were included. Satisfaction with quality of life was assessed using the Single Step Questionnaire (SSQ) 6 months after surgery. Fisher's exact test was used to analyze factors associated with satisfaction.

Results: The overall satisfaction score was 3.77 ± 0.24 , and the overall satisfaction rate was 87.4% (97/111). The highest satisfaction rate was observed in the social domain (86.5%), followed by psychological well-being (80.2%), cosmetic appearance (73.9%), physical function (66.7%), and body perception (60.4%). Early and late postoperative complications were significantly associated with satisfaction after surgery ($p < 0.001$ and $p = 0.012$, respectively).

Conclusion: Sandwiched double-bar repair for pectus excavatum achieved a high level of satisfaction with quality of life. Prevention of complications, pain control, and management of discomfort related to the implanted bars should be emphasized to improve postoperative patient experience.

Keywords: Pectus excavatum; sandwiched double-bar repair; quality of life; satisfaction

1. INTRODUCTION

Congenital pectus excavatum is a common deformity of the anterior chest wall, which may cause body deformity and affect the aesthetic appearance, psychosocial status, and cardiopulmonary function of patients [1, 2]. The Nuss procedure is a minimally invasive method that uses a metal bar placed behind the sternum to elevate and correct the chest wall without the need for sternal or costal cartilage resection [3, 4]. Along with the development of the technique, many modifications of the Nuss procedure have been proposed to improve treatment effectiveness and reduce complications. Among them, sandwiched double-bar correction, defined as the use of an internal retrosternal bar and an external presternal bar fixed together with screws, is applied to increase chest wall stability and improve correction in selected complex or asymmetric cases of pectus excavatum [5, 6].

In addition to correction effectiveness, postoperative complications and patient experience are important factors that should be considered when evaluating treatment outcomes [7, 8]. In particular, because congenital pectus excavatum greatly affects body appearance, self-confidence, and social activities, satisfaction and quality of life after surgery are practically meaningful criteria in evaluating treatment effectiveness. In a study of 98 adult patients undergoing the Nuss procedure, the results after bar removal showed an overall satisfaction rate of 94.4%; among the patients who responded to the survey, 89.7% were satisfied with the postoperative chest shape. However, this study also recorded that 4.1% of patients required reoperation due to bar displacement, and some cases of dissatisfaction were related to postoperative chest pain or surgical scars [9]. In Vietnam, data specifically on satisfaction with quality of life after sandwiched double-bar correction remain limited. In addition, satisfaction assessed at 6 months after surgery may reflect patients' early postoperative experience while the

bars remain in place. Therefore, this study was conducted to evaluate satisfaction with quality of life 6 months after sandwiched double-bar correction for congenital pectus excavatum at the University Medical Center Ho Chi Minh City and to explore selected factors associated with satisfaction.

2. METHODS

2.1. Study design

This was an analytical cross-sectional study, combining retrospective medical record review and postoperative patient interviews.

2.2. Patients

Patients with congenital pectus excavatum treated with sandwiched double-bar repair at the University Medical Center Ho Chi Minh City.

Inclusion criteria included: (1) congenital pectus excavatum; (2) treatment with sandwiched double-bar repair at the University Medical Center Ho Chi Minh City.

Exclusion criteria included: (1) medical records with insufficient research data; (2) patients who had previously undergone surgery for pectus excavatum; pectus excavatum due to trauma; or pectus excavatum accompanied by complex chest wall deformities such as sternal cleft or Poland syndrome; (3) failure to complete the interview questionnaire.

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2.3. Study time and location

The study was conducted from November 2022 to November 2024 at the Department of Thoracic and Vascular Surgery, University Medical Center Ho Chi Minh City.

2.4. Sample size and sampling method

The study applied total sampling. All patients with congenital pectus excavatum who underwent double-bar placement surgery and met the selection criteria were included in the analysis.

2.5. Study variables

The primary outcome variable was satisfaction with quality of life after surgery, assessed using the Single Step Questionnaire (SSQ). The results were divided into two groups: satisfied and not satisfied. Patients were classified into the satisfied group when the SSQ score reached 50 points or higher, corresponding to 70% of the maximum total score; cases with an SSQ score below 50 points were classified into the not satisfied group.

The satisfaction aspects assessed included: physical, social, cosmetic, body perception, and psychological aspects.

Some related factors analyzed included: sex, BMI (Body mass index) classification, preoperative Haller severity, early complications, and late complications. Early complications were defined as complications occurring during surgery and within 30 days after surgery. Late complications were defined as complications occurring after 30 days postoperatively.

2.6. Data collection tools and methods

Research data were collected from electronic medical records using a predesigned data collection form. The recorded information included baseline characteristics, clinical characteristics, paraclinical characteristics, surgical characteristics, postoperative characteristics, early complications, late complications, and satisfaction with quality of life.

Satisfaction with quality of life was assessed using the Single Step Questionnaire (SSQ), which was introduced and validated for patients with pectus excavatum by Krasopoulos et al. The SSQ includes 16 items covering five domains: physical function, social function, cosmetic appearance, body perception, and psychological well-being. Items 1–7 and 10–15 are scored on a 5-point Likert scale, whereas items 8 and 9 are scored using a 10-point visual analogue scale. For the total SSQ score, all items are summed, with the difference between item 8 and item 9 used as a single score component according to the scoring instruction of the instrument [10].

Patients were classified as satisfied when the total SSQ score was ≥ 50 points and not satisfied when the total SSQ score was < 50 points. Information on satisfaction with quality of life was collected by telephone interview with patients 6 months after the date of surgery. Verbal informed consent was obtained before the telephone interview, and patients could decline participation in the interview.

2.7. Study procedure

The researchers and collaborators accessed the electronic medical records of patients with congenital pectus excavatum treated with bar placement surgery during the study period. Records that met the selection criteria were included for collection of baseline information, clinical and paraclinical characteristics, surgical characteristics, postoperative information, and complications. Information on early complications was recorded from the date of surgery to 30 days after surgery; late complications were recorded after 30 days postoperatively. Information on satisfaction with quality of life was collected 6 months after the date of surgery.

2.8. Data processing and analysis methods

Data were entered and managed using Microsoft Excel, then analyzed using Stata 17.0 software. Qualitative variables were presented

as frequencies and percentages. Quantitative variables were presented as means and standard deviations. Fisher's exact test was used to compare the factors of sex, BMI classification, Haller severity, early complications, and late complications between the satisfied and not satisfied groups. Statistical significance was defined as $p < 0.05$.

2.9. Research ethics

The study was approved by the Ethics Committee in Biomedical Research of the University of Medicine and Pharmacy at Ho Chi Minh City according to Decision No. 813/HDDD-DHYD dated September 22, 2023.

3. RESULTS

3.1. General characteristics of the study subjects

The study recorded 111 patients with congenital pectus excavatum who underwent double-bar placement surgery and had data on satisfaction with quality of life after surgery. Among them, males accounted for the majority with 94 cases, and females accounted for 17 cases. According to BMI classification, the underweight group accounted for the highest proportion with 86 cases, followed by the normal BMI group with 24 cases and the overweight group with 1 case. Regarding preoperative Haller severity, there were 41 mild cases, 23 moderate cases, 42 severe cases, and 5 very severe cases.

3.2. Satisfaction with quality of life after surgery

The overall satisfaction score with postoperative quality of life was 3.77 ± 0.24 points. The overall satisfaction rate for the entire scale was 87.4%, corresponding to 97/111 patients. When analyzed by each aspect, the social aspect had the highest satisfaction rate at 86.5%, followed by the psychological aspect at 80.2% and the cosmetic

aspect at 73.9%. The physical aspect had a satisfaction rate of 66.7%. The body perception aspect, including the perception of pain and the perception of the presence of metal bars, had the lowest satisfaction rate at 60.4% (Table 1).

Table 1. Satisfaction rate with quality of life according to each domain of the SSQ scale

Domain	Mean score	Satisfaction rate, n (%)
Physical	3.81 ± 0.61	74 (66.7)
Social	4.06 ± 0.56	96 (86.5)
Cosmetic	3.99 ± 0.58	82 (73.9)
Psychological	4.05 ± 0.55	89 (80.2)
Body perception	3.88 ± 0.65	67 (60.4)
Overall satisfaction	3.77 ± 0.24	97 (87.4)

3.3. Some factors related to satisfaction with quality of life

No statistically significant association was recorded between satisfaction with quality of life and sex, BMI classification, or preoperative Haller severity. The satisfaction rate was 87.2% in males and 88.2% in females ($p > 0.99$). According to BMI classification, the satisfaction rates in the underweight, normal, and overweight groups were 88.4%, 83.3%, and 100%, respectively ($p = 0.564$). According to Haller severity, the satisfaction rates in the mild, moderate, severe, and very severe groups were 85.4%, 91.3%, 88.1%, and 80.0%, respectively ($p = 0.805$) (Table 2).

In contrast, early and late complications were statistically significantly associated with satisfaction with quality of life after surgery. The group with early complications had a lower satisfaction rate than the group without early complications, 55.6% and 93.6%, respectively ($p < 0.001$). Similarly, the group with late complications had a lower satisfaction rate than the group without late complications, 40.0% and 90.5%, respectively ($p = 0.012$) (Table 2).

Table 2. Association between satisfaction with quality of life and some related factors

Characteristic	Satisfied, n (%)	Not satisfied, n (%)	p
Sex			> 0.99
Male	82 (87.2)	12 (12.8)	
Female	15 (88.2)	2 (11.8)	
BMI classification			0.564
Underweight	76 (88.4)	10 (11.6)	
Normal	20 (83.3)	4 (16.7)	
Overweight	1 (100)	0 (0)	
Preoperative Haller severity			0.805
Mild	35 (85.4)	6 (14.6)	
Moderate	21 (91.3)	2 (8.7)	
Severe	37 (88.1)	5 (11.9)	
Very severe	4 (80.0)	1 (20.0)	
Early complications			< 0.001
Yes	10 (55.6)	8 (44.4)	
No	87 (93.6)	6 (6.4)	
Late complications			0.012
Yes	2 (40.0)	3 (60.0)	
No	86 (90.5)	9 (9.5)	

Fisher's exact test.

4. DISCUSSION

4.1. Overall level of satisfaction with quality of life after surgery

In this study, the overall satisfaction rate with quality of life after sandwiched double-bar repair surgery was 87.4%. This result shows that most patients had a positive perception after surgery. This is an important point because congenital pectus excavatum is not only a body deformity

but also affects the psychological status, self-confidence, and social activities of patients.

The satisfaction rate in our study is within the range reported in international studies. Sacco Casamassima et al. recorded that results after bar removal achieved an overall satisfaction level of 94.4%, of which 89.7% of patients who responded to the survey were satisfied with their chest shape after surgery [9]. Viggiano et al. also recorded that the proportion of patients who rated their quality of life as “better” or “much better” after the Nuss procedure was 84.1% at 3 months, 86.0% at 12 months, and 91.4% at 24 months [11]. Thus, the result of 87.4% in this study is consistent with the general trend of the literature, showing that double-bar placement surgery may provide a high level of satisfaction with quality of life after surgery.

The systematic review and meta-analysis by Mohamed et al. also showed that minimally invasive repair of pectus excavatum is associated with improved quality of life, especially in the aspects of self-esteem and the impact of the chest on social activities [12]. This is consistent with the results of our study, in which the social and psychological aspects were the two aspects with high satisfaction rates.

4.2. Differences between satisfaction aspects

Among the aspects of the SSQ scale, the social aspect had the highest satisfaction rate, reaching 86.5%, followed by the psychological aspect at 80.2%. This result suggests that after the chest shape is improved, patients may become more confident in communication, daily activities, and participation in social activities. This is a result with practical significance, because many patients with congenital pectus excavatum seek treatment due to functional symptoms and body-image concerns.

The cosmetic aspect reached a satisfaction rate of 73.9%. This rate was lower than the social

and psychological aspects, but still showed that most patients were satisfied with the corrective results after surgery. Cosmetic satisfaction after surgery may be influenced by many factors such as chest wall symmetry, surgical scars, preoperative expectations, and the personal perception of each patient. In the study by Sacco Casamassima et al., some patients who were not satisfied with the overall outcome were related to postoperative chest pain or surgical scars [9]. This shows that cosmetic results depend not only on the chest shape after correction but also on postoperative experience.

The body perception aspect had the lowest satisfaction rate, reaching 60.4%. This result is consistent with the characteristics of the Nuss procedure, because patients still carry metal bars in the chest for a long time after surgery. Pain, discomfort, a feeling of obstruction, or awareness of the presence of the bars may reduce the level of satisfaction in this aspect. Sacco Casamassima et al. suggested that postoperative pain may be a factor that dominates patients' perception of the recovery process. Therefore, pain control, preoperative counseling, and postoperative activity guidance are contents that should be emphasized to improve patient experience [9].

4.3. Some factors related to satisfaction

The study did not record a statistically significant association between overall satisfaction and sex, BMI classification, or preoperative Haller severity. This result shows that satisfaction after surgery may not completely depend on baseline characteristics or the initial degree of deformity. Instead, patients' perceptions may be influenced by many other factors such as actual cosmetic results, pain level, complications, preoperative expectations, and the recovery process.

Norlander et al.'s study on patients after the Nuss procedure recorded that male sex, younger age at surgery, and having had the bar removed were associated with better quality of life after surgery [13]. The difference between that study and our results may be related to differences in

study design, assessment time point, characteristics of the study population, and measurement tool. In our study, satisfaction was assessed in patients who had undergone double-bar placement surgery after bar placement, whereas many international studies evaluated patients at different stages, including after bar removal.

The group with early complications had a markedly lower satisfaction rate than the group without early complications. Similarly, the group with late complications also had a lower satisfaction rate than the group without late complications. This is reasonable because complications may increase pain, prolong recovery time, increase the number of follow-up visits, cause anxiety, and reduce patients' confidence in treatment outcomes.

This result is also consistent with studies emphasizing the role of complications and postoperative pain in evaluating Nuss procedure outcomes. Coughlin et al. showed that older age increased the risk of complications after the Nuss procedure [7]. Therefore, complication prevention and systematic postoperative follow-up are important conditions for improving patient satisfaction.

4.4. Significance of assessing quality of life using SSQ

In this study, satisfaction with quality of life was assessed using the SSQ scale. This is an appropriate tool because it can reflect many aspects directly related to patient experience after pectus excavatum surgery, including physical, social, cosmetic, body perception, and psychological aspects.

Zuidema et al. suggested that SSQ results in patients with pectus excavatum may depend on the assessment phase [14]. This is very important when interpreting the results of our study, because patients were assessed while still in the postoperative stage after double-bar placement surgery. At this time point, patients may have had

clear improvement in body appearance and psychosocial status, but still experienced pain, obstruction, or discomfort due to the metal bars. This may explain why the social and psychological aspects had high satisfaction rates, while the body perception aspect was lower.

4.5. Limitations of the study

First, this was a cross-sectional study combining retrospective medical record review and interviews, so information bias from medical records and recall bias were difficult to avoid. Second, there were no preoperative quality-of-life data to assess the degree of change over time. Finally, the study was conducted at a single center, so caution is needed when generalizing the results to other facilities. In addition, the analysis of factors associated with satisfaction was limited to bivariate comparisons. Because the number of patients in the not-satisfied group was small, multivariable logistic regression was not performed. Therefore, the reported associations should be interpreted as exploratory and unadjusted.

5. CONCLUSION

In this single-center cross-sectional cohort, satisfaction with quality of life was assessed 6 months after sandwiched double-bar correction for congenital pectus excavatum. The overall satisfaction rate was 87.4%, with the highest satisfaction observed in the social domain and the lowest in the body perception domain. Early and late postoperative complications were associated with lower satisfaction. These findings suggest that complication prevention, pain control, and preoperative counseling may be important practical considerations to improve postoperative patient experience.

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