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The relationship between anxiety and postoperative pain after Laparoscopic Sleeve Gastrectomy; A prospective cohort study

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Abstract

Background: Anxiety is an emotional situation marked by apprehension, agitation, tachypnea, tachycardia and hypertension. There has been a recent rise in the amount of patients who have undergone surgery for morbid obesity. The STAI anxiety scale was the primary tool for measuring anxiety levels.

Aim: The purpose of this research was to evaluate the levels of anxiety in patients with morbid obesity both before and after surgery and to identify the factors that contribute to this anxiety.

Methods: This is a prospective cohort study that uses quantitive descriptive methodology. The study included 129 patients planned for laparoscopic sleeve gastrectomy. The STAI anxiety scale was used to assess anxiety levels both before and after surgery. The patients' pain levels were assessed using VAS during the postoperative period.

Results: In comparison of genders, female patients' pre-op anxiety levels were statistically significantly higher (p= 0.001). The anxiety levels differed significantly between preoperative and postoperative patients. Even it has not reached a significant level, the elderly group had lower pre-op anxiety scores than the others, but higher post-op anxiety scores. Educational level didn't effect anxiety scores. The correlation between patients' anxiety levels and VAS pain levels was found to be statistically significant (p=0.001).

Conclusions: Anxiety plays a significant role in influencing postoperative pain and the subsequent analgesic needs after sleeve gastrectomy procedures. Postoperative pain is the primary cause of perioperative anxiety. Females exhibit higher preoperative anxiety levels than males.

Key words: Anxiety; Postoperative pain; Visual Analog Pain Scale; Sleeve Gastrectomy; Bariatric surgery

1. Introduction

Anxiety is a common emotional state charactarized by apprehension, agitation, tachypnea, tachycardia and hypertension[1]. The most prevalent form of perioperative anxiety is apprehension of death. Affected patients also worry about postoperative pain, the effects of anesthesia, being unable to work, being separated from relatives, being unable to perform daily routines, and having a lower standard of life. The expression of anxiety among surgical patients can be shaped by multiple factors, including prior medical experiences, inherent personality traits, concerns about anesthesia, anticipation of postoperative pain, and the complexity of the surgical procedure.[2]

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Postoperative complications have decreased with the introduction of laparoscopy and new techniques in the surgical treatment of morbid obesity, and there is growing evidence that bariatric surgery is the most effective method for weight loss. Although many different techniques are used in bariatric surgery, they are all based on three basic principles. These consist of methods such as adjustable gastric banding and sleeve gastrectomy that reduce food intake by only restricting the stomach, methods based on reducing the digestion of food by malabsorption with by-pass of the upper digestive system such as biliopancreatic diversion and doudenal switch, and methods including both restriction and bypass such as gastric bypass method.[3] There is no consensus on which surgical technique is best for which obese patient and the amount of weight lost varies depending on the surgical technique used.

The objective of our study was to assess the levels of anxiety before and after the surgery, identify the factors that contribute to these levels, and examine the impact of preoperative information on anxiety levels. The State-Trait Anxiety Inventory (STAI) anxiety scale was employed for this purpose.

2. Materials and Methods

The study comprised patients aged 18 to 65 who were scheduled for laparoscopic sleeve gastrectomy at our clinic, with a total of 129 participants included. Those with a history of alcoholism, drug addiction, or psychiatric or neurological disorders were excluded from the study (Figure 1). After recording age, gender, education level, and previous anesthesia experience using the one-on-one interview method, we used the most commonly used anxiety scale, namely Spielberger et al.'s Trait Anxiety Inventory (STAI) scale, to assess the preoperative anxiety level.[4] The STAI is a 40-item questionnaire evaluating trait (20 items) and state (20 items) anxiety; greater anxiety is reflected by higher scores. After giving information about general anesthesia and surgery to all patients, they were informed about the VAS (Visual Analog Scale) pain scoring system, in which they would score the severity of pain they felt in the postoperative period between 0 and 10. In this study, the postoperative pain experienced by the participants was determined based on the mean pain scores at 0, 2, 4, 6,12 and 24 hours after surgery. Moreover, the duration of the surgical procedure, the duration of anesthesia were meticulously recorded.

Standart LSG and anesthesia technique were performed for all patients. During surgery, five incisions were made. Three of them were 5 mm, one was 10 mm and one was 15 mm lenght. A thirty-eight Fr calibration tube was used. The stomach was divided by similar staples. Analgesia was provided by paracetamol and opiods. The patient's adjusted body weight (ABW) was calculated and all drug dose adjustments were made according to ABW. Premedication was achieved with midazolam 0.03 mg/ kg. Anesthesia induction was performed with fentanyl 2 μg/kg, propofol 2 mg/kg, rocuronium 0.6 mg/kg. Infusion of remifentanil (0.1-0.3 μg/kg/min) is continued during the operation. To reduce postoperative nausea and vomiting, ranitidine 50 mg, metoclopramide 20 mg were administered. Tramadol 100 mg, and 1 g of paracetamol IV were administered for analgesia.

To measure the anxiety levels of the patients 12 to 24 hours following surgery, the STAI questionnaire was administered again via one-on-one interview. The form was deemed invalid if more than three questions were not answered in the STAI questionnaire. The STAI score of each patient was calculated at the conclusion of the questionnaire. The same physician explained the surgical technique and anesthesia to all of the patients. The STAI and VAS questionnaires were filled out by the same bariatric nurse.

Furthermore, participants received a comprehensive list containing 15 items that covered various aspects of anesthesia and surgery. Afterward, they were asked to prioritize their most significant sources of concern.

The present study was carried out in compliance with the guidelines set forth in the Declaration of Helsinki, which was established by the World Medical Association. The Institutional Review Board (IRB) approved the study protocol (2021-18342), and all study participants provided informed consent prior to their inclusion in the study.

2.1. Statistical Analysis

Statistical analyses were conducted to compare variables between groups. Categorical variables were analyzed using the Chi-square test, while continuous variables were analyzed using either Student's t-test (for normally distributed variables) or the Mann-Whitney U test/Kruskal Wallis analysis of variance (for non-normally distributed continuous or ordinal variables). When a difference was found between the groups as a result of Kruskal Wallis analysis of variance, multiple comparison test was applied to determine which group differed from the others. Intragroup comparisons were made with the Wilcoxon test in paired samples. SPSS version 11.0 package program was used for statistical evaluation, $p<0.05$ value was considered statistically significant.

3. Results

This study comprised 129 participants with an avarage age of 43.1±18.5 years. The sociodemographic characteristics of all patients are shown in Table 1. A significant reduction was observed when comparing preoperative and postoperative periods ($p<0.05$) (Table 2). When analyzing the association between age groups and STAI scores, the older group (51-65 years) exhibited lower preoperative anxiety scores compared to both the young (18-30 years) and middle-aged (31-50 years) group. In the postoperative period, the anxiety scores of the older group were higher than the other age groups. However, these differences were not statistically significant. The analysis of patients' educational status revealed that those with a university degree had higher preoperative anxiety scores compared to other groups. On the other hand, postoperative anxiety scores were lower in high school graduates when compared to other groups. It was observed that individuals with a university degree derived more benefits from receiving information about their surgery. However, these differences did not reach statistical significance. Furthermore, no significant relationship was found between previous surgical history and STAI scores (Table 3).

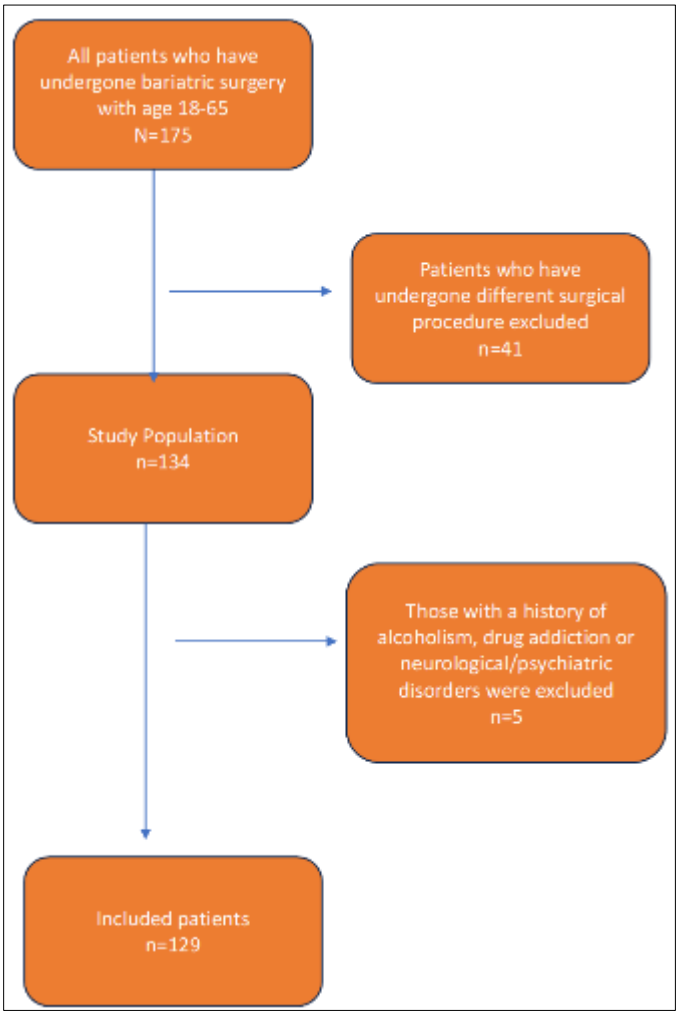

Figure 1 Flowchart of the study

An analysis of the relationship between gender and STAI scores revealed that females had significantly higher preoperative scores ($p<0.05$). However, when postoperative scores were examined, no significant difference was found between males and females, although the anxiety levels of females were observed to be higher than those of males ($p=0.05$) (refer to Table 4 for more details).

The anxiety scores measured by STAI decreased in 100 out of 129 patients, while they increased in the remaining 29 patients after surgery compared to their preoperative levels. The statistical analysis showed that the mean VAS pain score was significantly higher in patients whose STAI scores had increased compared to those with decreased STAI scores (6.0 ± 1.80 vs 3.0 ± 2.10; $p=0.001$) (Table 5).

Table 1 Patients' Demographic variables and perioperative parameters affecting anxiety

	n (%)
Gender	
Male	25 (%19.3)
Female	104 (%80.6)
Education	
High school	79 (%61.2)
University	50 (%38.75)
Age	
18-30	45 (%34.8)
31-50	55 (%42.6)
51-65	29 (%22.4)

Table 2 Preoperative and postoperative STAI scores of the patients

Preoperative (n=129)	**Postoperative (n=129)**	**p**
40.3 ± 12.33	37.6 ± 11.28	0.001*

Mean ± sd, p < 0.05 significant; *Paired t-test

Table 3 Relationship between age groups and preoperative-postoperative STAI scores

	Preoperative	**Postoperative**	**p**
Age groups			
18-30 (n=45)	42.0 ± 12.6	39.3 ± 9.8	0.38*
31-50 (n=55)	42.4 ±10.6	38.4 ± 10.7	
51-65 (n=29)	36.1 ± 8.6	39.4 ± 11.3	
Education			
High School (n=79)	37.8 ± 10.3	35.2 ± 10.0	0.45**
University (n=50)	42.6 ± 11.3	36.6 ± 7.8	0.08**
Previous Surgery			
No (n=40)	40.9 ± 11	38.0 ± 11.2	0.55**
Yes (n=89)	40.3 ± 12	37.2 ± 9.7	0.45**

Mean ± sd, p < 0.05 significant; *Wilcoxon test; **Paired t-test

Table 4 Relationship between gender and STAI

	Male (n=25)	**Female (n=104)**	**p**
Preoperative	36.1 ± 7.90	45.0 ± 10	0.001*
Postoperative	36.2 ± 10.20	38.4 ± 10	0.05*

Mean ± sd, p < 0.05 significant; *Paired t-test

Table 5 Correlations between postoperative anxiety and postoperative VAS pain scores.

	VAS Score	**p**
Postoperative anxiety decreased (n:100)	3.0 ± 2.12	0.001*
Postoperative anxiety increased (n:29)	6.0 ± 1.80	

Mean ± sd, $p < 0.05$ significant; *Student t-test

The analysis also identified the primary factors contributing to preoperative anxiety, which encompassed concerns about failure to regain consciousness after the procedure (20%), being in the intensive care unit (10%), complications such as leakage and bleeding (10% each), as well as postoperative pain (20%). Also, the study investigated the main concerns of the patients regarding postoperative period. The most frequently reported issues included postoperative pain (reported by 20% of participants), leakage (20%), bleeding (10%), insufficient weight loss (10%), cosmetic skin problems (8%), and physical deformities (8%) (Table 6).

Table 6 Causes of concerns

Anesthesia	**Preoperative (%)**	**Postoperative (%)**
1-Anesthesiologist's lack of knowledge	5	0
2-Anesthesiologist's lack of experience	5	0
3- Failure to regain consciousness	20	0
4-Intraopertive awareness	5	0
5-Intensive care hospitalization	10	2
SURGERY		
6- Pain	20	20
7- Leak	10	20
8- Bleeding	10	10
9- Nausea-Vomiting	5	5
10- Thrombosis	5	5
POSTOPERATIVE PERIOD		
11- Ineffective weight loss	3	10
12- Physical deformities	0	8
13- Weight regain	1	5
14- Cosmetic skin problems	1	8
15- Excessive weight loss	0	7

4. Discussion

Anxiety plays a significant role in perioperative comfort. In our study, we observed that female patients experience higher levels of preoperative anxiety compared to males following LSG surgery. Moreover, there was a correlation between increased anxiety and higher postoperative pain scores among the patients. However, we did not find any significant association between education level and anxiety in this study. Interestingly, both preoperative and postoperative questionnaires identified postoperative pain as the primary cause of anxiety among participants.

Anxiety is a multifaceted emotion of uncertain origin, encompassing fear, distress, and apprehension about potential negative outcomes. It arises as a natural response when an individual perceives a lack of safety in their surroundings and serves as an alert mechanism for potentially life-threatening situations.[5] Anxiety is prevalent among patients who are hospitalized, impacting approximately 10-30% of individuals. Preoperative anxiety is frequently observed in adult patients, with reported occurrence rates ranging from 11% to 80%.[2,7,8] Research indicates that this type of anxiety can detrimentally affect surgical outcomes, as it triggers the release of neuroendocrine mediators and heightens the stress response in patients. This chain of events can have adverse effects on anesthesia, postoperative recovery and

complications. [9] Notably, patients experiencing such anxiety also exhibit increased analgesic requirements during the postoperative period.[10,11] Consequently, it becomes imperative for healthcare providers to effectively address and mitigate preoperative anxiety in order to improve patient outcomes.

Anxiety levels exhibit variations based on factors such as gender, age, the complexity of the planned surgery, and prior negative surgical experiences. [12] Prior research has shown that offering patients information during the preoperative phase can lead to lowered anxiety, reduced postoperative analgesic needs, and heightened satisfaction with the surgical process as a whole.[13] Informing patients about the surgical procedure and its rationale has been found to effectively decrease anxiety levels.[14]

Spielberg et al. formed the State-Trait Anxiety Inventory (STAI) scale, which is frequently used in medicine to quantify anxiety.[15] The STAI is considered the gold standard for measuring preoperative anxiety, according to the literature. In a study with 320 patients, Moerman et al. found a significant difference between gender and anxiety, reporting higher anxiety levels in females. Similarly, in a study with 96 patients, Badner et al. reported a statistically significant difference in STAI scores between females (42.9±12.8) and males (38.2±12.3). Our study revealed that in the preoperative period, the STAI scores of female patients were significantly higher compared to male patients. However, in the postoperative period, although the anxiety levels of females were higher than males, this difference did not reach statistical significance.

Previous studies have yielded inconsistent results on the relationship between age and preoperative anxiety. Some studies found no significant effect of age on preoperative anxiety, while others reported higher anxiety levels in specific age groups. [7,17,18] For instance, Calvin et al.[19] conducted a study on 106 orthopedic patients and compared the preoperative anxiety levels of young, middle-aged, and elderly patients. They found no significant difference in preoperative anxiety levels among the three age groups. Ramsay[20] attributed high anxiety levels in middle-aged patients to their higher family responsibilities, while Grabow[21] reported high anxiety levels in young people. On the other hand, Shevde[22] found lower preoperative anxiety levels in the elderly. In our study, we found that the elderly group (aged 51-65 years) had lower preoperative anxiety scores compared to the young (aged 18-30 years) and middle-aged (aged 31-50 years) groups. However, anxiety scores in the postoperative period were higher in the elderly group than the other groups.

While many publications report that anxiety levels increase as the education level increases, some publications reported that the duration of education is not a risk factor for anxiety. [2,7,12] Although there are data showing that patients with higher education have higher levels of anxiety because they better evaluate the risks of surgery, it is also stated that low socioeconomic level increases baseline anxiety. [2,12,23] Shevde et al.[22] reported that the profession did not affect the degree of anxiety in their study. Caumo et al.[12] reported that preoperative anxiety levels were higher in people who received more than 12 years of education and they stated that better assessment of surgery risks could increase anxiety. In our study, although it was not statistically significant, it was determined that the group that benefited most from the information was the university graduate group.

Females' preoperative anxiety levels are known to be higher than males'.[23,24] It has been proposed that this is due to females' more comfortable expression of anxiety and the fact that being away from family has a greater impact on females.[4,7,10]

It has been reported that previous anesthesia experience may have an effect on preoperative anxiety. Ramsey[20] reported that those with more than ten years of anesthesia experience had less anesthesia-related anxieties than those who had an operation in the past ten years. Domar et al.[18], on the other hand, suggested that anesthesia experience did not change the level of anxiety. In their study with 96 patients, Badner et al.[7] reported that the anxiety score of the group with anesthesia experience was statistically significantly lower than the group with no anesthesia experience. Caumo et al.[12] stated that the history of surgery did not change the level of anxiety. In our study, the relationship between the surgical history of the patients and their anxiety scores was not statistically significant.

In a study, the causes of anxiety related to anesthesia were reported as not being able to wake up, fear of masks and needles, pain during surgery, nausea and vomiting in the postoperative period, meaningless speech during anesthesia, and postoperative pain. [12] In the study of Shevde and Panagopoulos[22], anesthesia-related anxiety was reported as lack of knowledge of the anesthetist, lack of experience of the anesthetist, inability to wake up, and postoperative pain. While Chew et al.[25] reported the most worrying causes as pain and not being able to wake up after surgery, another study[26] reported the most worrying causes as waking up during surgery, not being able to wake up after surgery, and pain.[25,27] In our study, anesthesia and pain were the most common causes of anxiety in the preoperative period. In the

postoperative period, complications related to surgery and pain are among the most important causes of anxiety. Pain was the most important cause of anxiety in both periods.

It has been demonstrated that individuals with high anxiety levels experience more postoperative pain and require more painkillers.[7,28] It has been suggested that anxiety and hippocampal formation that overestimates pain severity reduces the pain threshold by enhancing the activation of the entorhinal cortex. [29]

There are some limitations of the current study. The small population of the cohort can be considered as an important limitation. Furthermore, this study did not analyze several variables that may have an effect on anxiety and pain, such as ethnicity, duration of anesthesia and operation, and occurrence of unexpected events. In addition, the survey of 15 items for ranking perioperative anxiety causes is not a standardized questionnaire; rather, it was created based on a literature review.

5. Conclusion

Preoperative and postoperative anxiety levels affect postoperative pain levels and analgesic requirements after sleeve gastrectomy. Postoperative pain is the primary cause of perioperative anxiety. Females may tend to exhibit a higher propensity for preoperative anxiety.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare that they have no conflict of interest.

Authorship Contribution

- **Conceptualization** – Hasan Erdem, Selim Sözen
- **Data curation** – Anıl Barni, Mehmet Gençtürk, Merih Yılmaz
- **Formal analysis** – Abdullah Şişik, Seyfi Emir, Merih Yılmaz
- **Funding acquisition** - Hasan Erdem, Abdullah Şişik
- **Investigation** – Selim Sözen, Anıl Barni
- **Methodology** – Selim Sözen, Abdullah Şişik
- **Project administration** – Mehmet Gençtürk, Selim Sözen
- **Resources** – Muhammed Said Dalkılıç, Merih Yılmaz
- **Software** – Mehmet Gençtürk, Anıl Barni
- **Supervision** – Abdullah Şişik, Hasan Erdem
- **Validation** – Muhammed Said Dalkılıç, Mehmet Gençtürk
- **Visualization** – Muhammed Said Dalkılıç, Seyfi Emir
- **Writing – original draft** – Selim Sözen, Hasan Erdem
- **Writing – review & editing** – Abdullah Şişik, Muhammed Said Dalkılıç

Key Points

- Perioperative anxiety and postoperative pain is correlated.
- Postoperative pain is the primary cause of perioperative anxiety.
- Females exhibit higher preoperative anxiety levels than males.

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