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Review Article

The Effect of Anxiety on Intraoperative and Postoperative Pain in Patients Undergoing Dermatologic Surgery: Learn to Manage

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ABSTRACT

Background: Dermatological surgery has a primary role in dermatologists' daily practice and is usually performed under local anesthesia. This approach required particular attention in patient management before, after, and especially during the surgical procedures. Many people experience anxiety and negative emotions when approaching surgery, and how they feel before surgery affects outcomes after surgery. **Objective:** The main goals of the present research were to measure and describe anxiety and pain in dermatologic surgery patients and to investigate the anxiety prediction power in predicting surgical pain. Anxiety has been considered at two different moments: before the surgery (preoperative anxiety) and immediately after (postoperative anxiety). Intraoperative as well as postoperative pain have been assessed. The relationships between these two main variables and other factors, including demographics, skin disease history, and vital signs, have been analyzed. **Results:** The first data concerns the number of patients who experienced preoperative clinical anxiety, which is equal to 150 (29.4%) and has been reduced to 74 (14.5%) regarding postoperative anxiety. Preoperative anxiety, but not postoperative anxiety, significantly contributes to pain prediction. Occupation and previous tumor surgery resulted the main factors associated with preoperative anxiety in intraoperative pain prediction. Diastolic blood pressure, patient occupation, and previous tumor surgery were associated with preoperative anxiety in predicting postoperative pain. **Conclusion:** Detecting anxiety pre and post-surgery in patients and knowing its relation with pain may allow corrective or palliative measures since anti-inflammatory medication may increase the risk of postoperative bleeding and complications. Patients with features linked to pain perception variation require increased attention to pain management.

1. Background

Dermatological surgery holds a significant and essential position in the daily operations of dermatologists. Dermatosurgery can be distinguished according to its purpose as diagnostic, therapeutic, reparative, or corrective. Surgical procedures vary widely, including incisional or excisional biopsies, radical excision of oncological or non-oncological lesions, mohs surgery, electrosurgery, laser surgery, or electro-chemotherapy. At the same time, reparative dermatosurgery allows for restoring the function and aesthetics of areas with significant skin tissue loss, utilizing methods such as flaps, skin grafts, and dermal substitutes [1, 2]. Therefore, a considerable number of dermatology patients are expected to undergo local anesthesia surgeries [3, 4]. This type of anesthetic approach reduces all the risks associated with general anesthesia, expanding the pool of treatable patients. On the other hand, particular attention to patient management before, after, and especially during dermatosurgical procedures is required as the patient remains conscious throughout the entire procedure.

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Approaching surgery can cause anxiety and negative emotions in many individuals [5]. There is strong evidence that a person's thoughts and emotions before surgery impact their post-surgery outcomes: negative psychological factors such as anxiety or depression have been found to predict postoperative pain [6-9]. However, most of the studies are limited to patients undergoing surgery in general anesthesia, which does not involve the intraoperative management of a conscious patient. Thus, intraoperative pain during dermatological surgery must be managed as much as postoperative pain. The extent of anxiety's impact on patients undergoing dermatological surgery remains unquantified. In literature, several reports demonstrate how patients undergoing a dermatological examination show much lower anxiety levels than those requiring a scheduled surgery [10]. Moreover, patients who undergo mohs micrographic surgery also experience anxiety caused by the risk associated with the surgery, an unfamiliar place, separation from family and friends, fear of pain, and postoperative complications [11].

The present study aims to quantify pre- and postoperative anxiety and assess the link with pain during and after dermatological surgery. Socio-demographic, psychosocial, and surgery-related factors that may affect the anxiety levels of the patients were also considered.

2. Materials and Methods

2.1. Study Design and Procedure

A multicenter cohort study was conducted at the University Hospitals of Ortona (Chieti), Brescia, Pavia, and Siena. Data collection started on 01.07.2021 and required the enrollment of at least 125 patients per site to reach a total sample of 500 patients. Patients of any age who were scheduled to undergo any dermo-surgery procedure under local anesthesia were eligible to be enrolled in this survey. Exclusion criteria included inability to understand the questions, known history of mental or psychiatric disorders, and impaired vision that could prevent patients from completing a questionnaire. In accordance with the decision of the local ethics committee, no written consent for participation was required because of the voluntary character of this anonymous survey. Eligible patients were informed about the methodology and aims of the survey and informed consent to participate was taken verbally. Following verbal consent, patients were given the questionnaire and asked to complete it, which took 5-10 minutes on average. A member of the study team was present to answer any questions the patients had. Pre- and post-surgery assessments were conducted in person with a physician.

2.2. Measures

The research protocol included questionnaires to evaluate two categories of variables: general information (demographic, medical, and dermatologic disease history) and psychological information.

2.2.1. The General Information Questionnaire

It was used to collect the patient's demographic, medical data, and information regarding dermatologic disease history. The form was divided into three parts: i) demographic information, ii) dermatologic disease history, and iii) medical information. In part i, participants were asked about gender, age, education level, birthplace, residence, occupation, and whether they were accompanied for the surgical intervention. Part ii included information regarding the dermatologic disease history and surgical history: presumptive diagnosis, body localization, type of surgery intervention, type of anesthesia, type of hospitalization, previous tumors, previous surgery interventions, and time before intervention. Part iii included questions regarding the patient's medication, the presence of allergies, as well as physiologic measurements such as heart rate (HR), systolic blood pressure (SBP), and diastolic blood pressure (DBP).

2.2.2. The Psychological Variables (Anxiety and Pain) were Measured using the Italian Version of Specific Standardized Questionnaires

2.2.2.1. The State-Trait Anxiety Inventory (STAI)

It is a commonly used measure of anxiety [12]. The STAI-Y is a variant form including 20 items to evaluate how participants feel about anxiety "at the present moment". This study applied the STAI-Y to measure preoperative and postoperative anxiety in dermatologic surgery patients. Items include: "I am tense; I am worried" and "I feel calm; I feel secure". The answers are based on a 4-point likert scale ranging from 1 (not at all) to 4 (very much so), with the total score ranging from 20 to 80, with higher scores indicating higher anxiety symptoms. A cutoff score of 40 is commonly used to define probable clinical anxiety levels. The tool has high reliability and validity. Internal consistency for the inventory in the present study was excellent (Cronbach's alpha = .81).

2.2.2.2. The Verbal Numeric Rating Scale (VNRS-11)

It has been used to measure the patient's perceived pain. The measurement has been performed in two different moments to investigate the intraoperative and postoperative pain. Scores range from 0-10 points, with higher scores indicating higher pain intensity: 0 indicate no pain, 10 worst pain imaginable, mild pain in the range of 1 to 3, moderate 4 to 7, and severe, from 8 to 10.

2.3. Statistical Analysis

Descriptive statistics were used to summarize the participant's demographic characteristics, dermatological disease history, and medical information. The t-tests were used to analyze differences between groups based on gender, age, anxiety, and pain. The sample was divided into two groups according to the STAI clinical cut-off (>40): the first group with clinical anxiety (Gr1; STAI≥40) and the second group with nonclinical anxiety (Gr0; STAI<40). This clustering was performed both preoperatively and postoperatively. As well as studying anxiety, also for pain the sample was divided into two groups according to the VNRS -11 cut-off: patients with no pain (Gr.0, VNRS-11=0) and patients with any degree of pain (Gr.1, VNRS-1l≥1). As for anxiety, it was performed both for intraoperative as well as for postoperative pain.

A series of hierarchical regression analyses were conducted to estimate the associations among the demographic characteristics, personal history of the dermatological disease, the patient's medical condition, preoperative anxiety, and postoperative anxiety in predicting pain. The first step enables the examination of the relative contributions of each

domain of predictors. For the regression model, demographic characteristics (gender, age, education level, place of birth, residence place, employment, and accompanied or not to the hospital) were entered as independent variables of pain determinants. The second step included variables representing the personal history of dermatologic disease: previous dermatological tumors, previous surgical interventions, presumptive diagnosis, tumors localization, and time intercurred until surgical intervention. The third step included variables describing the patient's medical condition: drug intake, heart rate, systolic and diastolic blood pressure, and allergies. The fourth step included preoperative and postoperative anxiety. Intraoperative pain has been considered a predicted variable in the first regression model (M1). The second regression model (M2) had postoperative pain as a dependent variable. The statistical level of .05 by two-tailed tests was set as significant, and all of the above tests were performed using SPSS version 25.0.

3. Results

3.1. Anxiety and Pain

Overall, the sample consisted of 510 patients; the first data concerns the number of patients who experienced preoperative clinical anxiety, equal to 150 (29.4%), which has been reduced to 74 (14.5%) regarding postoperative anxiety. We have established the two comparison groups (preoperative Gr1=150; Gr0=360 and postoperative Gr1=74; Gr0=436). Data collected for intraoperative and postoperative pain also shows that 164 (32,2%) patients experience pain during surgery. After surgery, pain persisted in 81 (15.9%) patients. Also, in this case, we have established the two comparison groups (intraoperative Gr0=346; Gr1=164 and postoperative Gr0=429; Gr1=81).

3.2. Demographic Characteristics and Explanatory Variables by Gender

Table 1 shows the respondents' demographic characteristics and the explanatory variables. The sample comprised 510 eligible participants who completed the research protocol, 54% (n=276) males and 45.8% (n=234) females. The mean age of the sample was 56.82 (SD=18.891). There were 267 (52.3%) participants who declared their residence in the north of Italy, 238 (46.6%) in the center of Italy, and only four (0.8%) in the south. Regarding education, 26.6% of the overall sample had completed postsecondary education, and 12.9% had received a primary education or lower.

At the moment of the evaluation, 265 participants (51.9%) were employed and had stable work. Data regarding patient skin disease and medical information reported previous tumors in 151 (29.5%) patients, while 127 (24.7%) reported previous tumor surgery. Regarding the presumptive diagnosis and the surgical intervention type, the collected data showed that 140 (27.4%) patients received a diagnosis of melanoma and sarcoma, 236 (46.2%) a carcinoma diagnosis, and 130 (25.4%) other diagnosis. Almost all participants 485 (94.9%) were admitted in the hospital in an outpatient regime for simple sporting 426 (83.4%) and received local anesthesia.

Table 1 also presents the means and standard deviations of some continuous variables describing the patient medical condition including heart rate (HR) (M=71.26, SD=10.814), systolic blood pressure (SDP) (M=135.06, SD=18.624.) and diastolic blood pressure (DBP) (M=76.47, SD=11.396) as well as the mean delay (in days) before the intervention (M=53.85, SD=80.506).

TABLE 1: Demographic characteristics.

	Variables	N=510
1.	Age – mean(SD)	56.82(18.891)
2.	Gender - n (%)	
	Female	234(45.8)
	Male	276(54.0)
3.	Residence – n(%)	
	North of Italy	267(52.3)
	Centre of Italy	238(46.6)
	South of Italy	4(0.8)
4.	Occupation – n(%)	
	Employed	265(51.9)
	Unemployed	245(47.9)
5.	Education – n(%)	
	Elementary and Secondary School	192(37.6)
	High School	192(37.6)
	University	126(24.7)
6.	Presumptive Diagnosis – n(%)	
	Melanoma, Sarcoma	140(27.4)
	Carcinoma	236(46.2)
	Other	130 (25.4)
7.	Surgical Intervention Type	
	Biopsy	46(9.0)
	Simple Excision	426(83.4)
	Enlargement	37(7.2)

8.	Time Before Intervention(days) – mean(SD)	53.35(80.506)
9.	Body Areas	
	Head and Neck	163(31.9)
	Other Body Areas	341(66.7)
10.	Hospitalization Type	
	Outpatient regime	485(94.9)
	Day Hospital	22(4.3)
	Recovery	3(0.6)
11.	Previous Tumors Surgery	
	Yes	381(74.6)
	No	127(24.9)
12.	Accompaniment	
	Yes	256(50.1)
	No	251(49.1)
13.	Medication	
	Cardiovascular and / or psychotropic	163(31.9)
	Hypoglycaemic, Hypolipidemic, Gastro and other	33(6.5)
	No Medication	314(61.4)
14.	Allergies	
	Yes	74(14.5)
	No	433(84.7)
15.	Previous Tumors	
	Yes	151(29.5)
	No	359(70.3)
16.	Heart Rate – mean(SD)	71.26(10.814)
17.	Systolic Blood Pressure – mean (SD)	135.06(18.624)
18.	Diastolic Blood Pressure – mean (SD)	76.47(11.396)

3.3. Correlations between Variables

The existence of significant linear relations between variables has been investigated using Pearson and Spearman's correlation coefficients as primary analysis. The results showed that preoperative anxiety is significantly correlated with postoperative anxiety (r=.59, p<.001), intraoperative pain (r=.17; p<.001), postoperative pain (r=.24; p<.001), and HR (r=.16, p<.001). Postoperative anxiety significantly correlated only with postoperative pain (r=.15, p=.001).

3.4. Differences between Groups

First, the differences in anxiety, pain, HR, SBP, and DBP between gender and age groups have been analyzed. The results showed a significant relationship between gender and anxiety. Females reported higher anxiety, both preoperative and postoperative, than males (Table 2). There were significant differences in preoperative and postoperative anxiety between age groups. Younger (<65 y.o.) showed higher anxiety scores than older participants (>65 y.o.). At the same time, there were no significant differences in pain between gender and age groups. As expected, physiologically, HR (p=.002), SBP (p=.007), and DBP (p=.004) were significantly different between gender groups. HR resulted higher in women than men, while men reported higher values in SBP and DBP than women (Table 2). HR (p<.05) and SBP (p<.001) resulted in significant differences between age groups. Younger persons showed higher HR values and lower SBP values than aged ones (Table 2).

TABLE 2: Differences between gender and age groups. Gender: Gr0 (Males, N=276), Gr1 (Females, N=234). Age: Gr0 (<65, N=311), Gr1 (≥65, N=195).

	Gender Gr0 N=276		Gender Gr1 N=234				Age Gr0 N=311		Age Gr1 N=195			
	M0	SD	M1	SD	t	p	M0	SD	M1	SD	t	p
Preoperative Anxiety	32.16	10.100	36.38	10.798	-4.552	**.000*** **	34.88	10.570	32.66	10.402	2.327	**.020***
Postoperative Anxiety	28.55	9.299	30.74	9.056	-2.686	**.007** **	30.33	9.195	28.32	9.273	2.393	**.017***
Intraoperative Pain	.96	1.738	1.03	1.912	-.415	.678	.96	1.803	1.05	1.860	-.551	.582

Postoperative Pain	.37	1.038	.40	1.143	-.333	.740	.35	1.070	.44	1.122	-.877	.381
Heart rate	69.86	10.553	72.92	10.907	-3.172	**.002****	72.06	11.254	69.99	10.093	2.123	**.034***
Systolic Blood Pressure	137.13	18.600	132.63	18.398	2.691	**.007****	131.80	17.975	139.88	18.657	-4.780	**.000*****
Diastolic Blood Pressure	77.83	10.875	74.87	11.803	2.902	**.004****	76.01	11.148	76.98	11.747	-.924	.356

Values are significant for *p<0.05, **p<0.01 and ***p<0.001.

In the second step, the differences between anxiety groups as described before (clinical group (Gr1; STAI≥40) and nonclinical group (Gr0; STAI<40) have been studied. The results of the scholar t-test for independent groups are presented (Table 3). There are significant differences between the two preoperative anxiety groups. Three out of five variables, intraoperative pain (p=.002), postoperative pain (p=.000), and heart rate (p=.004), presented essential differences between the clinical and nonclinical groups. The patients with clinical preoperative anxiety presented higher intraoperative and postoperative pain scores than those with normal preoperative anxiety. These results have not been confirmed in postoperative anxiety groups. The patients with clinical postoperative anxiety reported only higher postsurgical pain than the standard postoperative anxiety group.

TABLE 3: Differences between anxiety groups pre-surgery and post-surgery. Gr.0 (STAI<40), Gr.1 (STAI≥40).

	I Pre-operative Anxiety						II Post – operative Anxiety				.,	
	Gr. 0 (N=360)		Gr. 1 (N=150)				Gr. 0 (N=436)		Gr. 1 (N=74)			
	IM0	SD	IM1	SD	t	**p**	IIM0	SD	IIM1	SD	t	**p**
Intraoperative pain	.83	1.621	1.38	2.181	-3.107	**.002****	.94	1.742	1.25	2.221	-1.322	.187
Postoperative pain	.22	.772	.77	1.542	-5.361	**.000*****	.34	.999	.65	1.484	-2.273	**.023***
Heart rate	70.37	9.928	73.44	12.476	-2.909	**.004****	71.03	10.626	72.68	11.850	-1.202	.230
Systolic blood pressure	134.70	18.071	135.92	19.907	-.664	.507	134.49	18.477	138.48	19.258	-1.673	.095
Diastolic blood pressure	76.17	10.931	77.18	12.435	-.898	.898	76.09	11.158	78.75	12.566	-1.824	.069
Postoperative anxiety	27.02	7.798	35.63	9.623	**-9.717**	**.000*****	-	-	-	-	-	-
Preoperative anxiety	-	-	-	-	-	-	32.26	9.469	44.91	10.700	-9.548	.000***
Time before intervention	52.62	81.928	55.07	77.317	-.320	.749	54.17	84.039	48.46	55.136	746	.457
Age	57.13	18.967	56.05	18.749	.558	.557	56.91	18.981	56.30	18.475	.260	.795

Values are significant for *p<0.05, **p<0.01 and ***p<0.001.

In the third step, the differences between the pain groups (no pain: Gr.0, VNRS-11=0 and patients with any degree of pain: Gr.1, VNRS-11≥1) in preoperative anxiety, postoperative anxiety, intraoperative pain, postoperative pain, HR, SBP, DBP, time delay and age have been assessed (Table 4). As for intraoperative pain, the results of the scholarly t-test for independent groups showed that preoperative anxiety (p=.006) and postoperative pain (p<.001) were significantly different between the two pain-related groups. At the same time, there was no significant difference in postoperative anxiety for these groups. There were significant differences between these groups for physiological variables: HR (p=.003), SBP (p<.05), and DBP (p<.001). The time delay before surgical intervention resulted in significant differences between the related groups for intraoperative pain (p<.05) (Table 4). Between the two postoperative pain groups, preoperative anxiety (p<.001), postoperative anxiety (p=.002), and intraoperative pain (p<.001) resulted significantly different. Only two physiologic variables showed significant

differences: HR (p<.05) and DBP (p=.001). There was a moderately significant difference in time delay before intervention (p<.05) (Table 4).

TABLE 4: Differences between intraoperative and postoperative pain groups. Gr.0 no pain (VNRS-11=0), Gr.1 any degree of pain (VNRS-11≥1). Values are significant for *p<0.05, **p<0.01 and ***p<0.001

	I Intra-operative pain						II Post-operative pain					
	Gr. 0 (N=324)		Gr. 1 (N=164)				Gr. 0 (N=429)		Gr. 1 (N=81)			
	IM0	SD	IM1	SD	t	**p**	IIM0	SD	IIM1	SD	t	**p**
Preoperative anxiety	33.34	10.061	36.12	11.413	**-2.759**	**.006****	33.01	10.225	40.02	10.908	**-5.474**	.000***
Postoperative anxiety	29.45	9.075	30.31	9.242	-.980	.328	29.01	9.147	32.42	9.280	**-3.071**	**.002****
Heart rate	70.14	10.033	73.23	11.646	**-3.027**	**.003****	70.75	10.650	74.03	11.322	**-2.486**	**.013***
Systolic blood pressure	134.06	17.546	138.11	20.628	**-2-242**	**.025***	134.47	18.315	138.16	20.007	-1.618	.106
Diastolic blood pressure	73.73	10.455	81.80	11.489	**-7.699**	**.000*****	75.71	11.145	80.44	11.935	**-3.148**	**.001****
Postoperative pain	.09	.489	1.01	1.620	**-9.412**	**.000*****	-	-	-	-	-	-
Intraoperative pain	-	-	-	-	-	-	.57	1.193	3.09	2.758	**-8.227**	**.000*****
Age	57.35	18.552	55.93	19.104	.785	.433	56.83	18.490	56.75	20.999	.033	.974
Time before intervention	46.57	82.541	66.54	78.548	**-2.592**	**.010***	49.56	77.649	73.01	91.989	**-2.412**	**.016***

3.5. Intraoperative and Postoperative Pain - Prediction Models

The pain prediction has been investigated in two ways: first using anxiety (preoperative and postoperative) as unique predictors in a simple regression analysis, and second using anxiety in association with other variables (demographic, medical, disease history) in a hierarchical multiple regression analysis. The differences between the results of the two regression analyses have been investigated. The results of the simple regression analysis showed that the model having preoperative and postoperative anxiety as unique predictors explained only 4% of intraoperative pain (F=7.992, P<.001) and 6% of postoperative pain (F=15.183, p<.001). Preoperative anxiety resulted as the main predictor in both intraoperative (β=.187, p<.001) and postoperative pain (β=.241, p<.001), while the participation of postoperative anxiety in predicting surgical pain was not significant (Table 5). A series of hierarchical regression analyses have been conducted to examine the associations between demographic characteristics, personal dermatologic disease history, medical condition, and preoperative and postoperative anxiety in predicting patients perceived pain (Table 5).

TABLE 5: Regression analysis.

MODEL M1 **Predicted Variable – Intraoperative Pain**	**R^2**	**Adj. R^2**	**SE**	**R_2 Change**	**F Change**	**P F Change**	**F**	**p**
Step 1	.051	.037	1.824	.051	3.495	**.001****	3.495	**.001****
Step2	.079	.055	1.806	.028	2.750	**.010***	3.224	**.000*****
Step3	.149	.116	1.746	.070	7.253	**.000****	4.568	**.000*****
Step4	.178	.142	1.721	.028	7.551	**.000*****	5.003	**.000*****
MODEL M2 **Predicted Variable –Postoperative Pain**								

Step 1	.052	.038	1.096	.052	3.693	**.001*** **	3.693	**.001*** **
Step 2	.085	.062	1.082	.033	3.372	**.005** **	3.614	**.000*** **
Step 3	.119	.086	1.068	.033	3.469	**.004***	3.639	**.000*** **
Step 4	.171	.138	1.037	.054	14.839	**.000*** **	5.014	**.000*** **

	b	***SE***		***t***	***p***
MODEL M1 – INTRAOPERATIVE PAIN (Dependent Variable)					
Predictors					
Age	-.010	.006	-.101	-1.723	.086
Gender	-.068	.169	-.018	-.403	.687
Birth Place	.335	.275	.090	1.221	.223
Residence	.209	.291	.056	.719	.472
Education	.073	.200	.019	.367	.713
Occupation	-.457	.205	-.123	-2.224	**.027***
Accompaniment	.317	.177	.085	1.789	.074
Previous Tumors	.019	.204	.005	.091	.928
Previous Tumors Surgery	.500	.224	**.119**	**2.229**	**.026***
Body Zones	-.222	.187	-.055	-1.190	.235
Presumptive Diagnosis	.374	.222	.085	1.684	.093
Time Before Intervention	.000	.001	.017	.362	.718
Medication	.002	.050	.002	.048	.962
Allergies	.468	.245	.087	1.908	.057
Heart Rate	.016	.008	.087	1.877	.061
Systolic Blood Pressure	.000	.006	-.001	-.019	.985
Diastolic Blood Pressure	.034	.010	.209	**3.450**	**.001*** **
Preoperative Anxiety	.033	.010	.187	**3.209**	**.001*** **
Postoperative Anxiety	.002	012	-.008	-.144	.886
MODEL M2 – POSTOPERATIVE PAIN (Dependent Variable)					
Predictors					
Age	-.006	.003	-.094	-1.626	.105
Gender	-.072	.100	-.032	-.727	.468
Birth Place	.071	.159	.032	.448	.655

Residence	.091	.169	.041	.541	.589
Education	.087	.118	.038	.737	.462
Occupation	-.384	.123	**-.174**	**-3.173**	**.002****
Accompaniment	.173	.105	.078	1.655	.099
Previous Tumors	.063	.124	.026	.521	.602
Previous Tumors Surgery	.189	.133	.075	1.419	.157
Body Zones	-.305	.111	**-.125**	**-2.755**	**.006****
Presumptive Diagnosis	.263	.131	**.100**	**2.015**	**.045***
Time Before Intervention	.001	.001	.047	1.033	.302
Medication	-.009	.030	-.015	-.309	.758
Allergies	.362	.144	**.112**	**2.510**	**.012***
Heart Rate	.006	.005	.052	1.153	.249
Systolic Blood Pressure	.005	.003	.081	1.392	.164
Diastolic Blood Pressure	.002	.006	.023	.389	.698
Preoperative Anxiety	.025	.006	**.241**	**4.224**	**.000*****
Postoperative Anxiety	.002	.007	.013	.235	.814

Values are all significant for *p<0.05, **p<0.01 and ***p<0.001.

The regression analysis to predict perceived pain during surgery intervention (M1) and pain after surgery intervention (M2) showed significant changes for each class of variables added to the models. The results, including the significance coefficients of change in the four regression steps, are summarized in (Table 4). The final moderated linear regression models are presented in (Table 5). The model M1 [F (19) = 5.003, p = <.001)] accounted for approximately 18% of the variance in intraoperative pain (perceived pain during the surgery intervention) (R2 = .178 [Adj R2 = .146], F-change = 7.771, p < .001). DPB (β=.209, p=.001), preoperative anxiety (β=.187, p=.001), occupation (β=-.123, p<.05), previous tumors surgery (β=.119, p<.05) were found to be significant predictors of intraoperative pain.

The model M2 [F (19) = 5.014, p = <.001)] also accounted for approximately 17% of the variance in postoperative pain (perceived pain after surgery intervention) (R2 = .166[Adj R2 =.138], F-change = 14.839, p < .001). Preoperative anxiety (β=.241, p<.001), occupation (β=- .174, p=.002), body zones (β=-.125, p=.006), allergies (β=.112, p<.05), and presumptive diagnosis (β=.10, p<.05), were found to be significant predictors of postoperative pain (Table 5).

4. Discussion

Dermatologists must be able to manage all the risks associated with surgical procedures. Dermatologic surgery may be complicated by various events that may enhance morbidity and discomfort: necrosis may develop in extensive skin grafts, operative or postoperative bleeding, surgical site infections, and intraoperative and postoperative pain. The nature of skin surgery and the type of anesthesia may enhance patients' anxiety and pain perception risk [13]. Patient management must include evaluation and control of intraoperative pain and postoperative pain. Patient anxiety can interfere with surgical performance by causing significant discomfort for some patients: it also could induce hemodynamic instability, such as high blood pressure, tachycardia or syncope, and mostly modulating pain. [14]. Most of the studies published on pain are limited to patients undergoing surgery in general anesthesia, which does not involve the intraoperative management of a conscious patient. Thus, intraoperative pain during dermatological surgery must be managed as much as postoperative pain. The burden of anxiety in patients undergoing dermatological surgery has not yet been deeply investigated. In the literature, we find reports demonstrating how patients undergoing a dermatological surgical procedure show much lower levels of anxiety than those requiring a programmed surgery [10]. Moreover, patients undergoing Mohs micrographic surgery also experience anxiety due to the risk associated with performing surgery in an unfamiliar place, and many other characteristics, including fear of pain [11].

Pain and anxiety management is crucial in dermatologic surgery. The only published work assessing both intraoperative pain and anxiety, in a cohort of patients operated for varicose veins, reported that intraoperative anxiety and pain ratings were significantly lower when

participants interacted with doctors and nurses, used stress balls, or watched a DVD during surgery versus treatment conducted as usual [15]. On the other hand, some anxiety-reducing strategies, such as listening to music, failed to induce any effect in patients but had some on surgeons [16].

One of the main goals of the present research was to measure and describe anxiety and pain in dermatologic surgery patients and to investigate the anxiety prediction power in estimating surgical pain to give surgeons a model to better manage patients with higher pain risk. Pain prediction was investigated in two ways: first, using anxiety as a unique predictor in a simple regression analysis, and second, using anxiety in association with other variables in a hierarchical multiple regression analysis. The differences in the results of the two types of regression analysis have been evaluated. Anxiety has been considered at two different moments of skin intervention: prior to the intervention (preoperative anxiety) and immediately after completing the intervention (postoperative anxiety). Patient's perceived pain has been another essential variable of the study. The intraoperative pain, as well as the postoperative pain, have been assessed. The relationships between these two main variables and a series of factors have been analyzed. These include demographics, skin disease history, and medical factors. Our study demonstrates that anxiety persists after surgery in almost half of clinically anxious patients before the intervention. There is an essential relationship between preoperative anxiety and perceived pain, both intraoperative and postoperative.

Furthermore, females and younger participants reported more preoperative and postoperative anxiety than males and older participants. The prediction models revealed that preoperative anxiety significantly contributes to pain prediction. Preoperative anxiety's predictive power is higher when associated with other factors. Occupation referred allergy to previous tumor surgery, and specific body location of the excised lesions were found to be significant predictors of postoperative pain. It is somewhat likely that patients may have lived a distressful moment consequent to previous skin tumor excision and would be more anxious for a second surgery procedure. Also, people already stressed by the fear of allergy may raise their stress perception for the procedure that needs anesthetic injections that could be perceived as potentially allergic. So, it would be rational to raise the attention to pain management in this patient.

One other publication has studied, with hierarchical multivariable regression analysis, the impact of several features on pain during surgical treatment for De Quervain's, a procedure that could be compared to skin surgery. In this work, baseline pain variance was explained chiefly by pain catastrophizing, emotional distress, and illness perception. These findings are not far from ours as features of patient's distress and anxiety may dictate a large part of patients' pain [17].

5. Conclusions

After most uncomplicated procedures, postoperative pain can be adequately managed with acetaminophen or ibuprofen [18]. However, in a prospective study, approximately one-third of patients were also given prescriptions for opioids after dermatologic surgery [19]. Detecting anxiety pre- and post-surgery in patients and knowing its relation with pain may allow the opportunity for corrective or palliative measures since anti-inflammatory medication may increase the risk of postoperative bleeding and other postoperative complications. It would be rational to pay more attention to pain management in patients with specific characteristics that are strongly associated with differences in pain perception (female, young, with previously excised tumors). Further work should consider if these or other factors could also be associated with postoperative pain.

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None.

Conflicts of Interest

None.

Data Availability Statement

The datasets analyzed during the current study are available from the corresponding author on reasonable request.

Ethics Statement

This work was conduced according to Declaration of Helsinki ethical principles.

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