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Research Article

COMPARISON OF DISCOMFORT IN THE PALATAL DONOR AREA AFTER FREE GINGIVAL GRAFT WITH THREE DIFFERENT PAIN SCALES

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ABSTRACT

The aim of this study was to evaluate the pain experienced by patients after free gingival graft (FGG) surgery using three different pain scales – the Visual Analog Scale (VAS), the Numeric Rating Scale (NRS), and the Verbal Rating Scale (VRS) – and to compare the effectiveness of these scales in pain assessment. Thirty-six individuals aged between 18 and 53 years, comprising 27 females (75%) and 9 males (25%), were included in the study. A single researcher assessed the pain of the participants using the different scales on the 3rd day, 7th day, 14th day, and the 1st month after FGG surgery. Data were analyzed using IBM SPSS Statistics 22 (IBM SPSS, Turkey). Positive, high-level, and statistically significant correlations were observed among the three scales (p<0.05). Additionally, the age of the patients correlated significantly with VAS/NRS scores on the 14th day, and with the VRS score on the 7th day (p<0.05). Our findings suggest that VAS, NRS, and VRS scales can all be used for pain assessment after FGG surgery, although VAS may offer an advantage in scientific studies due to its wide evaluation range and the ability to utilize parametric data.

INTRODUCTION

Pain is defined by the International Association for the Study of Pain (IASP) as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage" (Merskey, 1986). Postoperative pain begins with surgical trauma, ends with tissue healing, and is often a well-localized type of acute pain (Eti Aslan, 2006). The intensity of such pain may vary depending on factors such as the type and extent of the incision, as well as individual characteristics. In addition, the perception of pain is influenced by variables such as age, gender, cultural differences, past experiences, and psychological state. Therefore, accurate pain assessment is critical for enhancing patient comfort and ensuring effective pain management (Aslan, 2006; Uysal, Eratilla, Topbaş, Ergül & Çelik, 2022). Recent comprehensive reviews have emphasized that unidimensional scales such as the Visual Analog Scale (VAS), the Numeric Rating Scale (NRS), and the Verbal Rating Scale (VRS) are foundational tools for acute postoperative pain evaluation.

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Nevertheless, the selection of the appropriate scale must align with clinical objectives and patient factors (Robinson et al., 2024).

Free gingival graft (FGG) surgery is a common procedure aimed at strengthening gingival tissues and improving periodontal health. The graft material is harvested from the palate, resulting in the formation of a secondary wound at the donor site. Although the wound typically heals within 2-4 weeks, patients may experience complications such as pain, paresthesia, mucoceles, herpetic lesions, and bleeding during the healing period (H.L. Wang, Bunyaratavej, Labadie, Shyr & MacNeil, 2001). Pain is the most frequently reported concern, and a major factor that directly affects patient comfort. Thus, pain management and assessment after FGG surgery are of critical importance to ensure patient satisfaction during the healing process (Dahl, 1996).

Nevertheless, pain is an individual and subjective experience, which makes its evaluation challenging. Pain assessment scales aim to measure the sensory component of pain (Birol, 2004; Briggs & Closs, 1999). VAS, NRS, and VRS are among the most commonly used unidimensional scales for assessing pain (Ergün et al., 2007; McCaffery & Pasero, 1999). The VAS uses a line on which subjects mark their pain level, while NRS assigns a numerical value to pain perception. On the other hand, VRS requires patients to select a descriptive word that best represents their pain level. Although these scales have been validated as reliable tools for pain assessment, they exhibit differences in terms of sensitivity, clinical applicability, and patient comprehensibility. Nevertheless, the effectiveness of the pain scales, particularly in the context of oral and maxillofacial surgeries, has been extensively reported in literature (Philip, 1990; Sirintawat et al., 2017; Williamson & Hoggart, 2005). There is limited research on the comparative advantages and accuracy of these scales, making it challenging for researchers to select the appropriate scale. In this study, we compared the efficacy of VAS, NRS, and VRS in measuring the intensity of pain in the palatal donor site after FGG surgery. The primary aim was to determine the advantages of each scale in terms of sensitivity, reliability, and usability, and identify the most suitable method for postoperative pain management. Furthermore, we also aimed to develop recommendations for improving patient satisfaction by minimizing subjectivity in pain assessment. The findings are expected to guide clinical practices and serve as a reference for pain evaluation after FGG surgery.

MATERIAL AND METHOD

This study was conducted between May 2018 and February 2019 at the Department of Periodontology, Faculty of Dentistry, Inonu University, on patients undergoing FGG surgery.

The study was designed in accordance with the Declaration of Helsinki and approved by the Malatya Clinical Research Ethics Committee under protocol code 2018/46. The study participants were systemically healthy, non-smokers, and not on regular medication. Written informed consent was obtained from all participants. A total of 36 individuals aged between 18-53 years, including 27 (75%) females and 9 (25%) males, were enrolled.

Pain assessment

Pain was assessed on the 3rd, 7th, and 14th days, and 1 month post-operation using NRS, VAS, and VRS. Evaluations were performed in a quiet environment by the same researcher for all patients to minimize the impact of environmental factors and ensure standardization.

VAS for pain assessment

A 100-mm line was used as the scale, and the endpoints were labeled as "no pain" and "worst pain imaginable." Patients were asked to mark a point on the line that best represented their pain level. The distance from the "no pain" endpoint to the patient's mark was measured in millimeters to determine their pain score (Flaherty, 1996) (Figure 1).

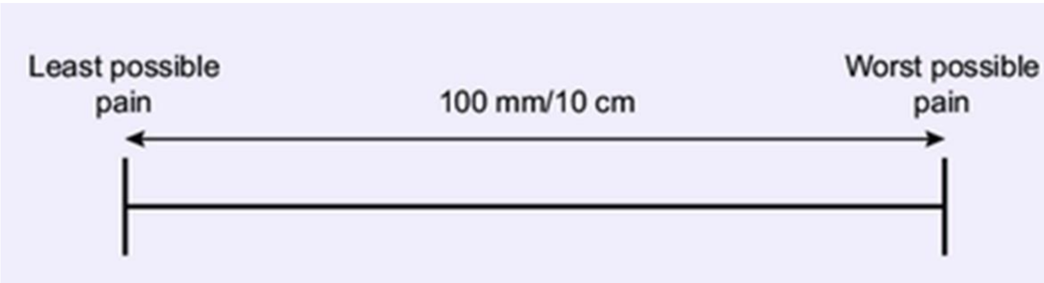

Figure 1. Visiual Analog Scale.

NRS for pain assessment

The NRS ranged from 0 (no pain) to 10 (worst pain imaginable). Patients selected the score that best described their pain (van Dijk, Kappen, van Wijck, Kalkman, & Schuurmans, 2012) (Figure 2).

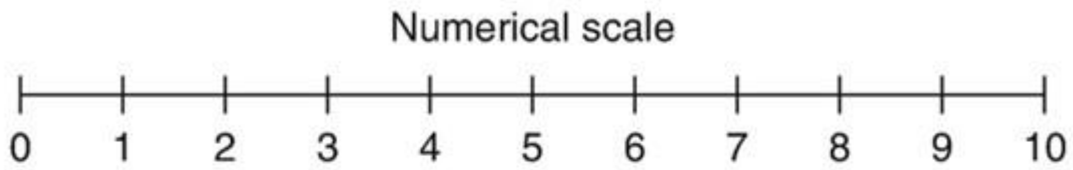

Figure 2. Numerical Rating Scale.

VRS for pain assessment

Patients were presented with six options describing their pain level: no pain (0), mild (1), moderate (2), severe (3), very severe (4), and worst pain imaginable (5). The score corresponding to the descriptive word chosen by the patient was recorded as their pain score (Williamson & Hoggart, 2005) (Figure 3).

Figure 3. Verbal Rating Scale.

Sample size calculation

The sample size was determined based on similar studies comparing pain scales in oral surgery. Işık et al. (2011) reported a high correlation (r > 0.90) between pain scales in third molar surgery with a sample of 48 participants (Isik, Unsal, Kalayci, & Durmus, 2011). A power analysis conducted using G*Power 3.1 software indicated that, with a significance level of α = 0.05 and a power of 0.80, a minimum of 29 participants would be required to detect an effect size of r = 0.916. Considering a potential dropout rate of 20%, a total of 36 participants were included in the study.

Statistical analysis

IBM SPSS Statistics 22 (IBM SPSS, Turkey) was used for all statistical analyses. The normality of data distribution was assessed using the Kolmogorov-Smirnov test, which revealed that the parameters did not follow a normal distribution. The data have been presented as mean, standard deviation, and frequency. The Mann-Whitney U test was used to compare gender-based parameters, and the Friedman test (post hoc Wilcoxon signed-rank test) was used for intra-group comparisons. The correlation between the different parameters was examined by Spearman's rho correlation analysis. Statistical significance was set at $p<0.05$.

RESULT

A total of 36 individuals (age 18-53 years) were included in the study, of which 27 (75%) were female and 9 (25%) were male. Postoperative pain in the palatal donor area after FGG surgery was evaluated using VAS, NRS, and VRS.

Relationship between age and pain scores

We observed a moderately positive correlation between age and the NRS/VAS scores on the 14th day, and between age and VRS score on the 7th day (NRS: 40.8%, VAS: 38.3%, VRS: 33.2%; p<0.05). No significant correlation was observed between age and pain scores at other time intervals (p>0.05) (Table 1).

Table 1. Correlation Between Age and Pain Scores

			Age
NRS	**3rd day**	**r**	0.079
		p	0.647
	7th day	**r**	0.279
		p	0.099
	14th day	**r**	**0.408**
		p	**0.013***
	1st month	**r**	-
		p	-
VAS	**3rd day**	**r**	-0.028
		p	0.873
	7th day	**r**	0.310
		p	0.066
	14th day	**r**	**0.383**
		p	**0.021***
	1st month	**r**	-0.261
		p	0.124
VRS	**3rd day**	**r**	0.118
		p	0.491
	7th day	**r**	**0.332**
		p	**0.048***
	14th day	**r**	0.297
		p	0.078
	1st month	**r**	-0.261
		p	0.124

Spearman's Rho correlation test **p<0.05*
Correlation could not be calculated for the 1st month as all NRS values were 0.

Relationship between gender and pain scores

No significant differences were observed in the NRS, VAS, and VRS scores of male and female patients on the 3rd, 7th, and 14th days, and the 1st month after surgery (p>0.05) (Table 2).

Table 2. Evaluation of Pain Scores by Gender

		Female	Male	p
		Mean±SD (median)	Mean±SD (median)	
NRS	**3rd day**	2.37±2.08 (2)	2.11±1.45 (1)	0.985
	7th day	2.19±1.88 (2)	2.56±1.42 (3)	0.492

	14th day	0.67±1.24 (0)	0.56±0.88 (0)	0.928
	1st month	0±0 (0)	0±0 (0)	1.000
VAS	**3rd day**	25.89±20.06 (23)	25.89±13.84 (20)	0.927
	7th day	24.63±20.43 (20)	29.33±15.14 (29)	0.431
	14th day	7.96±13.79 (0)	8.22±9.07 (6)	0.442
	1st month	0±0 (0)	1.11±3.33 (0)	0.083
VRS	**3rd day**	1.33±1.04 (1)	1.33±0.5 (1)	0.720
	7th day	1.3±0.99 (1)	1.56±0.73 (1)	0.502
	14th day	0.37±0.63 (0)	0.56±0.53 (1)	0.251
	1st month	0±0 (0)	0.11±0.33 (0)	0.083

Mann Whitney U test

Correlation among pain scales

A high positive correlation was observed among the NRS, VAS, and VRS scores on the 3rd, 7th, and 14th days (p<0.05). In addition, the VAS and VRS scores showed 100% correlation in the 1st month after surgery (p<0.05) (Tables 3 and 4).

Table 3. Correlations between VRS, NRS, and VAS

		r	**p**
NRS-VAS	**3rd day**	0.953	0.000*
	7th day	0.930	0.000*
	14th day	0.910	0.000*
	1st month	**-**	**-**
NRS-VRS	**3rd day**	0.864	0.000*
	7th day	0.899	0.000*
	14th day	0.886	0.000*
	1st month	**-**	**-**
VRS-VAS	**3rd day**	0.887	0.000*
	7th day	0.908	0.000*
	14th day	0.942	0.000*
	1st month	1.000	0.000*

Spearman's Rho correlation test *$p<0.05$*
The correlation could not be calculated for the 1st month as all NRS values were 0.

Table 4. Correlations between VRS, NRS, and VAS

		NRS-0	NRS -1	NRS -2	VAS-0	VAS-1	VAS-2	VAS-3	VRS-0	VRS-1	VRS-2	VRS-3
NRS-0	r	1.000	0.598	0.465	0.953	0.561	0.421*	0.176	0.864	0.437	0.443	0.176
	p	.	0.000	0.004	0.000	0.000	0.011	0.305	0.000	0.008	0.007	0.305
NRS-1	r	0.598	1.000	0.578	0.580	0.930	0.514	0.083	0.642	0.899	0.538	0.083
	p	0.000*	.	0.000	0.000	0.000	0.001	0.632	0.000	0.000	0.001	0.632
NRS-2	r	0.465	0.578	1.000	0.380*	0.529	0.910	-0.110	0.437	0.504	0.886	-0.110
	p	0.004*	0.000*	.	0.022	0.001	0.000	0.523	0.008	0.002	0.000	0.523
VAS-0	r	0.953	0.580	0.380	1.000	0.528	0.364*	0.204	0.887	0.420*	0.371*	0.204
	p	0.000*	0.000*	0.022*	.	0.001	0.029	0.233	0.000	0.011	0.026	0.233
VAS-1	r	0.561	0.930	0.529	0.528	1.000	0.514	0.098	0.638	0.908	0.507	0.098
	p	0.000*	0.000*	0.001*	0.001*	.	0.001	0.570	0.000	0.000	0.002	0.570
VAS-2	r	0.421	0.514	0.910	0.364	0.514	1.000	0.083	0.427	0.463	0.942	0.083
	p	0.011*	0.001*	0.000*	0.029*	0.001*	.	0.629	0.009	0.004	0.000	0.629
VAS-3	r	0.176	0.083	-0.110	0.204	0.098	0.083	1.000	0.178	0.137	0.203	1.000
	p	0.305	0.632	0.523	0.233	0.570	0.629	.	0.300	0.427	0.236	.
VRS-0	r	0.864	0.642	0.437	0.887	0.638	0.427	0.178	1.000	0.540	0.442	0.178
	p	0.000*	0.000*	0.008*	0.000*	0.000*	0.009*	0.300	.	0.001	0.007	0.300
VRS-1	r	0.437	0.899	0.504	0.420	0.908	0.463	0.137	0.540	1.000	0.499	0.137
	p	0.008*	0.000*	0.002*	0.011*	0.000*	0.004*	0.427	0.001*	.	0.002	0.427

VRS-2	r	0.443	0.538	0.886	0.371	0.507	0.942	0.203	0.442	0.499	1.000	0.203
	p	0.007*	0.001*	0.000*	0.026*	0.002*	0.000*	0.236	0.007*	0.002*	.	0.236
VRS-3	r	0.176	0.083	-0.110	0.204	0.098	0.083	1.000	0.178	0.137	0.203	1.000
	p	0.305	0.632	0.523	0.233	0.570	0.629	0.000*	0.300	0.427	0.236	.

Spearman's Rho correlation test *p<0.05
Note: Correlation could not be calculated for NRS values at 1 month as all NRS values were 0.

Changes in pain scores over time

Significant differences were observed in the scores of three scales (VAS, NRS, and VRS) across all time points (p<0.05). While no significant changes were noted between the 3rd and 7th days (p>0.05), the pain scores decreased significantly between the 14th day and the 1st month (p<0.05). Similarly, significant reduction in pain scores were observed between the 7th day and the 14th day, and between the 14th day and the 1st month post-surgery (p<0.05) (Table 5).

Table 5. Change in Pain Scores over Time

	NRS	VAS	VRS
	Mean±SD (Median)	**Mean±SD (Median)**	**Mean±SD (Median)**
3rd day	2.31±1.92 (1.5)	25.89±18.52 (21.5)	1.33±0.93 (1)
7th day	2.28±1.77 (2)	25.81±19.15 (23)	1.36±0.93 (1)
14th day	0.64±1.15 (0)	8.03±12.65 (0)	0.42±0.6 (0)
1st month	0±0 (0)	0.28±1.67 (0)	0.03±0.17 (0)
^{1}p	0.000*	0.000*	0.000*
3rd day -7th day ^{2}p	0.680	0.583	0.802
3rd day -14th day ^{2}p	0.000*	0.000*	0.000*
3rd day -1st month ^{2}p	0.000*	0.000*	0.000*
7th day -14th day ^{2}p	0.000*	0.000*	0.000*
7th day -1st month ^{2}p	0.000*	0.000*	0.000*
14th day -1st month ^{2}p	0.003*	0.001*	0.001*

^{1} Friedman Test, ^{2}Wilcoxon Sign Test, * p<0.05

DISCUSSION

This study aimed to determine the effectiveness, sensitivity, reliability, and usability of VAS, NRS, and VRS for assessing pain severity in the palatal donor area after FGG surgery. Pain assessment can be challenging during or after surgery. As patient-reported outcomes are considered the gold standard for pain assessment (McCahon, Strong, Sharry & Cramond, 2005), the relevant scales should be comprehensible and user-friendly for patients, while also being comparable to other methods of pain evaluation (H. Breivik et al., 2008). Furthermore, pain assessment tools should ideally measure both the initial discomfort and the response to treatment (Garra et al., 2010).

Multidimensional scales are often recommended for evaluating chronic pain, such as in cases of cancer or back pain, as chronic pain is more difficult to assess compared to acute pain (H. Breivik et al., 2008; Melzack, 2005). On the other hand, unidimensional scales such as

VAS, NRS, and VRS are recommended for measuring acute pain caused by trauma, surgery, childbirth, or other emergency medical conditions (Birol, 2004; H. Breivik et al., 2008; Briggs & Closs, 1999; Gagliese, Weizblit, Ellis & Chan, 2005; Odai, Ehizele & Enabulele, 2015).

In this study, the VAS, NRS, and VRS scales produced consistent results, indicating their reliability in pain assessment after FGG surgery. This is in agreement with previous studies that have shown that these pain assessment scales, especially VAS, are effective tools for evaluating acute pain in oral and maxillofacial procedures due to their sensitivity and practicality (Ferreira-Valente et al., 2011; Li et al., 2007; Sirintawat et al., 2017: Zhou et al., 2011). Nevertheless, there is considerable interest in determining the superiority of one scale over the others. For example, VAS is often the preferred tool for acute pain assessment in research settings due to its sensitivity to changes in pain intensity. Bijur et al. (2001) reported that VAS is a highly reliable tool for evaluating acute pain in adults. Similarly, Garra et al. (2010) suggested that VAS is more informative and sensitive to changes in pain compared to other scales, and recommended its use for pre- and postoperative pain evaluation. Furthermore, VAS is compatible with parametric statistical methods when data are normally distributed, making it more suitable for scientific research (Philip, 1990). Despite these advantages, VAS has limitations, particularly for physically disabled patients who may struggle to mark their pain on the scale. Additionally, it requires patients to equate the length of the line with the amount of pain they are experiencing, which can be conceptually challenging for the elderly or cognitively impaired individuals (Briggs & Closs, 1999).

NRS, while being less sensitive than VAS due to its narrower scoring range, is known for its ease of administration, particularly in clinical settings where the instructions can be given verbally (Bijur, Latimer & Gallagher, 2003). Studies suggest that NRS can be a reliable alternative to VAS for acute pain assessment (Polly et al., 2003). VRS, on the other hand, categorizes pain into descriptive levels, allowing easier application in scenarios such as phone or mail surveys (Isik, Unsal, Kalayci & Durmus, 2011). However, its categorical nature may limit its sensitivity, and the application of parametric statistical analysis (Briggs & Closs, 1999). Patients may also find it challenging to choose a single descriptor when their pain level falls between two categories, making researchers hesitant to rely solely on VRS for pain studies (Jensen & Karoly, 2011).

The relationship between age and postoperative pain remains unclear. While some studies suggest that older patients report lower pain intensity compared to the younger counterparts (Bisgaard et al., 2001; Kalkman et al., 2003), others have found no significant differences (Gagliese et al., 2000; Morin et al., 2000). Although we did not observe any significant correlation between gender and the pain scores, age correlated significantly with the pain scores on specific days (e.g., 14th-day NRS/VAS and 7th-day VRS scores). These inconsistencies may arise from variations in surgical procedures, analgesic regimens, and the pain scales.

There are several limitations in this study that warrant mention. For instance, the small, single-center cohort, and the inherently subjective nature of pain assessment may have introduced bias. Furthermore, the measurements were limited to specific time points and were taken by a single researcher, which may affect the generalizability of the findings. Future studies should include larger and more diverse populations, along with more frequent pain assessments. Additionally, psychological factors and standardized analgesic use should be considered for a more comprehensive evaluation of postoperative pain.

CONCLUSION

Similar results were obtained with VAS, NRS, and VRS, indicating that all three scales can be used for postoperative pain assessment. VRS and NRS are usually preferred for elderly patients due to the ease of verbal application. However, despite the challenges in application, VAS is more suitable for scientific studies as it allows the use of parametric data and offers comprehensive assessment capability. Our findings can guide the development of more effective strategies for pain management after FGG.

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