Original Article

Comparison of four Different Pain Scales and Patient Preferences in the Evaluation of Pain Severity after Open Cardiac Surgery

Nilgun Sert Bas, RN, MSc
Lecturer, Ankara Medipol University, Faculty of Health Sciences Department of Nursing, Department of Surgical Diseases Nursing, Turkey

Hatice Ayhan, RN, PhD
Prof. University of Health Sciences Turkey, Gulhane Faculty of Nursing, Department of Surgical Diseases Nursing, Turkey

Correspondence: Nilgun Sert Bas, RN, MSc, Lecturer, Ankara Medipol University, Faculty of Health Sciences Department of Nursing, Department of Surgical Diseases Nursing, Turkey
e-mail: nilgun.sert@ankaramedipol.edu.tr

Abstract
Background: Cardiovascular diseases are among the most common chronic diseases in the world. Open-heart surgery is among the most painful surgical procedures due to sternum and leg incisions, chest tubes, turning, coughing, breathing and chest tube removal. Postoperative pain relief reduces the likelihood of complications and the duration of hospital stay. In this direction, it is very important to evaluate the pain experienced by the patient
Aim: The aim of this study was to compare the pain levels of open-heart surgery patients in the first three days after surgery with four pain scales, to examine the consistency between the scales and to determine patient preferences.
Methodology: This research is a descriptive study. The research was conducted with 87 patients who had open cardiac surgery between May 2020-2021. Data were collected using the Verbal Descriptor Scale (VDS), Numeric Rating Scale (NRS), Visual Analog Scale (VAS), and Thermometer Pain Scale (TPS).
Results: Patients experienced the most pain at the graft incision (100%), sternal incision (94.3%) and drain site (87.4%). The most severe pain was experienced in the first two days and gradually decreased with days in all four different pain scales ($p<0.05$). However, pain in the coccygeal region increased from the third day ($p<0.05$). Pain intensity and scores evaluated in all pain scales used were found to be similar ($p>0.05$). The scale preferences of the patients were NRS, VDS, VAS and TPS, respectively. When the pain scale preferences of the patients according to the descriptive characteristics of the patients in the postoperative period were analyzed, 69.8% of the patients under 60 years of age preferred NRS, while 85.7% of the patients aged 60 years and over preferred VDS ($p<0.05$).
Conclusion: The results of the study show that the use of NRS, VDS, VAS and TPS scales have similar efficacy in pain assessment of patients undergoing cardiac surgery. It is recommended that the scales to be used should be selected in line with patient preferences and individual characteristics.

Keywords: pain; one-dimensional pain scale; cardiac surgery; nursing; postoperative nursing; postoperative pain.

Introduction

Cardiovascular diseases are among the most common chronic diseases in the world and are the leading preventable causes of death (WHO, 2018). In the world and in our country, non-communicable diseases constitute the main public health problem that causes the highest number of deaths and disabilities, impairs the quality of life and causes high health expenditures. In Europe, more than 60 million people die every year due to cardiovascular diseases. According to the 2023 data of Turkish Statistical Institute, circulatory system diseases are in the first place with 33.4% among the causes of

mortality and 42.4% of these deaths are due to ischemic heart disease (TÜIK, 2023). In a study investigating the characteristics of patients who underwent open heart surgery in our country, it was reported that the majority of patients were male, the mean age was 64.5 years and CABG surgery was performed. When comorbid conditions were analyzed, hypertension (59.7%) was the most common comorbid condition, followed by smoking (55.2%) (Tamtekin et al., 2022). In the treatment of cardiovascular diseases, besides medical treatment and lifestyle changes, surgical procedures such as coronary artery bypass graft (CABG) and valve surgeries are mostly applied. Open cardiac surgery is considered among the most painful surgical procedures due to the presence of sternum and leg incisions, chest tubes, etc. (Ozmen et. al., 2019; Tufekci, Akansel and Sivrikaya, 2022). After open cardiac surgery, approximately 21% to 60% of patients experience pain and their pain levels increase with procedures such as turning, coughing, breathing, and chest tube removal (Bjørnnes et. al., 2017; Yazdchi et. al., 2022; Zubrzycki et. al., 2018)

Background

There are many effective pain management tools available today, but a literature review shows that one of the reasons why many patients still experience pain is that a pain scale is not used to assess pain, or a scale that is inappropriate for the patient population is used (Gurkan et. al., 2020; Yazdchi et. al., 2022; Zubrzycki et. al., 2018). Effective treatment of pain can only be possible with the pain being diagnosed, measured, and recorded. To ensure this, it is recommended in the anesthesia and pain societies and ERAS guidelines that evaluation should be performed by choosing one of the valid and reliable one-dimensional scales (Visual Analog Scale (VAS), Numeric Rating Scale (NRS), Verbal Descriptor Scale (VDS), Thermometer Pain Scale (TPS), and Faces Pain Scale (FPS)), taking the individual characteristics of the patient into account (Chou et. al., 2016; Yazdchi et. al., 2022). VDS was developed by Melzack and Katz (1992). Pain intensity is ranked in 5 stages from mild to unbearable. The patient was asked to choose the appropriate one among these categories. NRS was developed by Black and Matassarin (1993). The patients were asked to provide a numerical score from 0 to 10 for the pain they experienced, with 0 being no pain and 10 being very severe pain. VAS was developed by Cline, Herman, Show et al. (1992). The patient was asked to mark their own pain on a 10 cm ruler, with zero pain being on one end and the most severe pain on the other. TPS was developed by Waterhouse (1996). 0-1 is no pain, 2-3 is mild, 4-5 is uncomfortable, 6-7 is severe, 8-9 is very severe, and 10 is unbearable pain. The patient is asked to mark a point on the thermometer in accordance with the severity of their pain.
There are limited number of studies comparing these scales in multiple surgical clinics and mixed surgical patient populations. In these studies, it was found that all scales had good validity and reliability (Chou et. al., 2016), are compatible with each other (Gurkan et. al., 2020, Temiz and Ozer, 2015). Also, NRS was the easiest, most reliable, and most preferred scale (Gangliese et. al., 2005; Gurkan et. al., 2020), the scale with the highest validity and reliability was FPS (Gangliese et. al., 2005; Gurkan et. al., 2020; Yazici and Akyolcu, 2014), and the least preferred and faulty scale was VAS (Gurkan et. al., 2020).

However, in these studies, it was found that variables that may affect the evaluation such as early postoperative period and cognitive deficits were considered (Li, Herr and Chen, 2009; Yazici and Akyolcu, 2014) and psychometric properties of patients were evaluated (Gangliese et. al., 2005; Temiz and Ozer, 2015; Yazici and Akyolcu, 2014), and it was reported that further studies are recommended in different patient populations (Gangliese et. al., 2005; Gurkan et. al., 2020; Li, Herr and Chen, 2009; Temiz and Ozer, 2015; Yazici and Akyolcu, 2014). No comparative study has been found on which of the one-dimensional measurement tools can be used in clinical care specific to the patient population undergoing open heart surgery. In this direction, the aim of this study is to examine between-scales consistency and to determine patient preferences by comparing the pain levels of patients undergoing open heart surgery with four pain scales in the first three days after surgery.

Methodology

Population and Sample of the Research: The population of the study consists of all patients who underwent open heart surgery between May 2020 and May 2021. The sample consisted of 87 patients determined by G-Power analysis. In the research, patients, who were hospitalized on the 1-2nd and 3rd days, aged 18 and over, had an American Society of Anesthesiologists (ASA) score of I-II-III, and agreed to participate in the study, were included. Exclusion criteria were patients who refused to participate in the study, patients undergoing minimally invasive cardiac surgery and illiterate patients.

Data Collection Tools: Research data were collected using Descriptive Information Form, Pain Localization Form, VDS, NRS, VAS, and TPS. The scales and forms used were marked by the researcher with the verbal expression of the patients.

Descriptive Information Form: Descriptive Information Form: The form prepared by the researcher included a total of 9 questions, including 3 questions about sociodemographic characteristics (patient's age, gender, educational status) and 7 questions about clinical characteristics (smoking-alcohol use, presence of chronic disease, reason for hospitalization, type of surgery, ASA score). In addition, to evaluate the patient's pain according to Verbal Descriptor Scale (VDS), Numerical Rating Scale (NRS), Visual Analogue Scale (VAS), Thermometer Pain Scale (TPS) and to determine the localization of pain, Part 1 of the McGill Melzack Pain Scale Short Form were included.

Ethical Aspect of the Research: Ethics committee approval was received for this study from the Health Sciences University Scientific Research Ethics Committee (23.06.2020 Date / Decision No: 2020/142), and the necessary written permissions from the university hospital where the research will be conducted were obtained. The investigation conforms with the principles outlined in the Declaration of Helsinki. The purpose of the study was explained to all patients before the operation and their written consent was obtained in accordance with the voluntary principle.

Data Collection: Data were obtained by face-to-face interviews with patients who underwent surgery in the cardiovascular surgery service between May 2020 and May 2021 and met the inclusion criteria. The pain severity and characteristics of patients, who agreed to participate in the study in the 1-2-3rd days after surgery between 19:00-20:00, were evaluated by the researcher using relevant scales. On the 2nd and 3rd days, between 19:00 and 20:00 in the evening, the characteristics and pain severity were evaluated by the researcher using the scales. According to our clinical experience, since the patients experience pain most in the evening hours, pain assessments were made between these hours, and routine analgesic treatments were applied according to the physician's request after the evaluation. Each time, patients were presented with all scale options. On the 3rd postoperative day, the patient was asked to rank the pain scales according to their preference, in descending order (1-4, 4 being the least preferred). The application duration of the data collection forms is 10-15 minutes on average for each participant.

Data Analysis: Data were analyzed with IBM SPSS V23. Conformity to normal distribution was evaluated with the Kolmogorov-Smirnov test. Chi-square test was used to compare categorical data in accordance with the scales. Kruskal Wallis test was used to compare pain scores that were not normally distributed in accordance with the scales. Cochran's Q test was used to compare bi-state categorical data for three or more times. The Friedman test was used to compare three or more data that were not normally distributed over time. Statistical significance level was determined as $p<0.05$.

Statistical significance level was determined as $p<0.05$.

Results

The study was conducted on a total of 87 patients, mostly male (63.2%), ranging in age from 19 to 87 years. The demographic characteristics of patients are given in Table 1. According to this, it was found that 57.5% were primary school graduates, 52.9% smoked, 14.9% used alcohol, 89.7% had a chronic disease, and 81.8% of the patients with chronic diseases were diagnosed with

hypertension. 58.6% of patients were on painkillers continuously before the operation. Most patients (62.1%) had CABG.

When the localization of postoperative pain experienced by patients according to days was examined (Table 2), it was found that on the 1st postoperative day, they mostly experienced pain at the graft incision (100%), the sternal (94.3%), and the drain sites (87.4%). When the incidence of pain was analyzed by time, it was found that the rate of pain at the sternal incision site on the 1st day (94.3%) was like that of the 2nd day ($p<0.05$) and higher than that of the 3rd day (82.8%) ($p<0.05$). The incidence of pain at the graft incision and drain site was found to be higher on the 1st and 2nd days than that of the 3rd day ($p<0.05$). Pain in the coccygeal region was observed in 8% of patients on the 1st day, in 16.1% on the 2nd day, and in 18.4% on the 3rd day, compared to the 1st day ($p<0.05$). There was no statistically significant difference between the distribution of pain states by time in other regions ($p>0.05$) (Table 2). Paracetamol and opioid analgesics were administered to patients according to their pain levels in the postoperative period. On the first day after surgery, 63.2% of patients were administered paracetamol along with opioids. On the third day after the operation, only paracetamol was administered to 71.3% of patients.

In study, it was found that 100% of patients experienced pain on the first postoperative day, 89.7% on the second day, and 59.9% on the third day (Table 3). A statistically significant difference was found between the distribution of pain states on the 2nd day according to pain assessment scales ($p<0.05$). This difference was because the rate of severe pain in TPS (42.5%) was higher than that of severe pain in VDS (21.8%). According to pain assessment scales, there was no statistically significant difference between the distribution of pain states on the 1st and 3rd days ($p>0.05$). There was a statistically significant difference between the distributions of all scale groups (VDS, NRS, VAS, TPS) by time ($p<0.05$). This difference was because the difference in the level of pain experienced according to the days.

When the scale scores were compared by days (Table 4), the median pain values were obtained as 9.00 on the 1st day, 6.00 on the 2nd day, and 3.00 on the 3rd day, like NRS, VAS, and TPS ($p>0.05$). There was a statistically significant difference between the median values of the NRS, VAS and TPS score by days ($p<0.05$). These differences were because the median value of pain on the 1st day was higher than the 2nd and 3rd day, and that of the 2nd day was higher than the 3rd day.

The postoperative pain assessment scale preferences of patients are presented in Table 5. The 1st scale preference was NRS in 60.9% of patients, the 2nd scale preference was VDS in 52.9%, the 3rd preference was VAS in 59.8%, and the 4th was TPS in 70.1% of patients. In addition, when the scale preferences of patients were compared in terms of sociodemographic characteristics, it was found that there was no significant difference except for age ($p>0.05$). When the pain scale preferences according to age were examined, while 69.8% of patients under 60 years of age preferred NRS, 85.7% of patients aged 60 years and older preferred VDS ($p<0.05$).

Table 1. Distribution of Some Sociodemographic and Clinical Characteristics of Patients (n=87)

	Frequency (n)	Percentage (%)
Age group		
Under 60 years	45	51.7
60 years and older	42	48.3
Gender		
Female	32	36.8

Male	55	63.2
Educational status		
Illiterate	11	12.6
Primary Education	50	57.5
High School	15	17.2
University	11	12.6
Smoking		
Yes	46	52.9
No	41	47.1
Alcohol Usage		
Yes	13	14.9
No	74	85.1
Presence of chronic disease		
Yes	78	89.7
No	9	10.3
Chronic diseases*		
Hypertension	63	81.8
Diabetes	49	63.6
Chronic heart failure	26	33.8
Thyroid disease	18	23.4
COPD	10	13
Asthma	10	13
Chronic renal failure	8	10.4
ASA Score		
II	65	74.7
III	22	25.3
Surgery type		
CABG Surgery	54	62.1
Valve surgery	23	26.4
CABG and valve surgery	10	11.5
Continuous use of painkillers in the preoperative period		
Using	51	58.6
Not Using	36	41.4

* n folded, COPD: Chronic Obstructive Pulmonary Disease, CABG: Coronary Artery Bypass Graft

Table 2. Localization of Postoperative Pain by Days

Localization of Pain	Day 1	Day 2	Day 3	Test statistics	p
Head n (%)					
No pain	79 (90.8)	82 (94.3)	78 (89.7)	Q=1.857	0.395
Pain manifest	8 (9.1)	5 (5.7)	9 (10.2)		
Neck-Shoulder n (%)					
No pain	82 (94.3)	81 (93.1)	75 (86.2)	Q=6.143	0.051
Pain manifest	5 (5.7)	6 (6.9)	12 (13.8)		
Sternal Incision n (%)					
No pain	5 (5.7)	11 (12.6)	15 (17.2)	Q=10.133	**0.006**
Pain manifest	82 (94.3)[a]	76 (87.4)[ab]	72 (82.8)[b]		
Graft Incision n (%)*					
No pain	0 (0.0)	1 (1.5)	4 (6.2)	Q=10.000	**0.007**
Pain manifest	64 (100.0)[a]	63 (98.5)[a]	60 (93.8)[b]		
Drain Location n (%)					
No pain	11 (12.6)	15 (17.2)	37 (42.5)	Q=29.400	**<0.001**
Pain manifest	76 (87.4)[b]	72 (82.8)[b]	50 (57.5)[a]		
Back Waist n (%)					
No pain	69 (79.3)	70 (80.5)	67 (77.0)	Q=0.583	0.747
Pain manifest	18 (20.7)	17 (19.5)	20 (23.0)		
Coccygeal Region n (%)					
No pain	80 (92.0)	73 (83.9)	71 (81.6)	Q=7.444	**0.024**
Pain manifest	7 (8.0)[a]	14 (16.1)[ab]	16 (18.4)[b]		

* Patients who had valve surgery were excluded and n=64.
Q : Cochran's Q test statistic, χ^2: Friedman test statistic ab: There is no difference between times with the same letter

Table 3. Comparison of Pain Levels According to Pain Rating Scales and Time

	VDS	NRS	VAS	TPS	Test statistics	p
Day 1 n (%)						
No pain (0)	---	---	---	---	χ^2=6.542	0.685
Mild pain (1-3)	2 (2.3)	2 (2.3)	2 (2.3)	2 (2.3)		
Moderate pain (4-5)	11 (12.6)	4 (4.6)	4 (4.6)	6 (6.9)		
Severe pain (6-8)	26 (29.9)	34 (39.1)	33 (37.9)	30 (34.5)		
Unbearable pain (9-10)	48 (55.2)^{A}	47 (54)^{A}	48 (55.2)^{A}	49 (56.3)^{A}		
Day 2 n (%)						
No pain (0)	6 (6.9)	3 (3.4)	---	---	χ^2=24.357	**0.018**
Mild pain (1-3)	22 (25.3)	24 (27.6)	24 (27.6)	25 (28.7)		
Moderate pain (4-5)	27 (31)	15 (17.2)	18 (20.7)	13 (14.9)		
Severe pain (6-8)	19 (21.8)^{a}	31 (35.6)^{ab}	28 (32.2)^{ab}	37 (42.5)^{b}		
Unbearable pain (9-10)	13 (14.9)^{B}	14 (16.1)^{B}	17 (19.5)^{B}	12 (13.8)^{B}		
Day 3 n (%)						
No pain (0)	12 (13.8)	9 (10.3)	9 (10.3)	5 (5.7)	χ^2=10.152	0.603
Mild pain (1-3)	35 (40.2)	40 (46)	38 (43.7)	43 (49.4)		
Moderate pain (4-5)	20 (23)	14 (16.1)	10 (11.5)	14 (16.1)		
Severe pain (6-8)	13 (14.9)	18 (20.7)	23 (26.4)	19 (21.8)		
Unbearable pain (9-10)	7 (8)^{B}	6 (6.9)^{C}	7 (8)^{C}	6 (6.9)^{C}		
Test statistics	χ^2=94.151	χ^2=100.606	χ^2=94.679	χ^2=105.728		
p	**<0.001**	**<0.001**	**<0.001**	**<0.001**		

VDS, Verbal Descriptor Scale; NRS,Numeric Rating Scale; VAS,Visual Analog Scale; TPS, Thermometer Pain Scale χ^2: Chi-square test statistic, χ^2: Friedman test statistic, $^{a\text{-}b}$: have the same letter There is no difference between Pain Rating Scales, $^{A\text{-}C}$: There is no difference between times with the same letter in each scale

Table 4. Comparison of Pain Assessment Scale Scores by Days

	Numerical pain scale	Visual comparison scale	Burford pain	Test statistics	P
Day 1 M (IQR)	9 (3)[a]	9 (3)[a]	9 (3)[a]	χ^2=0.017	0.991
Day 2 M (IQR)	6 (5)[b]	6 (5)[b]	6 (5)[b]	χ^2=0.297	0.862
Day 3 M (IQR)	3 (4)[c]	3 (4)[c]	3 (4)[c]	χ^2=0.079	0.961
Test statistics	χ^2=106.706	χ^2=106.3	χ^2=117.228		
p	**<0.001**	**<0.001**	**<0.001**		

M (IQR): Median (Interquarter range),χ^2: Kruskal Wallis test statistic, χ^2: Friedman test statistic, [a-c]: There is no difference between times with the same letter in each scale

Table 5. Preferences of Pain Assessment Scale in the Postoperative Period

	1st Preference n(%)	2nd Preference n(%)	3rd Preference n(%)	4th Preference n(%)
NRS	**53 (60.9)**	23 (26.4)	14 (16.1)	---
VDS	28 (32.2)	**46 (52.9)**	10 (11.5)	1 (1.1)
VAS	4 (4.6)	6 (6.9)	**52 (59.8)**	25 (28.7)
TPS	2 (2.3)	12 (13.8)	11 (12.6)	**61 (70.1)**

VDS,Verbal Descriptor Scale; NRS, Numeric Rating Scale; VAS,Visual Analog Scale TPS, Thermometer Pain Scale

Discussion

In this study, the pain level and characteristics experienced by patients undergoing open cardiac surgery in the first three postoperative days were compared with four one-dimensional pain scales and the pain scale preferences of patients were evaluated. Cardiac surgery patients experience pain in the postoperative period due to incision of the intercostal nerves and pleural irritation caused by chest tubes, coughing, and turning in bed (Aydin and Cilingir, 2016; Cevik et. al., 2020; Ogut and Sucu Dag, 2019; Ozmen et. al., 2019; Parvan et. al., 2013). In study, it was determined that all the patients experienced pain on the first day, the majority (89.7%) on the second day, and more than half (59.9%) on the third day after surgery. Similarly, Parvan et al. (2013) stated in their study that 84.6% of patients experienced pain on the 1st day after cardiac surgery, which decreased in the following days (Parvan et. al., 2013).

When the level of pain was examined, it was emphasized that the pain after open cardiac surgery is more severe compared to other surgical operations (Bjørnnes et. al., 2017; Zubrzycki et. al., 2018). In study, it was found that 54% of patients experienced unbearable pain on the 1st postoperative day, 35.6% experienced severe pain on the 2nd day, and 46% experienced mild pain on the 3rd day. Pain severity was highest in the first two days after surgery and decreased with wound healing. Gan et al. (2014) also reported that 75% of patients have severe or excruciating pain after surgery (Gan et. al., 2014). In another study, it was determined that the pain level of patients after open cardiac surgery was in the range of 85% (severe) on the 1st day and in the range of 57% (moderate) on the 4th day (Bjørnnes et. al., 2017). In our study,

the pain level of patients and its time-dependent reduction are consistent with the literature (Li, Herr and Chen, 2009; Temiz and Ozer, 2015; Zubrzycki et. al., 2018). It was determined that 8% of patients had pain in the coccygeal region on the 1st day and 18.4% on the 3rd day ($p<0.05$). This increase was due to the constant sitting position of patients and immobilization. Patients should be encouraged to mobilize in the early postoperative period, pressure areas should be supported by pillows, cushions, etc. while sitting.

Opening the sternum in open cardiac surgery, due to the destruction of nerves on skin, tissue, bone, cartilage (Dai et. al., 2020), and the chest tube in the intercostal space both cause patients to experience pain during breathing-coughing exercises and movement (Budak Erturk and Karadag, 2020). In addition, severe pain is experienced in the graft incision site, especially in the first week, in the case of removal of a peripheral vein during surgery (Tufekci, Akansel and Sivrikaya, 2019). In the study, it was found that patients mostly experienced pain on the first day after surgery at the sternal (94.3%) and graft incision sites (100%), along with the drain site (87.4%). Ogut (2020) also found, like our study, that after open cardiac surgery, patients experience the most pain at the sternum incision (94.2%), drain site, and saphenous vein incision site, respectively (Ogut and Sucu Dag, 2019). In other studies, it was found that the highest level of pain (55-82%) after cardiac surgery was at the sternum incision site (Bjørnnes et. al., 2017; Tufekci, Akansel and Sivrikaya, 2019). Patients postpone deep breathing-coughing exercises and mobilization due to pain. Therefore, patients should be informed, supported, and adequate pain management should be provided.

Pharmacological treatment is often preferred to provide analgesia in the first days after cardiac surgery (Acar et. al., 2016; Dirimese, Ozdemir and Sahin, 2016; Karabulut at. al., 2015; Tufekci, Akansel and Sivrikaya, 2019). It was determined that 88% of all patients with postoperative pain were administered IV analgesic drugs (Gan et. al., 2014). Opioid drugs are generally used in analgesic treatment after cardiac surgery (Acar et. al., 2016; Reisli et. al., 2021; Tufekci, Akansel and Sivrikaya, 2019). However, it is recommended to use combinations of different drugs to reduce the adverse effects that may occur due to prolonged or high-dose administration of analgesics (Reisli et. al., 2021). In study, on the first day after surgery, 63.2% of patients were administered paracetamol along with opioids. On the 3rd day after the operation, only paracetamol was administered to 71.3% of patients in accordance with the decrease in pain levels. Similarly, Acar et al. (2016) stated that 78% of patients were administered NSAID and paracetamol along with opioid drugs in the postoperative period (Acar et. al., 2016). In the study by Ogut (2018), it was determined that 72.8% of patients received only paracetamol after cardiac surgery (Ogut and Sucu Dag, 2019). This difference is thought to be due to hospital protocols. It is considered that the multimodal analgesia approach will be more beneficial in the first two days after the surgery.

Pain assessment is the basis of an effective analgesia. However, according to the literature, most nurses evaluate pain only with the verbal expressions of patients and their relatives, instead of using a scale (Akbas and Kose, 2019; Eti Aslan, Badir and Karadag Arlı, 2014; Ucuzal and Dogan, 2015). The use of scales in pain assessment makes the severity and characteristics of pain experienced by patient's objective (Yazici and Akyolcu, 2014; Ucuzal and Dogan, 2015). In study, a statistically significant difference was found between the distribution of pain states on the 2nd day according to pain assessment scales, but no statistically significant difference was found for the 1st and 3rd days. Considering the evaluations of patients, it is thought that this difference was because they defined 9-10 as unbearable, 1-2 as mild pain, perceiving other pain levels as moderate pain. In study, it was found that the pain scales were compatible and similar in terms of pain severity and pain scores for patients undergoing cardiac surgery. Similarly, in some studies, VAS, NRS, VDS, and FPS were closely correlated to each other (Gurkan et. al., 2020; Li, Herr and Chen, 2009; Temiz and Ozer, 2015), and some studies reported that NRS, VDS, and TPS were closely correlated with each other,

except for VAS. In some studies, for more accurate assessment of pain, it was found that VAS should not be used alone, its use is more difficult than others, and the use of NRS for general use has a better accuracy (Yazici and Akyolcu, 2014; Karcioglu et. al., 2018). In line with this, it is recommended that all the scales can be used in the assessment of after cardiac surgery, but considering the patient's characteristics and preferences, a scale that is easy to understand and applicable to the patient should be preferred.

In study, the 1st scale preference was NRS in In study, the 1st scale preference was NRS in 60.9% of patients, the 2nd scale preference was VDS in 52.9%, the 3rd preference was VAS in 59.8%, and the 4th was TPS in 70.1% of patients. According to the study conducted by Akyolcu and Yazıcı (2014) in all surgical clinics, 97.4% of patients preferred FPS, 88.6% NRS, 84.1% VDS, 78.1% TPS, and 11.4% VAS after surgery (Yazici and Akyolcu, 2014). In the study by Temiz and Ozer (2015) in surgical clinics, the preferred scales were listed as FPS (38.9%), VAS (30.6%), NRS (20.6%), and VDS (9.9%) (Temiz and Ozer, 2015). Gürkan et al. (2020) reported that the simplest (36.7%) scale to be used by all patients, the most preferred (36.6%) scale to be used in the future, and the scale with the least error rate was NRS, followed by the VDS (35%) (Gurkan et. al., 2020). Like this study, it was also emphasized in many studies outside the surgical population that the NRS is the most frequently preferred scale by patients (Eriksson et. al., 2014; Bech et. al., 2015). When the demographic data of the patients and their pain scale preferences were compared, a significant relationship was found only with the age variable. Considering the pain scale preferences of patients in the postoperative period according to their ages, while 69.8% of patients under 60 years of age preferred NRS, 85.7% of patients aged 60 and over preferred VDS. In the study by Gurkan (2020), like our study, NRS was preferred as the simplest and most preferred scale to be used by young and middle-aged patients, while VDS was chosen by the elderly (Gurkan et. al., 2020). In addition to that, in previous studies, it was reported that the elderly had difficulty in understanding and evaluating the scale while using the VAS (Gagliese et. al., 2005; Gurkan et. al., 2020; Yazici and Akyolcu, 2014).

The use of pain scales provides a better assessment and intervention to address pain in nursing practice. The results of this study show that all pain scales can be easily used for patients undergoing cardiac surgery have similar efficacy. The most preferred scale by the patients was NRS, while VDS was preferred by the elderly patients. Therefore, the individual characteristics of patients, especially age and personal preferences, should be considered in the selection of pain scales to effectively measure pain intensity. The benefits of the use of pain scales should be introduced to nursing students and used in practice to raise awareness in these situations during the nursing education process. In addition, it is recommended to investigate the pain profile and assessment methods in different surgical patient populations in future studies.

The limitations of the study The study was conducted in a single center and four unidimensional pain scales were used for pain assessment, so the results obtained from all pain scales and all cardiac surgery patients may not be generalizable. While determining the time when the patients experienced the most pain, the researchers utilized their own experiences and evaluated the patients once at the same time every day. These situations constitute the limitations of the study.

Conclusion: The results of this study show that all pain scales used for patients undergoing cardiac surgery are of similar effectiveness. The most preferred scale by patients was NRS, and the preference of elderly patients was VDS. Therefore, it is important to use a pain assessment tool that is suitable for the patient's individual characteristics and scale preferences to effectively measure the severity of pain. It is recommended to investigate the pain profile and assessment methods in different surgical patient populations in future studies.

References

Acar K, Acar H, Demir F & Aslan FE. (2016). Determination of Post-Surgical Pain Incidence and Amount of Analgesic Use. *ACU Saglık Bil Derg.* 2:85-91.

Akbas M & Kose Tosunoz I. (2019). Knowledge and approaches of nurses about pain related interventions. *Cukurova Med J.* 44(1):136-143. doi: 10.17826/cumj.431892.

Aydin A & Cilingir D. (2016). Pain Management with Non-pharmacological Methods in Patients with Coronary Artery Bypass Graft Surgery. *Turkiye Klinikleri J Nurs Sci*. 8(2):146-52. doi: 10.5336/nurses.2014-43196.

Bech RD, Lauritsen J, Ovesen O & Overgaard S. (2015). The Verbal Rating Scale Is Reliable for Assessment of Postoperative Pain in Hip Fracture Patients. *Pain Res Treat.* 2015:676212. doi:10.1155/2015/676212.

Bicici B. (2010). Investigation of the validity and reliability of Mcgill pain scale short form *(Master's thesis).* Ege University Institute of Health Sciences.

Bjørnnes AK, Parry M, Lie I, Fagerland MW, Watt-Watson J, Rustøen T, Stubhaug A, & Leegaard M. (2017). The impact of an educational pain management booklet intervention on postoperative pain control after cardiac surgery. *European journal of cardiovascular nursing*. 16(1), 18–27.

Budak Erturk E & Karadag M. (2020). Non-Pharmacological Methods Applied in Pain and Anxiety Control Caused by Chest Tube Removal. *THDD.* 1(1):53-68.

Cevik K, Ince S, Pakis-Cetin S & Tetik O. (2020). Effect of Applying Cold Gel Pack to the Sternum Region on the Postoperative Pain after Open-Heart Surgery. *CBU-SBED*. 7(1):76-80.

Chou R, Gordon DB, de Leon-Casasola OA, Rosenberg JM, Bickler S, Brennan T, Carter T, Cassidy CL, Chittenden EH, Degenhardt E, Griffith S, Manworren R, McCarberg B, Montgomery R, Murphy J, Perkal MF, Suresh S, Sluka K, Strassels S, Thirlby R & Wu CL. (2016). Management of Postoperative Pain: A Clinical Practice Guideline From the American Pain Society, the American Society of Regional Anesthesia and Pain Medicine, and the American Society of Anesthesiologists' Committee on Regional Anesthesia, Executive Committee, and Administrative Council. *The journal of pain*, 17(2), 131–157.

Dai WS, Huang ST, Xu N, Chen Q & Cao H. (2020). The effect of music therapy on pain, anxiety and depression in patients after coronary artery bypass grafting. *J Cardiothorac Surg*. 15:81-86.

Dirimese E, Ozdemir FK & Sahin ZA. (2016). Nursing students' knowledge of related to pain management, cultural awareness and competence. *Gumuşhane University Journal of Health Sciences,* 5:1-6.

Eriksson K, Wikström L, Årestedt K, Fridlund B & Broström A. (2014). Numeric rating scale: patients' perceptions of its use in postoperative pain assessments. *Appl Nurs Res*, 27(1):41-46.

Eti Aslan F, Badir A & Karadag Arli S. (2014). Patients' experience of pain after cardiac surgery. *Contemporary Nurse,* 34(1):48-54.

Gagliese L, Weizblit N, Ellis W & Chan VWS. (2005). The measurement of postoperative pain: a comparison of intensity scales in younger and older surgical patients. *Pain,* 117(3):412-420.

Gan TJ, Habib AS, Miller TE, White W & Apfelbaum JL. (2014). Incidence, patient satisfaction, and perceptions of post-surgical pain: results from a US national survey. *Curr Med Res Opin,* 30(1):149-160.

Gurkan A, Aldemir K, Isik-Andsoy I & Gul A. (2020). Comparison of four different pain scales in the evaluation of postoperative acute pain intensity. *Cukurova Med J*, 45(4):1562-1571.

Karabulut N, Aktas YY, Gurcayir D, Yılmaz D & Gokmen V. (2015). Patient satisfaction with their pain management and comfort level after open heart surgery. *Australian Journal of Advanced Nursing,* 32(3):16.

Karcioglu O, Topacoglu H, Dikme O & Dikme O. A systematic review of the pain scales in adults: Which to use? *Am J Emerg Med,* 36(4):707-714.

Leblebici, M., Dincer, B., Savcı, C., Soyhan, F., & Alimoğlu, O. (2022). Assessment of postoperative pain intensity after laparoscopic cholecystectomy: Comparative analysis of three rating scales in terms of scores and patient preferences. *Gevher Nesibe Journal Of Medical And Health Sciences*, *7*(16), 75–81.

Li L, Herr K & Chen P. (2009). Postoperative pain assessment with three intensity scales in Chinese elders. *J Nurs Scholar,* 41(3):241–9.

Ogut S & Sucu Dag G. (2019). Pain Characteristics and Pain Interference Among Patients Undergoing Open Cardiac Surgery. *J Perianesth Nurs*, 34(4):757-766.

Ozmen O, Ozcelik F, Kaygin MA, Yilmaz H & Karakaya MA. (2019). Evaluation of pain scoring and free cortisol levels of postoperative analgesic methods in cardiac surgery: A new perspective. *Turkish Journal of Thoracic and Cardiovascular Surgery,* 27(39):294-303.

Parvan K, Zamanzadeh V, Lakdizaji S & Mousavi SM. (2013). Nurse's perception of stressors associated with coronary artery bypass surgery. *J Cardiovasc Thorac Res,* 5:113-117.

Reisli R, Akkaya OT, Arican S, Can OS, Cetingok H, Gulec MS & Koknel Talu G. (2021). Pharmachologic treatment of acute postoperative pain: A clinical practice guideline of The Turkish Society of Algology. *Agri*, 33(1):1–51.

Temiz Z & Ozer N. (2015). Comparison of postoperative pain severity with four different pain scales. *Anatolian Journal of Nursing and Health Sciences*, 18(4):245-251.

Tufekci, H., Akansel, N., & Sivrikaya, S. K. (2022). Pain interference with daily living activities and dependency level of patients undergoing CABG surgery. *Pain Management Nursing*, *23*(2), 180-187.

TÜİK 2023. https://data.tuik.gov.tr/Bulten/Index?p=Olum-ve-Olum-Nedeni-Istatistikleri-2023-53709. Accessed July 04, 2024.

Ucuzal M & Dogan R. (2015). Emergency nurses' knowledge, attitude and clinical decision making skills about pain. *Int Emerg Nurs,* 23(2):75-80.

Yazdchi F, Hirji S, Harloff M, McGurk S, Morth K, Zammert M, Shook D, Varelmann D, Shekar P, Kaneko T; ERAS Working Group; Bedeir K, Madou ID, Choi J, Percy E, Kiehm S, Woo S, Bentain-Melanson M, Swanson J, Rawn J, Rinewalt D, Mallidi HR, Sabe A & Aranki S. (2022). Enhanced Recovery After Cardiac Surgery: A Propensity-Matched Analysis. *Semin Thorac Cardiovasc Surg,* 34(2):585-594.

Yazici Sayin Y & Akyolcu N. (2014). Comparison of pain scale preferences and pain intensity according to pain scales among Turkish Patients: a descriptive study. *Pain Manag Nurs,* 15(1):156-164.

World Health Organization. Noncommunicable diseases. Published 2018. Accessed January 21, 2021. https://www.who.int/newsroom/fact-sheets/detail/noncommunicable-diseases.

Zubrzycki M, Liebold A, Skrabal C, Reinelt H, Ziegler M, Perdas E, & Zubrzycka M. (2018). Assessment and pathophysiology of pain in cardiac surgery. *Journal of pain research,* 11, 1599–1611.