

The Effect of Applications on Pain After Open and Closed Heart Surgery: Descriptive Research

Açık ve Kapalı Kalp Cerrahisi Sonrası Yapılan Uygulamaların Ağrı Üzerine Etkisi: Tanımlayıcı Araştırma

¹ Gamze ATAMAN YILDIZ^a, ² Fadime ÇINAR^b, ³ Ersin KADİROĞULLARI^c, ⁴ Fatma ETİ ASLAN^d

^aBahçeşehir University Nursing Doctorate Programs, İstanbul, Türkiye

^bNişantaşı University Faculty of Health Sciences, Department of Health Management, İstanbul, Türkiye

^cİstanbul Mehmet Akif Ersoy Thoracic and Cardiovascular Surgery Training and Research Hospital, Clinic of Cardiovascular Surgery, İstanbul, Türkiye

^dBahçeşehir University Faculty of Health Sciences, Department of Nursing, Division of Surgical Diseases Nursing, İstanbul, Türkiye

This study was presented as a summary orally 2023 Turkish Surgical and Operating Theatre Nurses Association Congress in November 16-19, 2023, Aydın, Türkiye.

ABSTRACT Objective: The primary aim of this study was to determine the effect of postoperative practices (dressing, getting out of bed, walking, coughing, chest tube and pacing wire removal) on pain in patients undergoing open and closed heart surgery. The secondary aim was to determine the activities that patients had difficulty in performing during pain. **Material and Methods:** This prospective and descriptive study was conducted in a cardiovascular surgery clinic between September 2022 and July 2023. The sample calculation was carried out according to the simple random sampling method with 65 patients in the open heart surgery patient group according to the Power (G-power) analysis, and 57 of the 79 patients in the closed heart surgery patient group between these dates were reached. The research data consisted of a 16-question form that determined personal information and pain levels, and pain levels during the applications performed on the 1st day (dressing, getting out of bed, walking, coughing) and 3rd day (chest tube/drain and pacing wire removal) after surgery were asked and recorded. **Results:** The mean ages of the patients in the open and closed cardiac surgery groups were 61.5±8.4 and 45.5±12.8 years, respectively. Coronary artery bypass graft was performed in 75.4% of open operations and septal defect in 36.8% of closed operations. Pain measurements during dressing ($p=0.017<0.05$) and pacing wire removal ($p=0.001<0.05$) were significantly different in patients who underwent open surgery. The pain experienced by patients in both groups during chest tube withdrawal was found to be severe. **Conclusion:** It was determined that there was a significant difference in the pain experienced in open and closed surgeries after cardiac surgery. It is recommended that pain control of the patients during the applications is ensured in order to perform the exercises effectively.

Keywords: Open cardiac surgery; closed cardiac surgery; pain

ÖZET Amaç: Bu çalışmanın birinci amacı, açık ve kapalı kalp cerrahisi geçiren hastaların cerrahi sonrası yapılan uygulamaların (pansuman, yataktan kalkma, yürüme, öksürme, göğüs tüpü ve pace teli çekilmesi) ağrı üzerine etkisini belirlemektir. Hastaların ağrı yaşadıkları sırada yapmakta zorlandıkları aktivitelerin belirlenmesi ikincil amacıdır. **Gereç ve Yöntemler:** Prospektif ve tanımlayıcı bir tasarıma sahip olan bu araştırma kalp damar cerrahisi kliniğinde Eylül 2022-Temmuz 2023 tarihleri arasında gerçekleştirildi. Örneklem hesabı Güç (G-power) analizine göre açık kalp cerrahisi geçiren hasta grubunda 65 hasta olacak şekilde basit rastgele örneklem yöntemine göre, kapalı kalp cerrahisi geçiren hasta grubu için bu tarihler arasındaki 79 hastadan 57'sine ulaşılarak gerçekleştirildi. Araştırma verileri, kişisel bilgileri ve ağrı düzeylerini belirleyen 16 soruluk formdan oluşmakta, ameliyattan sonra 1. gün (pansuman, yataktan kalkma, yürüme, öksürme) ve 3. günde (göğüs tüpü/dren ve pace teli çekilmesi) yapılan uygulamalar sırasındaki ağrı düzeyleri sorulup kaydedildi. **Bulgular:** Çalışmada açık kalp cerrahisi grubunda yer alan hastaların yaş ortalaması 61,5±8,4, kapalı kalp cerrahisi grubundaki hastaların yaş ortalaması ise 45,5±12,8 olarak bulundu ($p=0,015<0,05$). Açık ameliyatların %75,4'ü koroner arter baypas grefti, kapalı ameliyatlarında %36,8'i septal defekt ameliyatıdır. Hastaların ameliyat türüne göre açık ameliyat olanların pansuman sırasındaki ($p=0,017<0,05$) ve pace teli çekilirken ($p=0,001<0,05$) ağrı ölçümleri anlamlı farklılık gösterdi. Her iki gruptaki hastaların göğüs tüpü çekilirken yaşadıkları ağrı şiddetli ağrı olarak saptandı. **Sonuç:** Kardiyak cerrahi sonrası yapılan uygulamaların açık ve kapalı cerrahilerde yaşanan ağrı üzerinde anlamlı farklılık olduğu tespit edildi. Hastaların bu uygulamalar sırasında ağrı kontrolünün sağlanması egzersizlerin etkili bir şekilde yapabilmeleri için önerilmektedir.

Anahtar Kelimeler: Açık kalp cerrahisi; kapalı kalp cerrahisi; ağrı

Correspondence: Gamze ATAMAN YILDIZ
Bahçeşehir University Nursing Doctorate Programs, İstanbul, Türkiye
E-mail: gamzeataman39@gmail.com



Peer review under responsibility of Türkiye Klinikleri Cardiovascular Sciences.

Received: 12 Mar 2024 Accepted: 04 Jun 2024 Available online: 10 Jun 2024

2146-9032 / Copyright © 2024 by Türkiye Klinikleri. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Cardiovascular diseases (CVD) are among the diseases with the highest mortality rate in our country as in the whole world.¹ According to Turkish Statistical Institute (TurkStat) data, CVD account for 44.5% of all deaths in 2021 in our country.² Surgical treatment is the most preferred treatment modality for CVD.³ Currently, open heart surgery is applied as the standard method and is performed with extracorporeal circulation (ECS) by standard median sternotomy. In addition, off pump/Beating Heart cardiac surgery and cardiac surgery with minimally invasive methods have also been performed in recent years. Minimally invasive cardiac surgery (MICS) can be performed in three different ways: “port access” (by performing left minithoracotomy under cardiopulmonary bypass), “total endoscopic coronary artery bypass (TECAB)” (which can be performed without thoracotomy), “minimally invasive direct coronary artery bypass (MIDCAB)” (by performing left minithoracotomy without electrocardiogram). Open surgery or MICS is primarily performed in patients with coronary artery bypass graft, heart valve and congenital heart disease.⁴ Cannulation of peripheral vessels to connect the patient to cardio-pulmonary bypass (CPB) is a commonly used technique in MICS. The femoral vein and artery are the preferred sites of peripheral cannulation. Distal limb ischaemia due to peripheral cannulation can be seen in patients.^{5,6}

With the sternotomy or thoracotomy procedure performed during surgery, chest wall and intercostal nerve damage develops with the cutting of large muscle groups, thus causing pain in the early postoperative period.⁷ The pain felt after sternotomy or thoracotomy significantly reduces the patient’s postoperative deep breathing and coughing effort.^{8,9} It is known that the most important complication of pain in patients after cardiac surgery is its negative effects on the respiratory system. Postoperative pain control is important in terms of enabling patients to cough easily, to perform deep breathing exercises and to expel secretions from the lungs. In cases where pain control is not achieved, an increase in the secretion level in the lungs and an increase in the CO₂ level in the blood may occur as a result of the inability of patients to cough adequately and effectively. In case of

inability to expel secretions, the risk of atelectasis and pneumonia increases in patients.^{8,9} Due to postoperative pain, activities such as movement and sleep become difficult in patients, therefore, discharge is disrupted in the early period and the patient’s quality of life decreases.¹⁰ In addition, many patients who underwent cardiac surgery reported pain during removal of the chest drain and pacing wire as the worst experience.¹¹

It is extremely important to define pain in all aspects in order to prevent the development of complications after cardiac surgery. Evaluation of pain only at rest may be inadequate and misleading.¹² Therefore, it would be more accurate to evaluate pain individually during postoperative procedures (dressing, getting out of bed, walking, deep breathing and coughing exercise, chest tube and pacing wire removal). For this reason, it is necessary to know how these extremely important procedures performed after cardiac surgery affect the level of pain. Determination of the effect of these interventions on pain level was aimed to be carried out in this study considering that it would be useful in terms of planning appropriate interventions in pain management before and during the interventions.¹³ The primary aim of this study was to determine the effect of postoperative practices (dressing, getting out of bed, walking, coughing, chest tube and pacing wire withdrawal) on pain in patients who underwent open and closed cardiac surgery, and the secondary aim was to determine the activities that patients had difficulty in performing while experiencing pain.

MATERIAL AND METHODS

RESEARCH DESIGN

This study, which has a prospective and descriptive design, was planned to determine the effect of the practices performed after open and closed heart surgery on pain in patients.

Hypotheses of the Study;

H 0; Practices performed after open and closed heart surgery have no effect on pain.

H 1; Practices performed after open and closed heart surgery have an effect on pain.

H 2; There is a difference between the pain caused by the applications performed after open and closed heart surgery.

PLACE AND TIME OF THE STUDY

The study was conducted between September 2022 and September 2023 in the cardiovascular surgery clinic of the Ministry of Health, Ministry of Health, University of Health Sciences İstanbul Mehmet Akif Ersoy Chest Cardiovascular Surgery Training and Research Hospital.

POPULATION AND SAMPLE OF THE STUDY

The population of the study consisted of patients hospitalised in the cardiovascular surgery ward of the hospital on the dates of the study. The sampling calculation of the study was made by G-power analysis and the minimum sample size was calculated as 65 patients with a Type I error of 0.05 and a power of 0.80 ($\alpha=0.05$, $1-\beta=0.80$). It was planned to include 65 patients each who underwent open and closed heart surgery. During the study period, 79 closed surgeries were performed and 57 patients were included in the study when the patients who did not accept to participate in the study were excluded. Open surgery was terminated when the number of 65 patients was reached. At the end of the study, Type I error was 0.05 and the power of the test was 0.96. Open or closed surgery was decided by the operating surgeon according to the suitability of the surgical method, not according to the patients' preference.

Inclusion criteria;

- Being over 18 years of age
- Volunteering to participate in the study
- Having undergone cardiac surgery
- No barriers to communication
- No mental or neurological disability

DATA COLLECTION TOOLS AND COLLECTION OF DATA

The research data were collected with the Sociodemographic Characteristics Form consisting of 15 questions prepared in line with the literature. Within these questions, the conditions that caused them to experience pain in the postoperative period and the

activities that they had difficulty in doing while experiencing pain were questioned. Numeric Rating Scale (NRS) was used to measure the intensity of pain experienced in these situations.^{13,14} The patients were asked about the pain and its intensity during dressing, getting out of bed, walking, and coughing exercises on the 1st postoperative day, and during the withdrawal of the chest tubes and pacing wire on the 3rd postoperative day, and the activities that they had difficulty in performing while experiencing pain were asked and recorded.

NRS: It is the simplest and most frequently used measurement method in pain assessment. It contains gradually increasing numbers placed at equal intervals on a line (Figure 1). It is a scale in which patients indicate 0 as no pain and 10 as the most severe pain. This type of scale is easily understood by the patient. It can be applied both orally and in writing. In the measurements made between 0 and 10 in the NRS, 1-4 indicates mild pain, 4-6 indicates moderate pain, and 7-10 indicates severe pain.¹⁴

SURGICAL PROCEDURES

All patients undergoing open and closed cardiac surgery are admitted to the cardiovascular surgery ward on postoperative day 1 and there is a standard analgesic procedure applied as a hospital. Accordingly; paracetamol 1 g (maximum 4 times a day) and opioid class tramadol 2 mg/kg (2 times a day) are used in all patients.

All patients undergoing open or closed surgery receive a chest tube and pacing wire as part of the procedure. Surgical temporary pacing wires are routinely used in adult patients undergoing cardiac surgery (bypass, valve, septum, mass or aneurysm)

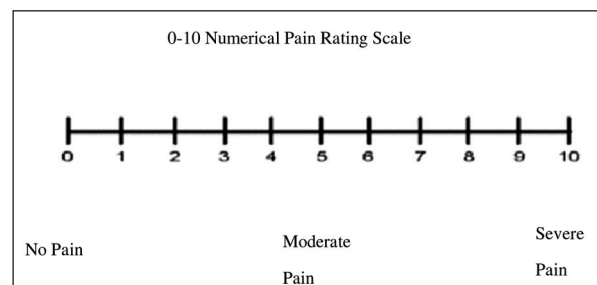


FIGURE 1: Numeric Rating Scale.¹⁴

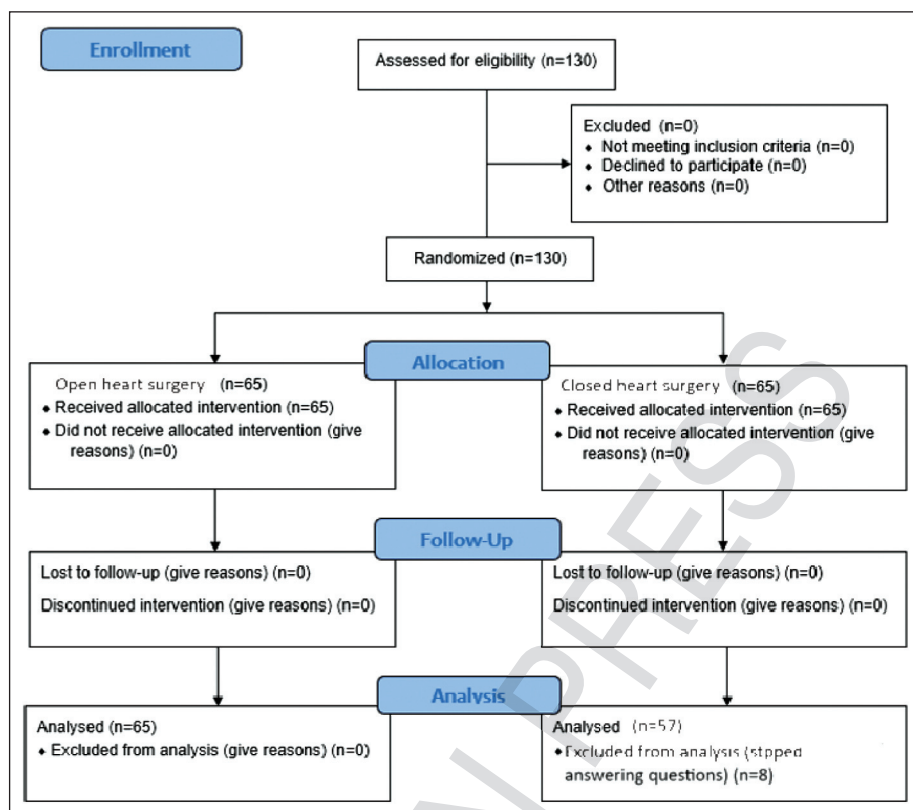


FIGURE 2: Consort flow diagram of the study.

to provide haemodynamic stabilisation to combat arrhythmia.

DATA EVALUATION

The data obtained in the study were analysed using SPSS for Windows 22.0 software. Number, percentage, mean, standard deviation were used as descriptive statistical methods in the evaluation of the data. Differences between the rates of categorical variables in independent groups were analysed by chi-square and Fisher exact tests. T-test was used to compare quantitative continuous data between two independent groups.

ETHICAL DIMENSION OF THE STUDY

The study was conducted in accordance with the Declaration of Helsinki and the principles of good clinical practice. In order to conduct the research, permission was obtained from the Ethics Committee of the Ministry of Health, Ministry of Health, Ministry of Health, İstanbul Mehmet Akif Ersoy Chest Cardiovascular Surgery Training and Research Hos-

pital (date: August 29, 2022, no: 2022.07-47). Written permission was obtained with an informed consent form after explaining the purpose of the study to each patient included in the sample before the study.

RESULTS

In the study, the mean age of the patients in the open heart surgery group was 61.5 ± 8.4 years and the mean age of the patients in the closed heart surgery group was 45.5 ± 12.8 years ($p=0.015 < 0.05$). The mean age of the patients differed significantly according to the type of surgery [$t(120)=8.230$; $p=0.000 < 0.05$].

The type of surgery does not differ significantly according to gender ($X^2=0.007$; $p=0.540 > 0.05$) and previous surgery ($X^2=0.159$; $p=0.414 > 0.05$). However, the type of surgery showed a significant difference according to educational status ($X^2=15.231$; $p=0.009 < 0.05$) and marital status ($X^2=9.660$; $p=0.002 < 0.05$) (Table 1).

There was a significant difference between open and closed surgery groups for bypass ($X^2=38.223$;

TABLE 1: Descriptive characteristics.								
		Open surgery		Closed surgery		Total		p value
		n	%	n	%	n	%	
Gender	Female	29	44.6	25	43.9	54	44.3	X ² =0.007
	Male	36	55.4	32	56.1	68	55.7	p=0.540
Education status	Illiterate	13	20.0	3	5.3	16	13.1	X ² =15.231
	Literate	1	1.5	0	0.0	1	0.8	p=0.009
	Primary school	32	49.2	21	36.8	53	43.4	
	Middle school	6	9.2	7	12.3	13	10.7	
	High school	12	18.5	19	33.3	31	25.4	
	Universty	1	1.5	7	12.3	8	6.6	
Marital status	Married	63	96.9	45	78.9	108	88.5	X ² =9.660
	Single	2	3.1	12	21.1	14	11.5	p=0.002
Previous operation status	Yes	32	49.2	26	45.6	58	47.5	X ² =0.159
	No	33	50.8	31	54.4	64	52.5	p=0.414
		Mean	SD	Mean	SD	Mean	SD	p value
Age		61.540	8.463	45.530	12.825	54.060	13.355	0.000

Chi-square analysis, SD: Standard deviation.

p=0.000<0.05) and septum defect (X²=25.607; p=0.000<0.05), but not for valve (X²=1.160; p=0.185>0.05), mass (X²=0.009; p=0.718>0.05) and aneurysm (X²=0.884; p=0.533>0.05) operations.

Pain measurements of the patients during dressing according to the type of surgery showed a significant difference [t(120)=2.432; p=0.017<0.05]. Pain measurements during dressing of patients who had open surgery (X=3.430) were higher than pain measurements during dressing of patients who had closed surgery (X=2.530).

According to the type of surgery, the pain measurements of the patients during pacing wire removal showed a significant difference [t(120)=3.547; p=0.001<0.05]. The pacing wire pain measurements of the patients who had open surgery (X=3.880) were higher than the pacing wire pain measurements of the patients who had closed surgery (X=2.400) These results of the study confirm H1 and H2 hypotheses.

The pain measurements of the patients while getting out of bed, walking, coughing and chest tube removal did not show a significant difference according to the type of surgery (p>0.05). However, according to the numerical pain assessment scale, the pain experienced by patients undergoing open surgery during chest tube removal was 6.910 and the pain

experienced by patients undergoing closed surgery during chest tube removal was 6.330 (severe pain). Again, when coughing, according to the numerical pain rating scale, 6.050 was measured in open surgeries and 5.210 in closed surgeries, and it was determined that they experienced moderate pain. This result of the study confirms the H1 hypothesis.

“Breathing”, which is one of the activities that patients have difficulty in during pain, shows a significant difference according to the type of surgery. (X²=3.621; p=0.043<0.05). It was found that 50.9% of those who had closed surgery and 33.8% of those who had open surgery had difficulty in breathing.

According to the type of surgery, there was no significant difference according to “moving”, one of the activities in which patients had difficulty during pain (X²=0.824; p=0.237>0.05). Again, according to the type of surgery, there was no significant difference according to ‘sleeping’ (X²=2.934; p=0.063>0.05), but more than half of the open surgery patients (52.3%) stated that they had difficulty in sleeping.

Although “coughing”, one of the activities in which patients had difficulty during pain, did not show a significant difference according to the type of surgery (X²=0.159; p=0.414>0.05), more than half of

the patients stated that they had difficulty in coughing in both types of surgery (50.8% of open surgery patients and 54.4% of closed surgery patients).

DISCUSSION

After cardiac surgery, respiratory and circulatory complications occur in patients who cannot perform effective breathing and remain immobilised due to pain. Therefore, pain control is among the priority treatment and care interventions in preventing the development of complications and improving patient outcomes.^{13,15} When the studies on the subject were examined, it was observed that pain conditions experienced in open heart surgery were generally examined and pain conditions after closed heart surgery were not found.

It is thought that the reason why the mean age is lower in closed surgery in the open and closed cardiac surgery patient groups included in this study is generally due to the fact that young patients have aesthetic concerns as an indication for closed surgery.¹⁶ As in the studies of Ögüt and Kök, it was determined that the majority of the operated patients were male, and according to TurkStat 2018 data, the risk of cardiovascular disease is higher in men (13.8%) than in women (7.8%).^{2,17,18} Although there was no significant difference between the groups undergoing open and closed surgery according to their previous surgery status, it also affects the results of the study. The significant difference in the educational status of

the patients according to the open and closed surgeries can be interpreted as the fact that the preference for closed surgery is higher with increasing educational level and the educational level is higher in the younger group with decreasing average age in closed surgery. The difference in the marital status of the patients in both groups is thought to be due to the fact that the number of single patients is higher in the closed surgery group than in the open surgery group due to the lower average age of the closed surgery group (Table 1).

Considering the distribution of the types of surgery in Table 2, the reason for the significant difference between bypass ($p < 0.05$) and septum defect ($p < 0.05$) surgeries in open and closed surgery patient groups is thought to be that coronary artery bypass surgery is more preferred as open surgery due to advanced age and the number of vessels bypassed. The fact that septum defect surgery is more preferred as closed surgery is thought to be due to the fact that the results of the surgery are as successful as open surgery, the hospital stay is shorter with less pain and the average age of the patient group is lower due to aesthetic concerns.¹⁹

In the study by Ögüt, on the pain experienced by patients after open heart surgery, 88.57% of the patients stated that dressing was the condition that caused them to experience postoperative pain.¹⁷ In this study, the pain measurements of the patients during dressing were determined as mild pain according

TABLE 2: Distribution of types of operations.

		Open surgery		Closed surgery		Total		p value
		n	%	n	%	n	%	
Bypass	Yes	49	75.4	11	19.3	60	49.2	$X^2=38.223$
	No	16	24.6	46	80.7	62	50.8	p=0.000
Heart valve	Yes	29	44.6	31	54.4	60	49.2	$X^2=1.160$
	No	36	55.4	26	45.6	62	50.8	p=0.185
Septum defect	Yes	1	1.5	21	36.8	22	18.0	$X^2=25.607$
	No	64	98.5	36	63.2	100	82.0	p=0.000
Mass	Yes	1	1.5	1	1.8	2	1.6	$X^2=0.009$
	No	64	98.5	56	98.2	120	98.4	p=0.718
Aneurysm	Yes	1	1.5	0	0.0	1	0.8	$X^2=0.884$
	No	64	98.5	57	100.0	121	99.2	p=0.533

Chi-square analysis

to NRS. According to the type of surgery, it was determined that those who had open surgery felt more pain during dressing than those who had closed surgery. It is known that the incision site of open surgery being larger and being on the sternum will increase pain during dressing (Table 3).

In the study, the pain experienced by the patients when getting out of bed did not make a difference according to whether they had open or closed surgery, but they experienced moderate pain according to NRS. In the study of Öğüt, 85.71% of the patients reported that they experienced pain when getting out of bed.¹⁷ In the same study, the pain experienced by the patients while walking was mild and no significant difference was found between open and closed surgeries (Table 3).

In this study, although there was no significant difference in the pain experienced while coughing according to open and closed surgery type, it was found that patients experienced severe pain in open surgery according to NRS. Çevik and Zaybak examined the effect of exercises on pain after open heart surgery and found that patients experienced severe pain during coughing on the first day after surgery. In the study of Öğüt, 92.86% of the patients stated that they experienced pain when coughing (Table 3).¹⁷

The pain experienced by the patients when the chest tube was removed after surgery was found to be the most severe pain in the study and no significant difference was found between open or closed surgery. In the study of Aktaş and Karabulut, it was found that the patients in the control group had severe pain immediately after the chest tube was removed.²¹ Emir,

also found that the pain of patients in the control group after chest tube removal was higher than before removal (Table 3).²²

Although the pain experienced during postoperative pacing wire withdrawal was mild compared to NRS, a significant difference was found between open and closed surgeries, and it was determined that more pain was experienced during pacing wire withdrawal in open surgery than in closed surgery (Table 3).

In Table 4, when the activities that the patients had difficulty in doing while experiencing pain are considered; more than half of the patients in both types of surgery stated that they had difficulty in coughing while experiencing pain, and half of the open surgery patients stated that they had difficulty in breathing. In the study of Kök, on the level of postoperative pain in patients undergoing cardiac surgery, it was determined that 64.9% of the patients prevented coughing and breathing during pain.¹⁸ In the study of Öğüt, it was determined that deep breathing and coughing exercises were moderately affected when all patients experienced pain.¹⁷

It was found that patients had difficulty in sleeping during the pain they experienced, and more than half of the patients who underwent open surgery had an effect on their sleep. In the study of Viana et al. evaluating pain and quality of life in patients undergoing cardiac surgery, it was found that patients' sleep was highly affected during pain.²³ According to the study of Öğüt, the pain experienced by all patients had a moderate effect on their sleep.¹⁷

TABLE 3: Differentiation of pain measurements according to type of operation.

Groups	Open surgery (n=65)		Closed surgery (n=57)		t value	sd	p value
	Mean	SD	Mean	SD			
Pain During Dressing	3.430	2.061	2.530	2.036	2.432	120	0.017
Pain when getting out of bed	5.050	2.211	4.810	2.553	0.555	120	0.580
Pain when walking	3.490	2.223	3.860	2.869	-0.795	120	0.436
Pain when coughing	6.050	2.683	5.210	2.769	1.691	120	0.094
Pain during Chest Tube Extraction	6.910	2.620	6.330	2.911	1.147	120	0.254
Pain in Pace Wire Withdrawal	3.880	2.446	2.400	2.095	3.547	120	0.001

Independent groups t-test; SD: Standard deviation.

TABLE 4: Activities that are difficult during pain.

		Open surgery		Closed surgery		Total		p value
		n	%	n	%	n	%	
Breathing	Yes	22	33.8	29	50.9	51	41.8	$\chi^2=3.621$
	No	43	66.2	28	49.1	71	58.2	p=0.043
Movement	Yes	20	30.8	22	38.6	42	34.4	$\chi^2=0.824$
	No	45	69.2	35	61.4	80	65.6	p=0.237
Sleeping	Yes	34	52.3	21	36.8	55	45.1	$\chi^2=2.934$
	No	31	47.7	36	63.2	67	54.9	p=0.063
Coughing	Yes	33	50.8	31	54.4	64	52.5	$\chi^2=0.159$
	No	32	49.2	26	45.6	58	47.5	p=0.414

Chi-square analysis

It was determined that only 34.4% of the patients participating in the study were affected by movement during pain. It is not similar to the studies conducted. In the study of Viana, et al., it was found that patients' walking and general activities were affected when they experienced pain.²³

In the study, the significant difference in pain experienced during dressing and pacing and the significant difference in difficulty in breathing activities during pain may lead patients to choose closed heart surgery. However, correct patient selection is very important in valve, coronary artery bypass grafting and aortic surgeries that are planned to be performed with minimally invasive technique or robotics. The surgical team checks whether the patient's femoral artery and vein and right jugular vein are suitable for peripheral cannulation before surgery. For mitral valve operations, they pay attention to the absence of adhesions in the right thorax, good ventricular function in coronary artery bypass since the aortic clamping time will be longer, and appropriate measurements of the thorax and aortic valve in aortic valve replacement. For this reason, the choice of open or closed surgery mostly belongs to the surgical team with preoperative patient assessment.²⁴

LIMITATIONS OF THE STUDY

The pain experienced by the patients included in the study during dressing, getting out of bed, walking, coughing exercise was evaluated on the 1st postoperative day and other days were not taken into consid-

eration. In addition, it was determined that the patients generally responded according to the Verbal Rating Scale when the pain was evaluated.

CONCLUSION AND RECOMMENDATIONS

It was found that there were significant differences between open and closed surgeries on the pain experienced after cardiac surgery. Considering that the pain of the patients will increase during these applications, it is recommended that pain evaluations should be performed not only during rest but also during these applications and pain control should be ensured in order to perform the exercises effectively.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: Fadime Çınar; Gazme Ataman Yıldız; **Design:** Fadime Çınar; Gazme Ataman Yıldız; **Control/Supervision:** Fatma Eti Aslan, Ersin Kadiroğulları; **Data Collection and/or**

Processing: Gazme Ataman Yıldız; **Analysis and/or Interpretation:** Fadime Çınar; **Literature Review:** Gazme Ataman Yıldız, Fadime Çınar; **Writing the Article:** Gazme Ataman Yıldız; **Criti-**

cal Review: Fatma Eti Aslan, Ersin Kadiroğulları; **References and Fundings:** Gazme Ataman Yıldız, Ersin Kadiroğulları; **Materials:** Gazme Ataman Yıldız, Ersin Kadiroğulları.

REFERENCES

1. World Health Organization [Internet]. © 2024 WHO [Cited: July 15, 2023]. Cardiovascular diseases. Available from: https://www.who.int/health-topics/cardiovascular-diseases#tab=tab_1
2. TÜİK [İnternet]. [Erişim tarihi: 15 Temmuz 2023]. Ulusal Veri Sayfası. Erişim linki: <https://data.tuik.gov.tr/Search/Search?text=%C3%B6l%C3%BCm%20nedeni&dil=1> Date of access:
3. Kunter D. Derin solunum ve öksürük egzersizi öncesi median sternotomi üzerine yapılan soğuk uygulamanın sternotomi ağrısına etkisi [Yüksek lisans tezi]. Aydın: Adnan Menderes Üniversitesi; 2016. (Erişim linki ve erişim tarihi eklenmelidir.)
4. Kavuncu N. Koroner arter bypass greft cerrahisi geçiren bireylerin yoğun bakım deneyimleri ve etkileyen faktörlerin saptanması [Yüksek lisans tezi]. İstanbul: İstanbul Medipol Üniversitesi; 2016. (Erişim linki ve erişim tarihi eklenmelidir.)
5. Stessel B, Nijs K, Pelckmans C, Vandenbrande J, Ory JP, Yılmaz A, et al. Neurological outcome after minimally invasive coronary artery bypass surgery (NOMICS): an observational prospective cohort study. PLoS One. 2020;15(12):e0242519. PMID: 33362277; PMCID: PMC7757846.
6. Ceulemans A, Derwael R, Vandenbrande J, Buyck K, Gruyters I, Van Tornout M, et al. Incidence, predictors and vascular sequelae of distal limb ischemia in minimally invasive cardiac surgery with femoral artery cannulation: an observational cohort study. Heart Vessels. 2023;38(7):964-74. PMID: 36723766; PMCID: PMC10209224.
7. Erciyas A. Cerrahi ağrı deneyimi olmayan hastaların ameliyat sonrası ağrı inançları [Yüksek lisans tezi]. Ankara: Yıldırım Beyazıt Üniversitesi; 2019. (Erişim linki ve erişim tarihi eklenmelidir.)
8. Khan RS, Skapinakis P, Ahmed K, Stefanou DC, Ashrafian H, Darzi A, et al. The association between preoperative pain catastrophizing and postoperative pain intensity in cardiac surgery patients. Pain Med. 2012;13(6):820-7. PMID: 22568812.
9. Dechant LM. Care of patients with acute coronary syndromes. In: Ignatavicius D, Workman ML, eds. Medical Surgical Nursing. 7th ed. USA: Elsevier Health Science; 2013. (Verilen bölüm başlığına istinaden sayfa aralığı eklenmelidir.)
10. Yaman Ö. Açık kalp ameliyatı öncesi hastaların kaygı düzeylerinin ameliyat sonrası ağrı, dispne, bulantı-kusma ve tedaviye uyuma etkisinin değerlendirilmesi [Yüksek lisans tezi]. Sakarya: Sakarya Üniversitesi; 2018. (Erişim linki ve erişim tarihi eklenmelidir.)
11. Vatansever E. Açık kalp ameliyatı geçiren ve mekanik ventilatöre bağlı erişkin hastaların işlemsel ağrı düzeyleri [Yüksek lisans tezi]. İzmir: Dokuz Eylül Üniversitesi; 2019. (Erişim linki ve erişim tarihi eklenmelidir.)
12. Milgrom LB, Brooks JA, Qi R, Bunnell K, Wuestfeld S, Beckman D. Pain levels experienced with activities after cardiac surgery. Am J Crit Care. 2004;13(2):116-25. PMID: 15043239.
13. Çevik K, Zaybak A. Açık kalp ameliyatı sonrasında yapılan egzersizlerin ağrıya etkisi [The effect of exercises performed after open heart surgery on pain]. Anatolian Journal of Nursing and Health Sciences. 2011;14:4. <https://dergipark.org.tr/tr/download/article-file/29582>
14. Coşgun NE. Kardiyovasküler operasyon geçiren hastaların erken postoperatif dönemde ağrı ile baş etme düzeylerinin belirlenmesi [Yüksek lisans tezi]. İstanbul: İstanbul Bilim Üniversitesi; 2015. (Erişim linki ve erişim tarihi eklenmelidir.)
15. Eti-Aslan F, Demir-Korkmaz F, Karabacak Ü. Pain in cardiac surgery and the nursing approach. Turk Göğüs Kalp Damar. 2012;20(1):172-6. https://tgkdc.dergisi.org/uploads/pdf/TGKDC_1540.pdf
16. Reser D, Hemelrijck Mv, Pavicevic J, Tolboom H, Holubec T, Falk V, et al. Mid-term outcomes of minimally invasive direct coronary artery bypass grafting. Thorac Cardiovasc Surg. 2015;63(4):313-8. PMID: 25207487.
17. Öğüt S. Açık kalp ameliyatı sonrası hastaların yaşadıkları ağrı şiddeti, ağrının özellikleri ve ağrıyı etkileyen faktörlerin incelenmesi [Yüksek lisans tezi]. KKTC: Doğu Akdeniz Üniversitesi; 2018. (Erişim linki ve erişim tarihi eklenmelidir.)
18. Kök E. Kalp cerrahisi geçiren hastalarda postoperatif ağrı düzeyinin ve yönetim kalitesinin incelenmesi [Yüksek lisans tezi]. Gaziantep: Hasan Kalyoncu Üniversitesi; 2018.
19. Çelik M, Günaydın AÇ, Özülkü M. Minimally invasive atrial septal defect closure: a single centre experience. Journal of General Medicine. 2022;32(6):756-60. doi: 10.54005/genel.1178921
20. Çevik K, Zaybak A. Açık kalp ameliyatı sonrasında yapılan egzersizlerin ağrıya etkisi [The effect of exercises performed after open heart surgery on pain]. Anatolian Journal of Nursing and Health Sciences. 2011;14:4. <https://dergipark.org.tr/tr/download/article-file/29582>
21. Aktaş YY, Karabulut N. The use of cold therapy, music therapy and lidocaine spray for reducing pain and anxiety following chest tube removal. Complement Ther Clin Pract. 2019;34:179-84. PMID: 30712725.
22. Emir H. Göğüs tüpü çıkarma işlemi öncesi uygulanan solunum egzersizinin yaşam bulguları ve ağrı düzeyine etkisi [Yüksek lisans tezi]. Ordu: Ordu Üniversitesi; 2013. (Erişim linki ve erişim tarihi eklenmelidir.)
23. Viana LBD, Oliveira EJS, Oliveira CMB, Moura ECR, Viana LHL, Nina VJDS, et al. Assessment of pain and quality of life in patients undergoing cardiac surgery: a cohort study. Rev Assoc Med Bras (1992). 2023;69(3):473-8. PMID: 36820781; PMCID: PMC10004288.
24. Çaynak B, Akpınar B. Minimal İnvaziv ve Robotik Kalp Cerrahisi. Türk Kalp Damar Cerrahisi Derneği Minimal İnvaziv ve Robotik Girişimler Çalışma Grubu. İstanbul: Türk Kalp ve Damar Cerrahisi Derneği; 2016. https://www.e-bem.com/public/uploads/files/pdf/Minimal_Invaziv_ve_Robotik_Kalp_Cerrahisi.pdf