Original Article

The Effect of Cold Application Performed in Early Post-operative Period for Pain and Bleeding in Patients who had Septoplasty Surgery due to Septum Deviation

Zeynep Karaman Ozlu[1], Feriha Kutuk[2]
[1]Department of Surgical Nursing, Faculty of Health Sciences, Ataturk University, Erzurum, Turkey
[2]Nursing, Department Of Otolaryngology, Duzce University, Duzce, Turkey

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ABSTRACT

Objective: The study was conducted to determine the effect of cold application in the early postoperative period for pain and bleeding in patients who had septoplasty to correct septum deviation.
Design: Randomized, controlled, experimental study
Setting: This study was conducted at Ear, Nose and Throat Clinic, Research and Application Hospital of Düzce University, Turkey.
Subjects: The study was conducted on 60 patients. One half of the patients were included in the experiment group (n = 30) and the other half in the control group (n = 30).
Interventions: Data collection was achieved using a form for patients' identifying information and the Post-Operative Pain Intensity Assessment Scale and Post-Operative Grading Scale for assessments of bleeding.
Main outcome measures: Post-Operative Pain Intensity Assessment Scale and Post-Operative Grading Scale for assessments of bleeding
Result: Cold application was shown to be effective in reducing pain that developed in the early postoperative period ($p < 0.05$). The degree of bleeding was found to be lower in the experiment group in comparison with the control group ($p > 0.05$).
Conclusion: Applying cold in the early postoperative period to patients who had septoplasty to correct septum deviation is recommended to reduce operation-related pain and bleeding in the postoperative period.

KEY WORDS: bleeding, cold application, pain, septoplasty

INTRODUCTION

Septum deviation is a condition where the septum is displaced towards the right or left, causing blockage of nasal air passages. Deformities of the cartilage and bones forming the septal framework arise from deflection, angulation, and luxation. It is often observed in the population and is one of the most common causes of admission to Ear, Nose, and Throat (ENT) polyclinics[1,2]. Septoplasty is the treatment for septum deviation and is one of the commonly performed ear, nose, and throat surgeries. Bleeding, adherence, haematoma, abscess, or perforations are complications commonly seen after septoplasty. Pain is one of the major disturbances the patients experience after septoplasty[3-5].

Postoperative pain is an acute form of pain that starts with surgical trauma and resolves upon tissue healing. Management of postoperative pain becomes increasingly important because of the adverse and recovery-delaying effects caused by pain. If postoperative pain is not treated, increases in catabolic hormones such as cortisol, adrenocorticotrophic hormone, glucagon, aldesterone, and catecholamines, and decreases in anabolic hormones such as insulin and testosterone affect the respiratory, circulating, gastrointestinal, renal, and autonomous nervous systems. All these endocrinal alterations negatively affect hemostasis[6].

Pain is the main symptom that leads a patient to request assistance of healthcare personnel. However,

Address correspondence to:
Zeynep Karaman Ozlu, Assistant Professor, Department of Surgical Nursing, Faculty of Health Sciences, Ataturk University, Erzurum, Turkey. Tel: +90 442 231 2314, Fax: +90 442 236 0984, E-mail: zynp_krmnzl@hotmail.com

the literature shows that the measures taken for management of pain are extremely inefficient in general, and that pain is not eliminated in the majority of patients. Inefficacies in pain management may include lack of healthcare personnel having adequate knowledge about pain; failure to administer the newly-developed and widely-used pain management methods and applications; lack of attention to pain on part of the nurses; or their not having knowledge about pain elimination methods. There are also concerns about addiction that may develop if a drug is administered; many patients do not complain about the pain or try to hide it; the physician not recommending analgesics for the patients; and a failure to adopt a multidiciplinary approach to pain management[7,8].

Pharmacological and non-pharmacological methods can be used together as well as individually for pain elimination. Non-pharmacological methods have advantages in terms of cost and pain elimination without introducing a chemical substance to the body; also, these methods can easily be used by nurses. At present, many non-pharmacological methods are used such as massage, hot and cold applications, menthol application to the skin, relaxation by deep inspiration, meditation, drawing attention in another direction, and using the imagination[9]. Cold applications have major importance in non-pharmacological pain management as simple and inexpensive treatment methods[10]. Cold application creates capillary contraction, reduces the temperature in the damaged area, slows metabolism and controls edema by reducing capillary permeability and bleeding, reduces the risk of haematoma formation and bacterial activity in infections, prevents the pain signal from reaching higher centers, and eliminates painful spasms[11-13]. Applying cold after trauma affects the adhesion of leukocytes to the vascular endothelium in tissue; as a result, it reduces microvascular permeability, prevents edema formation by reducing extravasation of macromolecules, and reduces bleeding and formation of haematoma. Also, it decreases the severity of local tissue damage by reducing metabolic activity in the tissue, provides analgesia, and decreases the need for analgesia by slowing down the pain signal conduction at efferent nerves after trauma[11,13,14].

Since no study has been previously conducted in Turkey to determine the effect of cold application performed in the early postoperative period for pain and bleeding in patients who had septoplasty surgery due to septum deviation, the goal of the present study is to contribute to the existing literature.

The questions the study proposes to answer are;

1. Does cold application performed in the early postoperative period in patients who had septoplasty surgery due to septum deviation reduce the pain which might occur?
2. Does cold application performed in early postoperative period in patients who had septoplasty due to septum deviation decrease the possibility of consequent bleeding?

SUBJECTS AND METHODS

This study is a randomized, controlled, experimental design research. The study was conducted between January and May 2015 in the ENT clinic at Research and Application Hospital of Duzce University.

The study population included hospitalized patients in the ENT surgical clinic at the Research and Application Hospital of Duzce University. The study was conducted in a single center to ensure randomization and minimize the factors that could affect the result of the study (standardized interventions, physician practice, anesthetic techniques applied to patients, and standardization of environmental conditions of patients).

The Number Cruncher Statistical System and Power Analysis and Sample Size 2007 were used for calculation of sample size. For each group, it was assumed that the power analysis of the study would be 99% when 30 patients with 0.05 alpha level and 95% reliability levels were included in the study. Accordingly, the population was divided into 2 groups: 30 patients for the experiment group and 30 patients for the control group.

The characteristics of patients included in the study:

- Similarity in the number of males and females in both groups to avoid any gender factor related to pain sensation,
- The patients were 18 years old and older,
- The patients had this surgery for the first time to avoid the possibility of comparison with previous experiences,
- Patients were adults who had never been exposed to nasal trauma and had no secondary nasal complaints,
- Patients had no analgesic medication before the procedure that might affect the pain sensation,
- Patients without any mental impairment or perception issues and communication difficulties,
- Patients who were not allergic to cold and had normal vital signs.

Data Collection Tools

A patient identification form was constructed through a review of the literature. The Post-Operative Pain Intensity Assessment Scale (a verbal and numerical scale) and the Post-Operative Grading Scale

for Bleeding, an ice bag, and waterproof bags were used for data collection.

A Patient Identification Form was constructed by the researchers based on the literature and included identifying characteristics of the participants.

Post-Operative Pain Intensity Assessment Scale (Numerical Assessment Scale): This method for determining pain intensity has the goal that the patients express their pain sensation with numbers. The numerical scale starts with non-existence of pain (0) and rises to the level of intolerable pain (10 – 100). Numerical scales are more often adopted because they simplify pain definition, providing facility in scoring and recording and evaluation of minimum and maximum effects[15,16].

Pain scales were used in the 24 hours postoperative in the following way: applied 8 times (hourly) for the first 8 hours, the next 2 times (10^{th} and 12^{th} hours) at 2-hour intervals, and the final 3 times (16^{th}, 20^{th} and 24^{th} hours) at 4-hour intervals.

Post-Operative Pain Intensity Assessment Scale (Verbal Category Scale): The Verbal Category Scale is a simple, descriptive scale based on choosing the most appropiate word to describe the patient's pain status. Pain severity is described by a range from mild to intolerable. The patient is asked to choose an appropiate category for his/her situation[17].

Post-Operative Bleeding Assessment Scale: No evaluation tool was found in the literature for assessment of nasal bleeding. For this reason, this scale was organized by the study researchers in line with specialists' suggestions. The scale was organized to measure the amount of blood that was leaking through the incisional area during the postoperative 24 hours. The scale was used hourly for the first eight postoperative hours, once every two hours for the next four hours, and once every four hours for the next 12 hours. One piece of sterile gauze dressing (described as a "tampon" in Table 3) with equal and standard size was attached to the incisonal areas of each patient by antiallergic plaster to absorb the leaking blood. The gauze dressing was not removed until the upper surface was completely covered by blood; it was changed when there was no observable white area on the upper surface of the dressing. Each change was marked by the corresponding hour on the patient form. Each change was performed under supervision of a nurse, and the bloody gauze bandages were collected in transparent bags and were recounted to avoid any possible errors.

Data Collection

Data were collected by a face-to-face interview by a researcher. The researcher arrived at the clinic and interviewed with physicians at 08:30 am every morning on weekdays and designated the patients who were to undergo the surgery. The researcher interviewed the patients and determined whether the patients fulfilled the requirements for the study sample. All patients included in the test and control groups were informed about the research both verbally and in written form by the researcher. The researcher informed patients about the visual comparison scale in the data collection form and taught them how to use it. The researcher interviewed the patients and recorded the informed consent of those who agreed to participate in the study. Two patients in the experiment group and one patient in the control group did not agree to participate.

Process Steps for Experiment Group

The researcher applied the data collection method to the patients who were decided to be included in the experiment group and agreed to participate, in the rooms of the ENT clinics and the patient identification form was also recorded. The researcher then took an ice bag from the clinic refrigerator, put it into a waterproof bag, and sealed the bag firmly by allowing room for it to settle on the right and left sides of the nose. Cold applications were performed for 15 minutes[11]. Two pain assessment forms and one nasal bleeding monitoring form were supplied by the researcher to the patient at 1^{st} and 2^{nd} postoperative hours by explaining face-to-face and showing the scale on the form. Application of all data collection forms took approximately 12 minutes. All cold applications were applied by the researcher (researcher who is clinical nurse of the otorhinolaryngology) in the same order. The researcher then recorded the scores and ended the application. No side effects related to the application of ice were seen in the patients.

Process Steps for Control Group

The researcher supplied the data collection method to the patients who had decided to be included in the control group and had agreed to participate in the rooms of the ENT clinics. The patient identification form was recorded by the researcher. The same clinical routine without cold application was applied to the patients in the control group.

Data Evaluation

The data were analyzed by computer. Data were evaluated using percentages, mean values, chi-square test, and an independent samples t-test. In

analyzing the differences between the groups, the significance level was set as 0.05.

Ethical Principles of the Study

Approval of the ethics committee was received before starting the study. Later, written authority was received from the chief physician after presenting the information form of the study, including aim and contents, to the chief physician. The patients were informed verbally about the aim of the study because using human cases in the study requires the protection of individual rights. The patients were informed that individual information patients shared with the researcher would be preserved.

Strengths of the Study

A randomized, controlled, experimental design was used in the study. The collected data were evaluated by a specialist statistician. Individual skill of the surgeon, the surgeon's level of experience, and the surgical techniques used in the surgical intervention may affect the development of pain and hemorrhage. For this reason, only patients whose surgery were performed by the same surgeon were included in the study.

RESULTS

When the identifying characteristics of the test and control groups were compared (Table 1), the average age was 28.53 years in the experiment group and 34.23 years in the control group; average height was 172.23 cm in the experiment group and 173.23 cm in the control group; average weight was 71.60 kg in the experiment group and 77.23 kg in the control group; average body mass index (BMI) was 23.59 kg/m^2 in the experiment group and 25.16 kg/m^2 in the control group. The number of male patients was higher in both groups. The majority of the patients were primary school graduates, were workers, had no children, did not use alcohol, were not living at home alone, and were living at home with their partners.

Table 1: Comparing the identifying characteristics of patients

Characteristics	Test		Control		Test and p-value
	n	%	n	%	
Age					
18 - 30	20	66.7	13	43.3	$X^2 = 3.30$
> 30 ↑	10	33.3	17	56.7	p = 0.06
Gender					
Female	10	33.3	7	23.3	$X^2 = 0.73$
Male	20	66.7	23	76.7	p = 0.06
Education					
Primary school	13	43.3	16	53.4	$X^2 = 1.69$
High school	8	26.7	4	13.3	p = 0.42
College	9	30	10	33.3	
Occupation					
Unemployed	1	3.3	2	6.7	$X^2 = 5.50$
Self-employed	-	-	4	13.3	p = 0.13
Worker	19	63.4	13	43.3	
Officer	10	33.3	11	36.7	
Number of children					
0	16	53.3	14	46.7	$X^2 = 0.35$
1 - 2	8	26.7	10	33.3	p = 0.83
≥ 3	6	20	6	20	
Smoking Status					
Smoker	11	36.7	18	60	$X^2 = 3.27$
Non-smoker	19	63.3	12	40	p = 0.07
Alcohol Using Status					
Using	4	13.3	2	6.7	$X^2 = 0.74$
Not using	26	86.7	28	93.3	p = 0.38
Living in home alone					
Alone	1	3.3	3	10	$X^2 = 1.07$
Not-alone	29	96.7	27	90	p = 0.30
Living with					
Wife-Husband	16	55.2	17	63	$X^2 = 0.43$
Parents	11	37.9	8	29.6	p = 0.80
Housemate	2	6.9	2	7.4	
	Mean ± SS		Mean ± SS		
Age	28.53 ± 9.32		34.23 ± 13.37		t = 1.91, p = 0.06
Height	172.23 ± 6.39		173.23 ± 8.29		t = 0.52, p = 0.60
Weight	71.60 ± 13.57		77.23 ± 16.85		t = 1.42, p = 0.15
Body mass index	23.59 ± 3.47		25.16 ± 4.30		t = 1.56, p = 0.1

Table 2: Comparing the health characteristics of patients

Characteristics	Test		Control		Test and p-value
	n	%	n	%	
Experiences of constipation					
Experiencing	-	-	1	3.3	$X^2 = 1.01$
Not experiencing	30	100	29	96.7	p = 0.31
Experiences of having chronic disease					
Have	7	23.3	9	30	$X^2 = 0.34$
Not have	23	76.7	21	70	p = 0.55
Chronic drug use					
Using	5	16.7	8	26.7	$X^2 = 0.88$
Not using	25	83.3	22	73.3	p = 0.34
Difficulty in breathing through nose					
Experiencing difficulty	30	100	30	100	Test was not performed
Difficulty in breathing through nose during sleeping					
Experiencing difficulty	30	100	30	100	Test was not performed

No statistically significant difference was found between the groups when the identifying characteristics of the patients in the test and control groups were compared ($p > 0.05$), showing that the groups are homogenous. The comparison of the patients' health characteristics is shown in Table 2.

It was determined that a majority of the patients had no constipation issue, had no chronic disease, did not use continuous medication, had a problem breathing through the nose on a regular basis during the day and while sleeping.

When the amount of postoperative bleeding was compared (Table 3), it was found that the number of tampons changed in the experiment group were fewer compared with the number in control group, meaning that the amount of bleeding was lower in the experiment group, but not at a statistically significant level.

Table 3: Comparing the degree of bleeding in patients

Characteristics	Test		Control		Test and p-value
	n	%	n	%	
1st hour					
1 tampon	15	100	15	88.2	$X^2 = 1.88$
2 tampons	-	-	2	11.8	$p = 0.17$
6th hour					
1 tampon	13	100	21	95.5	$X^2 = 0.60$
2 tampons	-	-	1	4.5	$p = 0.43$
12th hour					
1 tampon	14	87.5	20	90.9	$X^2 = 1.48$
2 tampons	1	6.2	2	9.1	$p = 0.47$
3 tampons	1	6.2	-	-	
16th hour					
1 tampon	12	100	18	90	$X^2 = 1.28$
2 tampons	-	-	1	5	$p = 0.52$
3 tampons	-	-	1	5	
20th hour					
1 tampon	16	100	21	95.5	$X^2 = 0.74$
3 tampons	-	-	1	4.5	$p = 0.38$
24th hour					
1 tampon	11	100	8	88.9	$X^2 = 1.28$
2 tampons	-	-	1	11.1	$p = 0.25$

In the comparison of postoperative pain status (Table 4), the experiment group patients were found to experience less severe pain in comparison with the control group patients during the 24 hours, except for the 1st hour ($p < 0.05$).

When the average visual analog scale scores of the patients within 24 hours postoperative were compared (Table 5), the average pain scores of the patients in the experiment group were much lower in comparison with the patients in control group, and at a level sufficient to build a high level of significance, meaning that the experiment group patients experienced less severe pain ($p < 0.001$).

Table 4: Comparing the degree of post-operative pain in patients

Characteristics	Test		Control		Test and p-value
	n	%	n	%	
1st hour					
No pain	1	3.3	1	3.3	
Mild pain	13	43.3	6	20	
Disturbing pain	5	16.7	3	10	$X^2 = 5.69$
Moderate pain	5	16.7	9	30	$p = 0.22$
Severe pain	6	20	11	36.7	
6th hour					
No pain	4	13.3	1	3.3	
Mild pain	13	43.3	6	20	
Disturbing pain	5	16.7	3	10	X2 = 11.47
Moderate pain	6	20	10	33.3	$p = 0.04$
Severe pain	2	6.7	8	26.7	
Intolerable	-		2	6.7	
12th hour					
No pain	5	16.7	1	3.3	
Mild pain	11	36.7	3	10	$X^2 = 18.62$
Disturbing pain	9	30	5	16.7	$p = 0.00$
Moderate pain	4	13.3	18	60	
Severe pain	1	3.3	2	6.7	
Intolerable	-	-	1	3.3	
16th hour					
No pain	4	13.3	-	-	
Mild pain	12	40	6	20	
Disturbing pain	8	26.7	6	20	$X^2 = 14.40$
Moderate pain	3	10	14	46.7	$p = 0.01$
Severe pain	3	10	3	10	
Intolerable	-	-	1	3.3	
20th hour					
No pain	5	16.7	-	-	
Mild pain	18	60	4	13.3	$X^2 = 27.21$
Disturbing pain	1	3.3	12	40	$p = 0.00$
Moderate pain	6	20	12	40	
Severe pain	-	-	2	6.7	
24th hour					
No pain	5	12.2	-	-	
Mild pain	16	55.3	7	23.3	$X^2 = 15.99$
Disturbing pain	4	13.8	14	46.7	$p = 0.00$
Moderate pain	3	10.3	7	23.3	
Severe pain	1	3.4	2	6.7	

Table 5: Comparison of mean post-operative VAS scores

Characteristics	Test	Control	Test and p-value
	Mean ± SS	Mean ± SS	
1st hour	4.46 ± 2.66	6.2 ± 2.65	t = 2.52, p = 0.01
2nd hour	4.36 ± 2.76	6.26 ± 2.62	t = 2.73, p = 0.00
3rd hour	4.03 ± 2.79	6 ± 2.51	t = 2.86, p = 0.00
4th hour	3.80 ± 2.41	5.96 ± 2.68	t = 3.28, p = 0.00
5th hour	3.30 ± 2.36	5.86 ± 2.45	t = 4.11, p = 0.00
6th hour	3.33 ± 2.45	5.83 ± 2.46	t = 3.93, p = 0.00
7th hour	2.89 ± 2.31	5.7 ± 2.21	t = 4.74, p = 0.00
8th hour	2.90 ± 2.41	5.46 ± 2.28	t = 4.23, p = 0.00
10th hour	2.63 ± 2.35	5.3 ± 2.36	t = 4.37, p = 0.00
12th hour	2.70 ± 2.21	5.5 ± 2.34	t = 4.75, p = 0.00
16th hour	2.93 ± 2.47	5.13 ± 2.11	t = 3.70, p = 0.00
20th hour	2.53 ± 2.59	4.53 ± 1.87	t = 3.42, p = 0.00
24th hour	2.33 ± 2.35	4.1 ± 1.93	t = 3.17, p = 0.00

DISCUSSION

The data obtained through this study, which was conducted to analyze the effect of cold application in the early postoperative period for pain and bleeding in patients who had septoplasty, were discussed in line with previous literature.

Cold application is a non-pharmacological method used to derive benefit from the effects of cold on prevention or control of pain, edema, and ecchymosis. Cold is known to have been used as a treatment method since ancient times. For example, there is information about cold treatment in the Edwin Smith Papyrus (BC 3500), Egyptians (BC 2500) used the cold effect in the early treatments of wounds and inflammation, and Hippocrates used the cold effect in treatments of edema, pain, and hemorrhage[18,19]. Cold applications have an analgesic effect by reducing indirectly the pressure and tension on the nerve endings by reducing inflammation, spasm, and edema.

Application of cold is known to decrease local pain and spasm, and suppress edema formation after trauma or surgical intervention by decreasing bleeding and inflammation. The aims of cold application are to provide local vasoconstriction by lowering the temperature of the subcutaneous tissue under the application area, thus reducing vascular permeability, preventing and reducing haematoma or edema formation, and reducing possible bleeding, by slowing down metabolism[11,20]. The results of the present study are in line with the literature: the amount of bleeding in experiment group patients with applied cold was determined to be less than the amount of bleeding in the control group patients, but not at a high enough level to build statistical significance. When the literature was reviewed, studies aimed at determining the effect of cold application for control of pain, edema, and ecchymosis were found. However, these studies were conducted in patients with soft tissue injury or in patients who underwent oral or orthopedic surgical treatment[21-25]. There are no studies to date that focus on controlling the pain and bleeding developments after septoplasty.

Many studies have been conducted that focus on the effect of cold application in controlling edema/ecchymosis[21-30]. In some of these studies[23,24,26,27,29,30], cold was applied for 14 - 72 hours together at intervals of 20 - 30 minutes or continously, to prevent facial edema formation, and ice packs, cold gel pads, or hilotherapy face masks (a mask that keeps the temperature between 15 - 20 ^{0}C) were used. In our study, ice packs were used to provide an effective cold application for the patients. McMeekan *et al* applied cold on forearms of 26 adults for 20 minutes using 3 different methods to monitor the effect of cold application on cutaneous temperature and nervous conduction velocity[31]. These methods were an ice pack, a cold pack covered by a wet towel, and a cold pack covered by a dry towel, applied to the same individuals at different times. The ice pack provided the fastest decline of cutaneous temperature among all measurements taken using the three methods.

Edema and ecchymosis, which negatively affect the esthetic results and cause disturbance by reducing the patient's visual acuity, also generally develop in the periorbital area and on the face after surgical treatments that affect the face, such as rhinoplasty. For this reason, studies have been conducted to prevent or reduce periorbital edema and ecchymosis developing after rhinoplasty, and in these studies the effect of a steroid were emphasized[32-34]. The results of the studies showed that a single dose of steroid treatment reduced eyelid edema and ecchymosis of upper eyelid for the first 2 days, but this effect diminished after the 2nd day[34]; therefore, the number of doses had to be increased to bring the effect to a desired level[32]. However, steroids are known to affect carbohydrate, fat, and protein metabolisms, immune-mediated and inflammatory responses, and the central nervous system; they also cause complications such as headache, thrombocytopenia, adrenal atrophy, gastric ulceration, and gastrointestinal hemorrhage[28,32-34]. The cold application used in our study was shown to reduce pain and bleeding together with ecchymosis and edema. Periorbital ecchymosis may develop as a result of leakage of accumulated blood in the deep tissues to the periorbital area; that is due to bleeding during facial surgical interventions, especially rhinoplasty. Periorbital ecchymosis generally becomes evident on the 1st or 2nd day of the postoperative period and improves in 1 - 2 weeks. Color changes occur in the ecchymosis area due to the effects of erythrocytes and hemoglobin. In the beginning, the color is dark red; over time, due to chemical changes in the hemoglobin, the color changes first to purple-brown, then to green-brown, finally to a green-yellow color, and the ecchymosis is healed. Ecchymosis is a normal situation; it is expected to develop after surgical trauma. However, ecchymosis may cause deformation of body, permanent pigmentation changes, anxiety, fear, and thereby, social isolation. Shortening the healing time of the ecchymosis that develops after surgical intervention is important for the patients to recover their work and social lives in a shorter time[28,34,35].

As a result of the present study, cold application was found to significantly decrease the pain related to the operation. Fee *et al* and De Jesus *et al* studied the effects of cold on nervous conduction velocity and showed that it was reduced by applying cold[36,37]. Also,

the pain reducing features of cold application have been shown in many studies[38,39]. Pain is currently defined as the fifth vital sign. For this reason, reducing the pain of patients who undergo septoplasty surgery by applying cold in the postoperative period and improving their quality of life are considered to be extremely important.

This study had several limitations. The study was conducted in only one center, and the study sample reflects only one area of Turkey. The findings, therefore, cannot be generalized to all patients undergoing septoplasty to correct septum deviation in Turkey. Another limitation of this study is that it calculated pain based on the patients' subjective assessments. Therefore, the findings must be interpreted cautiously.

CONCLUSION

As a result of our study, it can be stated that cold application performed in the early postoperative period in patients who had septoplasty surgery due to septum deviation decreases the pain and bleeding that develop as a result of the procedure. In conclusion, applying cold is recommended to be done in the early postoperative period to patients who are not allergic to cold and have no risk of alteration in vital signs to decrease pain and bleeding that develop due to septoplasty.

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