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Research

The Effects of Two Different Cold Application Times on Edema, Ecchymosis, and Pain After Rhinoplasty: A Randomized Clinical Trial

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A B S T R A C T

Purpose: This study was performed to determine the effects of different cold application times to the periorbital area after rhinoplasty on edema, ecchymosis, and pain.
Design: A randomized clinical study.
Methods: Patients were divided into two groups, and cold application was applied to one group for 4 hours and to the other for 48 hours. The cold application was applied with ice packs for 20 minutes every hour to the periorbital region in both groups. Data were collected with the Patient Information Form, Scoring Diagram for Edema, the Scoring Diagram for Ecchymosis, and the Visual Analogue Scale for Pain.
Findings: Periorbital edema, eyelid ecchymosis, and pain were not significantly different between the two groups. The mean edema score of the 48-hour group was 0.87 ± 0.93, while the mean edema score of the 4-hour group was 0.70 ± 0.87 (P = .48) on the 2nd day. The mean ecchymosis score was found as 2.03 ± 1.12 in the 48-hour group and 2.10 ± 1.09 in the 4-hour group (P = .817). The mean pain score was 12.50 ± 17.40 in the 48-hour group and 13.00 ± 16.00 in the 4-hour group (P = .98).
Conclusions: The effects of 48-hour and 4-hour cold applications are similar. Cold application for 4 hours may be recommended to patients who undergo rhinoplasty, as it is more practical and easier to apply than the 48-hour practice.

Rhinoplasty is one of the most common and complex operations in cosmetic plastic surgery. Ecchymosis, edema, and pain are commonly expected complications immediately after rhinoplasty.[1–3] The main reason for these complications is bleeding within soft tissues during osteotomy.[4] Rhinoplasty patients are mostly young and have high esthetic concerns. Therefore, edema and ecchymosis in these patients may negatively affect body image, cause discomfort and fear, and delay the return to daily life.[5,6]

In recent years, nonpharmacological methods have been valuable complements to surgical procedures.[1] Complementary therapies such as decongestants, herbal products, head elevation, and cold application techniques have been used for reducing postoperative edema, ecchymosis, and pain after the rhinoplasty procedure.[2,4,7–16] Among these methods, cold application is an inexpensive, easy-to-use, noninvasive, safe, and effective method, and it is among the independent practices of nurses.[1,17,18]

Cold application creates capillary contraction, reduces the temperature of the damaged area, lowers capillary permeability and bleeding, and slows down the metabolism. Consequently, it controls edema and reduces the risk of hematoma. It provides analgesia for a short period and reduces analgesic requirements by slowing down pain conduction speed in the efferent nerves.[10,12]

Many previous studies have recommended cold application to be routinely carried out for 36 to 48 hours during or after rhinoplasty.[5,19–23] However, there are limited numbers of randomized studies that have supported these recommendations. Existing studies have evaluated the effectiveness of cold application for long times in comparison to control groups. However, there is no research showing the effects of cold application for short periods after surgery.

The aim of this study was to compare the effects of 4-hour and 48-hour cold application after rhinoplasty on edema, ecchymosis, and pain.

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Methods

Study Design

This study was a randomized clinical study conducted on rhinoplasty patients, who underwent surgery at the Otorhinolaryngology department of a large research and training hospital.

Setting and Sample

The study population consisted of rhinoplasty/septorhinoplasty patients who underwent open/closed surgery in the Otorhinolaryngology service of a training and research hospital. The minimum required sample size was calculated using the G*Power 3.1 package program as 30 individuals per group, with an effect size of 0.65 and a power of 0.80. Considering that case losses could occur, 66 individuals who were eligible for the sample were enrolled in the study. The inclusion criteria were being 18 years old or older and undergoing a rhinoplasty/septorhinoplasty operation. Patients who had cold allergy symptoms, those who needed reoperation in the early period due to postoperative complications, those who had a previous rhinoplasty operation, and those who did not take part in more than 20% of the cold application interventions were excluded from the study. The sample excluded six patients, including one who previously had another rhinoplasty operation (n = 1), one who did not agree to participate in the study (n = 1), and four who did not complete all stages of the study (n = 4). The patients who were included in the sample were randomly assigned to groups. Randomization was performed using a computer program. The flow diagram for the study protocol is shown in Figure 1.

Data Collection Tools

Data were collected by face-to-face interview using a Patient Information Form prepared by the researcher, the Scoring Diagram for Edema, the Scoring Diagram for Ecchymosis, and the Visual Analogue Scale (VAS) for Pain. The Patient Information Form included questions on the patients' sociodemographic and surgical characteristics, such as age, gender, diagnosis, surgical intervention, duration of surgery, previous operation status, continuous use of medication, blood pressure, and vomiting.

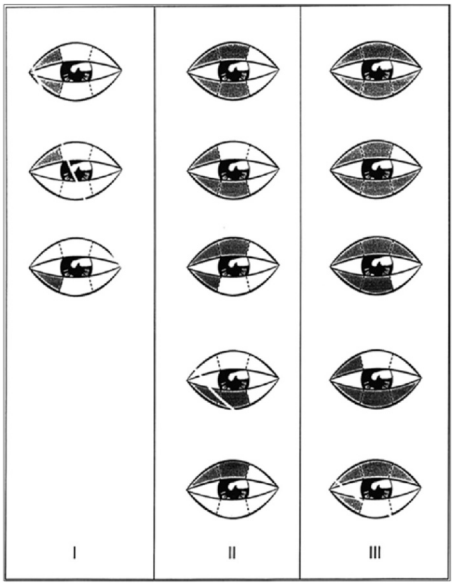

Figure 2. Ecchymosis score.[13]
From: Yucel O.T. Which type of osteotomy for edema and ecchymosis: external or internal? Ann Plast Surg. 2005;55(6):587–590.

Scoring Diagram for Ecchymosis

This scoring system, which was developed by Kara and Gokalan[4] and modified later by Yucel,[13] determines the severity of periorbital ecchymosis in rhinoplasty patients (Figure 2). This measurement tool has a single question that is scored between grades 0 and 3. Grade 0: no ecchymosis, grade 1: ecchymosis up to the medial one-third of the lower and/or upper eyelid, grade 2: ecchymosis up to the medial two-thirds of the lower and/or upper eyelid, and grade 3: ecchymosis up to the full length of the lower and/or upper eyelid.

Scoring Diagram for Edema

This scoring system, which determines the severity of eyelid edema in rhinoplasty patients, was developed by Kara and Gokalan[4] and modified later by Yucel[13] (Figure 3). This measurement tool has a single question that is scored between grades 0 and 4. Grade 0: no edema, grade 1: no coverage of the iris with the eyelids, grade 2: slight coverage of the iris with swollen eyelids, grade 3: full coverage of the iris with swollen eyelids, and grade 4: full closure of the eyes.

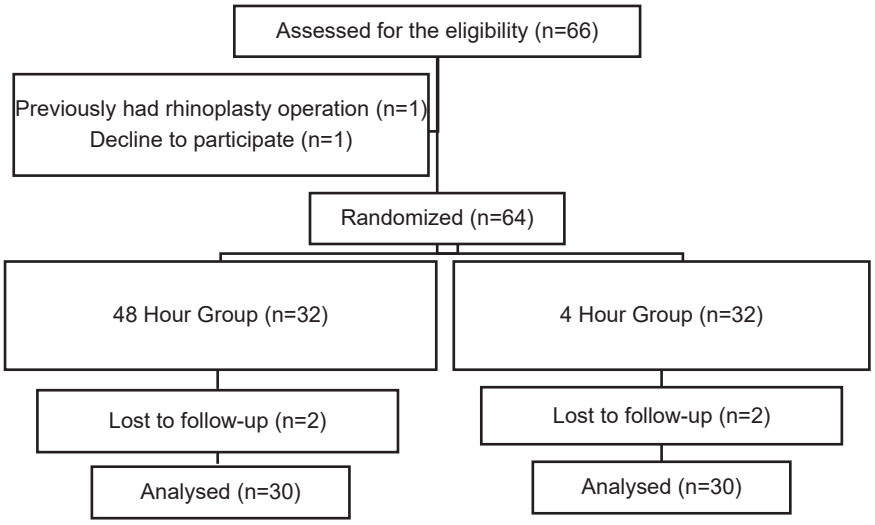

Figure 1. Flow diagram of the study.

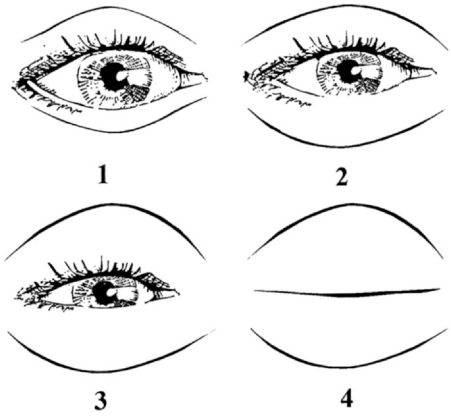

Figure 3. Eye edema score.[13]
From: Yucel O.T. Which type of osteotomy for edema and ecchymosis: external or internal? Ann Plast Surg. 2005;55(6):587–590.

Visual Analog Scale

Pain was assessed using the 0 to 100 mm VAS based on the patients' perceptions of pain after their surgery. This scale is widely used and has demonstrated reliability and validity in the measurement of acute pain. It is a 100-mm line that has the number 0 on one end, indicating no pain, and the number 100 on the other end, indicating unbearable pain.[24] Each participant was asked to mark their perceived current level of pain on the scale, and the length corresponding to the marked point was recorded as their pain score.

Pain Record Chart

The patients recorded their pain at home using the "Pain Record Chart" based on VAS.

Cold Application Follow-Up Chart

The hours of cold application and sleep hours were included on the chart that was given to the patients by the researcher. The patients marked the chart for every hour when they applied cold compress.

Data Collection

Before surgery, the Patient Information Form was completed for both groups. The ecchymosis, edema, and pain scores of the patients were recorded three times in total by the researcher in the 1st hour, at the 4th hour, and when they came to the follow-up examination on the 2nd day after surgery.

In both groups, the patients' pain (0 to 100) was evaluated using the VAS for the first 4 hours by the researcher, and then by the patient and their companions until the 48th hour. Patients or their companions began to self-record their pain levels on the evening of surgery. Patients recorded their pain levels 4 times a day for 2 days, immediately before and 45 minutes after receiving their standard analgesics. At the same time, additional analgesic doses were recorded on the form by the patients.

Intervention

A face-to-face education and training brochure was given to all patients approximately 4 days before the operation. The education and brochure included information on cold application in addition to standard postoperative training. In information about the cold application, it was stated that at the beginning of the cold application, discomfort would be felt for a short time, then they would feel burning for a few minutes, and at the end, they might feel numbness.[25] It was explained that the application area should be evaluated by the patient or the patient's companions in terms of possible complications of cold application every 2 minutes during the application.

All patients had companions. Both groups were told how to record their pain with the Pain Record Chart.

In both groups, ice packs of the same height and weight (13 cm × 13 cm—approximately 100 g) were applied to both eyes by the researcher for 20 minutes per hour for the first 4 hours. The researcher evaluated the application area every 2 minutes for the first application to prevent a possible complication.

The patients in the long-term application group and their companions were given training on how to apply cold, its duration, and what required attention. In this training, the patients were told to keep the ice packs in the freezer for at least 1 hour in line with the recommendation for use, to wrap them in a cotton sheath after removing them, to keep the bag around both eyes for 20 minutes, not to apply more than 20 minutes, and to come for a control examination at the end of 48 hours. The patients were told to use the "Cold Application Follow-up Chart" to help them remember the process. Patients had backup gel pads in the freezer. At the same time, patients filled out the "Cold Application Follow-up Chart." The cold application was terminated at the 48th hour. The application was applied for a total of 48 hours, approximately 16 hours a day. Ice packs were not applied between 12 a.m. and 8 p.m. to ensure optimal sleep and rest. All patients were called once a day to remind them of the cold application procedure.

The patients in the short (4 hours) application group received the cold pack only for the first 4 hours by the researcher, and then the cold application was terminated.

The pain levels of the patients in both groups were recorded on the "Pain Record Chart" by the researcher at the 1st and 4th hours, and by the patient and their companions until the end of 48 hours. Patients in both groups were called and reminded about pain follow-up.

The patients in both groups gave the "Pain Record Chart," and the patients in the long-term group gave the "Cold Application Follow-Up Chart" to the researcher when they came to the hospital for follow up at the end of 48 hours. Patients who did not fill out the form completely or did not perform the application as specified were excluded from the study.

Ethical Considerations

Written permission was given by the head of the otorhinolaryngology department before starting the study. Written approval was obtained from the Health Sciences University Gulhane Scientific Research Ethics Committee at the hospital where the study was conducted (Approval number: 50687469-1491-91-14/1648.4-128). Rhinoplasty patients who met the inclusion criteria determined in the study were informed about the purpose of the study and the anonymity of their answers. All patients provided written consent.

Statistical Analysis

SPSS for Windows, Version 16.0 was used to analyze the data. The normality of the distribution of the continuous variables was evaluated by Kolmogorov-Smirnov test. Descriptive statistics are presented using means and standard deviations for the normally distributed variables. Independent-sample t test was used for the normally distributed data. A P value of ≤.05 was considered statistically significant.

Table 1
Distribution of Sociodemographic and Surgical Characteristics of the Groups (N = 60)

	48-Hour Group (n: 30)	4-Hour Group (n: 30)	Total	*P*	
	Mean ± SD	Mean ± SD	Mean ± SD		Min-Max
Age	31.07 ± 8.95	27.73 ± 6.52	29.40 ± 7.94	.694*	19-53
Duration of stay in the operating room (min)	202 ± 65.10	173 ± 50.22	187.67 ± 59.43	.438*	105-310
	N (%)	N (%)	N (%)		
Gender					
Female	17 (56.7)	13 (43.3)	30 (50)	.439†	
Male	13 (43.3)	17 (56.7)	30 (50)		
Nasal packing					
Yes	16 (53.3)	16 (53.3)	32 (53.3)	1.0†	
No	14 (46.7)	14 (46.7)	28 (46.7)		
Surgical intervention					
Septorhinoplasty	25 (83.3)	25 (83.3)	50 (83.3)	1.0†	
Rhinoplasty	5 (16.7)	5 (16.7)	10 (16.7)		
Surgical method					
Open	26 (86.7)	27 (90.0)	53 (88.3)	1.0†	
Closed	4 (13.39)	3 (10.0)	7 (11.7)		

SD, standard deviation.
*Mann-Whitney U test.
†Pearson's χ^2 test.

Findings

Demographic and Surgical Characteristics

The distributions of the participants' sociodemographic and surgical characteristics are given in Table 1. The distributions of the patients in the 4-hour and 48-hour groups were homogenous in terms of age, gender, duration of stay in the operating room, use of nasal packing, use of additional analgesics, surgical intervention, and surgical method ($P > .05$).

Effects of Interventions on Periorbital Edema

The mean edema score was 0.87 ± 0.93 in the 48-hour group and 0.70 ± 0.87 in the 4-hour group on the 2nd day after their operation. The mean edema score of the 4-hour group was slightly lower, but the difference was not statistically significant ($P > .05$). There was also no statistically significant difference between the groups at the 1st and 4th hours ($P > .05$). The mean edema scores of the patients in both groups were the highest on the 2nd day (Table 2).

Effects of Interventions on Eyelid Ecchymosis

The mean ecchymosis score was 2.03 ± 1.12 in the 48-hour group and 2.10 ± 1.09 in the 4-hour group on the 2nd day after their operation. The mean ecchymosis score of the 48-hour group was slightly lower, but the difference between the groups was not statistically significant ($P > .05$). There was also no statistically significant difference between the groups at the 1st and 4th hours ($P > .05$) (Table 2).

Effects of Interventions on Pain

The mean VAS score was 12.50 ± 17.40 in the 48-hour group and 13.00 ± 16.00 in the 4-hour group of the 2nd day afternoon. There was no statistically significant difference between the groups based on their pain scores ($P > .05$). The mean pain scores of the patients in both groups were higher in the 1st hour after the operation and in the evening of the 1st day (Table 3).

Table 2
Differences in the Mean Edema and Ecchymosis Scores Between the Groups (N = 60)

	48-Hour Group (n: 30)	4-Hour Group (n: 30)	*P**	t
	Mean ± SD	Mean ± SD		
Periorbital edema				
1st hour	0.30 ± 0.59	0.20 ± 0.40	.451	0.880
4th hour	0.23 ± 0.56	0.33 ± 0.54	.490	0.388
2nd day	0.87 ± 0.93	0.70 ± 0.87	.480	0.589
Eyelid ecchymosis				
1st hour	0.63 ± 0.76	0.60 ± 0.77	.867	0.950
4th hour	1.23 ± 1.04	1.27 ± 1.17	.908	0.908
2nd day	2.03 ± 1.12	2.10 ± 1.09	.817	0.917

SD, standard deviation.
*Mann-Whitney U test.

Discussion

Edema, ecchymosis, and pain, which are expected complications after rhinoplasty operations, reduce the comfort level of the patient. Therefore, routine cold application is recommended for every patient after rhinoplasty in guidelines on rhinoplasty, many books, studies, and personal experience articles.[5,19–22] Nevertheless, there is a limited number of randomized studies supporting these recommendations. This study evaluated the effects of applying cold compress for 48 hours as suggested in the literature and for 4 hours on eyelid edema, ecchymosis, and pain in rhinoplasty patients, and there was no significant difference in any of these three parameters between the 48-hour and 4-hour groups.

Edema is frequently encountered in the postoperative period due to the trauma and manipulation of soft and hard tissues in the nose and paranasal regions during rhinoplasty. It causes a decrease in vision in the first 24 hours, delay in wound healing, anxiety, and patient dissatisfaction.[10,26] Ecchymosis after rhinoplasty occurs when the bleeding caused by the cutting of the angular blood vessels in the fractured nasal bone is displaced toward the surface after hemolysis, and it reaches its highest level on the 2nd and 3rd days after surgery.[7] It may also cause an interruption in the social lives of patients and permanent pigmentation on the skin.[4,13] In our study, in the 48-hour group, the mean edema score was found to be slightly higher at the 1st hour and the 2nd day and slightly lower at the 4th hour in comparison to the 4-hour group. The highest edema

Table 3
Differences in the Mean Pain Scores Between the Groups (N = 60)

	48-Hour Group (n: 30)	4-Hour Group (n: 30)	P*	t
	Mean ± SD	Mean ± SD		
1st hour	27.33 ± 23.29	23.50 ± 26.20	.552	0.534
4th hour	21.67 ± 20.60	18.33 ± 21.50	.542	0.542
Operation day—evening				
Before analgesic	24.83 ± 21.11	21.27 ± 19.55	.500	0.348
After analgesic	13.00 ± 14.65	13.57 ± 17.12	.891	0.674
1st Day—morning				
Before analgesic	25.60 ± 18.44	23.50 ± 23.30	.700	0.439
After analgesic	12.83 ± 14.48	10.83 ± 14.67	.597	0.716
1st Day—evening				
Before analgesic	29.83 ± 24.75	27.07 ± 23.21	.657	0.418
After analgesic	15.50 ± 19.58	12.87 ± 16.06	.571	0.415
2nd Day—morning				
Before analgesic	22.33 ± 25.52	18.13 ± 23.04	.506	0.455
After analgesic	9.83 ± 17.78	7.70 ± 14.76	.615	0.613
2nd Day—afternoon (48th hour)	12.50 ± 17.40	13.00 ± 16.00	.908	0.722

SD, standard deviation.
*Mann-Whitney U test.

scores were found on the 2nd day in both groups. The ecchymosis scores in both groups gradually increased from the 1st hour to the 2nd day. The highest ecchymosis scores were found on the 2nd day in both groups. According to our findings, there was no significant difference between the 48-hour and 4-hour groups in terms of edema and ecchymosis scores at the 1st and 4th hours and on the 2nd day.

There are many studies that have investigated the effects of cold application on edema and ecchymosis in different areas.[12,27–29] Some studies have found that cold application was effective in controlling edema and ecchymosis,[12,30] while some have shown that it was not effective.[18,28] There are also studies in which cold application was performed during rhinoplasty.[10,31,32] In the study by Taskin et al,[10] cold water-soaked gauze was applied to the operation area, and edema was at the highest level on the 1st day in the intervention and control groups, whereas it gradually decreased until the 7th day. There was a significant decrease in edema and ecchymosis in the cold application group on the 1st, 2nd, 3rd, 5th, and 7th days. Kaviani et al[31] applied cold compress to the face and nose area of patients starting at 1 hour before the surgery until the end of the surgery. It was found that edema and ecchymosis levels increased gradually in the first 24 hours in both groups, but the increase in the group without cold application was significantly higher ($P < .05$). A study comparing intraoperative and postoperative cold application with the control group found that the intraoperative cold application was significantly lower than the control group. Still, the postoperative cold application was similar to the control group.[32] One study evaluated the effects of cold application after surgery. Kayiran and Calli[33] performed cold application on only one periorbital region of patients for 3 days after rhinoplasty. The edema level on the cold application side was found to be significantly lower than the control side at the 1st hour and on the 1st and 3rd days.

Previous studies have emphasized that intraoperative and postoperative cold application is an effective method in preventing edema and ecchymosis.[10,31,33] In our study, no significant difference was found between the 4-hour and 48-hour cold application groups. Based on previous studies, the similarity of the edema scores in both groups in our study suggested that cold application for a short duration is as effective as cold application for a long duration.

According to the gate control theory, cold application increases the pain threshold and has an analgesic effect.[3] In our study, the highest mean pain scores in both groups were in the evening of 1st day, whereas these scores decreased in time, and there was no significant difference between the pain scores of the two groups. Cold application performed for different durations had a similar effect on pain (Table 3). There are many studies investigating the effects of cold application on postoperative pain in chest tube removal, craniotomy, inguinal hernia, episiotomy, and arthroplasty cases.[12,17,29,34–36] In some of these studies, cold application was effective in reducing pain,[16,28,35,37] while others reported no significant effect.[12,17,32,37,38] Although there are studies evaluating the effects of cold application performed during rhinoplasty surgery on edema and ecchymosis, pain was not evaluated in these studies.[9,10,31,33] Only one study investigated the effects of cold application after rhinoplasty on pain levels. In that study, there was no significant difference in pain at the 1st hour between the groups, but it was significantly lower between the groups on the 1st and 3rd days, but no analgesic was used in the study.[33] On the contrary, the patients continued to use their prescribed analgesics routinely in our study. Accordingly, the results in this study may have occurred due to the significant effects of pharmacological treatment rather than the effects of the cold application for different durations.

Limitations

The black-and-white ecchymosis scale used limits the evaluation of the ecchymosis. Since the pain scale (VAS) used was unidimensional, other parameters related to pain and the effects of pain on functional capacity were not measured.

Conclusion

Cold application after rhinoplasty has long been recommended for 12 to 48 hours after rhinoplasty in site studies, and it has been routinely applied in many relevant fields of medicine. Although there are several reports regarding the benefits of cold application, no study on determining the optimum material, method, duration, and frequency of cold application together has been found in the rhinoplasty literature. In this study, 4 hours of cold application was as effective as 48 hours of application in reducing postrhinoplasty edema, ecchymosis, and pain levels. Based on the results of this study, cold application for 4 hours may be recommended to patients who undergo rhinoplasty, as it is more practical and easier to apply than the 48-hour practice. It is recommended to investigate the effects of short-term cold application after similar or other surgical procedures.

Declaration of Competing Interest

None to report.

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