

Original article

Combined Effect of Cryotherapy and Kinesio Taping on Trismus Post-Third Molar Extraction Surgery

Esraa El-Sayed Abozied^{1,*}, Wafaa Hussien Borhan², Hassan Abdel-Ghany Osman³, Hussein Gamal Hussein⁴ and Mohmed Maher El-keblawy⁵

1,2 Department of Physical Therapy for Surgery, Faculty of Physical Therapy, Cairo University.

3 Department of Oral and Maxillofacial Surgery, Faculty of Oral & Dental Medicine, Cairo University.

4 Researcher, national center of research.

5 Department of Physical Therapy for Surgery, Faculty of Physical Therapy, Cairo University.

*Correspondence: Esraa El-Sayed Abozied; Email: esraaaboziert22@gmail.com.

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Abstract

Background: Mandibular third molar extraction, a common oral and maxillofacial surgery procedure, can lead to complications like pain, swelling, bleeding, limited mouth opening, and reduced quality of life.

Purpose: The study's purpose was to see how cryotherapy and Kinesio-taping affected pain and trismus after third molar extraction procedures.

Materials and Methods: The study involved 45 individuals aged 20-45 with discomfort and trismus, divided into three groups: Group A received cryotherapy and Kinesio-tape, Group B received Kinesio-tape, and Group C received cryotherapy in addition to traditional medical care.

Results: After treatment, group A showed a significant decrease in VAS and an increase in maximal mouth opening compared to groups B and C. Group B also experienced a decrease in VAS and an increase in maximal mouth opening.

Conclusion: Kinesio tape and cryotherapy had a positive effect on pain and trismus.

Keywords: Kinesio tape, cryotherapy, Third molar extraction surgery, pain, trismus, VAS, digital caliper.

Introduction:

Third-molar extraction is a well-known procedure in the practice of oral and maxillofacial specialists, and it is frequently associated with postoperative inflammatory difficulties, resulting in a decrease in patients' happiness during the recovery stage (1). A medical operation to remove an infected lower shrewdness tooth should always be meticulously attended to, and all contraindications and probable postoperative results should be

evaluated. The cautious evacuation of an afflicted third molar is one of the most difficult systems in the domain of oral medical treatments. The amount not entirely settled is governed, among other things, by the level of dental impaction, the physical design of the tooth, and the tooth's arrangement with adjacent structures (2). For seven to ten days after medical treatment, patients have various distresses and limitations, like

other oral cautious medications (expanding, anguish, and lockjaw) (3). There are a few methods for managing edema and discomfort during maxillofacial surgery. Regardless, there is a need for a system that can effectively reduce the risk of these concerns, such as any potentially unpleasant incidental consequences or excessive consumption. Intraoperative laser therapy, cryotherapy, and low-level laser therapy are all available. Platelet-rich fibrin (PRF) treatments, cautious channel addition, including manual lymph seepage (MLD), and the use of prescriptions, such as corticosteroids and nonsteroidal calming drugs, have all been used to reduce postoperative gloom in oral medical operations (1). Since old medication, ice pack treatment has been used to treat specific sicknesses and issues. Ice pack treatment is a non-pharmacological relief from discomfort approach. The cool application assists with alleviating torment in two ways. Cold application calms or brings down torment by decreasing edema and strong fits. Second, it frees torment by deferring or hindering the conduction from fringe nerves. Cryotherapy has been displayed to cause vasoconstriction in the related vascular region as well as a decline in metabolic rates (4). Cryotherapy is maybe the most straightforward and most established restorative methodology in the administration of intense delicate tissue harm brought about by wounds or medical procedures. The impacts of ice have been shown in various creature models and human examinations. Evacuation of affected third molars includes injury to the delicate tissues and hard designs of the oral hole, bringing about agony and expansion. It is frequently prompted that the worked side be treated with an ice pack (cryotherapy) (5). There are various kinds of cryotherapy. The least complex, generally normal, and most monetary sort of cryotherapy is the chilly application with ice packs. Oral specialists and dental specialists frequently suggest that patients apply ice packs for pain relief and against enlarging purposes after the

extraction of teeth and different oral medical procedure therapies (4).

On the other hand, Kinesio tape (KT), a flexible restorative tape, empowered compelling administration of postoperative inconveniences of head-and-neck medical procedure, upgrading lymphatic vehicle by lifting the skin, expanding the interstitial space, and further developing the course of blood and lymph. KT application is basic, and not prohibitive (6).

Kinesio tapes are thin, flexible tapes that can be stretched by up to 30–40% of their original length. After their application to the skin, they do not limit the mobility of the body area receiving treatment. They are made of cotton covered with hypoallergenic glue. The thickness, specific weight, and extensibility of the tapes are similar to the properties of the epidermis (2).

KT was initially used to treat sports injuries because it relieves pain in muscles and joints. KT raises the skin and directs fluids to migrate from high to low-pressure locations. In addition, Kinesio taping has been studied to decrease edema and discomfort after maxillofacial surgery, such as mandibular fractures, mid-face fractures, and 3M extraction (1).

The tapes are waterproof, airtight, and do not interfere with thermoregulation. They should be left on for four to five days. Kinesiology taping is a non-invasive and inexpensive technique. Another advantage is its therapy continuity, which permits it to have a therapeutic impact that lasts 24 hours (2).

Materials and Methods:

Subjects

forty- five patients (male and female) with pain and trismus, their ages ranged from 20 to 45 years. The participants were selected from the oral and maxillofacial surgery department at the faculty of dentistry Cairo University. All patients received cryotherapy and Kinesio tape for one week immediately post-surgical removal of the third molar. Cryotherapy was performed on the treated side using a cold pack (blocks of ice wrapped in a band to protect the skin). They were

given an ice pack for 30 minutes every day for seven days. The tape was first applied across the supraclavicular lymph nodes. The tape was then moved to the patient's face, where the most edema was anticipated. The strain in the tape was roughly 15% of its maximum stretch. Patients were assessed before the treatment and after the surgery on day 2 and day 7 postoperatively by using a visual analog scale to assess the pain and an electronic digital caliper to assess maximum mouth opening.

The study included the following clinical criteria: the patients' ages ranged from 20 to 45 years, all patients had lower right or left mandibular third molar extraction surgery and suffered from pain and trismus after third molar surgery, all patients had impacted third molars in the mesio-angular position, no patients had taken any medication that could influence the treatment procedures, and all patients were cooperative. The exclusion criteria were as follows: participants were excluded if they met one of the subsequent criteria: diabetes mellitus, malignant disease or heart failure and pulmonary congestion, dermatological disease of the face, arthritis or ankylosis, any permanent congenital anomalies, tumor, infection or fracture, receiving chemotherapy, pregnant or lactating women, sensitivity to tape adhesives, did not want to shave their face, intolerance to cold, any drug allergy, medical contraindications for the surgery, fracture or TMJ dislocation and limitation of mouth opening due to temporomandibular joint disorders.

The procedure of the study

All patients received full detailed information concerning the current study and a written approval consent form was signed at the beginning of the current study.

Measurement procedures

A baseline measurement was carried out just before the surgery and similar measurements were carried out on day 2 (48 hours) and day 7 post surgery. The difference between the

postoperative and pre-operative measurements was calculated. Three readings were taken for each patient and the average was determined.

Pain is assessed using a VAS, which is a straight line typically 100 mm long with anchor descriptions such as "no pain" and "worst pain imaginable." The patient marks her perception, and the distance between the left endpoint and the mark is measured in millimeters (7).

The Maximum inter-incisal opening MIO was evaluated by measuring with an electronic digital caliper that measured the maximal opening between the right maxillary and mandibular central incisors (8).

Therapeutic procedures

Procedures of cryotherapy:

Groups A and C The patient was put in a relaxed position. An ice pack was placed on the side of the face where the procedure was conducted. Cryotherapy was performed on the treated side using a cold pack (blocks of ice wrapped in a band to protect the skin). They were given an ice pack for 30 minutes every day for seven days (9).

Procedures of Kinesio tape:

Group A and B Following surgery, the KT (ares;5x5 cm) was made separately for each patient. The tapes were applied by cutting a big length of tape into three equal sections, generating smaller stripes. The tape was first applied across the supraclavicular lymph nodes. The tape was then moved to the patient's face, where the most edema was anticipated. The strain in the tape was roughly 15% of its maximum stretch (2).

Statistical analysis

ANOVA test was conducted for comparison of age between groups. Chi-squared tests were conducted for comparison of sex distribution between groups. Normal distribution of data was checked using the Shapiro-Wilk test. Levene's test for homogeneity of variances was conducted to test the homogeneity between groups. The MANOVA test was conducted for comparison of

VAS and MMO between groups. ANOVA with repeated measures was conducted for comparison of VAS and MMO between preoperative, day 2, and day 7 postoperative in each group. The level of significance for all statistical tests was set at $p < 0.05$. All statistical analysis was conducted through the statistical package for social studies (SPSS) version 25 for Windows (IBM SPSS, Chicago, IL, USA).

Results:

Subject characteristics

There was no significant difference between groups in age and sex distribution ($p > 0.05$) (Table 1).

Table 1. Basic characteristics of participants.

	Group A	Group B	Group C	p-value
Age, mean \pm SD, (years)	26.40 \pm 3.18	27.13 \pm 4.24	25.33 \pm 4.43	0.46
Sex, N (%)				
Females	12 (80%)	10 (67%)	11 (73%)	0.71
Males	3 (20%)	5 (33%)	4 (27%)	

SD, standard deviation; p-value, level of significance

Between-group comparison

Preoperatively, there was no significant difference in VAS or MMO across groups ($p > 0.05$).

At day 2 and day 7 postoperative, group A had a significantly lower VAS than groups B and C ($p < 0.05$ and < 0.01 , respectively). At day 7 postoperative, the VAS of group B was significantly lower than that of group C ($p < 0.05$). On day 2 postoperative, there was no

significant difference in VAS between groups B and C ($p > 0.05$).

At day 2 and day 7 postoperative, group A had a significantly higher MMO than group B ($p < 0.01$) and group C ($p < 0.001$). MMO was significantly higher in group B than in group C on day 2 and day 7 postoperatively ($p < 0.05$) (Table 2).

Within group comparison

There were no statistically significant differences in VAS between preoperative and postoperative day 2 in group A ($p > 0.05$). VAS was significantly greater on day 2 postoperative in groups B and C compared to preoperative ($p < 0.001$). There was a significant decrease in VAS on day 7 postoperative compared to preoperative ($p < 0.001$) and day 2 postoperative ($p < 0.001$) (Table 3).

MMO was considerably lower on postoperative day 2 compared to preoperative day 1 in groups A, B, and C ($p < 0.001$). MMO was considerably higher in group A on day 7 compared to group B.

Preoperative and postoperative day 2 ($p < 0.001$).

There was no significant change in MMO between preoperative and day 7 postoperative ($p > 0.05$), however, there was a substantial increase in MMO on day 7 compared to day 2 postoperative in group B ($p < 0.001$). In group C, there was a substantial decrease in MMO at day 7 postoperative compared to preoperative ($p < 0.001$), whereas there was a significant rise in MMO at day 7 compared to day 2 postoperative ($p < 0.001$) (Table 4).

Table 2. Mean VAS and MMO preoperative, day 2 postoperative, and day 7 postoperative of groups A, B, and C:

	Group A	Group B	Group C	p-value		
	mean ± SD	mean ± SD	mean ± SD	A vs B	A vs C	B vs C
VAS						
Preoperative	6.93 ± 0.96	7 ± 0.92	7.2 ± 0.94	0.98	0.72	0.83
Day 2 postoperative	7.20 ± 1.14	8.13 ± 0.83	8.26 ± 0.79	0.02	0.009	0.92
Day 7 postoperative	2.86 ± 0.99	3.73 ± 0.96	4.66 ± 0.81	0.03	0.001	0.02
	p = 0.001	p = 0.001	p = 0.001			
MMO (mm)						
Preoperative	42.58 ± 6.68	41.68 ± 5.51	40.12 ± 7.77	0.92	0.58	0.80
Day 2 postoperative	33.1 ± 4.76	28.02 ± 3.27	24.36 ± 2.70	0.001	0.001	0.02
Day 7 postoperative	48.17 ± 4.07	41.51 ± 5.62	35.61 ± 7.92	0.01	0.001	0.02
	p = 0.001	p = 0.001	p = 0.001			

SD, Standard deviation; p-value, Level of significance

Table 3. Comparison of VAS between preoperative, day 2 postoperative, and day 7 post-operative of groups A, B, and C.

	Group A			Group B			Group C		
	MD	% of change	p-value	MD	% of change	p-value	MD	% of change	p-value
Preoperative - Day 2 postoperative	-0.27	3.90	0.31	-1.13	16.14	0.001	-1.06	14.72	0.001
Preoperative - Day 7 postoperative	4.07	58.73	0.001	3.27	46.71	0.001	2.54	35.28	0.001
Day 2- Day 7 postoperative	4.34	60.28	0.001	4.4	54.12	0.001	3.6	43.58	0.001

MD, Mean difference; p-value, level of significance.

Table 4. Comparison of MMO between preoperative, day 2 postoperative, and day 7 post-operative of groups A, B, and C.

	Group A			Group B			Group C		
	MD	% of change	p-value	MD	% of change	p-value	MD	% of change	p-value
Preoperative - Day 2 postoperative	9.48	22.26	0.001	13.66	32.77	0.001	15.76	39.28	0.001
Preoperative - Day 7 postoperative	-5.59	13.13	0.01	0.17	0.41	1	4.51	11.24	0.001
Day 2- Day 7 postoperative	-15.07	45.53	0.001	-13.49	48.14	0.001	-11.25	46.18	0.001

MD, Mean difference; p-value, level of significance.

Discussion:

The present study aimed to investigate the impact of cryotherapy and Kinesio taping on post-surgery pain and trismus. MTM extraction, a common procedure in oral and maxillofacial surgery clinics, can result in complications such as pain, swelling, bleeding, and limited mouth opening, which can negatively affect patients' quality of life (1).

After treatment, a comparison between the three groups showed that group A had a significant decrease in VAS compared to groups B and C on days 2 and 7 postoperative. Additionally, group A demonstrated a significant increase in maximum mouth opening compared to groups B and C on days 2 and 7 postoperative.

Furthermore, group B showed a significant decrease in pain compared to group C on day 7 postoperative and a significant increase in maximum mouth opening compared to group C on day 7 postoperative.

Cryotherapy effectiveness results in our study are supported by **Cebi and Kasapoglu (4)** conducted a study to investigate the effectiveness of cold pack therapy in reducing pain after the extraction of mandibular third molars. The study involved thirty patients who underwent extraction of their mandibular third molars. They were given medication as usual along with ice pack therapy, which was applied directly over the masseteric region of the surgical area for 12 hours, intermittently for 20 minutes. The Visual Analog Scale was used to assess the pain levels. The results indicated that ice pack therapy significantly reduced pain levels following the mandibular third molar extraction. Therefore, ice pack therapy is a promising alternative method to improve the quality of life of patients after the extraction of third molars.

Thiridnle and Adeyemo (10) revealed that individuals who had cryotherapy after third molar surgery had a much higher quality of life than those who did not. Cryotherapy is a viable alternative or supplement to other known means of improving patients' quality of life following surgical removal of the third molar.

Zandi and Keshavarz (11) After impacted mandibular third molar surgery, it was found that cold therapy did not affect postoperative outcomes.

In a study conducted by **Altiparmak et al (12)**, the impact of ice packs on post-operative edema, trismus, and pain perception following impacted third molar surgery was investigated. The study involved eighteen individuals with bilateral third molars. Each post-operative period was assessed for edema, pain, and mouth opening. The results indicated that ice pack treatment had minimal effect on post-operative edema, trismus, or pain perception following impacted third molar surgery.

Kinesio tape effectiveness results in our study are supported by **Zheng et al. (13)** conducted a study that found that using kinesiology tape can help reduce postoperative inflammation symptoms, such as pain, swelling, and limited mouth opening, after mandibular third molar extraction. The study also revealed that kinesiology tape can be used as an alternative therapy or in addition to cryotherapy. The study included 60 patients who were randomly allocated to one of three groups: kinesio tape alone, cryotherapy alone, or a control group. While there was no significant difference between the kinesio tape and cryotherapy groups in any indication, the kinesio tape group reported fewer difficulties than the cryotherapy group. The study concluded that kinesiology tape can improve the quality of life of patients after mandibular third molar extraction.

Jaroń et al. (2) conducted a randomized controlled experiment to assess the effectiveness of kinesio tape on postoperative soft tissue edema, trismus, and pain in patients following surgical extraction of an impacted mandibular third molar. The study involved 100 patients who underwent surgical extraction of a lower wisdom tooth, and who were randomly assigned to one of two groups: one with kinesio taping, and one without. Measurements of swelling, trismus, and pain were taken before the surgery, as well as on the third and seventh post-procedural days. The

results showed that Kinesio tape significantly reduced facial edema, trismus, and pain intensity levels on the third and seventh days after surgery. Moreover, the kinesio tape method is non-invasive, active during application, and does not require any additional patient appointments. Therefore, following surgery for impacted mandibular wisdom teeth, KT therapy is a great technique to reduce postoperative edema, pain, and trismus.

Firoozi et al. (14) found moderate to high confidence evidence that KT reduces postoperative pain and improves mouth opening.

A study conducted by **Yurttutan & Sancak (15)** investigated the impact of Kinesio Taping using the Web Strip method on postoperative complications following the extraction of impacted mandibular 3M. The study comprised 60 patients who were randomly assigned to either a group that received KT or a control group that did not. The Web Strip technique of KT is a simple and cost-effective method that does not have any systemic adverse effects and has proved to be effective in minimizing morbidity.

Ristow et al. (16) carried out a randomized controlled trial to examine whether the application of kinesiologic tape can reduce the postoperative complications associated with 3M surgery. In the study, forty patients scheduled for 3M removal were randomly assigned to one of two groups: with or without kinesiologic tape. The researchers assessed facial swelling using a five-point scale at six different time points. The pain was assessed using a visual analog scale, and mouth opening range was measured with standard calipers. After 3M surgery, the use of kinesiologic tape significantly reduced edema, pain, trismus, and overall postoperative complications.

According to **TATLI et al. (3)**, KT therapy is an effective way to reduce morbidity after impacted mandibular third molar surgery. On the other hand, placebo taping is not as effective as

proper taping. When compared to no taping, placebo taping produces similar results.

Conclusions:

Cryotherapy and Kinesio tape had a positive effect on pain and trismus after impacted third molar extraction surgery. Cryotherapy and Kinesio tape are safe, easy, and less economical methods and have a more significant effect on reducing postoperative pain and trismus after impacted third molar extraction surgery.

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