

Study examples:

Cold Therapy in Maxillofacial Surgery

Belli E., Rendine G., Mazzone N.

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“The most used cooling system is the application of ice in the treated area. The low temperature achieved (0-C) and the continuous changes resulting from heating of the ice packs decrease therapeutic effects.^{1,3,6} In this study, a cooling and compression system, at fixed temperature and adjustable for maxillofacial cutaneous tissues, applied to 10 patients between January 2008 and July 2008 was used. The surgical treatment used was skeletal bases replacement by Le Fort I osteotomy of the maxillary bone and bilateral sagittal osteotomy of the mandible.”

“Results: With the use of Hilotherapy system, the swelling and pain decrease in intensity and time, allowing a quicker path to recovery of mandibular dynamics, a better comfort for patients, and an easy management of patients by medical attendants.

Conclusions: The Hilotherapy system has been proven to have a safe and effective use as a cold therapy to control postsurgery course.”

3D evaluation of postoperative swelling following third molar surgery using 2 different cooling therapy methods

A randomised observer blind prospective study

Rana M., Ghassemi A., Gerressen M., Riediger D., Modabber A.

submitted to be considered for publication as an original contribution in Journal of Oral and Maxillofacial Surgery (Manuscript Number: JOMS-D-10-00785)

“The aim of this study was to compare post-operative cooling therapy by cooling compresses with the water-circulating cooling face mask by Hilotherm® in terms of beneficial effects on postoperative facial swelling, pain, trismus and neurological complaints.”

“Results

Patients receiving a cooling therapy by Hilotherm® demonstrated less facial swelling, less pain, a tendency to less neurological complaints and were more satisfied than with conventional cooling.

Conclusions

Hilotherm® is more efficient to manage postoperative swelling and pain after removal of third molars compared to conventional cooling.”

3D evaluation of post-operative swelling using 2 different cooling methods following orthognathic surgery:

a randomised observer blind prospective pilot study

Rana M., Piffkó J., Joos U., Rana O. R., Kater W.

submitted to be considered for publication as an original contribution in Journal of Oral and Maxillofacial Surgery (Manuscript Number: IJOMS-D-10-00091)

“A new and promising method to measure facial swelling seems to be optical face scanning. Therefore, this study aimed to evaluate the 3D optical scanner (3D-Shape GmbH, Erlangen, Germany) to measure soft tissue swelling following orthognathic surgery. Post-operative swelling was treated either with conventional cooling by cold packs or with the water-circulating cooling device Hilotherm Clinic (Hilotherm®, Ludwigsburg, Germany). Secondary endpoints of each group included post-operative pain, neurological complaints, hospital stay duration, trismus and patients satisfactory.

The use of the cooling device by Hilotherm significantly reduced post-operative swelling, pain and hospital stay duration compared to conventional cooling. Moreover, postoperative trismus and satisfactory of the cooling method was significantly higher in the Hilotherm group compared to conventional cooling. [...].”

Observational study with cryotherapy Hilotherm in rheumatoid arthritis

Keysser P., Rehabilitation Clinic for Orthopaedics and Rheumatology, Rheumazentrum Oberammergau

“The cold therapy cryotherapy plays an integral role in orthopedics, traumatology and Rheumatology, particularly in the postoperative period after joint surgery but may be considered for patients with rheumatoid arthritis to provide pain relief and reduce swelling.

Especially in older patients, severe pain syndromes, or polyneuropathy and other nerve disorders are the typically treated Ice packs or Cold packs. This approach can often be problematic, since it may lead to uncontrolled application with cold damage, such as necrosis. Also the use of leaking ice water bags and displaced cold packs is often problematic.

The cold treatment in this study is provided using the Hilotherm device. The objective was to identify its capabilities to reduce pain, improve patient comfort and practicality of application.”

“Results:

[...] **Overall, all patients have at the end of the treatment with the device Hilotherm demonstrated lower pain intensity than indicated at the beginning.”**

“In summary, in our view, the application of cold therapy Hilotherm both in rheumatoid arthritis patients and in orthopedic trauma patients is recommended. In general, the application is perceived as pleasant, the pain intensity decreases. Applications showed no signs of problems or complications.”

The application of a new cooling system (Hilotherm®) after aesthetic plastic surgeries

D. v. Lukowicz, K.H. Herter, M. Dagdelen, E.-M. Noah

Red Cross Hospital Kassel

Poster Presentation DGPRAC 2008 (German poster translated to English)

“Introduction: [...] The Hilotherm® device is cooling water to a desired temperature between 10 and 30 °C and leads it through a tube system which is incorporated in different masks and thus suitable for various body regions.

Material and Methods: The analysis focussed on patient satisfaction in terms of wearing comfort, handling and general usability.”

“Result and Summary: **The evaluation of the questionnaires showed a high to very high patient satisfaction with the application of Hilotherm®. The wearing comfort, handling and usability showed high acceptance.** [...]

92% of the patients would like to be treated with Hilotherm® again.

88% of the patients will ask their doctor in future if he offers Hilotherm® therapy.”

Comparative evaluation of the usability of 2 different methods to perform mild hypothermia in patients with out-of-hospital cardiac arrest

M. Rana, J. W. Schröder, E. Saygili, U. Hameed, D. Benke, R. Hoffmann, P. Schauerte, N. Marx, O. R. Rana

„Background: Several studies have shown that mild hypothermia (32–34 °C) markedly mitigates brain damage after cardiac arrest (CA). This study aimed to compare the efficacy of the non-invasive cooling device Hilotherm® Clinic (Hilotherm® GmbH, Germany) with conventional cooling to induce and maintain mild hypothermia in patients after out-of-hospital CA.”

“**Results: The speed of cooling was significantly higher in both Hilotherm groups compared to conventional cooling** [...]. Temperature deviation from the target temperature of 33 °C was significantly higher in the conventional group compared to both Hilotherm groups. During induction of mild hypothermia a significant reduction of the mean arterial blood pressure and the heart rate was observed without significant differences between the groups. [...]

Conclusions: Rapid and reliable mild hypothermia can be better achieved by the non-invasive cooling system Hilotherm compared to conventional cooling with ice packs and cold infusion.”

Use of Cryotherapy for Orthopaedic Patients

McDowell, J.H., McFarland E.G., Jermier Nalli B. Orthopaedic Nursing, 1994, Volume 13, No. 5, pp.21-30

“Effective pain management and prevention of edema are goals for orthopaedic patients after injury and after surgery. [...] This article reviews the physiology of cold, basic principles of cryotherapy, various techniques of cold application, nursing assessment and care, and patient teaching for a patient with cryotherapy.”

“Conclusion

Cryotherapy has been shown to have beneficial effects when tissue is injured. The benefits of cold therapy in the total management of the orthopaedic patient include pain control with less narcotic usage and decreased edema which allows for earlier rehabilitation. [...]

Newer technologies and devices allow efficient and safe application of cold to postsurgical orthopaedic patients.”

A Comparison of Crushed Ice and Continuous Flow Cold Therapy

Barber F.A.

The American Journal of Knee Surgery Spring 2000/Vol 13 No 2

“Abstract: Crushed ice was compared to continuous flow cold therapy for control of postoperative pain after arthroscopic patellar tendon autograft anterior cruciate ligament (ACL) reconstruction. With all other variables held constant, cold was administered by either continuous flow (group 1) or crushed ice (group 2).”

“Conclusion

[...] Cold influences circulation, reduces pain and muscle spasm, reduces metabolic activity and inflammation, and increases tissue stiffness in injured soft tissue. **This study demonstrated that continuous flow cold therapy results in lower VAS and Likert pain scores, less Vicodin use, greater continuous passive motion, and greater knee flexion at 1 week after surgery than crushed ice.**

Patients report more complaints when using crushed ice, and compliance is inferior. The belief that crushed ice is a comparable modality to continuous flow cold therapy for postoperative pain reduction is not supported by these data. Crushed ice is not an equivalent modality and is inferior to continuous flow cold.”

Continuous-Flow Cold Therapy After Total Knee Arthroplasty

Morsi E.

The Journal of Arthroplasty Vol. 17 No. 6 2002

“In this prospective study, 60 primary TKAs (total knee arthroplasty) were done on 30 patients (all staged bilateral TKAs). For every patient, 1 TKA had a continuous-flow cooling device applied over the surgical dressing immediately postoperatively. The other TKA in the same patient (control TKA) was done 6 weeks later and had no cooling device. The study compared the range of motion, the volume of hemovac output and blood loss, visual analog pain score, analgesic consumption, and wound healing in the 2 limbs of the same patient.”

“Conclusion:

Continuous-flow cold therapy is advantageous after TKA. It provides greater knee extension and flexion at 1 week, but at 6 weeks the 2 groups were the same. It also results in a lower volume of hemovac output and blood loss, lower visual analog pain score, and less analgesic consumption, with no adverse effect on wound healing.”

Evaluation of the contribution to postoperative analgesia by local cooling of the wound

Brandner B., Munro B., Bromley L. M. and Hetreed M.
Anaesthesia, 1996, Volume 51, pages 1021-1025

“Summary

Thirty healthy patients undergoing lumbar spine surgery were randomly assigned to one of two groups for postoperative pain relief. Group 1 received morphine via patient controlled analgesia and local cooling of the wound by an externally applied cooling pad while group 2 received patient controlled analgesia alone.

There was a significant reduction in morphine consumption when local cooling was applied [...].

Patients were also significantly more satisfied with their overall postoperative pain management when cooling therapy was used.”

“For this study the cooling pad temperature was set between 7.2-10°C.”

Continuous-Flow Cold Therapy for Outpatient Anterior Cruciate Ligament Reconstruction

Barber F.A., McGuire D.A. and Click S.

The Journal of Arthroscopic and Related Surgery, Volume 14, No 2 (March), 1998: pp 130-135

“Summary:

This prospective, randomized study evaluated continuous-flow cold therapy for postoperative pain in outpatient arthroscopic anterior cruciate ligament (ACL) reconstructions. [...] **Continuous-flow cold therapy lowered VAS and Likert scores, reduced Vicodin use, increased prone hangs, CPM, and knee flexion. Continuous-flow cold therapy is safe and effective for outpatient ACL reconstruction reducing pain medication requirements.**”

The effects of cold therapy in the postoperative management of pain in patients undergoing anterior cruciate ligament reconstruction

Cohn B. T., Draeger R. I. and Jackson D. W.

The American Journal of Sports Medicine, Vol. 17, No. 3, 1989

“This prospective study assessed 54 consecutive arthroscopically assisted ACL reconstructions for the amount of postoperative pain relief provided by cold therapy, using the Hot/Ice Thermal Blanket. [...] The temperature of the fluid was set at 10°C in the recovery room and the unit was run continuously until the time of discharge, which was approximately 4 days.”

“In summary, this study showed a significant decrease in injectable pain medication consumption following ACL reconstruction in those patients using a Hot/Ice machine postoperatively. Subjectively the patients noted a considerable difference between when the machine was on and when it was off. [...]”

The effect of postoperative cold therapy in joint surgery with a new cooling device

Münst P., Bonnaire F., Kuner E. H.

Unfallchirurgie 14 (1988), 224-230 (Nr. 4)

„The effect of continuous cold therapy with a new cooling device in post-operative treatment after knee surgery has been proved. Ten patients with different operations of the knee joint participated in this study. Eight out of ten patients reported no or poor pain, whereas in the control group especially after arthrotomy considerable or violent pain was reported. After arthroscopical operations we found more a decrease of swelling and effusion, after arthrotomy more pain reduction. The subjective feeling of all patients was very good and they were generally very receptive to it.”

Cryotherapy as an Analgetic Technique in Direct Postoperative Management of Elective Joint Replacement

Albrecht St., le Blond R., Köhler V., Cordis R., Gill Ch., Kleihues H., Schlüter S., Noack W.
Z. Orthop. 135 (1997) 45-51

“The analgetic effect of postoperative cold therapy was evaluated in a prospective clinical trial, including 312 patients after total knee or hip arthroplasty. Conventional cold packs, consisting of microcrystalline silicate were compared to a continuous applicable closed system. Continuous cryotherapy resulted in a depression of skin temperature to 12 °C, whereas intermittent cooling only caused a mean temperature decrease of 1 °C. **Clinically continuous cold application leads to a more than 50% decrease of analgetic demands in both, systemic and regional application (p<0,001).** This observation was found in a significant correlation with patient’s pain sensation as well as primary range of motion. Intermittent cryotherapy was found to be ineffective in postoperative pain relieve in hip- and inadequate in knee arthroplasty patients. [...]”

The Effect of Cryotherapy on Intraarticular Temperature and Postoperative Care after Anterior Cruciate Ligament Reconstruction

Ohkoshi Y., Ohkoshi M., Nagasaki S., Ono A., Hashimoto T. and Yamane S.
The American Journal of Sports Medicine, Vol. 27, No. 3 (p. 357 - 362)

“Abstract

The objective of this study was to elucidate how cryotherapy after anterior cruciate ligament reconstruction affects intraarticular temperature and clinical results. [...]

During the low-temperature phase in the treated groups, the temperature of the suprapatellar pouch and of the intercondylar notch were significantly lower than the body temperature. **The pain score and the number of times an analgesic had to be administered were both significantly lower in the 10°C group than in the control group.** Blood loss was significantly less in the 5°C group than in the control group.”

The efficacy of cryotherapy in the postoperative shoulder.

Speer KP, Warren RF, Horowitz L.
J Shoulder Elbow Surg. 1996 Jan-Feb;5(1):62-8.

“Abstract

We report the results of an outcome study that used visual analog scales to evaluate the efficacy of cryotherapy in the postoperative shoulder. This prospective study included 50 consecutive patients admitted to the hospital for at least one night after anterior shoulder stabilization, rotator cuff repair, or total shoulder replacement. The patients were randomized: 25 were fitted with a cryotherapy device in the operating room, and 25 were not. Otherwise, postoperative treatment was identical for the two groups, including types of analgesic agents given. Visual analog responses were converted to numeric values by simple measurement techniques. The scales assessed pain, comfort, sleep, analgesic use, and overall satisfaction. On the night of the operation the pain was less severe and occurred less often in the cryotherapy group. **Those in the cryotherapy group slept better on the night of the operation and perceived the need to use pain medicine less often in comparison with those in the noncryotherapy group. By postoperative day 10 patients in the cryotherapy group reported their shoulders hurt less often and with less severity. Swelling was less, and shoulder movement hurt less during rehabilitation, enhancing the rehabilitative effort. Cryotherapy offers a number of benefits for care of patients in the immediate postoperative period.**”

The Influence of Cold and Compression on Lymph Flow at the Ankle

Meeusen R., Van der Veen P., Joos E., Roeykens J., Bossuyt A., De Meirleir K.
Clinical Journal of Sport Medicine, 1998;8:226-271

“Objective: To investigate the effects of cold application with different temperatures on lymph flow in healthy persons and to examine the effects of the combination of cold and compression on lymph vessels.”

“The superficial swelling reported by some authors (Farry, Matsen and McMaster) could have been caused by a cold-induced microvascular injury leading to an increase in protein permeability causing leakage to the extravascular space and interstitial edema (Meeusen).

Zhang and Wolf hypothesized that factors such as microvascular pressure changes produced this edema at temperatures <10°C. In our study, skin temperature did not drop below this temperature (lowest temperature measured, 13.6°C); this could explain why during the application of cold water, interstitial fluid migration is not stopped or why we did not observe swelling caused by the application.

Conclusion: These results indicate that lymph evacuation at the ankle is influenced significantly when cold water is applied with or without pressure.”