

CLINICAL PAPERS

(Abstracts)



WHAT IS SQUID GO ?

Squid Go is equipped with an intelligent Sequential Intermittent Compression (SIC) system, which is controlled by a powerful and compact pump unit. Sequential intermittent compression (SIC) is increasingly becoming a routine component after sport, training, or recovery from injury.

SIC improves healing by transporting lymphatic fluid out of the tissue, thereby reducing oedema and pressure, and allowing fresh blood to refill ischemic tissue. After intense physical activity, SIC can help remove metabolic by-products such as lactic acid from the muscles, enabling faster recovery and improved performance.

The Squid Go pump comes with four pre-programmed compression algorithms, allowing selection of compression pressures from low (30 mmHg), medium (50 or 70 mmHg) to high (85 mmHg), while providing a constant cooling effect, via the use of very cold (-18C) proprietary Gel Packs.

By combining SIC with these highly effective cold Gel Packs, Squid Go can be used virtually anywhere. Our studies show that the unique combination of cold Gel Packs and dynamic sequential intermittent compression effectively drives the cold deeper into the tissue. An internal study showed that the use of Squid Go resulted in 44% more cooling, measured at a tissue depth of 4 cm, compared with the use of cold Gel Packs alone.



A prospective, multi-center, randomised trial to evaluate the efficacy of a cryopneumatic device on total knee arthroplasty recovery

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Abstract:

Pain, swelling and inflammation are expected during the recovery from total knee arthroplasty (TKA) surgery. The severity of these factors and how a patient copes with them may determine the ultimate outcome of a TKA. Cryotherapy and compression are frequently used modalities to mitigate these commonly experienced sequelae. However, their effect on range of motion, functional testing, and narcotic consumption has not been well-studied. A prospective, multi-center, randomised trial was conducted to evaluate the effect of a cryopneumatic device on post-operative TKA recovery. Patients were randomised to treatment with a cryopneumatic device or ice with static compression. A total of 280 patients were enrolled at 11 international sites. Both treatments were initiated within three hours post-operation and used at least four times per day for two weeks. The cryopneumatic device was titrated for cooling and pressure by the patient to their comfort level. Patients were evaluated by physical therapists blinded to the treatment arm. Range of motion (ROM), knee girth, six minute walk test (6MWT) and timed up and go test (TUG) were measured pre-operatively, two- and six-weeks post-operatively. A visual analog pain score and narcotic consumption was also measured post-operatively. At two weeks post-operatively, both the treatment and control groups had diminished ROM and function compared to pre-operatively. Both groups had increased knee girth compared to pre-operatively. There was no significant difference in ROM, 6MWT, TUG, or knee girth between the 2 groups. We did find a significantly lower amount of narcotic consumption (509 mg morphine equivalents) in the treatment group compared with the control group (680 mg morphine equivalents) at up to two weeks postop, when the cryopneumatic device was being used ($p < 0.05$). Between two and six weeks, there was no difference in the total amount of narcotics consumed between the two groups. At six weeks, there was a trend toward a greater distance walked in the 6MWT in the treatment group (29.4 meters versus 7.9 meters, $p = 0.13$). There was a significant difference in the satisfaction scores of patients with their cooling regimen, with greater satisfaction in the treatment group ($p < 0.0001$). There was no difference in ROM, TUG, VAS, or knee girth at six weeks. There was no difference in adverse events or compliance between the two groups. A cryopneumatic device used after TKA appeared to decrease the need for narcotic medication from hospital discharge to 2 weeks post-operatively. There was also a trend toward a greater distance walked in the 6MWT. Patient satisfaction with the cryopneumatic cooling regimen was significantly higher than with the control treatment.

Impact of a new cryotherapy device on early rehabilitation after primary total knee arthroplasty (TKA): a prospective randomised controlled trial

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Abstract

Background: The aim of this prospective, randomised and single blinded study was to evaluate the efficiency and safety of a new cryotherapy device in patients undergoing unilateral, primary total knee arthroplasty (TKA). Our hypothesis was that patients administered to the new cryotherapy device would perform better than patients receiving a conventional standard cold therapy regimen.

Methods: Ninety-seven patients were randomised into two groups receiving either the cTreatment® (new cryotherapy device) or the standard cold therapy protocol (including cold pack application for six days after the surgical intervention). We evaluated the following endpoints consisting of range of motion (ROM), pain intensity, and knee girth on admission day and the second, fourth, and sixth post-operative day (POD).

Results: A statistically significant benefit of the new cryotherapy device was detected regarding the ROM on the sixth POD with an average gain of 7 degrees ($p = 0.021$). Pain in the numeric rating scale (NRS) score in motion was significantly lower in the cTreatment® group on the second POD ($p = 0.034$). There were no statistically significant differences between groups regarding the NRS in rest, patient controlled analgesia (PCA) consumption, and girth measurements. No adverse effects were observed in both study groups.

Conclusion: The new computer-controlled cooling therapy device provides benefits in terms of early post-operative remobilisation with respect to ROM and pain, which might be attributed to a reduced inflammatory response, as well as reduced secretion and bleeding. The cTreatment® system appears to be a safe and efficient procedure.

Keywords: Cryotherapy; Fast-track arthroplasty; Pain relief; Prospective randomised trial; Total knee arthroplasty.

Cryotherapy on postoperative rehabilitation of joint arthroplasty

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Abstract

Purpose: The effectiveness of cryotherapy on joint arthroplasty recovery remains controversial. This systematic review was conducted to assess the effectiveness of cryotherapy in patients after joint arthroplasty.

Methods: Comprehensive literature searches of several databases including Cochrane Library (2013), MEDLINE (1950-2013), and Embase (1980-2013) were performed. We sought randomised controlled trials that compared the experimental group received any form of cryotherapy with any control group after joint arthroplasty. The main outcomes were postoperative blood loss, adverse events, and pain. Analyses were performed with Revman 5.0. Results were shown as mean differences (MD) and standard deviations or as risk difference and 95 % confidence intervals (CIs).

Results: Ten trials comprised 660 total knee arthroplastys and three trials comprised 122 total hip arthroplastys (THAs) met the inclusion criteria. Blood loss was significantly decreased by cryotherapy (MD = -109.68; 95 % CI -210.92 to -8.44; P = 0.03). Cryotherapy did not increase the risk of adverse effect (n.s.). Cryotherapy decreased pain at the second day of postoperative (MD = -1.32; 95 % CI -2.37 to -0.27; P = 0.0003), but did not decreased pain at the first and third day of postoperative (n.s.).

Conclusions: Cryotherapy appears effective in these selected patients after joint arthroplasty. The benefits of cryotherapy on blood loss after joint arthroplasty were obvious. However, the subgroup analysis indicated that cryotherapy did not decreased blood loss after THA. Cryotherapy did not increase the risk of adverse effect. Cryotherapy decreased pain at the second day of postoperative, but did not decreased pain at the first and third day of postoperative.

Level of evidence: II.

Keywords: Cryotherapy; Total hip arthroplasty (THA); Total knee arthroplasty (TKA).

The efficacy of combined cryotherapy and compression compared with cryotherapy alone following anterior cruciate ligament reconstruction

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Abstract

While cryotherapy has been shown to decrease postoperative pain after anterior cruciate ligament (ACL) reconstruction, less is known of the effects of combined cryotherapy and compression. The goal of this study was to compare subjective and objective patient outcomes following ACL reconstruction with combined compression and cryotherapy compared with traditional ice therapy alone. Patients undergoing ACL reconstruction were randomized to cryotherapy/compression device (group 1) or a standardized ice pack (group 2). Both groups were instructed to use the ice or cryotherapy/compression device three times per day and return to the clinic at 1, 2, and 6 weeks postoperatively. Patient-derived outcome measurements used in this study consisted of the visual analog scale (VAS), the Lysholm knee score, Short Form-36 (SF-36), and single assessment numerical evaluation (SANE). Circumferential measurements of the knee at three locations (1 cm proximal to patella, mid-patella, and 1 cm distal to patella) were also obtained as a measure of postoperative edema. Narcotic medication use was recorded by questionnaire. The primary outcome measure (VAS) was significantly different among groups in the preoperative measurement, despite similarities in group demographics. Baseline VAS for group 1 was 54.9 compared with group 2 at 35.6 ($p = 0.01$). By 6 weeks, this had lowered to 28.1 and 40.3, respectively, resulting in a significant 27-point decrease in mean VAS for group 1 ($p < 0.0001$). However, the small increase in VAS for group 2 was not significant ($p = 0.34$). No significant differences were noted for the Lysholm, SF-36, or SANE scores either between groups or time points. Furthermore, no significant differences were noted for any of the circumferential measurements either between groups or time points. Of all patients, 83% of group 1 discontinued narcotic use by 6 weeks, compared with only 28% of group 2 ($p = 0.0008$). The use of combined cryotherapy and compression in the postoperative period after ACL reconstruction results in improved, short-term pain relief and a greater likelihood of independence from narcotic use compared with cryotherapy alone.

Cryotherapy with dynamic intermittent compression for analgesia after anterior cruciate ligament reconstruction.

Preliminary study

[J Murgier 1](#), [X Cassard 2](#)

Abstract

Background: Cryotherapy is a useful adjunctive analgesic measure in patients with postoperative pain following anterior cruciate ligament (ACL) surgery. Either static permanent compression or dynamic intermittent compression can be added to increase the analgesic effect of cryotherapy. Our objective was to compare the efficacy of these two compression modalities combined with cryotherapy in relieving postoperative pain and restoring range of knee motion after ligament reconstruction surgery.

Hypothesis: When combined with cryotherapy, a dynamic and intermittent compression is associated with decreased analgesic drug requirements, less postoperative pain, and better range of knee motion compared to static compression.

Materials and methods: We conducted a case-control study of consecutive patients who underwent anterior cruciate ligament reconstruction at a single institution over a 3-month period. Both groups received the same analgesic drug protocol. One group was managed with cryotherapy and dynamic intermittent compression (Game Ready®) and the other with cryotherapy and static compression (IceBand®).

Results: Of 39 patients, 20 received dynamic and 19 static compression. In the post-anaesthesia recovery unit, the mean visual analogue scale (VAS) pain score was 2.4 (range, 0-6) with dynamic compression and 2.7 (0-7) with static compression ($P=0.3$); corresponding values were 1.85 (0-9) vs. 3 (0-8) ($P=0.16$) after 6 hours and 0.6 (0-3) vs. 1.14 (0-3) ($P=0.12$) at discharge. The cumulative mean tramadol dose per patient was 57.5mg (0-200mg) with dynamic compression and 128.6 mg (0-250 mg) with static compression ($P=0.023$); corresponding values for morphine were 0mg vs. 1.14 mg (0-8 mg) ($P<0.05$). Mean range of knee flexion at discharge was 90.5° (80°-100°) with dynamic compression and 84.5° (75°-90°) with static compression ($P=0.0015$).

Conclusion: Dynamic intermittent compression combined with cryotherapy decreases analgesic drug requirements after ACL reconstruction and improves the postoperative recovery of range of knee motion.

Level of evidence: Level III, case-control study.

Keywords: ACL reconstruction; Analgesia; Cryotherapy.

Preoperative cryotherapy use in anterior cruciate ligament reconstruction

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Abstract

Unrelieved postoperative pain may impair rehabilitation, compromise functional outcomes, and lead to patient dissatisfaction. Preemptive multimodal analgesic techniques may improve outcomes after surgery. We hypothesized that patients using preoperative cryotherapy plus a standardized postoperative treatment plan will have lower pain scores and require less pain medication compared with patients receiving a standardized postoperative treatment plan alone after arthroscopically assisted anterior cruciate ligament reconstruction (ACLR). A total of 53 consecutive patients undergoing arthroscopically assisted ACLR performed by one of seven surgeons were randomly assigned to one of two groups. Group 1 received no preoperative cryotherapy and group 2 received 30 to 90 minutes of preoperative cryotherapy to the operative leg using a commercial noncompressive cryotherapy unit. Visual analog scale pain scores and narcotic use were recorded for the first 4 days postoperatively. Total hours of cold therapy and continuous passive motion (CPM) use and highest degree of flexion achieved were recorded as well. Group 1 consisted of 26 patients (15 allograft Achilles tendon and 11 autograft bone patellar tendon bone [BPTB]), and group 2 consisted of 27 patients (16 allograft Achilles tendon and 11 autograft BPTB). Group 2 patients reported less pain (average 1.3 units, $p < 0.02$) and used less narcotic use (average 1.7 tablets, $p < 0.02$) for the first 36 hours compared with group 1. No statistically significant differences were identified between the two groups with regard to demographics, hours of postoperative cryotherapy, hours of CPM use, or maximum knee flexion achieved. Complications did not occur in either group. This is the first report we are aware of showing the postoperative effects of preoperative cryotherapy. Our results support the safety and efficacy of preoperative cryotherapy in a multimodal pain regimen for patients undergoing ACL reconstruction.

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Compressive cryotherapy is superior to cryotherapy alone in reducing pain after hip arthroscopy

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Abstract

The early post-operative period after hip arthroscopy for femoroacetabular impingement is characterized by pain and swelling. Minimization of pain is of critical importance to the patient, but pain might also reduce patients' compliance to early physiotherapy, delay rehabilitation and hospital discharge. Avoiding early mobilization represents a risk factor for developing capsulolabral adhesions. Compressive cryotherapy (CC) has been shown to reduce pain after knee and hip replacement surgery. The aim of this study was to assess the effect of the inclusion of CC in the pain management and early discharge after hip arthroscopy. A prospective cohort of 20 patients who received CC and 20 retrospectively matched controls who received standard cryotherapy (SC) were compared. The CC was added to the standard post-operative analgesia and rehabilitation protocol. Using non-parametric tests, the percentage of patients discharged in post-operative day one, pain VAS scores and analgesia requirement were compared. The CC group reported significantly lower pain scores compared to SC; VAS 1 (0–3) and 2 (0–5) ($P = 0.0028$), respectively. A non-significant reduction in analgesic requirement 1.75 versus 2.8 doses per patient was found and 20/20 patients were discharged on post-operative day one versus 17/20 in the SC group ($P = 0.23$). Patients treated with CC after hip arthroscopy reported lower levels of pain during the early post-operative phase and were able to be discharged home sooner when compared with a matched control group receiving ice therapy alone. A trend towards lower opioid analgesia requirement was observed.

Cryotherapy With Dynamic Intermittent Compression Improves Recovery From Revision Total Knee Arthroplasty

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Abstract

Background: The goal of this study was to assess the efficacy of cryotherapy with dynamic intermittent compression (CDIC) in relieving postoperative pain, decreasing blood loss, and improving functional scores after revision total knee arthroplasty (rTKA).

Methods: We conducted a prospective case-control study (level of evidence: I) to evaluate the efficacy of CDIC on postoperative bleeding, pain, and functional outcomes after rTKA. Forty-three cases were included at a single institution and divided in 2 groups: a control group without CDIC (n = 19) and an experimental group with CDIC (n = 24). Bleeding was evaluated by calculating total blood loss, pain at rest was evaluated with a visual analog scale on postoperative day 3, and function was assessed using the Oxford score at 6 months postoperatively. The comparative analysis was performed using the Fisher exact test.

Results: The CDIC group had significantly lower total blood loss (260 vs 465 mL; $P < .05$), significantly less pain on day 3 (1 vs 3; $P < .05$), and a significantly higher functional score (42 vs 40; $P < .05$) than the control group.

Conclusion: This is the first report dealing with the use of CDIC after rTKA. According to our results, it improves the recovery of patients who underwent rTKA; thus, it should be integrated into our daily practice.

Keywords: arthroplasty; blood loss; compressive cryotherapy; knee; pain.

Cryotherapy Treatment After Unicompartmental and Total Knee Arthroplasty: A Review

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Abstract

Background: Cryotherapy is widely utilized to enhance recovery after knee surgeries. However, the outcome parameters often vary between studies. Therefore, the purpose of this review is to compare (1) no cryotherapy vs cryotherapy; (2) cold pack cryotherapy vs continuous flow device cryotherapy; (3) various protocols of application of these cryotherapy methods; and (4) cost-benefit analysis in patients who had unicompartmental knee arthroplasty (UKA) or total knee arthroplasty (TKA).

Methods: A search for "knee" and "cryotherapy" using PubMed, EBSCO Host, and SCOPUS was performed, yielding 187 initial reports. After selecting for RCTs relevant to our study, 16 studies were included.

Results: Of the 8 studies that compared the immediate postoperative outcomes between patients who did and did not receive cryotherapy, 5 studies favored cryotherapy (2 cold packs and 3 continuous cold flow devices). Of the 6 studies comparing the use of cold packs and continuous cold flow devices in patients who underwent UKA or TKA, 3 favor the use of continuous flow devices. There was no difference in pain, postoperative opioid consumption, or drain output between 2 different temperature settings of continuous cold flow device.

Conclusion: The optimal device to use may be one that offers continuous circulating cold flow, as there were more studies demonstrating better outcomes. In addition, the pain relieving effects of cryotherapy may help minimize pain medication use, such as with opioids, which are associated with numerous potential side effects as well as dependence and addiction. Meta-analysis on the most recent RCTs should be performed next.

Keywords: TKA management; cold flow; cold packs; cryotherapy; total knee arthroplasty; unicompartmental knee arthroplasty.

Perioperative Versorgung – Wie erziele ich die effektivste präoperative Abschwellung?

Rohner-Spengler M, Frotzler A, Honigmann P et al.

Einleitung

Prä- oder postoperative Schwellungen treten insbesondere bei ausgedehnten geschlossenen oder offenen Frakturen der unteren und oberen Extremität auf. Insbesondere bei Frakturen des oberen Sprunggelenks oder des Kalkaneus verhindert die oft massive Weichteilschwellung eine frühzeitige operative Versorgung. Mit zunehmender Schwellung erhöht sich das Risiko von postoperativen Wundkomplikationen wie Haut- und Weichteildefekten, Infektionen und bedingt zudem ein erhöhtes Thromboserisiko. Ziel der vorliegenden Studie der Arbeitsgruppe um Professor Reto Babst war es, verschiedene abschwellende Therapiemaßnahmen untereinander zu vergleichen. Dabei kam sie zu erstaunlichen Resultaten.

Methodik

Die Studienteilnehmer wurden in 3 Gruppen randomisiert. Die Kontrollgruppe mit 23 Teilnehmern wurde ausschließlich mit lokaler Kälte und 24 h-Hochlagerung therapiert. Die Kompressionsgruppe mit 21 Teilnehmern wurde mit mehrschichtiger elasto-kompressiver Wickelung für 22 Stunden therapiert und die betroffene Extremität wurde ebenfalls 24 Stunden hochgelagert. Eine Kryotherapie fand nicht statt. Die Impuls-Kompressions-Gruppe mit 23 Teilnehmern wurden mit Impuls-Pumpe beübt (130 mmHg, alle 2 Sekunden, 1 Sekunde lang). Dabei befand sich die behandelte Extremität auf Herzhöhe ohne Kryotherapie, keine Hochlagerung, keine Kompression. Die Studie war einseitig verblindet und der Erhebungszeitraum wurde von Januar 2007 bis Januar 2009 definiert. 58 Patienten mit unilateralen Frakturen des oberen Sprunggelenks bzw. Kalkaneusfrakturen wurden untersucht. Umfangsmessungen fanden an 5 Tagen prä- und an 5 Tagen postoperativ statt. Als Outcome wurde der Schwellungsrückgang festgelegt, der nach der Figure-of-Eight-20-Methode bestimmt wurde. Des Weiteren wurden u. a. ROM (range of motion: Bewegungsbereich), VAS-Schmerz (visuelle Analogskala), Wundheilung 6, 12 Wochen und 12 Monate postoperativ untersucht.

Ergebnisse

Der relative durchschnittliche Schwellungsrückgang in der Kontrollgruppe betrug präoperativ 5 %, in der Kompressionsgruppe 23 % und in der Impuls-Kompressions-Gruppe 0 %. Zwei Tage postoperativ zeigte sich eine relative durchschnittliche Schwellungszunahme in der Kontrollgruppe von 7 %, in der Kompressionsgruppe nahm die Schwellung um relativ 20 % ab, in der Impuls-Kompressions-Gruppe kam es zu einer deutlichen Schwellungszunahme mit 46 %. Bei je einem Patienten in Kontroll- und Kompressionsgruppe kam es zu einer verzögerten Wundheilung, 7 Patienten in der Impuls-Kompressions-Gruppe brachen die Therapie wegen auftretender Beschwerden ab, bei 2 Patienten kam es zu einer verzögerten Wundheilung. Alle Frakturen waren nach 2 Jahren ausgeheilt. Im Follow-up mussten 2 Patienten der Impuls-Kompressions-Gruppe chirurgisch revidiert werden und erhielten eine antibiotische Therapie.

