**Clinical question.**
Does the use of cooling (I) improve healing and pain control (O) in patients after thermal injuries (P)?

**Is this question addressing an intervention/therapy, prognosis or diagnosis? Intervention**

**State if this is a proposed new topic or revision of existing worksheet: Revision**

**Conflict of interest specific to this question: Yes**

Do any of the authors listed above have conflict of interest disclosures relevant to this worksheet? I have conducted a study on the effects of a cooling blanket on core body temperature in volunteers

**Search strategy (including electronic databases searched).**
PubMed “burns” or “thermal burns” as MESH (headings) AND “Cooling” AND/OR “First Aid” AND/OR “Lavage” textword in abstract.
EMBASE search using text words (all fields) burns AND (cooling OR first aid)
AHA EndNote Master library, Cochrane database for systematic reviews, Central Register of Controlled Trials, Review of references from articles.
Search using text words “burns” and “cooling” OR “first aid”

**State inclusion and exclusion criteria**
We included both human and animal studies, regardless of study design, that compared outcomes of burns that were cooled or not cooled. Only peer review studies were included. Studies published in abstract form were not included.
The following studies were excluded: In-vitro or inanimate models (e.g., Cell and tissue cultures), reports of single cases.

**Number of articles/sources meeting criteria for further review:**
53 studies met criteria for further review. Of these 5 were LOE 3 (retrospective case controlled), 4 were LOE 4 (case series), and 44 were LOE 5 (not directly related volunteers (3) or animal studies (37).
Summary of evidence

Evidence Supporting Clinical Question
In patients with thermal burns, cooling of burns with room temperature water improves healing and reduces pain.

<table>
<thead>
<tr>
<th>Level of evidence</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tung 2005 (E6), Berbarian 1960 (E2, E4, E5), Li 1997 (E1), Mathews 1987 (E4), Nguyen 2002 (E4)</td>
<td>Grounds 1967 (E2, E5), Jung 1963 (E1), Rose 1936 (E3), Shulman 1960 (E5)</td>
<td>Raghupati 1968 (E1, E2)</td>
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<td>5</td>
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</tbody>
</table>

A = Return of spontaneous circulation  
B = Survival of event  
C = Survival to hospital discharge  
D = Intact neurological survival  
E1 = Healing  
E2 = Pain relief  
E3 = Survival  
E4 = Grafting  
E5 = Edema  
E6 = Length of stay  
.Italic = Animal studies
### Evidence Neutral to Clinical question

Cooling of thermal burns room temperature water does not improve healing or result in hypothermia.

<table>
<thead>
<tr>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
<th>Level of evidence</th>
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<tbody>
<tr>
<td></td>
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<td>Blomgren 1985a (E1), Blomgren 1985b (E1), Demling 1979 (E5), Ferer 1962 (E3), Jacobsson 1985 (E5), King 1965c (E1)</td>
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<td></td>
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<td></td>
<td>Singer 2006 (E6), Schnell 2008 (E6), Werner 2002 (E2), Martineau 2006 (E6)</td>
</tr>
</tbody>
</table>

**Level of evidence**

- A = Return of spontaneous circulation
- C = Survival to hospital discharge
- B = Survival of event
- D = Intact neurological survival
- E1 = Healing
- E2 = Pain relief
- E3 = Survival
- E4 = Grafting
- E5 = Edema
- E6 = Hypothermia

*Italics = Animal studies*

### Evidence Opposing Clinical Question

Cooling of thermal burns with ice or ice water increases tissue damage.

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<tr>
<th>Good</th>
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<tbody>
<tr>
<td></td>
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<td></td>
<td>Venter 2007 (for ice water only E1), Sawada 1997 (E1), Baxter 1947(E5), Ofeigsson 1959 (C for ice water only).</td>
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<td></td>
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<td>Perdue 1985 (E1)</td>
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</tbody>
</table>

**Level of evidence**

- A = Return of spontaneous circulation
- C = Survival to hospital discharge
- B = Survival of event
- D = Intact neurological survival
- E1 = Healing
- E2 = Pain relief
- E3 = Survival
- E4 = Grafting
- E5 = Edema

*Italics = Animal studies*
Discussion: There are no randomized clinical trials evaluating the effects of cooling on thermal burns. Multiple, well-designed controlled animal studies (LOE 5) and several small retrospective case control studies and case series in humans with thermal burns (LOE 3 and 4) consistently demonstrate that early (within 30 minutes of injury) cooling of burns with room temperature (15-25°C) water (or saline) reduces pain, reduces edema, reduces depth of injury, speeds healing, and may reduce the need for excision and grafting of deep burns. Delayed cooling has not been consistently effective. These results were recently confirmed in two other animal studies. When burns were cooled with ice water (1-8 degrees C) there was more necrosis than in the wounds that were not cooled. When tap water was used (2-18 degrees C) it was demonstrated clinically and histologically that the cooled wounds had less necrosis than the uncooled wounds and healed faster (Veter 2007). The beneficial effects of cooling were still present when delayed for half an hour. Similarly in a study of pigs with partial thickness contact scald burns treatment with cold running tap water for 20-30 minutes reduced the depth of injury and shortened the time to healing (Barlett 2008).

While some animal studies suggest that cooling of burns with ice or ice water reduces the depth of injury and improves healing, others (as well as a small number of human case reports) have demonstrated that cooling with ice or ice water increases tissue damage. There is little evidence that cooling with water below room temperature is any more effective than cooling with room temperature water. A controlled animal experiment in rats with large burns (20% total body surface area) demonstrated highest mortality in animals cooled with ice water for 10 minutes (Offiegson 1959). In contrast, animals cooled with room temperature water for 30-45 minutes had lower mortality (nill) than uncooled controls. Another study of dogs with large burns cooled with ice water did not demonstrate increased mortality (King 1963).

The effects of cooling of large burns in children and adults with room temperature water have not been studied; however, expert opinion is that cooling of large burns might induce hypothermia, which could be detrimental. However, evidence that hypothermia is a significant problem in early burn care is lacking. A small study in unburned, healthy volunteers demonstrated that cooling with a commercially available cooling blanket at room temperature for 30 minutes had no effect on core body temperature. Another study of human volunteers cooled with sprayed or poured room temperature water demonstrated cooling of the skin without inducing hypothermia.

A case controlled study of 22 patients with burns cooled below 28 degrees C within 30 minutes of injury demonstrated better pain relief and healing that was 2 days faster than uncooled controls (Li 1997). In a retrospective study of 695 children with burns, patients whose burns were immediately cooled had a reduction in the number of deep burns (36% vs.49%) and the need for skin grafting was reduced by 32% compared with patients whose burns were not cooled (Nguyen 2002). A case series in which 52 patients that were cooled with cold tap water were compared to 130 historical control patients that were not cooled, investigators found that the percentage of deaths dropped from 15% to 8% (P=0.20) (Rose 1936). In a retrospective case series of 40 patients with deep burns of 5 to 20% total body surface area that were treated with ice cold towels (and heparin) in the emergency room for up to 5 hours, application of the cold towels reduced pain, edema, and the need for grafting compared with historical controls (Berberian 1960). A prospective survey of 104 burn patients found that nearly 2/3 of patients cooled their wounds and the need for grafting was less in these patients (1/64 vs. 4/46; P=NS) (Mathews 1987). Another retrospective case control study demonstrated that adequate first aid by water cooling in patients with burns less than 30% TBSA reduced the length of hospital stay (Tung 2005).
## Citation List

<table>
<thead>
<tr>
<th>Citation Marker</th>
<th>Full Citation*</th>
</tr>
</thead>
</table>
This was an animal study comparing various cooling periods with cold tap water after contact scald burns. A 20 minute period of cooling was optimal reducing intradermal temperatures.  
Evidence: Supports  
Quality of Evidence: Good  
Level of Evidence: 5 |
This was an animal experiment in which burns were created on the tails of rats by immersion in scalding water. The tails were then cooled at various temperatures (40 to 63 degrees F) and for varying durations (from 8 hours to 2 weeks) using cold air that circulated around the tails in specialized chambers. Prolonged cooling of the burned tails resulted in increasing evidence of injury and edema both microscopically and grossly.  
Evidence: Opposes  
Quality of Evidence: Good  
Level of evidence: 5 |
This was a retrospective case series of 40 patients with deep burns of 5 to 20% total body surface area that were treated with ice cold towels in the emergency room for up to 5 hours. Application of the cold towels reduced pain, edema, and the need for grafting compared with historical controls. Of note, these patients were also treated with intravenous heparin that may also account for some of the effects noted in these patients.  
Evidence: Support  
Quality of evidence: Fair  
Level of evidence: 3 |
This was an animal experiment where water immersion burns were cooled in 8 degrees C water for 30 minutes immediately after injury and compared to uncooled control burns. In this study post-burn cooling did not reduce the area of the burn when observed 4 days after injury.  
Evidence: Neutral  
Quality of evidence: Good  
Level of evidence: 5 |
This was an animal study looking at the amount of tissue edema in scalded ears of the mice with and without cooling with 8 degrees C water over a wide range of durations. In this model immediate cooling of the burn for 30 minutes significantly reduced the amount of edema. Interestingly, shorter and longer periods of cooling were not effective at reducing the amount of the edema.  
Evidence: Support  
Quality of evidence: Good  
Level of evidence: 5 |
This was an animal study looking at the effects of cooling on the amount of necrosis in scalded mice ears. While cooling in 8 degrees C water or saline for 30 minutes post burn reduced edema at 2 hr after injury, there was no effect on the extent of necrosis 4 days after injury.  
Evidence: Neutral  
Quality of evidence: Good  
Level of evidence: 5 |
This was an animal experiment in which scald burns were created on the ears of hairless mice. Immediate cooling of the burns was performed using water at 8 to 10 degrees C for 5 minutes. Cooling reduced edema formation for the first 2 hours after injury.

Evidence: Support
Quality of evidence: Good
Level of evidence: 5

Courtice 1946


This was an animal experiment in which scald injuries were created on the limbs of dogs, goats, and rabbits. The burned limbs were then kept at various temperatures (0, 37, and 45 degrees C) for varying amounts of time (2, 6, 12, 24, or 48 hours). Cooling of the limbs to 0 degrees C reduced edema formation and lymph flow in the burned limb. Cooling also resulted in less hemodynamic compromise then when the burns were not cooled.

Evidence: Support
Quality of evidence: Good
Level of evidence: 5

Cuttle 2008


Evidence: Support
Quality of evidence: Good
Level of evidence: 5

De Camara 1981


This was an animal study looking at the effects of cooling with ice water for 30 minutes starting 10 minutes after injury on the dermal circulation and epidermis. Ice immersion reduced the amount of epidermal necrosis, basement membrane damage at 24 hr. Ice immersion also reduced the amount of dermal injury at 96 hours.

Evidence: Support
Quality of evidence: Good
Level of evidence: 5

Demling 1979


This was an animal study looking at the effects of post burn cooling with 15 degree C saline on the degree of edema in deep second degree burns of sheep hindlimbs. While immediate cooling reduced initial edema, cooling that started 2 minutes after injury did not reduce initial edema and delayed subsequent resorption of edema fluid 1 week later.

Evidence: Support (immediate cooling) AND Neutral (minimally delayed cooling)
Quality of evidence: Good
Level of evidence: 5

Ferrer 1962


This was an animal experiment in which scald burns were created on the tails of rats. In some of the rats the tails were immediately cooled with cold water at 10 degrees C for 2 hours. After 24 hours improved healing was noted in the cooled tails which healed quicker and with less inflammation, gangrene, and necrosis. In another set of animals large scald burns were created on 75% of the total body surface area. Immediate cooling of the rats at 12 to 20 degrees C for 2 hours increased survival at 5 but not 24 hours after injury.

Evidence: Support (healing) AND Neutral (survival)
Quality of evidence: Good
Level of evidence: 5

Grounds 1967


This is a small case series of patients with burns cooled with iced water for 10 minutes. Cooling of the burns resulted in reduced pain and blister formation.

Evidence: Support
Quality of evidence: fair
Level of evidence: 4

Huang 2009

This was an animal experiment that demonstrated that cooling of scald burns reduced edema.

Evidence: Support
Quality of evidence: Good
Level of evidence: 5

Iung 1963


Evidence: Support.
Quality of evidence: fair.
Level of evidence: 4

Jakobsson 1985


This was an animal study looking at the effects of prompt cooling on edema formation in scalded rat paws. As the degree and duration of cooling increased, the amount of local edema also decreased. However, edema formation was later increased, possible due to reactive hyperemia.

Evidence: Neutral
Quality of evidence: Good
Level of evidence: 5

Jandera 2000


This was an animal study looking at the effect of immediate or delayed cooling on tissue temperature and rate of wound healing on porcine scald burns. Rapid cooling with tap water (15 degree C) or a hydrogel dressing immediately after injury as well as after a 30 minute delay resulted in cooling of the skin and more rapid healing of burns at 21 days after injury.

Evidence: Support
Quality of evidence: Good
Level of evidence: 5

King 1963

King TC, Price PB. JAMA (1963) 183:677-8. Surface cooling following extensive burns.

This was an experiment in which scald burns were created on dogs torsos. Immediate cooling of some of the burns was performed using cold water at 15 degrees C for 30 minutes. Cooling of the burns reduced mortality and prolonged survival in those that eventually died. However, due to the small sample size this difference was not statistically significant (P=0.09).

Evidence: Support
Quality of evidence: Good
Level of evidence: 5

King 1956


This was an animal experiment in which various types of burns were created. Local cooling of the burned area with cold compresses applied promptly and continuously for 20 to 30 minutes reduced loss of plasma proteins into the damaged area.

Evidence: Support
Quality of evidence: Good
Level of evidence: 5

King 1965 a


This was an animal experiment in which contact burns were created on dogs. Cold compresses were applied almost immediately on some of the burns for 45 minutes at temperatures from 0 to 30 degrees C. The optimum temperature for inhibiting edema formation appeared to be near 5 degrees C with considerable benefit noted at all temperatures below 17 degrees C.

Evidence: Support
Quality of evidence: Good
Level of evidence: 5

King 1965 b


This was an animal experiment in which various types of burns were created. Burns were cooled with cold compresses at temperatures of 10 to 40 degrees C for periods of 5 minutes to 2 hours. The interval from injury until initiation of cooling was also varied between immediate cooling and delayed cooling starting at up to 4 hours of delay. Cooling was noted to exert its most effects when initiated immediately and little benefit was noted when...
Cooling was delayed for at least 30 minutes. The benefits of cooling beyond the 30 minute period were measurable but diminished if cooled for 3 or 4 hours. This study suggests that cooling should begin within the first 30 minutes of injury and continue for at least 30 minutes.

Evidence: Support
Quality of evidence: Good
Level of evidence: 5

King 1965


This was an animal experiment in which various types of burns were created in dogs and immediately cooled with cold water compresses at 10 to 12 degrees C. Application of the cool compresses had little effect on the pattern of heat penetration at a depth of 4 mm beneath the skin level. However, this study did not look at other outcomes such as edema formation and depth of injury.

Evidence: Neutral
Quality of evidence: Good
Level of evidence: 5

King 1962


This was an animal study in which scald burns were created in dogs. Some of the burns were cooled in a water bath at 15 degrees C 30 seconds after injury for a period of 30 minutes.

Evidence: Support
Quality of evidence: Good
Level of evidence: 5

Koller 1977


Evidence: Support
Quality of evidence: Good
Level of evidence: 5

Langohr 1949


This was an animal study in which scald burns were created in the limbs of dogs. Some of the burns were cooled in cold water at 10 degrees C. Cooling resulted in reduced lymphatic flow and edema formation.

Evidence: Support
Quality of evidence: Good
Level of evidence: 5

Li 1997


This was an observational study in 22 patients with partial-thickness burns whose burns were cooled to below 28 degrees C. Pain relief was observed after prolonged (30 minute) cooling and wounds healed 2 days earlier than controls. An additional arm of this study included an animal experiment of deep burns in rats that looked at the effect of immediate and delayed cooling on epithelial cell activity. The activity of epithelial cells was partially maintained by all methods of cooling.

Evidence: Support
Quality of evidence: Fair
Level of evidence: 3

Martineau 2006


Evidence: Neutral (hypothermia)
Quality of evidence: Fair
Level of evidence: 5

Mathews 1987


This was a prospective survey of 104 consecutive burn patients regarding whether they cooled their burn with cold water prior to coming to the hospital. Nearly 2/3 of patients had cooled their burns and the need for grafting was less in those that cooled their wound than in those that did not (1/64 vs. 4/46).

Evidence: Support
Quality of evidence: Fair
Level of evidence: 3
<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
<th>Abstract</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moore 1952</td>
<td>Moore DH, Worf DL. Am J Physiol (1952) 170:616-23. Effect of temperature on the transfer of serum proteins into tissues injured by tourniquet and by scald.</td>
<td>This was an animal experiment in which scald burns were created in dog limbs. One of the legs was immersed in ice water while the other was either warmed to 35 to 38 degrees C or left untreated. Immediate cooling was found to reduce edema formation in the burned limbs. Evidence: Support Quality of evidence: Good Level of evidence: 5</td>
</tr>
<tr>
<td>Moserova 1975</td>
<td>Moserova J, Benhounkova E. Burns (1975) 1:267-8. Subcutaneous temperature measurements in thermal injury.</td>
<td>This was an animal experiment in which contact burns were created on rats. In some animals the burns were immediately cooled with ice until the subcutaneous temperatures returned to normal values. Cooling resulted in less deep burns and smaller scars 43 days after injury. Evidence: Support Quality of evidence: Good Level of evidence: 5</td>
</tr>
<tr>
<td>Nguyen 2002</td>
<td>Nguyen NL, Gun RT, Spamon AL, Ryan P. Burns (2002) 28:173-6. The importance of immediate cooling—a case series of childhood burns in Vietnam.</td>
<td>This was a retrospective chart review of 695 children with burns, of which some had been treated with immediate cooling with water. Immediate cooling of the burns reduced the odds of a deep burn and the need for excision and grafting by 32%. Evidence: Support Quality of evidence: Fair Level of evidence: 3</td>
</tr>
<tr>
<td>Ofeigsson 1959</td>
<td>Ofeigsson OJ. Br J Plast Surg (1959) 12:104-19. Observations and experiments on the immediate cold water treatment of burns and scalds.</td>
<td>This study consisted of two parts. In the first, scald injuries were created on the tails of rats. Half of the burns were treated with immediate immersion in ice water. In the second part of the experimental scald burns were created on rats covering 20% of their total body surface area. Some of these burns were also cooled with ice water. In this study there were multiple treatment groups in which the duration of cooling varied. In some groups a hot cloth was left on the animal to simulate unremoved clothing. Cooling of the burns resulted in less depth of injury across all groups. However, rats with extensive burns that were aggressively cooled died as did untreated rats. This study also demonstrates the importance of removing clothing to reduce heat conduction to the skin. Evidence: Support (cold water), Opposes (ice water) Quality of evidence: Good Level of evidence: 5</td>
</tr>
<tr>
<td>Ofeigsson 1961</td>
<td>Ofeigsson OL. Postgrad Med (1961) 30:330-8. First-aid treatment of scalds and burns by water cooling.</td>
<td>This report reiterates the results of the study reported by Ofeigsson in the British Journal of Plastic Surgery in 1959, but adds details and further clarification. The mortality rate of cooled rats was less than for uncooled rats, except when cooling was performed with ice water for 10 minutes. Lukewarm water (22 to 25 degrees C) was also found to be effective at reducing the depth of injury and subsequent infection rates. Evidence: Support Quality of evidence: Good Level of evidence: 5</td>
</tr>
<tr>
<td>Ofeigsson 1965</td>
<td>Ofeigsson OJ. Surgery (1965) 57:391-400. Water cooling: first-aid treatment for scalds and burns.</td>
<td>In this animal experiment the author created additional 20% total body surface area scald burns in rats but also included data from his earlier studies. Cooling of the burns was performed with ground ice or in water at 15 to 30 degrees C. Water cooling was delayed for 15, 30, and 45 minutes after injury. In this study very high mortality was reported in rats cooled with ice, and the longer the cooling with ice lasted, the sooner the animals died. The best results were seen in animals cooled with water at temperatures of 22 to 25 degrees C for 3 minutes. Again, water cooling was shown to reduce the depth of injury in all cooled burns. While immediate cooling had the best results, even delayed cooling had some benefit. Evidence: Support Quality of evidence: Good Level of evidence: 5</td>
</tr>
<tr>
<td>Ofeigsson 1972</td>
<td>Ofeigsson OJ, Mitchell R, Patrick RS. J Pathol (1972) 108:145-150. Observations on the cold water treatment of burns.</td>
<td>This study consisted of two parts. In the first, scald injuries were created on the tails of rats. Half of the burns were treated with immediate immersion in ice water. In the second part of the experimental scald burns were created on rats covering 20% of their total body surface area. Some of these burns were also cooled with ice water. In this study there were multiple treatment groups in which the duration of cooling varied. In some groups a hot cloth was left on the animal to simulate unremoved clothing. Cooling of the burns resulted in less depth of injury across all groups. However, rats with extensive burns that were aggressively cooled died as did untreated rats. This study also demonstrates the importance of removing clothing to reduce heat conduction to the skin. Evidence: Support (cold water), Opposes (ice water) Quality of evidence: Good Level of evidence: 5</td>
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<tr>
<td>Purdue 1985</td>
<td>Cold injury complicating burn therapy.</td>
<td>Purdue GF, Layton TR, Copeland CE. J Trauma (1985) 25:167-8.</td>
</tr>
<tr>
<td>Raghupati 1968</td>
<td>First-aid treatment of burns: efficacy of water cooling.</td>
<td>Raghupati N. Br J Plast Surg (1968) 21:68-72.</td>
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<tr>
<td>Reynolds 1956</td>
<td>Effect of local chilling in the treatment of burns.</td>
<td>Reynolds LE, Brown CR, Price PB. Surg Forum (1956) 6:85-7.</td>
</tr>
<tr>
<td>Rose 1936</td>
<td>Initial cold water treatment for burns.</td>
<td>Rose HW. Northwest Medicine (1936) 35:267-70.</td>
</tr>
<tr>
<td>Reference</td>
<td>Study Description</td>
<td>Evidence</td>
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<tr>
<td>Saranto 1983</td>
<td>This was an animal study looking at the effect of cooling on deep partial thickness burns. More hair follicles were preserved after cooling.</td>
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<td>Evidence: Support</td>
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<tr>
<td>Sawada 1997</td>
<td>This was an animal study that looked at the effects of cooling with tap water or ice for 1-10 minutes after scald burns. While exposure to tap water for 1 minute resulted in less severe injuries, cooling of burns with ice for 10 minutes resulted in more severe injury.</td>
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<td>Evidence: Opposes</td>
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<tr>
<td>Shulman 1960</td>
<td>This was a case series of 150 patients with burns of all degrees involving less than 20% of their total body surface area. Immersion of the burned area in ice water was performed as soon as possible and continued for several hours until all pain ceased, even after removing the burned area form the cool bath. Pain was immediately relieved and the degree of redness and blistering was reduced.</td>
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<td></td>
<td>Evidence: Supports</td>
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<tr>
<td>Shulman 1962</td>
<td>This was an animal experiment in which scald injuries were created on the limbs of rabbits. Half of the limbs were cooled with cold water at temperatures of 10 to 15 degrees C. Cooling reduced the amount of edema formation.</td>
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<tr>
<td></td>
<td>Evidence: Supports</td>
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<tr>
<td>Singer 2006</td>
<td>The effect of a commercially available burn-cooling blanket on core body temperatures in volunteers.</td>
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<td></td>
<td>Evidence: Neutral (hypothermia)</td>
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<tr>
<td>Tung 2005</td>
<td>&quot;A seven-year epidemiology study of 12,381 admitted burn patients in Taiwan--using the Internet registration system of the Childhood Burn Foundation.&quot; Burns 31 Suppl 1: S12-7.</td>
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<tr>
<td></td>
<td>Evidence: Supports</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Evidence: Supports (cold water), Opposes (ice water)</td>
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<tr>
<td>Werner 2002</td>
<td>This was a controlled study in 24 healthy volunteers looking at sensitivity to painful stimuli and inflammation after...</td>
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</table>
First degree burns with or without cooling of burns at 8 degrees for 30 minutes. The study demonstrated that cooling with 8 degrees for 30 minutes did not have any effect on inflammation and painful sensation.

Evidence: Neutral
Quality of evidence: Fair
Level of evidence: 5

Wiedeman 1971


This was an animal study in which scald burns were created on bat wings. Burns that were immediately cooled with water at a temperature of 18-20 degrees C for 4 hours had less edema that uncooled burns.

Evidence: Supports
Quality of evidence: Good
Level of evidence: 5

Yuan 2007


Evidence: Supports
Quality of evidence: Good
Level of evidence: 5

Zhang 2004


Evidence: Supports
Quality of evidence: Good
Level of evidence: 5