Cold air therapy at -30 °C

- Physiological reactions to the cold
- Cold air therapy
- Skin temperature
- „wind chill”
- Indications
- Contraindications
- Treatment guidelines
- Treatment recommendations
  - Sudeck’s disease
  - Post-stroke spasticity
  - Scars
  - Subacromial impingement syndrome, humeroscapular periarthritis
  - Muscle injury
  - Thoracic spine pain
  - Sprained ankle
  - Epicondylitis
  - Hematoma
  - Status post cruciate ligament reconstruction
  - Low back pain
  - Neck-shoulder-arm syndrome
  - Lymphedema
  - Rheumatoid arthritis
  - Inguinal pain
  - Sciatica
  - Multiple sclerosis
  - Piriformis syndrome
  - Achillodynia
  - Spasmodic torticollis

- Duration of treatment
- Support arm for the Cryo treatment hose
  for manual treatment and mobilization
Physiological reactions to cold

Therapeutic effects of cold applications
Short, sharp cooling initially causes vasoconstriction which is followed, once finished, by vasodilatation. This is particularly evident in the skin. The serial application of cold stimuli stimulates vasomotor function involving a training effect on vascular dynamics because vasodilatation after cooling perceptibly heats the treated area via reactive hyperemia. Short bursts of cold air to the trunk act as a strong reflex stimulus for systemic metabolic activity, with generalized improvement in the peripheral microcirculation and thus, warming, as is known from use in Kneipp therapy. In addition to the local effects on vasomotor function mentioned, cold air also has a two-stage systemic effect, particularly when applied to the trunk. This is characterized by an initial stimulation of respiration, an increase in blood pressure and cardiac activity followed by calming. This also occurs when cold stimuli are applied to the extremities but the latter must be warm. If cold stimuli are applied to cool/cold extremities, the microcirculation and metabolic activity are further reduced, even deep inside, and the patient develops frostbite. Care must therefore be taken to ensure that frostbite does not occur particularly when applying cold air to the extremities. If need be, the areas adjacent to the portion of the limb being treated must be covered to be kept warm, in order to prevent the dissipation of heat from the area inadvertently cooled. Contrastingly, the application of considerable cold stimuli to the face must be avoided unless there has been prior acclimatization, because this may lead to short-term apnea (diving reflex) with an increase in pressure in the chest (Valsalva maneuver) and to a considerable rise in blood pressure due to generalized constriction of the resistance vessels. The eyes should also be protected against cold air. In the case of acute inflammation, associated with local heating, among other things, cold air is a preferred method of pain control and prophylaxis of edema. For an initial ergotropic (sympathicotonic) situation, cryotherapy is ideally administered to the back for its general soothing properties and to promote sleep. This is in direct contrast to the relaxing, refreshing effect of mild cooling in an initial trophotropic (vagotonic) situation, especially of the face and neck region.

Other effects include
- Alleviation of mechanically, biochemically or infection-induced inflammation
- Reduction in inflammation activity
- Decrease in nerve conduction velocity
- Analgesia
- Inhibition of nociception (pain generation) and pain conduction as from 13 °C
- Blockade of nerve conduction from 8 °C
- Diminished metabolic activity
- Release of pain-inhibiting neurotransmitters
Effect on muscle tone
› Short cold stimuli increase the activity of the muscle spindles and lead to an increase in muscle tone.
› Long cold stimuli reduce the activity of the muscle spindles and lead to a decrease in muscle tone and muscle spasticity
› Decrease in the nerve conduction velocity of motor fibers

Vasoconstriction
› Immediate, persistent constriction of local superficial blood vessels through stimulation of the noradrenergic nerve endings in the vessels
› Immediate, general vasoconstriction (even at depth) via CNS reflex arcs
› Delayed, generalized vasoconstriction through activation of the posterior portion of the hypothalamus due to the return of cooler blood

Vasodilatation below a tissue temperature of 15 °C
› Temperature-dependent approximately 2 – 6 minutes after beginning cold therapy (as a protective function triggered by vasomotor “paralysis” of arteries, arterioles, veins, venules and lymph vessels)

„Hunting response“
› Wave-shaped fluctuations in blood flow during long-term cooling (from approximately 30 minutes)

Autonomous nervous system
› Increase in blood pressure and tachycardia with the sudden onset of the cooling action
but!
› Bradycardia following the application of cold therapy to the face

Activating respiration and O₂ consumption
› Especially on applying a current of cold air to the trunk (chest and back)

Metabolic activity in the muscles and joints
› Slowing down of metabolic rate in cooled tissue and reduced O₂ consumption
› Diminished enzyme activity in inflammatory processes, consequently inhibition of breakdown of cartilage, for example

Analgesia
› Inhibition of the release of algogenic agents (e.g. catecholamines, histamine)
› Reduction in the conduction velocity and impulse frequency of pain-conducting nerve fibers
› Onset of analgesic effect at approximately 13 °C (pain receptor temperature)
› Nerve blockade from approximately 8 °C (nerve temperature)
Non-contact cooling is an important therapeutic property of cold air therapy. The amount of water vapor in the air decreases as the temperature drops such that the cold air of the Cryo, with a starting temperature of up to -35°C, represents dry treatment. This minimizes the risk of frostbite.

The production of ice on the skin by freezing the moisture from the swirling surrounding air is likewise impossible since the air current prevents stationary condensation.

The following comments have been made in relation to other methods:

› Cool spray: the extremely rapid cooling of the skin masks the risk of local frostbite. The temperature of the skin falls very quickly, as a result of which deeper tissue cannot be cooled.

› Ice bags, cold packs: a substantial amount of heat is initially removed from the skin until the balance between heat loss from the tissue and heat influx is adjusted. In addition, a layer of vapor forms between the pack and the skin producing condensed water. At low temperatures (dry ice) and with a lack of skin protection (no intermediate layer), frostbite can occur. On the other hand, a substantial drop in temperature in deeper layers is not possible if the pack temperature definitely prevents any damage to the skin.

In contrast to the application of cool packs or ice packs, when cold air is used there is no moist layer of vapor on the skin making longer, sustained cooling difficult. Cooling with cold air is thus more effective.

› Cold air: when used properly, the skin does not cool to harmful temperatures. With cold air, sufficient heat can be removed even from deeper layers of tissue during prolonged application, in order to lower the temperature in these locations to therapeutically desirable values without damaging the skin.

The water content of the air at -35°C is approximately 0%.
The delivery of cold air can be carefully controlled via changes in airflow velocity and the distance of the nozzle from the skin.

Cold air therapy is suitable for both short-term, rapid, intense skin cooling as well as for longer-lasting moderate cooling, in order to lower the temperature to therapeutically relevant values even in deeper layers of tissue (joint space, muscle).

In deeper layers of tissue, the temperature only falls with the prolonged use of cold air since the stratum corneum and subcutaneous fatty tissue possess considerable insulating properties. Depending on the thickness of the subcutaneous fatty layer, cooling times of 15 min to 30 min are required in order to effectively cool the tissue underneath the layer of fat. Furthermore, reactive hyperemia induced by the prolonged cooling period no longer occurs.

The temperature of the air flow substantially increases with the removal of the air current such that there is no risk of excessive body cooling in adults, even with prolonged use.

In the case of children, care should be taken to ensure that untreated areas of the body are covered and kept warm. This is also recommended for adults in long-term cooling. Even if there is no risk of excessive cooling, steps can still be taken to ensure that the patient does not develop frostbite or muscle tremor, etc.

Compared to the methods of dry cooling with cold air, the therapeutic effect is also clearly more intense as measuring the pain threshold shows.
Reactive hyperemia

Joints and muscles must be cooled for a sufficiently long period since cooling procedures of just a few minutes’ duration only cool the skin surface and superficial skin layers and result in more intense blood flow in the overall region due to a regulatory mechanism in the body. This is known as reactive hyperemia.

Since, for instance, blood flow through an inflamed joint is already too high because of the inflammation, this effect is exacerbated by inadequately long or inefficient cooling.

Inadequate or inefficient cooling often therefore leads to more inflammation and more intense pain. The desired effect of pain relief is not achieved under any circumstances.

It should also be noted that the effects on vasomotor function, initial vasoconstriction and subsequent vasodilatation with reactive hyperemia during short-term cooling not only impact upon the skin but also affect deeper layers of tissue such as periarticular tissue and the muscles as a result of skin reflexes.

With a sufficiently long cooling period, the temperature can also drop at depth. Deep sensors are stimulated to prevent the regional increase in blood flow described above. The outcome is a reduction in local inflammation and alleviation of pain.

- Short-term cooling with cold air leads to reactive hyperemia
- Longer-lasting cooling avoids reactive hyperemia.

The general guideline for avoiding reactive hyperemia

- A large joint such as the knee joint should be cooled for approximately 20 – 30 minutes. The same applies to muscles in areas with a thicker subcutaneous fatty layer.
- Smaller joints such as the elbow joint or wrist and muscles in areas with a thinner layer of subcutaneous fat should be cooled for a somewhat shorter period of time (approximately 15 – 20 minutes).
Distance between the nozzle and the skin

The critical temperature is 0°C. Frostbite certainly occurs at a skin temperature of -2°C. The range of temperature to be assumed for the transformation of water into ice in tissues is -4°C to 0°C.

Based on the anticipated cooling of the skin and the area at minimum temperature, the following recommendations are made noting that the area cooled decreases the greater the nozzle to skin distance. Because larger areas should generally be cooled with moderate to greater distances between the nozzle and the skin, dynamic application of the nozzle over these treatment areas is recommended.

- Small nozzle-skin distances (up to 5 cm) are suitable for short-term cooling (1 cm up to 10 sec; 5 cm up to 30 sec.), e.g. for rapid, short-term skin anesthesia with static cooling or for intensive cooling of larger areas of skin and underlying tissue layers with dynamic nozzle movement
  - Blockade of pain fibers

- Moderate distances between the nozzle and the skin (approximately 10 to 15 cm) are suitable for the dynamic cold air therapy of larger areas of skin and for the static treatment of small regions of skin even with longer treatment times (approximately 15 – 30 minutes).
  - A nozzle-skin distance of 10 – 15 cm is ideal for treating joints and muscles.
  - Blockade of pain fibers
  - Decrease in muscle tone and muscle spasticity by inhibiting the conduction velocity of the motor nerve fibers
  - Prevention of inflammation without reactive hyperemia.

- Large nozzle-skin distances (15 – 20 cm) are suitable for the dynamic cold air therapy of larger areas with prolonged treatment times (> 30 minutes).
  - Pain relief by inhibiting conduction velocity and increasing the stimulus threshold of pain fibers
  - Inflammation prophylaxis without reactive hyperemia.
The air current prevents the formation of a stationary layer of vapor between the skin and the cold air carrier, thus ensuring efficient cooling.

It should be noted that the biological effect of the cold air does not depend on the starting temperature alone but also on the speed of the air current, i.e. the wind chill effect. The biologically effective temperature is derived from the two factors — air temperature and air speed.

The wind chill effect is essentially relevant up to an air speed of approximately 90 km/h, i.e. in the region of fan stage 3.

Higher air speeds have only a minor additional wind chill effect because the moisture is removed 100% from the air by the air current, including the water vapor which forms as a result of the heat within the skin.

Totally dry conditions therefore exist as from fan stage 4. Skin damage is therefore ruled out if the skin is intact and provided that the method is implemented correctly.
The following diagram provides information on recommended treatment strategies depending on the nozzle-skin distance and fan stage. This is based on the biologically effective temperature of the air used for the treatment and the skin temperatures recorded at the same time.

**Biologically effective indications taking the wind chill effect into account**

1. Reactive hyperemia:
   Suitable for the rapid superficial cooling of the skin (shock cooling for surface anesthesia)
   Application time: up to 30 sec

2. Reduced reactive hyperemia:
   Suitable for the intensive cooling of the skin (epidermis and dermis) and surface tissue
   Application time: 3 min

3. No reactive hyperemia:
   Suitable for cooling deep tissue (joints and muscle)
   Application time: max. 30 min
1. Painful acute and chronic conditions of the musculoskeletal system
   › Arthritis
   › Bursitis
   › Tendinitis
   › Tendosynovitis
   › Myositis
   › Fibrositis
   › Muscle tension
   › Cervical syndrome
   › Symptoms after whiplash injury
   › Lumbar syndrome
   › Muscle and joint injuries (bruising, tears, sprains)

2. Pain relief in rheumatic disorders
   Improvement in range of movement and reduction in joint stiffness.
   › Rheumatoide Arthritis (progressiv chronic Polyarthritis)
   › Status post synovectomy

3. Neurological disorders, reduction in spasticity
   › Multiple sclerosis
   › Post-stroke hemiplegia

4. Improved physiotherapy through prior cold therapy
   (15 – 20 minutes of cold air)

5. Combined with compression in acute injuries

6. Prevention of edema and hematomas

7. Early prophylactic treatment immediately after exertion during sporting activities before symptoms can develop, e.g. after a competition.

8. Targeted treatment of muscle trigger points in combination with stretching.

9. Vascular training, e.g. for chronically cold hands and feet as a series of intermittent short-term cooling procedures of 10 seconds’ duration.

10. As pre-treatment of CPD (complex physical decongestion therapy) in chronic lymphedema.

Cold air cooling is recommended and successfully used in dermatological and cosmetic treatments to inhibit pain during and after the following treatments:
   › Laser therapy
   › Photodynamic therapy
Contraindications

1. Cryoglobulinemia
2. Cold hemagglutination and cold hemolysis
3. Cold-induced itching
4. Impaired arterial blood flow as from stage II
5. Raynaud’s disease
6. Severe sensory disorders
7. Trophic disorders
8. Hypersensitivity to the cold

**Relative contraindications and precautionary measures**

1. In the treatment of children, untreated parts of the body must be covered and kept warm.
2. The eyes must be covered when treating the face.
3. The face and trunk of patients with severe arterial hypertension and severe heart failure (NYHA III and IV) should not be treated.
4. Patients must not develop frostbite during cold air therapy.
Treatment and dose recommendations can obviously only be given for individual cases with reservations.

The applications discussed are variable guidelines that must be adapted in line with the patient's clinical picture and individual reaction.

The reducing attachment with a diameter of 10 mm is recommended for targeted treatment of trigger points.

N.B. Contraindications

Patients with known contraindications to cold therapy must be excluded from treatment.
Sudeck’s disease

Definition
The onset of painful soft tissue and bone dystrophy in the arms and legs due to a reflex-induced disorder of the sympathetic nervous system

Symptoms
I. Severe pain, swelling
II. Pain, trophic changes, stiffness
III. Atrophy of the skin, bones, soft tissue, stiffness

Treatment targets
To regulate blood flow
Pain relief
Mobilization

Positioning
Depending on the affected joint (mostly wrist, elbow, ankle), relaxed, pain-free

Treatment
Stage 1
Active movements several times a day in a cold air current

Treatment method
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N.B.
No cold air if the patient cannot tolerate the cold and only at stage 1

Post-stroke spasticity

Definition
Spastic muscle dysfunction following a cerebral insult

Symptoms
Spasticity with or without loss of sensitivity

Treatment targets
Pain relief (shoulder pain)
Muscle relaxation

Positioning
Relaxed, pain-free

Treatment
Sweep the painful and paralyzed area, applying simultaneous moderate mobilization. Treatment is also feasible if sensitivity is impaired.

Treatment method
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depending on patient tolerance
**Scars**

**Definition**
Formation of replacement connective tissue following an injury

**Symptoms**
Inflammation in the early stages

**Treatment targets**
To inhibit inflammation

**Positioning**
Relaxed, pain-free, depending on the site

**Treatment**
Cool the tissue along the inflamed area at the junction of scar tissue with normal tissue

**Treatment method**

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**N.B.**
The scar must be closed and dry (after 3 weeks)

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**Subacromial impingement syndrome, humeroscapularis periarthritis**

**Definition**
Tendinitis of the rotary cuff muscles and acromial subdeltoid bursitis, mostly caused by overloading the shoulder

**Symptoms**
Acute painful stiffness of the shoulder, very painful abduction (even passive) and elevation of the arm

**Treatment targets**
Pain relief
Inhibition of inflammation
Muscle relaxation

**Positioning**
Relaxed, pain-free in the sitting position with arm support

**Treatment**
Cool the shoulder with cautious mobilization; apply the cold air stream to sweep the shoulder

**Treatment method**

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Programme 2
Treatment of trigger points: fan stage 9; 10 sec. per point
Muscle injury

**Definition**
Blunt trauma with bruising and/or rupture of muscle fibers

**Symptoms**
Persistent pain, especially on movement
Local swelling and hematoma

**Treatment targets**
Pain relief
Improved function

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**Positioning**
Relaxed, pain-free

**Treatment**
Sweep the affected muscle over its entire length

**Treatment method**

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Programme 5
Possibly continue to treat with fan stage 3

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Thoracic spine pain

**Definition**
Painful impaired function with myosclerosis

**Symptoms**
Fulgurant, neuralgic pain; slow onset with herniated disks

**Treatment targets**
Pain relief
Muscle relaxation

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**Positioning**
Relaxed, pain-free in the supine position

**Treatment**
Limited: cool the specific trigger points
Extensive: sweep the entire painful area

**Treatment method**

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Programme 4
Treatment of trigger points: fan stage 3; 10 sec. per point

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**N.B.**
The patient should test the cold air application prior to treatment
Sprained ankle

**Definition**
Injury following overstretching to the lateral ligament of the upper ankle, possibly associated with fracture of the fibula

**Symptoms**
Swelling, pain on movement and touch, possible hematoma

**Treatment targets**
Pain relief
Prevention of swelling

**Positioning**
Relaxed, pain-free, lying down with leg elevated

**Treatment**
Acute:
Regional cooling of the injured area
Chronic:
Regional cooling of the affected area

**Positioning**
Relaxed, pain-free in the sitting position

**Treatment**
Acute:
Local cooling of the irritated area
Chronic:
Sweep the entire painful region

**Treatment method**

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**N.B.**
Cover areas not being treated

Epicondylitis

**Definition**
Acutely inflammatory irritation of the tendon insertions at the elbow, lateral or medial

**Symptoms**
Acute inflammation with local pain on movement and touch; pain radiating to the forearm and hand

**Treatment targets**
Pain relief
Inhibition of inflammation

**Positioning**
Relaxed, pain-free in the sitting position

**Treatment**
Acute:
Local cooling of the irritated area
Chronic:
Sweep the entire painful region

**Treatment method**

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**N.B.**
Cover areas not being treated
Hematoma

**Definition**
Localized collection of internal blood due to various, mostly traumatic causes

**Symptoms**
Red/blue/violet discoloration of the skin
Pain on pressure
Swelling

**Treatment targets**
Acute: prophylaxis, containment
Chronic: resorption

**Positioning**
Relaxed, pain-free

**Treatment**
Acute:
Continuous, local cooling
Chronic:
Local cooling, possibly several times a day

**Treatment method**

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Acute: Programme 6
Chronic: Programme 3

**N.B.**
Cover areas not being treated

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Status post cruciate ligament reconstruction

**Definition**
Status post surgical reconstruction of the anterior cruciate ligament

**Symptoms**
Irritation, swelling, minimal effusion, diffuse bruising (especially in the case of a gracilis-semitendinosus procedure), pain

**Treatment targets**
Pain relief
Prevention of inflammation and swelling

**Positioning**
Relaxed, pain-free in the sitting position, knee should be bent > 15°

**Treatment**
Acute and post-operative:
Continuous cooling, especially around the patella

**Treatment method**

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Programme 5

**N.B.**
Cover areas not being treated
Low back pain

**Definition**
Muscle pain in the lower back region, sudden pain and inhibited movement in facet block

**Symptoms**
Kyphotic posture, severe, painful muscle tension, limited movement and pain on movement

**Treatment targets**
Pain relief  
Muscle relaxation

**Positioning**
Relaxed, pain-free, lateral supine position

**Treatment**
**Acute:** Intensive short-term cooling  
**Chronic:** Sweep the lower back area with cold air current

**Treatment method**

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**Acute:** Programme 5  
**Chronic:** Programme 3  
Treatment of trigger points: fan stage 9; 10 seconds per point

**N.B.**
Cover areas not being treated

Neck-shoulder-arm syndrome

**Definition**
Pseudoradicular syndrome caused by muscle imbalance and cervical hyperlordosis

**Symptoms**
Pain irradiating to the arm, limited cervical movements and muscle tension

**Treatment targets**
Pain relief  
Muscle relaxation

**Positioning**
Relaxed, pain-free in the sitting position

**Treatment**
**Acute:** Cooling of pain and trigger points over a small area  
**Chronic:** Sweep the painful region with cold air current

**Treatment method**

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**Acute:** Programme 6  
**Chronic:** Programme 4  
Treatment of trigger points: fan stage 9; 10 seconds per point

**N.B.**
Cover areas not being treated, especially the face and eyes
Lymphedema

**Definition**
Accumulation of fluid in the interstitium due to impaired lymph flow

**Symptoms**
Swelling of an extremity

**Treatment targets**
Improved resorption due to an increase in tissue pressure

---

Rheumatoid arthritis

**Definition**
Chronic inflammatory autoimmune disease of the joints

**Symptoms**
Destructive, chronic inflammation, mostly in the finger and toe joints with acute episodes of long duration

**Treatment targets**
Pain relief
Restoration of movement

---

**Positioning**
Relaxed, pain-free in the supine position, treatment area raised

**Treatment**
Sweep the extremity with cold air current

**Treatment method**

<table>
<thead>
<tr>
<th>Cryo 6 programme</th>
<th>P1</th>
<th>P2</th>
<th>P3</th>
<th>P4</th>
<th>P5</th>
<th>P6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programme 3: sweep the extremity with the cold air current for 20 min or</td>
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<table>
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<tr>
<th>Cryo 5 air flow</th>
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<tbody>
<tr>
<td>Programme 1: with large nozzle-skin distance for extensive treatment, 20 min</td>
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**N.B.**
Skin damage or atrophic skin

---

**Positioning**
Affected joints relaxed, pain-free

**Treatment**
Sweep joints with cold air current

**Treatment method**

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<td>Programme 6</td>
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**N.B.**
Only cautious passive exercising during cooling
Inguinal pain

**Definition**
Tendinitis of the adductor longus muscle at its origin on the pubic bone

**Symptoms**
Inguinal pain, increasing on stretching and moving
Pain at tendon insertion on pressure

**Treatment targets**
Pain relief
Restoration of movement

**Positioning**
Relaxed, pain-free in the supine position, hip bent, slightly abducted and rotated outwards, placed on a cushion

**Treatment**
Sweep the affected area (groin and inside of the thigh) with the cold air current

**Treatment method**

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**Acute:** programme 6, **chronic:** programme 3 or 4 depending on patient tolerance.
Treatment of trigger points: fan stage 9, 10 sec. per point

**N.B.**
Only cautious passive exercising during cooling

---

Sciatica

**Definition**
Nerve root compression with segmental sensory and motor episodes and pain patterns

**Symptoms**
Low back pain irradiating into one leg
In the case of radical symptoms, paresthesia and motor episodes in the segment

**Treatment targets**
Pain relief
Nerve root decompression

**Positioning**
Relaxed, pain-free

**Treatment**
Sweep the lower back region with cold air current

**Treatment method**

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Programme 6,
Treatment of trigger points: fan stage 9; 10 sec. per point

**N.B.**
Cover areas not being treated
Multiple sclerosis

**Definition**
Inflammatory/demyelinating and degenerative disease of the central nervous system

**Symptoms**
Muscle stiffness as a pyramidal tract symptom in addition to a range of neurological disorders

**Treatment targets**
Pain relief (shoulder pain)
Prevention of muscle contraction

---

Piriformis syndrome

**Definition**
Tension in the piriformis muscle

**Symptoms**
Pseudoradicular pain symptoms, local pain elicited on stretching and pressure. Active trigger points with radiating pain

**Treatment targets**
Relaxation of the piriformis muscle

---

**Positioning**
Relaxed, pain-free

**Treatment**
Sweep spastic muscles with cold air current

**Treatment method**

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Programme 4
depending on patient tolerance

**N.B.**
Sensory disorders

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**Positioning**
Relaxed, pain-free, lateral positioning with flexion of hip and knee, leg supported by cushion

**Treatment**
Sweep the mid section of the gluteal region with the cold air current

**Treatment method**

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Programme 4
Treatment of trigger points: fan stage 9; 10 sec. per point

**N.B.**
Cover areas not being treated

Achillodynia

**Definition**
Inflammatory irritation of the Achilles tendon due to microtrauma

**Symptoms**
Heel pain depending on loading, frequently radiating into the calf

**Treatment targets**
Pain relief
Relaxation of the gastrocnemius

Spasmodic torticollis

**Definition**
Dystonia caused by extrapyramidal disorder with central nervous damage

**Symptoms**
Incorrect head posture due to muscle spasm (rotated, tilting laterally, held forwards or backwards)

**Treatment targets**
Pain relief
Muscle relaxation
The duration of treatment primarily depends on the extent of the area to be treated. Individual patient tolerance must be taken into account in this respect.

If no set programmes are used, the following guidelines apply:

<table>
<thead>
<tr>
<th>Programme</th>
<th>Phase 1</th>
<th>Phase 2</th>
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<tbody>
<tr>
<td></td>
<td>Fan stage</td>
<td>Time</td>
</tr>
<tr>
<td>1</td>
<td>9</td>
<td>3 min</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>5 min</td>
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<td>3</td>
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<tr>
<td>4</td>
<td>3</td>
<td>10 min</td>
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<td>5</td>
<td>9</td>
<td>30 sec</td>
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<tr>
<td>6</td>
<td>7</td>
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**Cryo 6 programmes**
9 fan stages of 100 l/min to 1000 l/min

**Cryo 5**
6 fan stages of 300 l/min to 1000 l/min

In the case of Cryo 6 programmes 1 and 2 with high fan stages, an immediate decrease in skin temperature is recorded within 15 seconds with a nozzle-skin distance of 2 cm to 5 cm.
Continuous pain relief and the spasm-reducing effect of cold air combined with manual therapy and mobilization techniques offer treatment options that extend beyond traditional cold air applications.

- Chronic pain in arthrosis
- Post-operative mobilization following joint surgery
- Manual treatment and passive mobilization in chronic pain with muscle tension
- Spasticity with central paralysis as in the case of stroke patients

The advantage of long-term cold air therapy is the fact that it is effective at depth with only minor reactive hyperemia.

We therefore recommend fan stages 2 or 3 for at least 30 minutes with a nozzle-skin distance of 15 – 20 cm.

To treat muscle spasticity due to central damage such as a stroke, we recommend cooling the muscles with fan stage 2 or 3 for approximately 20 minutes before starting mobilization therapy. During the latter, the muscles can be further cooled but this should be avoided as the effect persists for at least 30 minutes.

A support arm is an important requirement for long-term cooling and/or cooling during manual therapy or mobilization, because it means that the therapist does not have to hold the hose for a long period during the (pre)cooling phase, thus leaving both hands free to treat the patient during the cooling process.
TREATMENT MANUAL

Cold therapy