Cryotherapy for Headache

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SYNOPSIS

45 patients with migraine or migraine plus chronic daily headache evaluated the effectiveness of a coldwrap for headache relief. 35.5% judged it not effective, 29% judged it mildly effective, 26.5% found it moderately effective, and 9% judged it completely effective. Previous studies on ice treatment for headache are reviewed.

(Headache 29:598-600, 1989)

INTRODUCTION

Ice treatment, or Cryotherapy, has its roots as far back as the ancient Greeks, with anesthesia being administered via cold therapy as early as the Middle Ages. 1 In 1849, James Arnott 2 published a paper on cold therapy, in which he used a mixture of salt and ice. Sir Samuel Wilks 3 suggested the use of a wet bandage around the head. Gowers 4 discussed local therapy to the head and neck.

Diamond and Freitag 5 published a study in 1984 in which they looked at the effect of cryotherapy on 90 outpatients with migraine, cluster and mixed headaches. They used a reusable frozen gel pack. 52% of patients reported an immediate decrease in pain. 71% of all patients, and 80% of migraine patients, reported that the pack was effective. Overall decrease in pain was reported by 63% of patients. Of the patients surveyed, 71% reported that they would use the gel pack in the future. Lance 6 (1988) published results of a new device (Migralief Apparatus) which employs cold, pressure, and heat around the head. Severity of headache was reduced in 15 of 20 migraine patients, and in 6 of 7 tension headache patients.

In this paper, the results of a study on cold for headache are presented, and the pathophysiology of cryotherapy is reviewed.

MATERIALS AND METHODS

45 patients, aged 16 to 54, agreed to participate in the study. They were all patients at the Robbins Headache Clinic. The patients had either the diagnosis of migraine plus chronic daily headache. Patients were given a CHAMP Coldwrap* which consisted of a cold pack inside an elastic bandage. The cold pack was stored in the freezer and provided 20 to 30 minutes of cold therapy.

At the onset of the migraine, patients placed the cold pack around the head with the elastic bandage, tic wrap. They were asked to evaluate at least three migraine attacks in this manner. And they were allowed to use their usual migraine abortive medication. On subsequent visits to the Clinic, the patients were asked, “Is the cold pack and pressure not effective (0-15% relief), mildly effective (15-45% relief), moderately effective (45-75% relief), or almost completely effective (75-100% relief)?” In addition, they were asked, “Would you use it in the future?” Results are seen in Table 1.

Table 1
Adjunctive Treatment with Cryotherapy for Migraine and Mixed Headaches: Results
Number of Patients=45

<table>
<thead>
<tr>
<th>Question: Is the cold pack, for the first 20-30 minutes of use:</th>
<th># of pt's</th>
<th>Percentage of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not effective (0-15% relief)</td>
<td>16</td>
<td>35.5%</td>
</tr>
<tr>
<td>Mildly effective (15-45% relief)</td>
<td>13</td>
<td>29.0%</td>
</tr>
<tr>
<td>Moderately effective (45-75% relief)</td>
<td>12</td>
<td>26.5%</td>
</tr>
<tr>
<td>Almost completely Effective (75-100% relief)</td>
<td>4</td>
<td>9.0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question: Do you intend to use the cold pack in the future?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>26</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>58.0%</td>
<td>42.0%</td>
</tr>
</tbody>
</table>

RESULTS

When the 45 patients were asked to judge the effectiveness of the cold pack, 35.5% judged it not effective, 29% judged it mildly effective, 26.5% thought it was moderately effective, and 9% judged the cold wrap almost completely effective. 58% of the patients intended to use a cold wrap or cold pack in the future. It is unclear how much the wrapping of the elastic bandage around the head added to the effectiveness of the cold pack.

DISCUSSION

The major effect of ice is to decrease the amount of blood flow to the area. Abramson noted that when a forearm is placed in a bath of 17°C for a prolonged period of time, the blood flow drops from 2.6 milliliters per 100 milliliters limb volume to 0.7 milliliters. Although it is controversial, it is felt that vasodilation occurs after the constriction. There are three main thoughts as to why vasodilation does occur. It may occur because of a reactive hyperemia, or due to a local contractile mechanism failure, or from a decrease in response to constrictor hormones. A further effect of the cryotherapy is a reduction in metabolism. In one study, the oxygen uptake in the forearm was decreased from .199 milliliters per minute at 32°C to .071 milliliters per minute in a bath of 17°C. Chemical reactions were decreased by approximately 50% when the temperature was reduced by 10°C.

Local anesthesis is an important consideration in the use of cryotherapy. Lowering pain stimuli may be caused by a decrease in contraction. The "gate theory" postulates that the cold sensations overwhelm and block transmission of the pain stimuli into the cerebral cortex. Ice reduces the release of histamines, vasoactive substances and enzymes that stimulate nerve endings. Conduction velocity of peripheral nerves is decreased as the temperature is lowered. Certain nerve fibers are effected more by the cold, particularly the small myelinated fibers, and gamma fibers of the muscle. This may contribute to a decrease in spasm, maintaining the muscle in a more relaxed state. Sympathetic activity may have a role to play in the cryotherapy mechanism. One further effect that cryotherapy may have is its influence on collagen. Cold will increase the stiffness of collagen, raising the resistance to stretching.

Hocutt described four stages of cryotherapy. In the first stage, lasting 3 minutes, there is a feeling of cold. During the second stage, 2 to 7 minutes into therapy, there is a burning or aching feeling. In the third stage, local numbness begins (5 to 12 minutes into the cryotherapy treatment). Finally, there is a deep dilation, but no increase in metabolism. This begins at the 12 to 15 mark of treatment. At least 12 minutes, therefore, of cryotherapy needs to be utilized.

Several studies have looked at cryotherapy in the postoperative setting. Average amounts of narcotics given to patients with and without cryotherapy, after foot surgery, were assessed. The amounts of codeine, morphine and meperidine were markedly decreased with cryotherapy.

Contraindications to cryotherapy are relatively scarce. Absolute contraindications may include Raynaud's phenomenon and cold hypersensitivity. A histamine release in these cases may possibly cause wheals, flushing of the face, or in extreme cases, syncope. Occasionally, exacerbates a headache, and, in rheumatoid conditions, ice may increase or precipitate cryoglobulinemia. Patients with paroxysmal cold hemoglobinuria need to avoid cryotherapy, as the free flow of hemoglobin produced may lead to renal dysfunction and hypertension.

It was believed in the past that headache was primarily of peripheral origin with nociceptors being activated in the periphery, much like the pain resulting from burning of the skin. The central nervous system, without activation of peripheral receptors, is another source of pain. Headaches may originate from either peripheral or central mechanisms. The vascular structures about the head are pain sensitive, primarily the proximal portion of the cerebral arteries and the large veins and venous sinuses. The trigeminal nerve provides the main
innervation to the blood vessels. Stretching and pulsating of the walls of the arteries, or muscle contraction, has been believed to affect peripheral nerve receptors in these tissues, with head pain being the result. However, it is most likely that muscle contraction and vasodilation, although certainly contributing factors in migraine, are secondary to the main central headache generating mechanism. It is very possible that cold to the area is helping this second source of pain, and pressure around the head may be constricting the arteries that are engorged. However, these are most likely secondary factors in pain relief. It is also pressure has played a role in certain of our patients.

REFERENCES