Cold Intolerance Is Not More Common or Disabling After Digital Replantation Than After Other Treatment of Compound Digital Injuries

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Cold intolerance is a common reason for disability after hand injury. In this study of posttraumatic cold intolerance, 20 patients with a history of digital replantation were matched with 20 control subjects who had not undergone replantation. The incidence and intensity of cold-related symptoms among patients in the two groups was investigated through the use of individual interviews and a grading scale for self-assessment of symptoms. The analysis of data indicates that although the pattern of symptoms may vary, the condition is neither more common nor more disabling among those who have undergone digital replantation. Cold intolerance after digital replantation seems, therefore, to be defined by the initial trauma and not by the subsequent reconstructive surgery.


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Cold intolerance of any etiology is potentially disabling. The condition is so common after digital replantation that many seem to believe that it relates more to the reconstruction than to the original trauma. That cold intolerance would be a complication specifically to digital replantation is, for example, suggested by authors who list cold intolerance among complications or contraindications to such surgery. Obviously, conclusions of this kind (“Post hoc, ergo propter hoc”) do influence the physician’s advice, the patient’s decision, and the insurer’s willingness to cover medical expenses. Complaints of cold intolerance are common after any injury to the hand. The present study was designed to investigate if digital replantation surgery is connected with an increased incidence or intensity of posttraumatic cold intolerance.

Patients and Methods

The charts of 20 patients with digital replantation (group A) were retrieved at random from hospital files (Department of Hand Surgery, University of Umeå). Using age and type/mechanism of trauma as parameters for matching, 20 control subjects (group B) were then selected (Table 1). The control subjects had undergone primary stump revision and closure after digital amputation (N = 8), primary repair after laceration of one or both neurovascular bundles (N = 8), or open reduction and internal fixation of open phalangeal fractures (N = 4). The patients were contacted for personal interviews, which were conducted by one of the authors (ML). Using the definitions described in the next section, each patient was asked to list all sequelae of the injury. If an increased sensitivity to cold was mentioned, the patient was asked to describe, in his or her own words, the character of the related symptoms, the triggering temperatures or situations, and the disability that the increased sensitivity to cold caused to the patient’s professional and leisure activities. A rank scale was used to grade the symptoms. Statistical analysis was performed using Student’s paired t-test.

Definitions

Posttraumatic cold intolerance (PTCI): Symptoms representing any discomfort or problem triggered by exposure to cold, and perceived by the patient as a direct sequel to their hand injury

Disability: Any grade of functional impairment
Table 1. Profiles of Participating Patients

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Group A</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (M/F)</td>
<td>18/2</td>
<td>20/0</td>
</tr>
<tr>
<td>Age (yr)</td>
<td>43.7 (20–64)</td>
<td>42.7 (20–67)</td>
</tr>
<tr>
<td>Years postinjury</td>
<td>7.7 (2.8–11.8)</td>
<td>4.8 (1.8–11.6)</td>
</tr>
</tbody>
</table>

M = male; F = female.

Table 2. Frequency of Groups of Individual Cold-Related Symptoms After Digital Injury

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Group A (N = 20)</th>
<th>Group B (N = 20)</th>
<th>All (N = 40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coldness</td>
<td>15 (75%)</td>
<td>15 (75%)</td>
<td>30 (75%)</td>
</tr>
<tr>
<td>Raynaud’s</td>
<td>12 (60%)</td>
<td>16 (80%)</td>
<td>28 (70%)</td>
</tr>
<tr>
<td>Pain</td>
<td>13 (65%)</td>
<td>8 (40%)</td>
<td>21 (53%)</td>
</tr>
<tr>
<td>Numbness</td>
<td>8 (40%)</td>
<td>9 (45%)</td>
<td>18 (43%)</td>
</tr>
<tr>
<td>Stiffness</td>
<td>8 (40%)</td>
<td>8 (40%)</td>
<td>15 (38%)</td>
</tr>
<tr>
<td>General malaise</td>
<td>1 (5%)</td>
<td>1 (5%)</td>
<td>2 (5%)</td>
</tr>
</tbody>
</table>

perceived by the patient as a sequel to their hand injury

Results

All patients agreed to participate in the study. The cold-induced symptoms and symptom patterns were described with large, individual variations. To process the information, the symptoms were organized under six separate headings: coldness, color changes (Raynaud’s), pain, numbness/paresthesias, stiffness/swelling, and general malaise.

Cold-induced symptoms from at least one of the six groups were reported by all patients, but with large, individual variations. The symptoms were not reported as occurring along any pattern common for all patients. Instead, great disparity was found between individuals in terms of the order in which symptoms manifested themselves with exposure to subthreshold temperatures. This part of the study will be reported separately.

All patients in both groups stated that the hand injury had resulted in some degree of disability and a decreased tolerance to cold. Thirty-two patients (80%) stated that PTCI contributed to the disability. Twenty-six patients (65%) considered PTCI the main reason for the disability.

The cold-induced symptoms related primarily to the injured fingers, but would occasionally involve uninjured digits or the whole hand.

Table 3. Disability Caused by Cold-Related Symptoms

<table>
<thead>
<tr>
<th>Disability</th>
<th>Group A (N = 20)</th>
<th>Group B (N = 20)</th>
<th>All (N = 40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coldness/pain</td>
<td>5.9</td>
<td>6.1</td>
<td>6.0</td>
</tr>
<tr>
<td>Stiffness</td>
<td>4.7</td>
<td>4.2</td>
<td>4.5</td>
</tr>
<tr>
<td>Numbness</td>
<td>5.3</td>
<td>4.1</td>
<td>4.7</td>
</tr>
</tbody>
</table>

The incidence of the various symptoms was similar in the two groups, with the exception of cold-induced pain, which was more common among the replantees (Table 2). More importantly, however, the perception of disability caused by the cold-related symptoms did not differ between the groups (Table 3).

Discussion

Although exceptions may exist, the loss of an extremity or part thereof is generally disabling, functionally and psychologically. It is generally assumed within the medical community as well as in the lay press that digital replantation restores function otherwise lost, and most patients request the replantation of a amputated digit when offered a choice. It has yet to be demonstrated conclusively that the functional disability is less after replantation than after stump revision and closure. Yet, the satisfaction among replantees is higher.

At times when outcome studies define the surgical alternatives that can be offered to an injured patient, lack of proof of functional gain can be used to argue against digital replantation as a reasonable method of reconstruction. The case against replantation would be even stronger if it can be argued that the reconstruction is likely to cause iatrogenic disability, such as PTCI. It is therefore of general interest to scrutinize not only indications for reconstructive surgery, but also alleged general contraindications or complications to treatment.

Cold intolerance may serve as an example of a complication that is perceived commonly as caused by treatment. It is often listed in the surgical literature among complications to the procedure, and Asko-Seljamaara and colleagues proposed that living in a cold climate should be considered a relative contraindication to replantation.
Disability after digital amputation and/or treatment for such injury is generally defined by level of amputation, grip strength, joint mobility, functional sensation, grip patterns, or complex manual tasks. Measurements are obtained indoors, and do not take into account any effect of temperature, wind, humidity, and so forth. However, although disability caused by PTCI is not assessed in any routine test, the condition is in itself a potentially serious cause of functional impairment after digital amputation injuries. Whether digital replantation causes more pronounced PTCI than other means of reconstruction is therefore a question of some significance.

The consequences of PTCI depend entirely on the patient’s social situation, environmental conditions at work and during leisure activities, etc., and we are not aware of any currently available method to measure the impact of PTCI objectively on a patient’s hand function or quality of life. The interview device therefore provides more reliable information than standardized measurements of digital circulation, two-point discrimination, grip strength, range of motion, etc. This is particularly true if the study group, such as in this investigation, represents a population with a variety of lifestyles and interests.

Measurements of such parameters of hand function as volumes, distances, forces, degrees, and so on, would not have provided information of value to this study. Instead, a considerable effort was invested in selecting each control subject appropriately. Although it was our initial intention to match replantees against amputees, we were unable to achieve this without compromising more important aspects. We therefore selected control subjects whose leisure activities and professional needs to function in cold environments resembled those of the replantees as closely as possible, and who had similar histories of trauma. That the injury had not resulted in an amputation in all control subjects is of less importance, since any resulting bias is unlikely to act in support of the hypothesis.

Digital replantation surgery may or may not represent an efficient use of the health-care resources that are available to society. However, arguments against a mode of reconstruction that is desired by the patient must be based on the rational consideration of facts. The high degree of patient satisfaction after digital replantation may reflect such subtle factors as body image and expectations from the patient or the doctor. Like PTCI, these factors are difficult to measure and are rarely considered in the surgical literature. Yet, they cannot be disregarded if the ultimate goal of any reconstruction is patient satisfaction rather than grip strength, whenever both cannot be achieved.

That psychological factors influence the perceived degree of disability is exemplified by our patients’ perception of color changes (Raynaud’s) as disabling. When questioned, most patients expressed fear that blanching of the fingers would herald some serious complication, or stated that the phenomenon in some nonspecific way is unpleasant. It seems that reassuring statements from the doctor do not suffice for most patients to accept cold-induced color changes as “normal” or harmless.

In times of cost containment and scrutiny of outcomes, there is a risk that relative contraindications against procedures perceived as sophisticated or costly are overemphasized. Since the number of patients in the two groups is limited, this study does not prove conclusively that certain cold-induced symptoms are not influenced by the mode of reconstruction. In fact, our results indicate that the pattern of cold intolerance may differ between the two investigated groups, and that cold-induced pain may be more common among the replantees. However, and more importantly, there is no indication that the perceived disability from PTCI would be higher after replantation than after other treatment for compound digital injuries. That most replantees suffer from cold intolerance is therefore not a valid argument against digital replantation, and PTCI should not be regarded as a complication to replantation surgery.

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