Electrophysical Agents
CHAPTER 6

Hot Pack and Paraffin Bath Therapy

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Learning Objectives

Knowledge: List the basic considerations associated with the application of hot pack and paraffin bath therapy.

Comprehension: Summarize the physiological and therapeutic effects of hot pack and paraffin bath therapy.

Application: Demonstrate paraffin bath therapy application methods.

Analysis: Explain how to establish objective or quantitative dosimetry with regard to the application of hot pack and paraffin therapy.

Synthesis: Explain the difference between heat and temperature.

Evaluation: Discuss the concepts of specific heat capacity and thermal conductivity and their relevance to the use of hot pack and paraffin bath therapy.
CHAPTER 6  Hot Pack and Paraffin Bath Therapy

I. RATIONALE FOR USE

A. DEFINITION AND DESCRIPTION

This chapter discusses the use of two therapeutic agents, namely, hot packs and paraffin baths. These agents fall under the field of thermotherapy, which is defined as the application of heat sources, called thermal agents, over skin surface areas for the purpose of heating soft tissues. Hot packs and paraffin baths deliver moist heat, as opposed to the dry heat delivered by other thermal electrophysical agents (EPAs) such as fluidotherapy (Chapter 7), shortwave diathermy (Chapter 10), and ultrasound therapy (Chapter 20). The rationale for integrating the discussion of these two agents into a single chapter, therefore, is based on the fact that both deliver moist heat to soft tissues.

1. Superficial Versus Deep Thermotherapy

Historically, thermotherapy has been classified as either superficial or deep in nature. There is a consensus in the EPA literature to define superficial thermotherapy as the heating of soft tissues located within 1 cm from the skin surface (Bell et al., 2002; Knight et al., 2008a,b). Therefore, deep thermotherapy can be logically defined as the heating of soft tissues deeper than 1 cm from the skin surface. Current EPA textbooks classify hot packs and paraffin baths as superficial thermal agents.

2. Superficial Versus Deep Soft Tissues

Research has shown that the application of paraffin baths and fluidotherapy (Chapter 7), which are classified as superficial thermal agents, to the hands and feet of human subjects can induce significant temperature increases not only in the most superficially located tissues (i.e., skin), but also in the deeply located soft tissues (muscles and joint capsules).

B. HOT PACKS AND PARAFFIN BATHS

Figure 6-1A shows a typical commercial hot pack; (B) shows a paraffin bath filled with a paraffin mixture. Hot packs are manufactured in different sizes and shapes to accommodate different parts of the human body. Paraffin baths are also manufactured in different sizes and are used to treat the distal parts of the upper and lower extremities.

1. Extent of Hot Pack Use

Lindsay et al. (1995) surveyed Canadian private physiotherapy clinics and found hot packs were available in all facilities (100%), with an overall frequency of use of 95.1%. Three years later, Robertson et al. (1998) surveyed more than 200 clinical physiotherapy facilities in Australia and found that hot packs were available in 88% of facilities and were used daily by 73% of all respondents. In 2007, Nussbaum et al. (2007) surveyed 125 Canadian physiotherapists and showed that superficial thermal agents were available to 96% and used by 54% of the respondents. No published survey could be found on the use of hot packs in the United States.
2. Extent of Paraffin Bath Use
The Australian survey by Robertson et al. (1998) revealed that paraffin baths were available in 64% of facilities and were used daily by 28% of the respondents. The Canadian survey by Lindsay et al. (1995) showed this agent to be present in 57.4% of private clinics, with a frequency of use of 11.1%. No literature on the use of hot packs in the United States could be found.

3. Current Use
No literature is available to indicate whether the use of these two thermal agents has increased, decreased, or remained steady. Judging from the fact that these two agents are still covered today in several EPA textbooks (see References) and listed in several brochures published by EPA manufacturers, it is fair to say that their clinical use is still common and widespread. This view is further substantiated by the fact that today, the teaching of hot pack and paraffin bath therapy is still mandatory in the physical therapy academic EPA curricula of many countries, such as Canada (NPAG, 2001), Australia and New Zealand (Chipchase et al., 2005), and the United States (APTA, 2001).

C. INFRARED LAMPS
The popular and routine use of hot packs and paraffin baths stands in clear contrast to the significantly declining use of another classic superficial thermal agent, infrared lamps. In Australia (Robertson et al., 1995), infrared lamps, which generate dry heat, were found in only 39% of the facilities surveyed and were used only 35% of the time. In Canada, Lindsay et al. (1995) found infrared lamps in only 2.2% of the clinics surveyed, with a 0% frequency of use. These results are in keeping with those of Pope et al. (1995) in England, who reported a very low rate of use. Therefore, infrared lamps are not covered in this chapter.

D. MICROWAVEABLE PACKS AND HEAT WRAPS
The declining use of infrared lamps may also be explained by the recent emergence of safe, over-the-counter, easy-to-use, reusable microwaveable packs and disposable heat wraps (Nadler et al., 2002, 2003a,b; Trowbridge et al., 2004). These packs and wraps, sold in various sizes and shapes, are capable of delivering superficial dry or moist heat to localized body areas. There is recent evidence to suggest that a particular dry heat wrap may have beneficial therapeutic effects on acute nonspecific low-back pain (Nadler et al., 2002, 2003a,b).

E. RATIONALE FOR USE
The rationale for hot pack and paraffin bath therapy is to provide practitioners with thermal agents capable of generating moist heat for the purpose of heating soft tissues, aside from using hydrotherapy (Chapter 9), and other dry-heat EPA such as fluidotherapy (Chapter 7), shortwave diathermy (Chapter 10), and ultrasound therapy (Chapter 20). It is also to provide practitioners with thermal agents capable of heating large body surface areas (hot packs) and difficult-to-reach body areas such as fingers and toes (paraffin bath).

II. HISTORICAL PERSPECTIVE
A. HOT PACKS
The literature suggests that the therapeutic use of hot packs was introduced during the mid-1950s by Hollander et al. (1949), Horvath et al. (1949), and Erdman et al. (1956).

B. PARAFFIN BATHS
The literature also indicates that paraffin bath therapy was first introduced in the early part of the 20th century by De Sanfort (1915), Humphris (1920), Portmann, (1926), and Zeiter (1939).

C. BODY OF LITERATURE
Despite their routine clinical use over the past 70 or 80 years, the topic of hot pack and paraffin bath therapy has been the subject of a limited number of articles (see References), review articles (Hardy et al., 1998; Aying et al., 2000; Brosseau et al., 2006; Robinson et al., 2006), and several chapters of textbooks (Jackins et al., 1990; Lehmann et al., 1990; Sekins et al., 1990; Basford, 1998; Hayes, 2000; Bell et al., 2002; Cameron, 2003; Starkey, 2004; Michlovitz et al., 2005; Hecox et al., 2006; Michlovitz et al., 2006; Knight et al., 2008a,b).

III. BIOPHYSICAL CHARACTERISTICS
A. HEAT TRANSFER VIA CONDUCTION
The use of hot pack and paraffin bath therapy is based on the biophysical principle of thermal energy transfer, via conduction, between the agents and the exposed soft tissues. Conduction is defined as the process of internal thermal energy exchange between areas of different temperatures, whereby the exchange of kinetic energy from particle to particle is accomplished by direct molecular collisions (Sekins et al., 1990). In other words, heat transfer by conduction occurs when there is direct contact between the warmer agent and the cooler exposed tissues (for details, see Chapter 5).

B. HEAT VERSUS TEMPERATURE
Heat and temperature, although interrelated, are separate concepts (as discussed in the Illustrated Glossary of Electrophysical Terminology presented in Chapter 5). It is correct to state that the greater the amount of heat
(or kinetic energy) within a thermal agent, the higher its temperature. Is it fair to say that of two hot packs with the same temperature, say $70^\circ C (158^\circ F)$, the one with the larger mass (1500 g versus 1000 g) will contain a greater amount of heat than the other? The answer is yes because the amount of heat a material possesses is also determined by its mass, as evidenced by the formula, $q = m \times c \times t$, where $m$ is the mass of the hot pack in this case (see Chapter 5 for details). This is to say, by analogy, that there is more heat in a full kettle of boiled water (i.e., more mass or molecules of water) than in a single cup of boiled water, although the boiled water is $100^\circ C$ in both cases. Clinically speaking, a practitioner will always select a larger hot pack over a smaller one, even if both have the same temperature, when the therapeutic purpose is to deliver more heat to the soft tissues per unit of time. This is simply because the larger pack contains more heat than the smaller pack.

### 1. Subcutaneous Fat as Thermal Barrier

When compared with all other soft tissues (except bone), subcutaneous fat has the lowest specific heat capacity ($c = 0.55$) and thermal conductivity ($k = 0.45$) values. Clinically speaking, this means that subcutaneous fat is the tissue that holds and conducts heat the least. Because of its poor capacity to conduct heat, subcutaneous fat acts as a significant thermal barrier, preventing heat from reaching the deeper soft tissues.

### 2. Paraffin Versus Water

Why is it that if you immerse a hand in a bath of hot water of a given temperature and immerse the other hand in a paraffin bath of the same temperature, the water bath feels hotter than the paraffin bath? Because water holds approximately 2 times more heat (higher specific heat capacity; $k = 1.0$ versus 0.45) and conducts heat approximately 2.5 faster (higher thermal conductivity; $k = 1.42$ versus 0.59) than paraffin.

### 3. Hot Pack Versus Paraffin Bath

Hot packs act like sponges by holding hot water from the hydrocollator unit. Why is it that applying a hot pack at $50^\circ C (122^\circ F)$ directly over the skin will cause severe pain and burn, whereas applying paraffin wax of the same temperature will feel comfortable and will not burn the skin? The answer, once again, lies in the fact that compared with water, paraffin has a much lower capacity to retain ($c = 0.45$ versus 1.0) and conduct heat ($k = 0.59$ versus 1.42) to the soft tissues.

### C. SPECIFIC HEAT CAPACITY AND THERMAL CONDUCTIVITY

These two important biophysical concepts, defined and described in Chapter 5, are related to the practice of hot pack and paraffin bath therapy. Specific heat capacity ($c$) is the ability of a substance to hold or store heat at a given temperature. Thermal conductivity ($k$) is the ability of a substance to transmit or conduct heat.

### IV. PHYSIOLOGICAL, AND THERAPEUTIC EFFECTS

#### A. THERMAL EFFECTS ON HEALTHY SUBJECTS

Listed in Box 6-1 is scientific evidence related to the physiological effects caused by thermal energy released from hot packs and paraffin baths on healthy subjects.

#### 1. Hot Packs

Evidence shows that the heating effect of hot pack therapy can increase thigh soft-tissue temperature (Lehman et al., 1961), increase shoulder range of motion (Lentell et al., 1992), and increase ankle dorsiflexion (Knight et al., 2001; Lehmann et al., 1966). Paraffin usage can also provide a similar increase in muscle length (Taylor et al., 1995), decrease skin temperature (Abramson et al., 1964). Box 6-1: Physiological Effects of Hot Pack and Paraffin Bath on Healthy Subjects

**Hot Pack**

Lehman et al., 1966: Over thigh area; increases skin surface temperature by $10^\circ C$ and soft tissue temperature by $2^\circ C$ at a depth of 3 cm.

Lentell et al., 1992: Over shoulder area; increases ROM.

Henrickson et al., 1984: Over hamstring muscle area; no significant increase in muscle length.

Taylor et al., 1995: Over hamstring muscle area; no significant increase in muscle length.

Cosgray et al., (2004): Over hamstring muscle area; no change in hamstring length.

Draper et al., 1998: Over triceps surae area; additive effect of ultrasound therapy for increasing the triceps surae muscle temperature.

**Paraffin Bath**

Abramson et al., 1964: Over forearm; increases skin temperature by an average of about $12^\circ C$, and subcutaneous fat and muscle temperature by $6^\circ C$ and $3^\circ C$, respectively.

Borrell et al., 1980: Over hand and foot; increases muscle temperature by an average of $4.5^\circ C$, and joint capsule temperature by $7.5^\circ C$.

Knight et al., 2001: Over triceps surae area; increases ankle dorsiflexion ROM.

Robertson et al., 2005: Over triceps surae area; increases ankle dorsiflexion ROM.
Robertson et al., 2005). There is no evidence that hot pack therapy increases hamstring muscle length (Henrickson et al., 1984; Taylor et al., 1995; Cosgray et al., 2004). Finally, there is evidence that application of a hot pack before ultrasound therapy may accelerate soft-tissue heating.

2. Paraffin Bath
Studies by Abramson et al. (1964) and Borrell et al. (1980) show that hot packs can induce significant heating effect in superficial (skin) as well as deep (muscle, joint capsule) soft tissues.

B. THERMOPHYSIOLOGICAL EFFECTS
Illustrated in Figure 6-2 are the proposed physiological and therapeutic effects that result from hot pack and paraffin bath therapy. First, the heating effect causes vasodilation, which in turn increases blood flow and cell metabolism at the wound site, thus facilitating soft tissue healing. Second, heating stimulates thermoreceptors, which induces a strong thermal sensation with a counter-irritant effect on pain, thus decreasing it. Third, hot pack and paraffin bath therapy are presumed to increase soft tissue elasticity and reduce joint viscosity, thus increasing joint range of motion (ROM).

V. DOSIMETRY
A. HOT PACK
The thermal dose is determined based on the following four parameters: size of pack, temperature differential between the agent and the skin \( T^{ag-s} \), application duration, and coupling thickness.

1. Size of Pack
Hot packs come in various sizes and shapes. Remember that the larger the size (or mass) of the pack, for any given temperature, the more heat will be conducted or transmitted to the treated area. Hot pack size should be as large as the tissue area under treatment.

2. \( T^{ag-s} \)
This value is the temperature differential between the agent (ag) and the exposed skin surface (s). This can be measured easily and quickly using a noncontact portable infrared thermometer, as described in Chapter 26. The higher the \( T^{ag-s} \), the greater the heating potential of the thermal agent. Hot packs are kept in water-thermoregulated units, called hydrocollators, where a temperature range between 71°C and 74°C (160–165°F) is maintained. Clinicians should never assume that the temperature of the hot pack just pulled out of the hydrocollator unit is exactly the temperature indicated on the hydrocollator thermometer, unless they are certain that the hot pack has been immersed in the unit for at least 30 minutes prior to usage.

3. Application Duration
Recommended treatment duration is 20 minutes, based on the work by Lehmann et al. (1966). They demonstrated that maximum heating of soft tissues was achieved after approximately 20 minutes of application and that repeated applications every 10 minutes did not increase soft tissue temperature any further.

4. Coupling Thickness
Hot packs are NEVER applied directly over the skin surface because their high heat content can easily cause a skin burn. A coupling medium, such as layers of towels, is always necessary. Set the thickness of the coupling medium by recording the number of layers (from 5 to 8 layers) of toweling between the pack and the skin surface. A thick commercial cloth cover may also be used as a coupling agent.

B. PARAFFIN BATH
The thermal dose is determined by setting the following three parameters: temperature differential between the agent and the skin \( T^{ag-s} \), application duration, and method of application.

1. \( T^{ag-s} \)
The temperature of the paraffin mixture (ag) can be read on the thermometer attached to the bath, and the skin temperature (s) is obtained using an infrared thermometer (Chapter 26). The paraffin mixture temperature is maintained in a thermoregulated bath with temperature ranging between 51°C and 56°C (124–133°F).
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2. Application Duration
The recommended application duration is 30 minutes and may be extended to 60 minutes depending on the application method used.

3. Application Methods
Paraffin bath therapy may be applied, as described in Box 6-2, using four methods: (1) continuous immersion, (2) continuous immersion with retention, (3) dip immersion with wrapping, and (4) brushing with wrapping. These descriptions are based on articles by Stimson et al. (1958), Abramson et al. (1964), and Burns et al. (1987). Select the most appropriate method of application for your case.

C. QUANTITATIVE DOSIMETRY
In the evidence-based practice of hot pack and paraffin bath therapy, the thermal dose administered to a patient is quantitatively assessed. To qualitatively assess dosage level by asking the patient about his or her perception of heat during treatment, as is done routinely in today’s practice, is not enough. A simple, practical, and rapid way to quantitatively assess thermal dosage is to measure two temperature differentials, namely, the temperature difference between the agent (ag) and the exposed skin (s) surface (T\(_{ag-s}\)), and the temperature differential between the exposed skin surface before (b) and after (a) treatment (T\(_{b-a}\)). Chapter 26 shows how to take these two measurements using a portable infrared surface thermometer.

1. Case Example—Hot Pack
The hot pack removed from the hydrocollator unit is measured at 70°C (158°F) and the exposed skin surface at 30°C (86°F). The thermal dose delivered (T\(_{ag-s}\)) equals 40°C (72°F), which represents its potential heating effect.

2. Case Example—Paraffin Bath
The paraffin within the bath is measured, using the built-in thermometer, at 54°C (130°F) and the exposed skin surface at 30°C (86°F); the thermal dose is thus 24°C (44°F). After treatment, the exposed skin is measured at 36°C (97°F); the actual skin heating effect of this dosage was +6°C (+11°F).

3. Recap
In the context of evidence-based practice, asking the patient how warm the thermal agent felt during and after treatment is fine, but to supplement this qualitative information with actual temperature measurements is better. This textbook strongly encourages practitioners to supplement their qualitative approach with the proposed quantitative approach, knowing that taking these temperature measurements using an infrared portable thermometer is easy, practical, and not time-consuming.

VI. EVIDENCE FOR INDICATIONS
A. GUIDED BY EVIDENCE
Dictionaries generally define evidence as anything that establishes a fact or gives reason to believe something. The aim of this textbook is to present scientific evidence behind therapeutic EPAs. To be guided by the evidence is the process of integrating the evidence from research, however imperfect or scarce this evidence may be, with clinical experience and patient’s values. In other words, the

<table>
<thead>
<tr>
<th>Box 6-2 Application Methods for Paraffin Bath Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Continuous Immersion</strong></td>
</tr>
<tr>
<td>Seven consecutive dip immersions, to form seven layers</td>
</tr>
<tr>
<td>of paraffin coating, followed by a continuous</td>
</tr>
<tr>
<td>immersion in the bath for a period of 30 minutes. The</td>
</tr>
<tr>
<td>paraffin coating is immediately removed after the 30-</td>
</tr>
<tr>
<td>minute immersion period.</td>
</tr>
<tr>
<td><strong>Continuous Immersion With Retention</strong></td>
</tr>
<tr>
<td>Seven consecutive dip immersions, to form seven layers</td>
</tr>
<tr>
<td>of paraffin coatings, followed by a continuous</td>
</tr>
<tr>
<td>immersion in the bath for 30 minutes, which is then</td>
</tr>
<tr>
<td>followed by a 30-minute period of retention of the</td>
</tr>
<tr>
<td>paraffin coating outside the bath. Wrapping the</td>
</tr>
<tr>
<td>hardened, coated surface during the retention period</td>
</tr>
<tr>
<td>is optional.</td>
</tr>
<tr>
<td><strong>Dip Immersion With Wrapping</strong></td>
</tr>
<tr>
<td>Ten to 12 consecutive dip immersions to form a glove</td>
</tr>
<tr>
<td>(for the hand) or a sock (for the foot) of paraffin</td>
</tr>
<tr>
<td>coating around the body part, which is then</td>
</tr>
<tr>
<td>immediately wrapped in layers of towel, waxed paper,</td>
</tr>
<tr>
<td>or plastic sheets and kept outside the bath for a</td>
</tr>
<tr>
<td>period of 30 minutes.</td>
</tr>
<tr>
<td><strong>Brushing With Wrapping</strong></td>
</tr>
<tr>
<td>Seven to 10 superimposed and consecutive coatings of</td>
</tr>
<tr>
<td>paraffin are brushed over the treated area using a</td>
</tr>
<tr>
<td>standard paintbrush. This waxed area is then</td>
</tr>
<tr>
<td>immediately wrapped in layers of a towel, waxed</td>
</tr>
<tr>
<td>paper, or plastic sheets for a period of time</td>
</tr>
<tr>
<td>determined by the practitioner.</td>
</tr>
</tbody>
</table>
evidence-based practice of EPA requires practitioners to consider the evidence from research in addition to their clinical experience and patient’s own preference and beliefs about therapy when the time comes to justify, prescribe, and apply the therapeutic agent. To be guided by the evidence is a process, not a search for the absolute truth. Finally, a lack of evidence from research for any given EPA does not mean that this EPA should never be used. What it does mean is that no statement can be made on its therapeutic effectiveness and that until more evidence from research is presented, its routine use cannot be recommended.

B. EVIDENCE FROM HUMAN RESEARCH

Box 6-3 provides evidence for hot pack and paraffin bath therapy based on an exhaustive search of published English-language peer-reviewed literature on human research. The term indication refers to a list of pathological conditions for which these two thermal agents are used. Ratings of therapeutic benefit (Yes or No) and grading of strength of scientific evidence (I, II, or III), including the reference, are included for each pathological condition.

### 1. Rating Therapeutic Benefit

The rating, expressed as Yes or No, is based on the overall conclusion(s) reached on the issue of therapeutic effectiveness by the author(s) who conducted the peer-reviewed study.

### 2. Grading Strength of Evidence

The grading, numerically classified as I, II, and III, is based on the type of research methodology or experimental design used by the author(s). All the studies listed are human studies published in English-language, peer-reviewed journals. It follows that the strength of evidence in studies graded I is stronger than those graded in II, which itself is stronger than those graded III.

a. Grade I

   Evidence based on human controlled studies regardless of their level of randomization and blindness.

b. Grade II

   Evidence based on human noncontrolled studies regardless of their level of randomization and blindness.

### Box 6-3 Research-Based Indications for the Use of Hot Pack (hp) and Paraffin Bath (pb) Therapy

<table>
<thead>
<tr>
<th>PATHOLOGY</th>
<th>BENEFIT</th>
<th>GRADE</th>
<th>REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-back pain (hp)</td>
<td>Yes</td>
<td>II</td>
<td>Landen, 1967</td>
</tr>
<tr>
<td>Neck and shoulder pain (hp)</td>
<td>Yes</td>
<td>II</td>
<td>Cordray et al., 1959</td>
</tr>
<tr>
<td>Adhesive capsulitis (hp)</td>
<td>Yes</td>
<td>II</td>
<td>Miller et al., 1996</td>
</tr>
<tr>
<td>Rheumatoid arthritis, shoulder (hp)</td>
<td>Yes</td>
<td>II</td>
<td>Williams et al., 1986</td>
</tr>
<tr>
<td>Trigger-point pain (hp)</td>
<td>Yes</td>
<td>II</td>
<td>McCray et al., 1984</td>
</tr>
<tr>
<td>Poliomyelitis (hp)</td>
<td>Yes</td>
<td>II</td>
<td>Fountain et al., 1960</td>
</tr>
<tr>
<td>Rheumatoid arthritis, hand (pb)</td>
<td>Yes</td>
<td>II</td>
<td>Hawkes et al., 1985</td>
</tr>
<tr>
<td>Rheumatoid arthritis, fingers (pb)</td>
<td>No</td>
<td>I</td>
<td>Dellhag et al., 1992</td>
</tr>
<tr>
<td>Rheumatoid arthritis, hand (pb)</td>
<td>No</td>
<td>I</td>
<td>Harris et al., 1955</td>
</tr>
<tr>
<td>Rheumatoid arthritis, hand (pb)</td>
<td>No</td>
<td>II</td>
<td>Yung et al., 1988</td>
</tr>
<tr>
<td>Rheumatoid arthritis, fingers (pb)</td>
<td>No</td>
<td>II</td>
<td>Bromley et al., 1994</td>
</tr>
<tr>
<td>Scleroderma, hand (pb)</td>
<td>Yes</td>
<td>I</td>
<td>Sandqvist et al., 2004</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>II</td>
<td>Pils et al., 1991</td>
</tr>
<tr>
<td>Burn contracture (pb)</td>
<td>Yes</td>
<td>II</td>
<td>Head et al., 1977</td>
</tr>
<tr>
<td>Traumatic hand injury (pb)</td>
<td>Yes</td>
<td>II</td>
<td>Hoyrop et al., 1986</td>
</tr>
</tbody>
</table>
c. Grade III
Evidence based on human case studies regardless of their level of randomization and blindness.

3. Strength of Evidence Behind the Agent
The strength of evidence behind the agent, as presented in the research-based indication box, is arbitrarily assessed in this textbook as being weak, moderate, or strong. For example, the larger the number of studies graded I, regardless of therapeutic benefit, the stronger the scientific evidence behind the agent.

4. Strength for Justification of Usage Behind the Agent
The strength of evidence behind the justification of usage of agent for individual or groups of pathologies, as listed in the research-based indication box, is arbitrarily assessed in this textbook as being poor, fair, good, or conflicting. For example, for any given pathology, the larger the number of studies showing therapeutic benefit (Yes) and graded I, “good” is the justification of usage of this agent. Conflicting justification is reported when similar numbers of studies, with similar grades, repeat therapeutic benefit (Yes) and no benefit (No).

C. STRENGTH OF EVIDENCE AND JUSTIFICATION FOR USAGE OF HOT PACK THERAPY
The results presented in Box 6-3 show moderate strength of evidence for the use of hot pack therapy with all studies graded as II. They also show poor to fair justification for the use of this thermal agent in a few clinical studies that are beneficial for different pathological conditions.

D. STRENGTH OF EVIDENCE AND JUSTIFICATION FOR USAGE OF PARAFFIN BATH THERAPY
Results from Box 6-3 further show moderate strength of evidence for paraffin bath therapy, with a mix of grade I and II studies. They also show poor to fair justification for the use of this agent with only half of which showing therapeutic benefits.

E. CONTRASTING FACTS
The limited research-based evidence behind these two thermal agents (Box 6-3) is in striking contrast to the fact that both have been used clinically for more than eight decades and that their percentage of availability and daily usage still remain high in several countries (see Section ID). Clearly, the justification for the use of these two thermal agents over the past decades has rested as much on the evidence gathered on healthy subjects (Box 6-1) as on patients (Box 6-3). Until more evidence from research is provided, the routine use of these two thermal agents cannot be recommended.

VII. CONTRAINDICATIONS
The contraindications associated with the practice of therapeutic hot pack and paraffin bath therapy are listed in Table 6-1. The majority of these contraindications are derived more from clinical common sense rather than from research studies.

<table>
<thead>
<tr>
<th>TABLE 6-1</th>
<th>CONTRAINDICATIONS TO HOT PACK (hp) AND PARAFFIN BATH (pb) THERAPY</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTRAINDICATIONS</td>
<td>RATIONALE</td>
</tr>
<tr>
<td>Over skin area where sensation to heat is severely impaired (hp, pb)</td>
<td>Risk of cutaneous burn.</td>
</tr>
<tr>
<td>Over a cancerous area (hp, pb)</td>
<td>Risk of enhancing tumor growth and metastasis.</td>
</tr>
<tr>
<td>Over thrombophlebitic area (hp, pb)</td>
<td>Risk of dislodging blood clot, which may then circulate into the vessels of vital organs, causing serious circulatory problems and, possibly, death (Cameron, 2003).</td>
</tr>
<tr>
<td>Over a hemorrhagic area (hp, pb)</td>
<td>Risk of additional bleeding caused by increased blood flow.</td>
</tr>
<tr>
<td>Over the abdominal, pelvic, and low-back areas of pregnant women (hb)</td>
<td>Risk of teratogenic effects on fetal development and growth caused by increased local or systemic maternal body temperature.</td>
</tr>
<tr>
<td>Over acute and severe inflammatory pathology (hp, pb)</td>
<td>Risk of worsening the condition by aggravating the inflammatory response through increased blood flow resulting from heat application.</td>
</tr>
<tr>
<td>Confused and unreliable patients (hp, pb)</td>
<td>Risk of complications during therapy, reducing treatment effectiveness.</td>
</tr>
</tbody>
</table>
VIII. RISKS, PRECAUTIONS, AND RECOMMENDATIONS

The practice of these two thermal agents is not without risk for the patient. The main risks associated with each of them, including some precautions and recommendations designed to improve safety and effectiveness, are listed in Table 6-2.

TABLE 6-2  RISKS, PRECAUTIONS, AND RECOMMENDATIONS FOR HOT PACK (hp) AND PARAFFIN BATH (pb) THERAPY

<table>
<thead>
<tr>
<th>RISKS</th>
<th>RATIONALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over an area of impaired blood circulation (hp, pb)</td>
<td>Risk of tissue overheating because the treated area will not be able to cope with the demand for additional and cooler blood flow during treatment.</td>
</tr>
<tr>
<td>Over superficial closed and open wounds, including grafted or burn wounds (pb)</td>
<td>Risk of breaking down the immature burn scars and grafts (Head et al., 1977; Helm et al., 1982). To minimize this risk, Burns et al. (1987) proposed the following brushing with wrapping method: (1) keep the paraffin mixture at a constant 47°C (117°F), (2) cover the open wound with a nonadherent, sterile gauze before applying the paraffin, (3) begin to wax the wound and surrounding area using the brushing with wrapping method, and (4) wrap the waxed area in paper or cloth and wait 15–20 mins.</td>
</tr>
<tr>
<td>Over superficial closed and open wounds, including grafted or burn wounds (hp)</td>
<td>Risk of breaking down the immature repair tissue. To minimize the risk, first, cover the wound surface with nonadherent, sterile gauze, and then add the necessary insulation through additional layers of toweling before applying the hot pack.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PRECAUTIONS</th>
<th>RATIONALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand motor skills and reaction time (hp, pb)</td>
<td>May delay reaction time and decrease tapping speed in healthy subjects (Kaurenen et al., 1997). Inform patients that their hand motor skills may be impaired for a few hours following therapy.</td>
</tr>
<tr>
<td>Patients with severe cardiac insufficiency (hp, pb)</td>
<td>May not be able to cope with the increased cardiac demand triggered by the heat-induced increase in blood circulation. Periodic monitoring of vital signs is advised during and after therapy.</td>
</tr>
<tr>
<td>Over body areas with superficially located metal implants (hp, pb)</td>
<td>May cause internal soft tissue burns because metals absorb and conduct heat well. Use caution when applying hot pack and paraffin over such body areas.</td>
</tr>
<tr>
<td>Preventing fainting (hp, pb)</td>
<td>Some patients may faint during or immediately after a thermotherapy treatment, especially if systemic vasodilation is triggered because of a transient decrease in cerebral blood flow (Cameron, 2003). In such cases, lowering the patient’s head while raising the feet will help recovery by increasing cerebral blood flow (Cameron, 2003). Patients suffering from orthostatic hypotension, if treated in the decubitus position, are also likely to experience fainting after treatment. Keep the patient’s head elevated with a pillow during therapy, and wait a few minutes after the treatment has ended before allowing the patient to resume the sitting position (Cameron, 2003). Treatment delivered in the sitting position should cause no problem to these patients.</td>
</tr>
<tr>
<td>Body part resting on the hot pack as opposed to supporting it</td>
<td>May induce overheating and cutaneous burn if the application is such that the body part rests on top of the hot pack, thus creating higher-pressure contact between the pack and the skin while reducing the towel insulating capacity. Closer monitoring is advised because the skin’s ability to dissipate heat is diminished.</td>
</tr>
</tbody>
</table>

IX. CONSIDERATIONS FOR APPLICATION AND DOCUMENTATION

A. BASIC CONSIDERATIONS

Listed in Table 6-3 are basic considerations for the practice of hot pack and paraffin bath therapy which include components of temperature range, coupling media, body application, and application duration.
CHAPTER 6  Hot Pack and Paraffin Bath Therapy

1. **Hot Pack and Cover**

Commercial packs, made of hydrophilic silicate gel, absorb and retain the hot water contained in the hydrocollator unit. Water in the hydrocollator unit is maintained at temperatures ranging from 70°C to 76°C (158–168°F). Hot pack therapy always requires a coupling medium, such as a commercial terrycloth cover, that fully covers the pack before it is applied over the treated area, as shown in Figure 6-3. These covers are washable and reusable. Dry thick terrycloth towels can be used instead of commercial covers. Application duration is approximately 20 minutes. Hot packs are used primarily over flat and large body areas.

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**TABLE 6-2 CONTINUED**

<table>
<thead>
<tr>
<th>RECOMMENDATIONS</th>
<th>RATIONALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disrobe the treated body areas and remove all objects, such as jewelry (hp, pb)</td>
<td>Maximize heat transfer and avoid cutaneous burn caused by heating of metal objects.</td>
</tr>
<tr>
<td>Inspect the exposed skin area before each treatment (hp, pb)</td>
<td>Assure close monitoring of potential side effects, such as skin irritation and burn caused by the agent.</td>
</tr>
<tr>
<td>Conduct skin thermal sensory discrimination testing—mandatory (hp, pb)</td>
<td>Minimize risk of cutaneous burn and maximizing dosimetry (see Chapter 25 for details).</td>
</tr>
<tr>
<td>Measure temperature differential between the agent and the skin (T_{ag-s}) before treatment—mandatory (hp, pb)</td>
<td>The taking of this measurement is a must in the context of evidence-based practice because it provides quantitative assessment of the thermal dose delivered to the soft tissues (see Chapter 26 for details).</td>
</tr>
<tr>
<td>Measure skin temperature differential before and after treatment (T_{b-a}) treatment—mandatory (hp, pb)</td>
<td>The taking of this measurement is a must in the context of evidence-based practice because it reveals the extent of soft-tissue heating caused by the thermal agent at the end of treatment (see Chapter 26 for details).</td>
</tr>
<tr>
<td>Wash and dry treated body areas before therapy (pb)</td>
<td>Minimize the risk of contaminating the paraffin mixture and optimize heat transfer.</td>
</tr>
<tr>
<td>Check on patient regularly during therapy (hp, pb)</td>
<td>Avoid overheating and assure optimal thermal comfort (Fyfe, 1982). Set a timer to warn both the patient and the clinician that the time of therapeutic exposure is over.</td>
</tr>
<tr>
<td>Discard used paraffin mixture</td>
<td>Eliminate the risk of contaminating the remaining mixture.</td>
</tr>
<tr>
<td>Use separate bath for hand and foot therapy (pb)</td>
<td>Maximize hygiene.</td>
</tr>
<tr>
<td>Instruct the patient to keep fingers apart and refrain from moving finger joints during therapy (pb)</td>
<td>Allow complete coating of each finger with wax and avoid the risk of breaking or cracking the hardened paraffin coatings.</td>
</tr>
<tr>
<td>Instruct the patient to stay awake during therapy (hp, pb)</td>
<td>Falling asleep during thermotherapy may occur. Instructing the patient to stay alert will prevent potential skin damage.</td>
</tr>
<tr>
<td>Do not repeat application of hot pack</td>
<td>Repeating the application of hot packs every 10 minutes does not lead to further increase of cutaneous temperature. It only causes a slight increase in the subcutaneous and muscular tissue temperature in healthy subjects (Lehmann et al., 1986).</td>
</tr>
<tr>
<td>Plug line-powered devices into a GFCI receptacle</td>
<td>Prevent the occurrence of macroshocks (see Chapter 23 for details).</td>
</tr>
<tr>
<td>Conduct regular maintenance and calibration procedures (hp, pb)</td>
<td>Ensure optimal therapeutic efficacy and effectiveness. Follow the recommended maintenance schedules outlined by manufacturers.</td>
</tr>
</tbody>
</table>
2. Paraffin Bath
Paraffin is mixed with mineral oil to lower the melting point and the specific heat capacity of the mixture. The bath temperature is maintained at 51°C to 54°C (124°F to 130°F). Paraffin bath therapy can be delivered using four different methods (see Box 6-2 for details). Figure 6-4 shows the typical paraffin cover observed over a hand that was just immersed in the paraffin bath. Coupling media is necessary only for the treatment of open wounds. Paraffin bath is used primarily for the treatment of extremities and over irregular body areas.

B. PROCEDURES
Safe, effective, and optimal application of these two thermal agents requires that clinicians go through a systematic set of procedures for each and every application. The following is a list of key procedures.

1. Checklists
Before proceeding with treatment, always go through the list of contraindications (Table 6-1) and the list of risks, precautions, and recommendations (Table 6-2).

2. Thermal Sensory Discrimination Testing
Because skin burn is always a possibility, thermal agents require thermal sensory discrimination testing prior to usage. The steps of this mandatory test are described in Chapter 25. Document the result of this test in the patient’s file.
3. Skin Inspection and Preparation
Expose the area to be treated and remove any jewelry. Inspect, wash, and dry the skin. Inspect the skin area over which the hot pack will be applied or that will be immersed in the paraffin bath. Any open wound must be covered with sterile gauze.

4. Pack and Bath Preparation
Select a hot pack size and terry cloth cover that best fits the size of the area to be treated. If towels are used, ensure proper layers of toweling (5–10) between the agent and the skin. Select a paraffin bath that best fits the size of the area to be treated. ALWAYS plug the line-powered bath into a ground-fault circuit interrupter (GFCI) receptacle to prevent any risk of macroshock or electrocution (see Chapter 27). Use commercial plastic liners and wraps to cover the immersed extremities to minimize paraffin heat loss.

5. During Treatment
Ensure that the patient is comfortably installed. Check the patient after 5 minutes of application to ensure thermal comfort. Instruct the patient that he or she should feel a warm, as opposed to a hot, sensation during therapy. If necessary, adjust the thickness of coupling to the desired level of heat sensation by adding or removing layers of toweling.

6. Dosimetry
Set the therapeutic dose by measuring the temperature differential between the agent and the skin ($T_{ag-s}$) before application. This measurement will reveal how hot the pack or paraffin mixture is. Select dosage levels ($T_{ag-s}$) that are capable of inducing heating changes ($T_{b-a}$) that will best meet the therapeutic goals. Note that the size of the pack (the larger the size, the more heat it contains for a given temperature), the patient’s layer of fat underneath the exposed treatment area, and the application duration influence dosage. Recall that the recommended application duration of hot pack is of 20 minutes and that of paraffin bath may vary greatly depending on the application method used (see Box 6-2).

7. End of Treatment
Inspect the exposed skin surfaces for signs of irritation or burn. Question the patient on the level of heat he or she has perceived during treatment in order to qualitatively assess the dose delivered. Any unusual sensation felt by the patient during treatment should be documented in the patient’s file. Immerse the used hot pack in the hydrocollator unit. Allow approximately 30 minutes of immersion before using this hot pack again. Peel off the used paraffin and discard into waste bag.

8. Maintenance and Calibration
Optimal functioning of hot packs, hydrocollator units, and paraffin baths can be obtained only through adequate maintenance and calibration. Lack of maintenance can lead to safety issues (see Chapter 27 for details). Lack of periodic calibration can lead to inadequate dosimetry. Follow the manufacturer’s recommendations with regard to all issues related to maintenance and calibration.

C. DOCUMENTATION
Adequate record taking in patients’ files is expected from all health practitioners. Table 6-4 shows key parameters to document in the patient’s file following hot pack and paraffin bath therapy.

<table>
<thead>
<tr>
<th>TABLE 6-4</th>
<th>KEY TREATMENT PARAMETERS TO BE DOCUMENTED IN PATIENT’S FILE AFTER HOT PACK OR PARAFFIN BATH THERAPY</th>
</tr>
</thead>
</table>
| **Hot Pack Therapy** | - Patient skin thermal sensory discrimination testing: record the result (see Chapter 25)  
- Application duration: min  
- Coupling medium: commercial cover or layers (number) of toweling  
- ($T_{ag-s}$): °C–°F  
- ($T_{b-a}$): °C–°F |
| **Paraffin Bath Therapy** | - Patient’s skin thermal sensory discrimination testing: record the result (see Chapter 25)  
- Application method used: description  
- Application duration: min; record duration of wrapping and retention, when applicable  
- Liner and wrap used: description  
- ($T_{ag-s}$): °C–°F  
- ($T_{b-a}$): °C–°F |
A 48-year-old male accountant, suffering from subacute low-back pain, consults for treatment. He recalls that his back pain first appeared 2 weeks earlier while lifting a heavy box of documents from the floor of his office. He went to see his physician on the following day. He left the physician’s office with a prescription of analgesics, as well as anti-inflammatory and muscle-relaxant drugs. Battling chronic gastric problems for years, this patient wants to stop his drug treatment and replace it with a conservative treatment. There is no past history of back pain. The patient is wearing a pacemaker. The physical exam reveals a man who is underweight (70 kg; 158 pounds) for his height (1.82 m; 72 inches). It further reveals moderate pain over the entire bilateral low-back area as well as a light paravertebral muscle spasm causing difficulty with prolonged sitting at work. There is no neurological sign. Spinal ROM is within the normal range. The patient has reduced his work schedule from 5 to 4 days a week. His goals are to resume prolonged sitting and full-time work without having to take medication.

Evidence-Based Steps Toward the Resolution of This Case

1. List medical diagnosis.
   Subacute mechanical low-back pain

2. List key impairment(s).
   - Lumbar pain
   - Lumbar paravertebral spasm

3. List key functional limitation(s).
   - Difficulty with prolonged sitting

4. List key disability(ies).
   - Difficulty with work

5. Justification for hot pack therapy.
   Is there justification for the selection of hot pack as the preferred thermal agent for this case? This chapter has established that there is moderate strength of evidence behind, and poor to fair justification for, the use of hot pack therapy for soft-tissue pathology (see Section VI). This finding is in clear contradiction with the results of many surveys showing that hot pack therapy is available in the very large majority of clinical facilities and used routinely by a large majority of practitioners. The bottom line therefore is that if hot pack therapy is used for the treatment of soft-tissue pathology, its justification must rest as much on the evidence gathered in healthy subjects (Box 6-1) as on patient populations (Box 6-3). So where is the justification for the selection of hot pack as the preferred thermal agent for this case? This textbook recommends the use of this agent for the following reasons. First, the use of shortwave diathermy therapy (Chapter 10) is contraindicated because the patient wears a pacemaker. Ultrasound therapy (Chapter 20) is also ruled out considering the disproportion between the small soundhead size and the much larger symptomatic treatment area. Fluidotherapy (Chapter 7) and paraffin bath therapy are also ruled out considering that the treatment area is large and involves the back area. Hot pack therapy appears as the preferred agent because there is evidence behind its heating effect on soft tissue and that heating can reduce pain, which in turn may reduce muscle spasm. The low-back area is ideal for the application of a hot pack, which can cover large symptomatic area. Considering the fact that this patient is lean (thin fat layer), heat transfer between the hot pack and the paravertebral musculature is maximized. Because EPAs should never be used in isolation or as a sole intervention, hot pack therapy is used here concomitantly with a regimen of manual spinal mobilization coupled with instructions on proper lifting techniques.

   None is found. Note that in this case, the use of shortwave diathermy therapy (Chapter 20) is contraindicated because the patient is wearing a pacemaker.

7. Search for risks and precautions.
   None is found.

8. Outline the therapeutic goal(s) you and your patient wish to achieve.
   - Decrease pain
   - Decrease muscle spasm
   - Eliminate drug intake
   - Improve sitting time
   - Improve performance at work

9. List the outcome measurement(s) used to assess treatment effectiveness.
   - Muscle spasm: manual palpation
   - Drug intake: pill count in personal diary
   - Pain/sitting and work performance: Modified Oswestry Low-Back Pain Questionnaire

10. Instruct the patient about what he/she should experience, do, and not do during the hot pack application.
   - Feel warm sensation over low-back area
11. Outline the therapeutic prescription of hot pack based on the evidence available.

There is no evidence from research on which to rely for establishing the prescription in this case. The following prescription, therefore, rests on the other two elements of evidence-based practice, that is, the practitioner’s own clinical experience with this agent and pathology and the patient’s preference and belief about therapy (see Section VI).

- **Thermal agent**: commercial hydrocollator pack
- **Hot pack size**: $38 \times 61$ cm ($15 \times 24$ in)—to cover the entire painful area
- **Hot pack temperature**: $70{}^\circ C$ ($158{}^\circ F$)
- **Treated body area**: over the entire lower back area
- **Patient’s positioning**: lying in prone position
- **Coupling media**: commercial cover wrapped in two layers of terrycloth toweling
- **Application duration**: 20 minutes
- **Total number of treatments**: 10 treatments, delivered daily, over a 2-week period separated by a weekend

12. Analyze outcome measurements.

- **Pre- and posttreatment comparison**
  - Muscle spasm: absent

13. Assess therapeutic effectiveness based on outcome measures.

The results show that the application of 10 hot pack treatments, combined with a therapeutic regimen of spinal mobilization and lifting instructions, delivered over a 2-week period, led to a full recovery. The fact that this patient remained active at work rather than staying at home during his therapy, benefited the therapeutic regimen. The patient is now free of muscle spasm, takes no drugs, and is working full time. Overall, this conservative treatment had a beneficial impact on the patient’s disablement status created by the pathology, as illustrated in the figure below.

14. State the prognosis.

Excellent if the patient continues to use the proper lifting techniques he learned, both at work and at home. With adequate compliance with these instructions, similar episodes of low-back pain are not likely to recur. If a similar back pain episode was to recur, this patient should consider using an over-the-counter heat wrap, wearable for several hours during daily activities, before relying on medication (see Nadler et al., 2002; 2003a,b; Trowbridge et al., 2004) or any other conservative intervention.
Case Study 6-2  Rheumatoid Arthritis: Paraffin Bath Therapy

A 65-year-old woman, with a long history of moderate rheumatoid arthritis, consults for treatment. Physical exam reveals painful walking, bilateral ankle joint and toe stiffness, light toe deformity, and chapped and dry skin on the feet and ankles. Examination of the upper limbs reveals adequate wrist and hand function. She is under the regular care of her rheumatologist, who has prescribed analgesic and anti-inflammatory drugs for her condition. She wears regular shoes and rubs an over-the-counter cream on her feet and ankles daily to soften her skin. She is concerned about her reduced and declining ability to walk and to perform activities of daily living (ADLs). She is also concerned about the increasing side effects of her medication. Her goals are to reduce drug intake while keeping her mobility. Her favorite social activity is to visit and chat with her friends who live at a walking distance from her home. Her preference is definitively for a home treatment, considering her reduced walking ability and the fact that she has no personal and easy access to public transportation to facilitate any hospital or clinic displacements. She heard from a good friend about the possibility of using home paraffin bath therapy for her arthritic condition. She is convinced that this conservative therapy may help her condition.

Evidence-Based Steps Toward the Resolution of This Case

1. **List medical diagnosis.**
   Rheumatoid arthritis

2. **List key impairment(s).**
   - Painful ankles and feet
   - Bilateral ankle/foot joint stiffness
   - Reduced bilateral ankle ROM
   - Chapped and dry skin overlying ankles and feet

3. **List key functional limitation(s).**
   Difficulty with walking

4. **List key disability(ies).**
   Difficulty with social visits

5. **Justification for paraffin bath therapy.**
   Is paraffin bath therapy the preferred therapeutic option in this case? This chapter has established that there is moderate strength of evidence behind, and poor justification for, the use of paraffin bath therapy for Rheumatoid Arthritis (see Box 6-3). This finding is in keeping with the results of surveys (see Section I) showing that the use of this agent, although available in many facilities, is on the decline. The bottom line therefore is that if paraffin bath therapy in this case, is used as treatment, justification must rest on elements other than the evidence from research one can gather from the English-language peer-reviewed literature (see Box 6-3). So where is the justification behind the selection of paraffin bath as the preferred thermal agent for this case? This textbook recommends the use of this agent for the following reasons: First, there is evidence, although limited, behind its superficial heating effect on soft tissue in healthy subjects (Abramson et al., 1984; Borrelli et al., 1980), which suggests that heating can reduce pain and joint stiffness, which in turn may improve function, reduce drug intake, and soften chapped and dry skin (Pils et al., 1991; Sandqvist et al., 2004). In other words, this thermal agent is expected to significantly heat the muscles and periarticular joint structures of the ankle, foot, and toe joints, and to hydrate and soften the skin overlying these joints. Deep heating of these periarticular structures is expected to reduce joint stiffness by decreasing joint viscosity, thus improving walking ability. Second, the irregular surfaces associated with the ankles, feet, and toes are ideal body areas for the application of paraffin mixture, transmitting heat to entire cutaneous surfaces. Third, the fact that this elderly patient prefers a home therapy approach and strongly believes that paraffin bath therapy can improve her condition are other reasons behind the selection of this agent over any other thermal agents. Finally this patient is alert, able to follow instructions, and has adequate upper limb mobility and function to operate a paraffin bath at home. Because EPAs should never be used in isolation or as a sole intervention, paraffin bath is used here concomitantly with a home regimen of passive and active joint (ankle and toes) mobilizations.

6. **Search for contraindications.**
   None is found.

7. **Search for risks and precautions.**
   None is found.

8. **Outline the therapeutic goal(s) you and your patient wish to achieve.**
   - Decrease pain
   - Increase ankle ROM
   - Improve skin texture
   - Decrease drug intake
   - Improve walking and ADLs

9. **List the outcome measurement(s) used to assess treatment effectiveness.**
   - Pain: Visual Analog Scale (VAS)
   - Ankle ROM: goniometry
   - Skin texture: visual assessment
   - Drug intake: pill count in personal diary
   - Walking/ADLs performance: Arthritic Impact Measurement Scale (AIMS)

10. **Instruct the patient about what he/she should experience, do, and not do during the paraffin bath application.**
    - Feel warm sensation over lower extremities
    - If a hot or burning sensation is felt, stop treatment and call the treated clinician
    - Follow the home instruction sheet given by your treated clinician
    - Follow the manufacturer’s operation and maintenance schedule for the bath and paraffin
11. Outline the therapeutic prescription based on the evidence available.

There is poor evidence from research (Table 6-3) on which to rely for establishing the prescription in this case (Hawkes et al., 1985). The following prescription, therefore, rests also on the other two elements of evidence-based practice, that is the practitioner’s own clinical experience with this agent and pathology and the patient’s preference and belief about therapy (see Section VI). Considering the reduced mobility and age of this patient, a home treatment approach was used. The recommendation is for the patient to rent a paraffin bath for a month. The first four treatments were delivered by the practitioner at home. During these visits, the patient was instructed on how to use the unit, how to do proper maintenance, and how to maximize safety during application. She was also instructed on how to mobilize her ankle and toes after therapy.

- **Thermal agent**: commercial paraffin bath filled with paraffin mixture
- **Paraffin mixture temperature**: 51°C (124°F)
- **Immersed body segments**: ankle and foot
- **Application method**: dip immersion with wrapping
- **Application duration**: 30 minutes
- **Total number of treatments**: 21 treatments, delivered daily, over a 3-week period

12. Analyze outcome measurements.

Pre- and posttreatment comparison:
- Pain: decrease VAS score from 6 to 2
- Ankle ROM: Right: increase by 15 degrees; Left: increase by 10 degrees
- Skin texture: softer
- Drug intake: decrease by 25%
- Walking/ADLs performance: AIMS score improved by 60%

13. Assess therapeutic effectiveness based on outcome measures.

The results show that 21 consecutive home paraffin bath treatments, combined with a daily self-regimen of ankle and foot mobilization, led to a significant functional gain of ankle ROM, which translated to a much better ability to walk and improved her ability to manage her ADLs and visit her friends. The patient’s pain was reduced, her chapped skin resolved, and she reduced her use of drugs. The patient is very satisfied with the results and is looking forward to continuing her paraffin bath therapy at home. Overall, this treatment approach had a beneficial impact on the patient’s disablement status created by the pathology, as illustrated in the figure below.

14. State the prognosis.

There is, unfortunately, no cure for rheumatoid arthritis. Consequently, this elderly patient is looking to a prolonged treatment, lasting months and years, with periodic control of her condition. She is thus advised to purchase, as opposed to renting, the paraffin bath and related accessories. She is again firmly instructed to always plug her paraffin bath into a GFCI receptacle at home so as to ensure full protection against electrical shock. She is also instructed to continue her therapeutic regimen every second day for another month and then to reduce the treatment frequency according to her symptoms and functional ability. The prognosis is good for many years to come if her rheumatoid flares are adequately controlled by her medication.

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**THERAPEUTIC IMPACT on Disablement**

![Diagram showing therapeutic impact on disablement]

**Pathology**
- Rheumatoid arthritis
- Neuronal muscular
- Arthroskeletal
- Ligaments/tendons

**Impairments**
- Decrease pain
- Increase ankle range of motion
- Improve skin texture
- Decrease drug intake
- Improve walking

**ELECTROPHYSICAL AGENT**
- Paraffin bath

**Functional limitation**
- Improve walking
- Improve ability to do ADLs

**Disability**
- Improve social ability
CRITICAL THINKING QUESTIONS

Clarification: What is meant by hot pack and paraffin bath therapy?

Assumptions: Because they are classified as superficial thermal agents, many of your colleagues assume that hot pack and paraffin baths can only induce heating effect in superficial soft tissues. How can you verify or disprove this assumption?

Reasons and evidence: What led you to believe that the subcutaneous fat layer, compared with other soft tissues, is the greatest thermal barrier?

Viewpoints or perspectives: How would you respond to a colleague who says that there is no difference between the concepts of heat and temperature, and thus whatever material or agent has the highest temperature is always the hottest?

Implications and consequences: What generalizations can you make about the use of hot pack and paraffin bath therapy based on the scientific evidence available?

About the question: Why is it important to measure the temperature differential between the agent and the skin \( T_{\text{a}} \) overlying the treatment area before treatment, and the temperature differential of the skin overlying the treatment area, before and immediately after treatment \( T_{\text{b}} \)? Why do you think I ask this question?

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Review Articles


Chapters of Textbooks


Monographs