Hydrotherapy
Evidence For Clinical Applications
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Abstract
Hydrotherapy is the use of water for therapeutic purposes. The mechanisms of action of hydrotherapy include local vasoconstriction followed by reflexive vasodilation which activates cutaneous circulation. The resulting therapeutic actions include muscle relaxation, enhanced collagen flexibility, pain reduction, and anti-inflammatory effects. Many acute and chronic health conditions can benefit from these effects. The limited evidence available for the most common uses of hydrotherapy is reviewed. Hydrotherapy is effective for both rheumatoid arthritis and osteoarthritis, providing reductions in pain, increased mobility, and improved quality of life. The evidence shows that hydrotherapy is not effective in reducing the incidence, duration, or severity of the common cold in children. For patients suffering from chronic heart failure, hydrotherapy improves exercise tolerance and the hemodynamic profiles of patients, including beneficial reductions in blood pressure and heart rate. Considered together, the existing studies suggest that hydrotherapy is an extremely safe treatment option for a variety of health conditions.
Introduction
In general, hydrotherapy is the use of hot and cold water for the maintenance of good health and treatment of disease (Poorman 2001). It can also be used to describe exercise in warm water under supervision by utilizing the buoyancy, assistance and resistance of warm water to relieve pain, induce muscle relaxation, and promote more effective exercise. Hydrotherapy provides a safe and effective means of achieving exercise-related goals and is commonly used in rehabilitation programs (Al-Qubaeissy 2013). It has been utilized since ancient times in Greek medicine (Papavramidou 2003). Nowadays, hydrotherapy is used by numerous health care practitioners for various health conditions including rheumatoid arthritis (RA), osteoarthritis (OA), fibromyalgia, chronic heart failure (CHF), immune conditions, menopausal symptoms, exercise recovery, and for pain reduction (Geytenbeek 2002, Versey 2013).

The mechanisms of action of hydrotherapy treatments depend on the type of protocol used. In general, hot treatments increase perspiration, metabolism, capillary pressure, and cell permeability. Heat causes an increased demand for nutrients as well as local vasodilation and hyperemia. In addition, collateral blood circulation is enhanced (Nadler 2004). The resulting therapeutic actions include muscle relaxation, enhanced collagen flexibility, pain reduction, and anti-inflammatory actions. The effects of cold temperatures generally include an analgesic effect due to acute anti-inflammatory actions as well as potentially decreasing muscle spasms (Nadler 2004). Hydrotherapy can also cause local vasoconstriction followed by reflexive vasodilation that activates cutaneous circulation. The byproducts of metabolically active cells are vasodilators such as carbon dioxide (Fathi 2011). There is a wide range in the quality of studies available for the varying uses of hydrotherapy treatments. In general the evidence is rather limited, rendering the interpretation of existing evidence even more important. This review article will outline the available evidence for the most common uses of hydrotherapy and highlight important clinical implications.

Rheumatoid Arthritis and Osteoarthritis
The effects of hydrotherapy for RA were investigated in 139 patients with chronic RA using a four category parallel design: hydrotherapy, seated immersion, land exercise or progressive relaxation (Hall 1996). For four consecutive weeks, twice a week, participants took part in 30 minutes of intervention under the supervision of physiotherapists. This study used a variety of assessment tools on three occasions including before and after the hydrotherapy treatment and at a 3-month follow up. Assessment parameters included physical abilities, pain, and health status measures using indices to assess joint tenderness, morning stiffness, grip strength, active range of motion, as well as C-reactive protein, the Beliefs in Pain Control Questionnaire, the McGill Pain Questionnaire, and the Arthritic Impact Measurements. It was found that regardless of the intervention all patients showed significant improvement in joint tenderness between pre and post-test, with the hydrotherapy group demonstrating the greatest reduction, with a mean decrease of 27% between pre and post-test. Females in the hydrotherapy group significantly increased knee range of motion by 6.6°. This improvement was maintained at follow up, but was no longer statistically significant. Other physical measures did not change significantly. All patients experienced a significant reduction in their evaluative and affective pain scores between pre and post-tests, however this was not maintained at follow up (Hall 1996).

More recently, a systematic review examined the effectiveness of hydrotherapy in treating RA (Al-Qubaeissy 2013). In this systematic review, a total of 197 studies were identified and narrowed to six randomized controlled studies after applying specific inclusion and exclusion criteria. The reviewed studies included 419 participants both male and female with an age range of 18-80 who obtained some sort of water-based treatment, including hydrotherapy pools and aquatic exercise routines. It was determined that patients who received hydrotherapy for treatment of RA gained some beneficial effects in improving their
health status and reducing their pain scores compared to the control groups, as well as joint
tenderness, mood and tension symptoms, and increasing grip strength. Benefits also included a
substantial increase in the physical activity and emotional well-being of patients involved in the
aquatic programs. However, the long-term benefits in this study were found to be inconclusive
(Al-Qubaeissy 2013). In total, the evidence suggests that hydrotherapy can improve the quality
of life of RA patients as well as multiple physical and emotional measures.

The literature on hydrotherapy and OA tends to focus on treatments that include exercises
in a body of water, part of the rationale being that the weight-relieving properties of water
immersion allow for easier joint movement. One study compared two groups using hydrotherapy
pool exercises versus similar exercises on land. This study showed that the hydrotherapy group
experienced statistically significant improvements in their functional ability and had decreased
pain, at least in the short-term (Sylvester 1990). A more recent randomized controlled trial
included 152 older persons with chronic, symptomatic OA of the hip or knee. Participants were
randomly allocated to hydrotherapy classes, Tai Chi classes, or a waiting list control group for
twelve weeks. It was found that at twelve weeks, participants allocated to hydrotherapy classes
demonstrated improvements for pain and physical function scores, compared with controls
(Fransen 2007).

Lastly, a pilot study has also been conducted comparing the effect of hydrotherapy
versus conventional physiotherapy. In this particular study, thirty patients diagnosed with
symptomatic OA of the hip or knees were randomly assigned to a hydrotherapy group,
a physiotherapy group, or both, for two weeks. The hydrotherapy group received daily
alternate thigh affusions (pouring water). The results showed that at a 10-week follow
up, the hydrotherapy group had the most beneficial effects on pain intensity and mobility
(Schencking 2013). Interestingly, hydrotherapy has strong evidence supporting its use in other
musculoskeletal conditions with pain, including fibromyalgia (McVeigh 2008).

**Immune-Stimulation**

Hydrotherapy is often described as an immune-stimulating therapy and appears to have
positive effects on immunoregulation, including increases in resistance and facilitated
activation of cell-mediated immune reactions (Schencking 2013). The evidence available
focuses on the effects of hydrotherapy for the common colds. An older study examined
the immune effects of hydrotherapy, hyperthermic exposure in particular, on the
incidence of common colds (Ernst 1990). Two groups of participants were utilized. The
first group was submitted to sauna bathing consisting of a warm shower, drying, eight
to 12 minutes of time spent in the sauna room, and 15 minutes of cooling with cold
water and resting, repeated two or three times. The second group abstained from this
procedure. In both groups, the frequency, duration, and severity of common colds were
recorded for six months. The results showed that there were significantly fewer episodes
of common cold in the sauna group, particularly in the last three months of the study
period when the incidence was approximately half compared to controls. However, the
mean duration and average severity did not differ significantly between groups and the
authors concluded that further research is needed (Ernst 1990).

A more recent and better designed, study examined whether or not hydrotherapy would
be effective in the prevention and treatment of common colds in children (Gruber 2003).
Children aged three to seven years with six or more common cold episodes during the previous
year were randomized to receive daily inhalation of normal saline in the control group, or
daily inhalation plus daily hydrotherapy in the experimental group for one year. The daily
hydrotherapy treatment consisted of alternating warm (39°C over 10 minutes) and cold (15°C
over 10 to 30 seconds). The main outcome measures were incidence, duration, and severity
of common cold episodes as reported by the children’s parents in a daily symptom diary.
The results showed that during the study period there were no significant differences in the
incidence of colds or the average duration of episodes (Gruber 2003). This evidence suggests
that hydrotherapy is therefore not an effective option for treating the common cold.
Although hydrotherapy may not be effective in treating the common cold, it may provide other immunological benefits. An in vivo study examined the immunological effects of warm and cold water exposure in mouse models (Kalenova 2005). When mice were exposed to warm or cold water, the activities of nonspecific resistance factors (peritoneal macrophages) increased upon first exposure, decreased for the following three exposures, and then increased after the fifth exposure. In particular, exposure to cold water activated cellular immunity, while warm water activated humoral immunity. The temperature alterations going from cold to warm led to the activation of cellular components and to the suppression of the humoral components of the immune system. However, the alteration of water temperature from warm to cold led to activation of nonspecific resistance factors, cellular and humoral immunity (Kalenova 2005). Many practitioners who use contrast hydrotherapy advocate ending any treatment with cold exposure. For the purposes of immune-stimulation, the evidence also favours this protocol.

Heart Failure
Hydrotherapy as part of a rehabilitation program for patients with CHF has previously been thought to be potentially dangerous due to the increased venous return caused by the hydrostatic pressure, or the changes in circulation due to the changes in fluid dynamics. However, one study found that physical training in warm water was well tolerated, improved exercise capacity as well as muscle function, with no accompanying adverse effects (Cider 2003). The New York Heart Association (NYHA) assesses
the stages of heart failure (I to IV or from mild to more severe) according to a functional classification based on patient symptoms. Twenty-five patients with stable CHF (NYHA grade II–III, age 72.1 +/- 6.1 years) were randomized to either eight weeks of hydrotherapy (n = 15) or into a control group (n = 10). The experimental group training program comprised of 45 minute sessions in a heated pool (33–34°C) three times a week, following a low to moderate exercise level (40-70% max heart rate). Patients in the hydrotherapy group showed a greater improvement in their maximal exercise capacity, maximal oxygen uptake, and six-minute walk test compared to the control group (Cider 2003). Specifically, they had improvements in isometric endurance in knee extension (+4 vs. -9, p=0.01) and improvement in the performance of heel-life (+4 vs. -3 n.o, p<0.01), shoulder abduction (+12 vs. -8 s, p=0.01) and shoulder flexion (+6 vs. +4, p=0.01) (Cider 2003).

Another study looked at the addition of hydrotherapy to endurance training in elderly male patients with CHF and found a significant improvement in exercise tolerance and hemodynamic profiles (Caminiti 2011). Twenty-one male CHF patients (NYHA II-III, age 68 +/- 7 years) were randomized into two groups: 11 patients in the combined group of endurance training and hydrotherapy, and 10 patients in an endurance training only group. Hydrotherapy took place three times per week in an upright position in water at a temperature of 31°C. The treatment protocol involved callisthenic movements of the torso and both upper and lower limbs, gradually increasing from one to three sets of ten repetitions. The endurance training involved performing the same movements on land and also included 10 minutes of warm up and cool-down exercises and thirty minutes of aerobic exercise (60-70% VO2 max). At the initiation of the program and after 24 weeks all participants underwent a battery of tests including a six-minute walking test, assessment of blood pressure and heart rate, an echocardiogram, a non-invasive hemodynamic evaluation, and maximal voluntary contraction of quadriceps test. The results showed that distance in the six-minute walking test improved in both groups, but with significant intergroup differences in favour of hydrotherapy (hydrotherapy group: 150+/-.32 m; control group: 105+/-.28 m). Diastolic blood pressure and heart rate significantly decreased in the hydrotherapy group, but remained unchanged in the control group (-11 mm Hg+/-.2, p = 0.04 and -12 beats per minute, p = 0.03; respectively). Overall, the exercise was well tolerated with no adverse effects reported (Caminiti 2011). In treating heart failure, hydrotherapy, at least delivered as exercise in warm water, appears to be a safe and effective conjunctive treatment.

Conclusion

Hydrotherapy is the use of water for therapeutic purposes, most commonly involving exposure to hot and cold temperatures. Though the exact mechanisms vary, there is usually an element of local vasoconstriction followed by reflexive vasodilation that activates cutaneous circulation. These physiological effects have therapeutic consequences including pain reduction and a reduction in inflammation. Hydrotherapy also appears to have positive effects on immunoregulation, including increases in resistance and facilitated activation of cell-mediated immune reactions. As discussed, many acute and chronic health conditions can potentially benefit from these effects.

Since it is limited, the evidence available with regards to effectiveness must be interpreted with caution. Hydrotherapy was shown to be effective for both RA and OA, causing reductions in pain, increased mobility, and improved quality of life. The evidence reviewed here showed that hydrotherapy was not effective in reducing the incidence, duration, or severity of the common cold in children, but that it may have other immune-stimulating effects. For patients suffering from CHF, hydrotherapy improved exercise tolerance and the hemodynamic profiles of patients, including beneficial reductions in blood pressure and heart rate. The large majority of the studies available on hydrotherapy suggest that it is a safe and effective treatment option for various health conditions.
References


