IN-DEPTH REVIEWS

Cutaneous Implications of Whole Body Cryotherapy

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ABSTRACT

Whole body cryotherapy (WBC) is a medical treatment utilizing sub-freezing temperatures to enhance recovery after exercise and facilitate injury rehabilitation. Recently the therapy has been advocated to help skin appear and feel healthier, fight age-related deficiencies, and increase antioxidant production. The currently available evidence appears to be insufficient to support the use of WBC for improving skin and there is some small potential for risk. There are no well-controlled studies evaluating the clinical effects of WBC on the skin. Although there is selected data to support possible theories for WBC's purported skin rejuvenation effects, the evidence at this time remains limited. Further investigation may be warranted to determine if WBC can actually have a proven beneficial effect on skin.

REVIEW

The science of aging has proceeded in numerous directions. An equally vast number of therapies have been suggested and/or used to prevent or reverse the aging process. Whole body cryotherapy (WBC) is a medical treatment utilizing sub-freezing temperatures to enhance recovery after exercise and facilitate injury rehabilitation.[1,2] It is considerably more convenient, but also more expensive than traditional forms of recovery cryotherapy (i.e. cold ice water immersion). Although originally developed in 1978 by Toshima Yamauchi in Japan to treat chronic medical conditions such as rheumatoid arthritis, WBC is increasingly employed for a variety of purposes.[3] Popularized by star athletes such as LeBron James and Kobe Bryant, many major sports teams have purchased cryo-chambers to potentially enhance post-athletic muscle recovery. Endorsements from celebrities including Jennifer Aniston and Jessica Alba have brought this treatment into public light for its use in the cosmetic industry.[4] Recently, WBC has been advocated to help skin appear and feel healthier, fight age-related deficiencies, and increase antioxidant production. The purpose of this paper is to review the current literature regarding the claims of potential benefits and possible risks of WBC related to the skin.

WBC involves single or repeated exposure to extremely cold dry air (usually between -100°C and -150°C) in a specialized chamber or room

for a short period of time (2-5 minutes per exposure). During these exposures, individuals wear minimal clothing, gloves, and socks to reduce the risk of cold-related injury. Regimens include up to daily treatment sessions and are recommended to continue indefinitely for prolonged and optimal results.

The principle of cryotherapy is to extract heat from body tissue to attain its various clinical effects. In the field of dermatology, cryotherapy has been used to provide exfoliation for treatment of actinic keratoses and photodamaged skin by a cryo-peeling technique.[5] WBC does not reach the similar tissue temperatures and remains non-ablative. Therefore one would expect to achieve only a mild clinical improvement for related skin disorders.

Histological studies have revealed that such ablative therapies may improve collagen synthesis and skin elasticity.[6,7] Studies have shown the ability of WBC to reduce skin and intramuscular temperature.[8-10] However, temperature reductions were small with almost no effect on core temperature. Other forms of cooling including cold water immersion and ice packs offered similar minimal reductions.

Cryolipolysis used for fat reduction has been reported to improve skin elasticity following treatment.[11] Assuming this hypothesis to be correct, WBC may possibly stimulate collagen and hyaluronic acid production thereby improving skin elasticity, firmness, and promote a smoother complexion. Other claims for WBC have included improvement for cellulite and psoriasis. Additional claims include reducing pore size and blemishes as well as alleviating sun damage. However, all these noted claims for clinical benefits of WBC are based upon anecdotal experiences or product websites.[12-14] Overall, users of WBC have been led to expect a more youthful appearance, but there have been no controlled studies to date demonstrating these results. To date, there appears to be no evidence supporting the cosmetic claims of WBC or if it definitively offers any additional cutaneous clinical effect.

Rapid cooling of the skin results in strong vasoconstriction of the skin capillaries. This is associated with enhanced venous return of cooled blood which results in activation of arterial baroreceptors and increase in parasympathetic stimulation of the heart.[15] This in turn causes an increased perfusion of the skin upon warming. Further studies have revealed improved circulation including a significant increase in cutaneous microcirculation following WBC for up to 10 days.[16] Additional studies are needed to determine the clinical significance of the possibly enhanced cutaneous blood flow on skin related processes.

Evidence regarding WBC's effect on oxidative stress is conflicting and limited. Several studies have yielded either an increase or decrease in antioxidant status.[17-19] Each study had significant limitations that contributed to the equivocal findings. Further research would need to include specific cell-signaling events and biomarkers to better determine any true clinical dermatologic impact.

There is limited reported evidence of adverse cutaneous effects with the use of WBC.[1,12] However, most studies did not actively investigate predefined adverse events. Caution should be taken given the hazards that extreme temperature may present. Isolated complications such as blistering and frostbite have been anecdotally reported and attributed to oversight during treatment. However, if proper protocol is followed and relevant contraindications are adhered to, it appears relatively unlikely for a patient to experience any significant harm.

In summary, the currently available evidence appears to be insufficient to support the use of WBC for improving medical or appearance related skin issues and there is some small potential for risk. There are no well-controlled studies evaluating the clinical effects of WBC

on the skin. Although there is selected data to support possible theories for WBC's purported skin rejuvenation effects, the evidence at this time is very limited. Further investigation may be warranted to determine if WBC could actually have a proven beneficial effect on skin.

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