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Research article

Comparison of the Effects of Local Cryotherapy and Passive Cross-body Stretch on Extensibility in Subjects with Posterior Shoulder Tightness

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Abstract

The objective was to compare the immediate effects of local cryotherapy (LC) and passive cross-body stretch on the extensibility of the posterior shoulder muscle in individuals with posterior shoulder tightness. Eighty-seven healthy subjects with a between-shoulder difference in internal rotation (IR) range of motion (ROM) greater than 10° were randomly divided into three groups: LC group, stretching group, and control group (n = 29 in each group). Subjects in the LC group received LC on infraspinatus and posterior deltoid muscles and subjects in the stretching group performed passive cross-body stretch. Stretch sensation was measured at the end range of passive IR and horizontal adduction (HA) using numerical rating scale, and the pressure pain threshold (PPT) at the infraspinatus and posterior deltoid muscles was measured using pressure algometry. Passive and active ROM of IR and HA of the glenohumeral joint were measured using an inclinometer. All measurements were performed at pre-intervention, post-intervention, and 10-min follow-up. Stretch sensation was significantly decreased and PPT was significantly increased in the LC and stretching groups at post-intervention, and these effects were maintained at 10-min follow-up, compared to the control group. Both the LC group and stretching group had a significantly greater increase in passive and active ROM of IR and HA, compared to the control group at post-intervention and 10-min follow-up. However, there were no significant differences in stretch sensation, PPT, or ROM of IR and HA between the LC group and stretching group. LC can be used to decrease the stretch sensation and increase PPT and ROM of IR and HA as much as a stretching exercise. LC could be an alternative method for increasing the restricted ROM of glenohumeral IR and HA for individuals with posterior shoulder tightness, especially for patients and sports players who have severe stretching discomfort.

Key words: Cryotherapy, muscle stretching exercise, shoulder.

Introduction

Posterior shoulder tightness is a common cause of shoulder impingement syndrome, labral lesions, and rotator cuff tears in clinical rehabilitation and sport activities (Ludewig and Cook, 2002; Tyler et al., 2000; Wilk et al., 2002; 2005). Posterior shoulder tightness is often assessed by measuring the range of motion (ROM) of glenohumeral internal rotation (IR) and horizontal adduction (HA) (Bach and Goldberg, 2006; McClure et al., 2007). A restricted ROM of IR and HA is caused by tightness of posterior muscles (i.e., infraspinatus and posterior deltoid) and the posterior capsule (Borsa et al., 2005; Poser and Casonato, 2008; Yang et al., 2012). Passive cross-body stretch is an effective method for stretching these areas (McClure et al., 2007).

Short-term (3- to 8- week) stretching program increases ROM by changing mechanical properties, such as increasing the length of stretched muscle, inducing elongating connective tissue, and increasing the number of sarcomeres in series (McNair et al., 2001; Taylor et al., 1995; Reid and McNair, 2004). However, although ROM increases after single stretching session, increased muscle length is transient and some studies have demonstrated that muscle stiffness (passive torque/ angle curve) do not change significantly (Law et al., 2009; Ben and Harvey, 2010; BjÅrklund et al., 2001). Increased muscle extensibility after stretching is due to sensory modification, rather than increased muscle length, an idea referred to as sensory theory (Nelson and Bandy, 2004; Weppler and Magnusson, 2010). Namely, stretching can increase the stretch tolerance at the terminal position of the stretch, resulting in increased muscle extensibility and ROM (Folpp et al., 2006; de Weijer et al., 2003; Weppler and Magnusson, 2010).

A previous study speculated that local cryotherapy (LC) may help endure the uncomfortable stretch sensation, felt at the final position of the stretch (Brodowicz et al., 1996). Stretching the hamstring with ice on it more effectively improved supine hamstring flexibility than both stretching alone and stretching with heat (Brodowicz et al., 1996). In addition, whole body cryotherapy effectively increases the active ROM of glenohumeral flexion, abduction, external rotation, and IR in patients with adhesive shoulder capsulitis (Ma et al., 2015).

To date, no studies have investigated the effects of LC on posterior shoulder muscles for the improvement of ROM of IR and HA, through modification of the stretch sensation at the end range of passive IR and HA. Thus, in this study, we investigated the effects of LC on the stretch sensation and on the ROM of glenohumeral IR and HA, comparing it to passive cross-body stretch and no stretching. We also investigated the lasting effects of LC and stretching (separately) at a 10-min follow-up assessment. We hypothesized that LC would decrease the uncomfortable stretch sensation, resulting in an increased ROM of IR and HA and have a lasting effect, similar to stretching.

스트레칭 대신
냉치료를
적용해 보자?!

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냉치료(Cryotherapy)은 염증이 있을 때 **통증**을 조절하거나, **부종**을 가라앉히기 위해 주변에서 많이 쓰이며 각종 **스포츠 손상**에도 널리 사용되고 있다.

이전 연구에 따르면, 대퇴 이두근(hamstring)에 냉동요법을 적용하였을 때 **근육의 유연성**을 증가시킨다고 하였다.
이는 냉치료가 스트레칭의 효과도 가지고 있음을 암시하여 준다.

정말 냉치료를 적용하면
스트레칭의 효과를 가져올 수 있을까?

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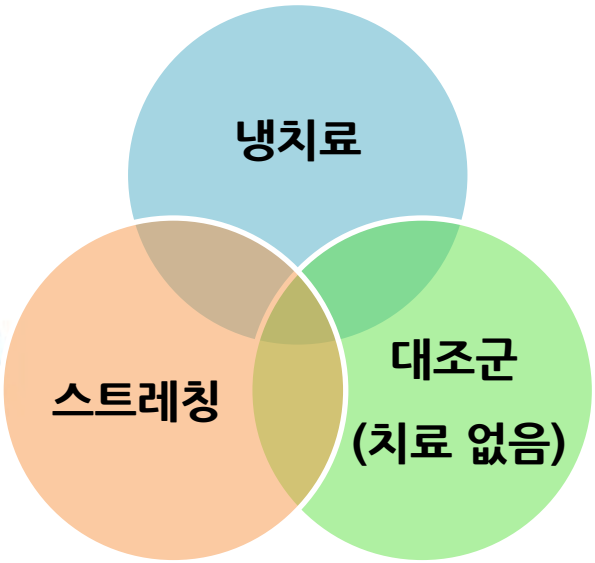

냉치료의 효과를 알아보기 위해,

Posterior shoulder tightness가 있는 환자들을 세 그룹으로 나누었다.

그 후 각각의 치료 **전, 후** 그리고 **10분 뒤**로 나누어 **어깨관절의 관절 가동범위**(능동, 수동 관절가동범위 - 내회전, 수평모음)와 **통증의 정도**(pressure pain threshold)를 측정하였다.

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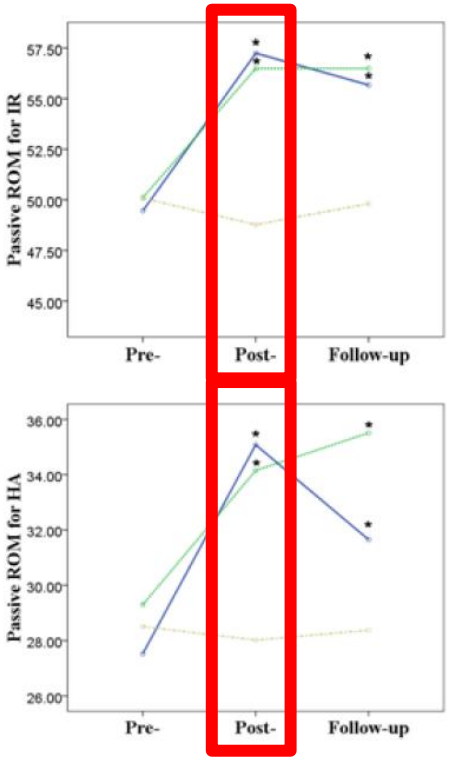
관절 가동범위에는 어떤 차이가 있었을까?

내회전 (수동 관절가동범위)



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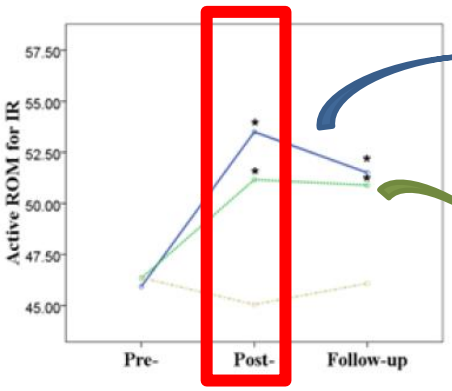
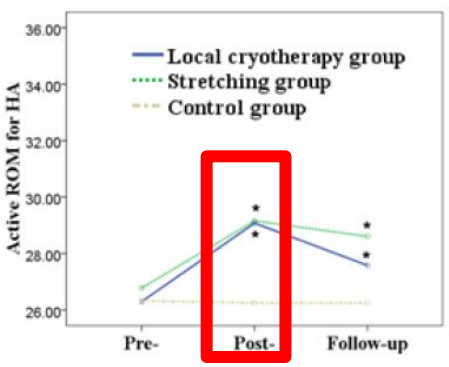


냉치료

수평모음 (수동 관절가동범위)



수평모음 (능동 관절가동범위)

스트레칭

냉치료를 적용한 그룹과 **스트레칭**을 적용한 그룹에서는 **아무 치료를 행하지 않은 그룹(control group)** 과 비교하였을 때 내회전, 수평모음의 능동, 수동 가동범위에 **큰 향상**을 보였다.

또, 이 두 그룹(냉치료, 스트레칭)을 비교해 보았을 때 관절 가동 범위에 영향을 준 **효과가 비슷**하게 나타났다.

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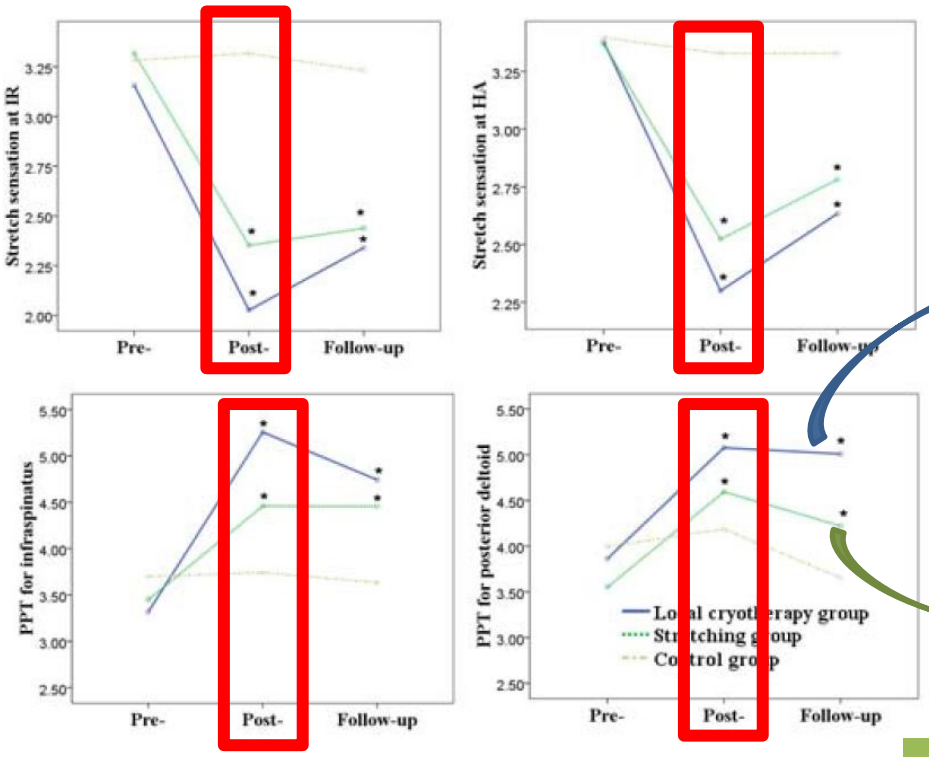
어깨의 감각에는 어떤 차이가 있었을까?



냉치료

스트레칭

내회전, 수평모음 할 때의 **신장 감각(stretch sensation)**과 **압박 통증 역치(pressure pain threshold)**를 각 치료법을 적용하고 비교하였다.

이때에도 대조군에 비해 **냉치료와 스트레칭**을 적용한 그룹이 **신장 감각은 낮게, 압박 통증 역치는 높게** 나타났다.

이는 관절가동범위를 증가시켜주는 요인이 될 수 있으며 이 자료를 통해 냉치료와 스트레칭을 적용하였을 때 **비슷한 효과**를 가져온다는 것을 알 수 있다.

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냉치료(cryotherapy)는 즉각적으로 신장감각(stretch sensitivity)를 감소시키고, 압박통증역치(pressure pain threshold)를 증가시킨다. 이 결과 어깨 관절의 내회전과 수평모음의 관절가동범위가 향상된다.

평소 우리는 환자의 **관절 가동범위**를 **증진** 시키고 **통증을 완화**시켜주기 위해서 **스트레칭** 운동법을 제공한다.
하지만 위의 결론 따라, **posterior shoulder tightness** 환자가 가시아래근과 뒤 삼각근에 **높은 신장감각**과 **낮은 압박 통증 역치**를 가지고 있다면 **냉치료는 스트레칭의 대체 방법으로 사용될 수 있다.**

따라서, Posterior shoulder tightness환자가
근골격계의 전문가인 우리들에게
"스트레칭을 대신 할만한 간단하고 빠른 방법이 없을까요?" 라고 물으면

"냉치료를 3분 정도 적용하시면
스트레칭을 시행 한 것과 같은 단기간 효과를 보실 수 있습니다."
라고 이 논문을 근거로 이야기 할 수 있을 것이다.

-KEMA 책임 연구원 정성훈-

-문의사항은 KEMA 홈페이지 기사에 댓글로 남겨주세요-

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