

Interesting Articles for KEMA Members

Does hand-behind-back range of motion accurately reflect shoulder internal rotation?

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Shoulder internal rotation (IR) is commonly assessed by an indirect method where the hand is placed behind the back and the distance reached by the tip of the extended thumb is recorded. The aim of this study was to assess the validity of measuring active IR range of motion (ROM) by use of the indirect hand-behind-back (HBB) ROM method in subjects with shoulder pain of mechanical origin. HBB ROM was determined by measuring the distance between the T1 spinous process and the radial styloid process. Active shoulder IR was measured in the supine position in 45° or 90° abduction. Correlation coefficients adjusted for measurement error were calculated. HBB ROM demonstrated only a low to moderate correlation with active shoulder IR. Active HBB ROM is not an accurate method of measuring active shoulder IR in patients with shoulder pain. *J Shoulder Elbow Surg* 2006;15:311-314.

The measurement of internal rotation (IR) range of motion (ROM) is an essential component of the clinical examination of the shoulder joint.^{1,2} IR is commonly assessed by an indirect method called posterior reach or hand behind back (HBB), where the hand is actively placed behind the back and the distance reached by the tip of the standardized thumb is recorded.^{3,4,5,6,7,8,9,10,11,12} This indirect method of measuring shoulder IR is part of the American Shoulder and Elbow Surgeons' (ASES) A recent study published in the *Journal of Shoulder and Elbow Surgery* evaluated the reliability of shoulder IR measured by the vertebral level reached by the fully extended thumb.¹³

In addition to shoulder IR, HBB incorporates shoulder extension, retraction, and downward rotation of the scapula and flexion of the elbow and wrist, and is influenced by mobility at the forearm, wrist, and thumb joints.^{10,12} In a study using various imaging procedures on normal subjects, Mallon et al¹² concluded that interpreting HBB ROM as a measure of shoulder IR greatly underestimated the contribution from other joints. In this study, 35% of the motion in HBB occurred at the scapulohumeral articulation, with a significant contribution from elbow flexion in internal range HBB. These results suggest that the interpretation of restricted HBB ROM as an accurate measure of shoulder IR is not valid. However, because this study was conducted on subjects without shoulder dysfunction, the question of whether restriction in HBB ROM reflects decreased shoulder IR in a symptomatic population remains unanswered.

MATERIALS AND METHODS

This study was approved by the Ethics Committees of the University of Sydney and St Vincent's Hospital, Sydney, Australia. The sample consisted of 137 subjects who volunteered to participate in a clinical trial investigating the effectiveness of, and prognostic indicators for, conservative treatment for shoulder pain of mechanical origin.^{14,15} All subjects gave written consent before participation. They had pain over the shoulder joint or the proximal arm (or both), which was exacerbated by active shoulder movements, inflammatory or neoplastic disorder, referred from vertebral column structures or as a result of recent trauma were not included. Of the subjects, 77 had decreased abduction or flexion (or both) accompanying their shoulder pain and 60 had a painful arc of abduction or flexion (or both) but retained full ROM.

HBB ROM was determined by asking subjects to reach up the center of their spine with their thumb as far as possible (Figure 1). The distance between the T1 spinous process and the radial styloid process was then measured to the nearest 0.5 cm with a tape measure. The tape measure was used to eliminate the error demonstrated by Edwards et al¹⁶ which was associated with determining the vertebral level reached. Measuring the distance to the radial styloid process was chosen to eliminate error associated with any coexisting lack of flexibility at the

**Hand-behind-back ROM이
과연 shoulder
internal rotation ROM
을 반영할 수 있을까?**

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“Shoulder internal rotation (IR)”

의 ROM 검사는 어깨 관절의 임상적 평가를 위한
아주 중요한 요소라고 할 수 있다.

IR 은 임상적으로

다양한 방법을 통해 측정할 수 있지만,

이 연구에서는

posterior reach 또는 hand behind back (HBB)

이라고 불리는 간접적인 방법을 제시하고 있다.

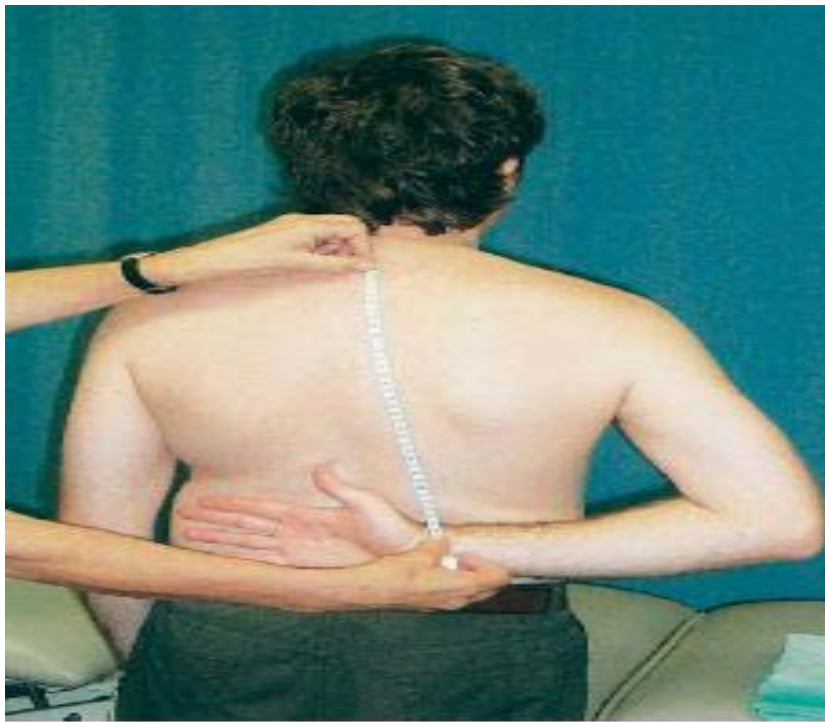


Figure 1 Measurement of HBB ROM.

그렇다면, HBB 를 이용하여 측정하는 간접적인 평가방법이

IR 의 accurate measurement 라고 볼 수 있을까?

많은 연구결과를 종합하여 볼 때, HBB ROM 을 통하여 IR 을 평가하는 것에는 정확하지 않다고 말하고 있다.

HBB ROM 측정 시 35%에 해당하는 motion 자체가 scapulothoracic articulation 에서 발생하고, 상당한 부분의 motion 이 elbow flexion 에서 기인되기 때문이라고 설명한다.

이러한 선행논문의 결과에서는 HBB ROM 을 이용한 IR 의 측정은 valid 하지 않다고 말하고 있지만, 이러한 연구들에서의 대상자는 모두 건강한 성인을 대상으로 한 실험에서 난 결론이었다.

그러나, HBB ROM 을 통하여 IR 을 평가하는 것이 symptomatic population 에서는 연구가 진행되지 않았다.

따라서, indirect HBB ROM method 가 어깨에 통증이 있는 대상으로 측정하였을 때 이것이 active IR ROM 을 측정하는 것에 대한 validity 를 확인하는 것이 이 연구의 목적이다.

우선 137명의 어깨관절과 상완 부위에 통증이 있는 대상자를 모집하였다. 소집된 대상자들은

1. shoulder instability
2. Inflammatory or neoplastic disorder
3. Referred from vertebral column structures
4. As a result of recent trauma

에 해당하는 사람은 제외되었다.

HBB ROM의 측정은 대상자가 손은 등 뒤로 넘겨 척추의 가운데를 따라 올라갈 수 있는만큼 올리도록 한다.

그런 후에 T1 spinous process와 radial styloid process 사이의 거리를 줄자를 이용하여 측정하는 것이다. (ICC=0.94)

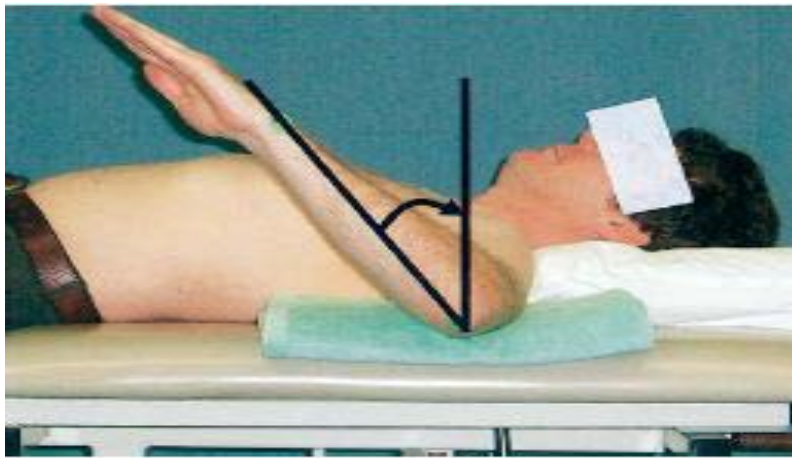


Figure 2 Measurement of shoulder IR at 90° abduction.

Active shoulder IR의 측정은 Photographic analysis를 사용하였고 그림과 같이 shoulder abduction 90도 + elbow flexion 90도에서 측정하였다. (ICC=0.79)

두 측정방법 모두 active movement에서 순서에 대한 randomization을 시행하였다.

결과적으로 볼 때, shoulder pain 이 있는 대상자에 대해서 두 가지 다른 측정 방법에 대한 상관관계가 0.64 (low to moderate correlation) 로 나왔음을 알 수 있었다.

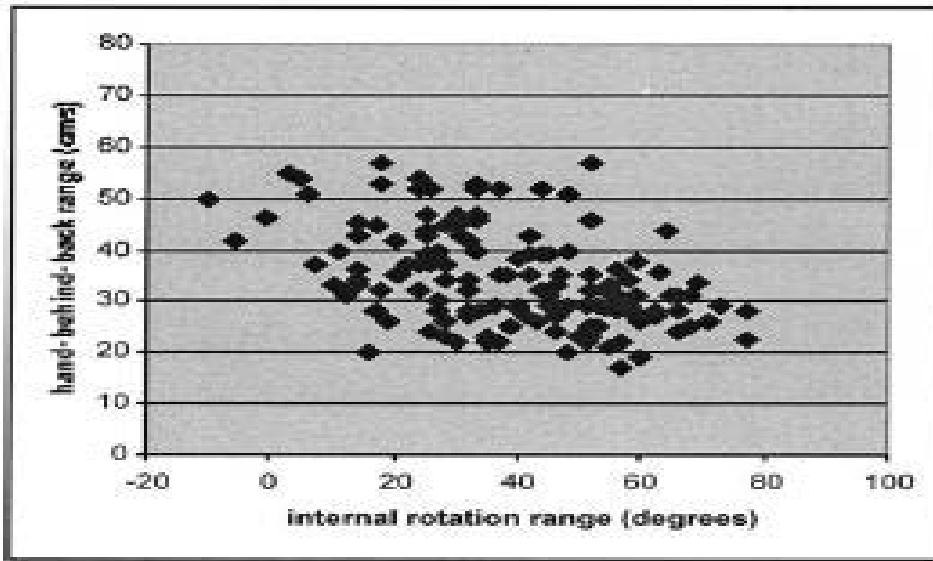


Figure 4 Scatter plot of shoulder IR versus HBB ROM in total sample.

따라서, 우리는

Active HBB ROM method 는
Healthy 한 대상자 뿐만 아니라
shoulder pain 있는 대상자에게
active shoulder IR 을 평가함에 있어서
Accurate indirect method 라고 할 수 없음
을 인지하면

정확한 shoulder evaluation 에 도움이 될 것이다.

-KEMA 책임 연구원 전인철-

-문의사항은 KEMA 홈페이지 기사에 댓글로 남겨주세요-