KEMA
Kinetic Ergocise based on Movement Analysis

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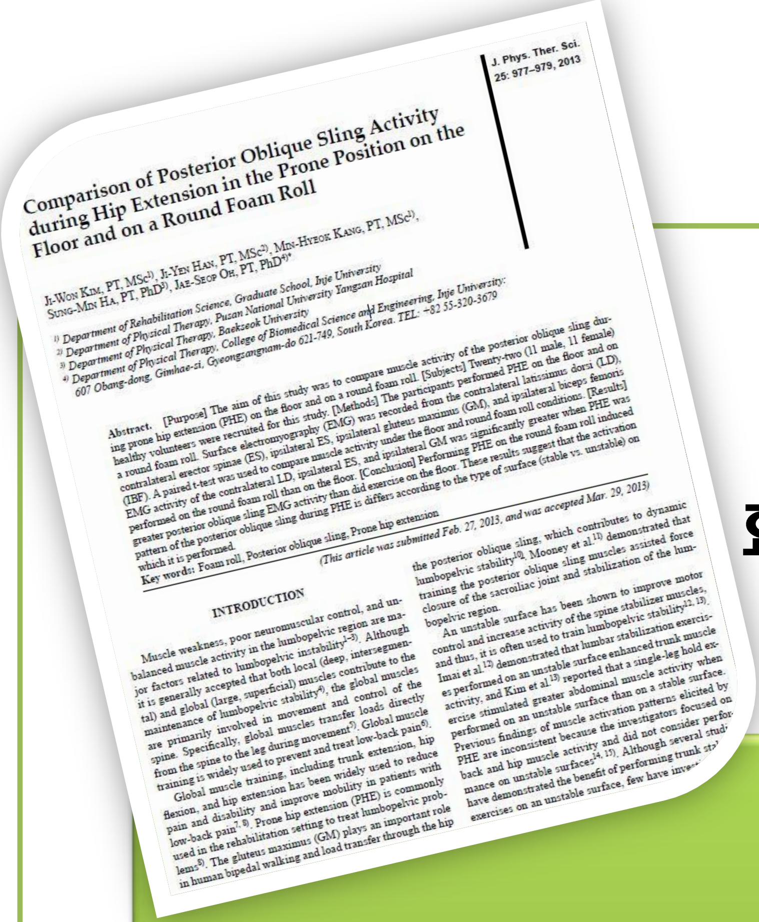

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Comparison of Posterior Oblique Sling Activity during Hip Extension in the Prone Position on the Floor and on a Round Foam Roll

Ji-Won Kim, PT, MSc[1)], Ji-Yen Han, PT, MSc[2)], Min-Hyeok Kang, PT, MSc[1)], Sung-Min Ha, PT, PhD[3)], Jae-Seop Oh, PT, PhD[4)*]

[1)] *Department of Rehabilitation Science, Graduate School, Inje University*
[2)] *Department of Physical Therapy, Pusan National University Yangsan Hospital*
[3)] *Department of Physical Therapy, Baekseok University*
[4)] *Department of Physical Therapy, College of Biomedical Science and Engineering, Inje University: 607 Obang-dong, Gimhae-si, Gyeongsangnam-do 621-749, South Korea. TEL: +82 55-320-3679*

Abstract. [Purpose] The aim of this study was to compare muscle activity of the posterior oblique sling during prone hip extension (PHE) on the floor and on a round foam roll. [Subjects] Twenty-two (11 male, 11 female) healthy volunteers were recruited for this study. [Methods] The participants performed PHE on the floor and on a round foam roll. Surface electromyography (EMG) was recorded from the contralateral latissimus dorsi (LD), contralateral erector spinae (ES), ipsilateral ES, ipsilateral gluteus maximus (GM), and ipsilateral biceps femoris (IBF). A paired t-test was used to compare muscle activity under the floor and round foam roll conditions. [Results] EMG activity of the contralateral LD, ipsilateral ES, and ipsilateral GM was significantly greater when PHE was performed on the round foam roll than on the floor. [Conclusion] Performing PHE on the round foam roll induced greater posterior oblique sling EMG activity than did exercise on the floor. These results suggest that the activation pattern of the posterior oblique sling during PHE is differs according to the type of surface (stable vs. unstable) on which it is performed.

Key words: Foam roll, Posterior oblique sling, Prone hip extension

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INTRODUCTION

Muscle weakness, poor neuromuscular control, and unbalanced muscle activity in the lumbopelvic region are major factors related to lumbopelvic instability[1–3)]. Although it is generally accepted that both local (deep, intersegmental) and global (large, superficial) muscles contribute to the maintenance of lumbopelvic stability[4)], the global muscles are primarily involved in movement and control of the spine. Specifically, global muscles transfer loads directly from the spine to the leg during movement[5)]. Global muscle training is widely used to prevent and treat low-back pain[6)].

Global muscle training, including trunk extension, hip flexion, and hip extension has been widely used to reduce pain and disability and improve mobility in patients with low-back pain[7, 8)]. Prone hip extension (PHE) is commonly used in the rehabilitation setting to treat lumbopelvic problems[5)]. The gluteus maximus (GM) plays an important role in human bipedal walking and load transfer through the hip the posterior oblique sling, which contributes to dynamic lumbopelvic stability[10)]. Mooney et al.[11)] demonstrated that training the posterior oblique sling muscles assisted force closure of the sacroiliac joint and stabilization of the lumbopelvic region.

An unstable surface has been shown to improve motor control and increase activity of the spine stabilizer muscles, and thus, it is often used to train lumbopelvic stability[12, 13)]. Imai et al.[12)] demonstrated that lumbar stabilization exercises performed on an unstable surface enhanced trunk muscle activity, and Kim et al.[13)] reported that a single-leg hold exercise stimulated greater abdominal muscle activity when performed on an unstable surface than on a stable surface. Previous findings of muscle activation patterns elicited by PHE are inconsistent because the investigators focused on back and hip muscle activity and did not consider performance on unstable surfaces[14, 15)]. Although several stud have demonstrated the benefit of performing trunk sta exercises on an unstable surface, few have inves

Posterior Oblique Sling..어떻게 효과적으로 단련할 수 있을까요?

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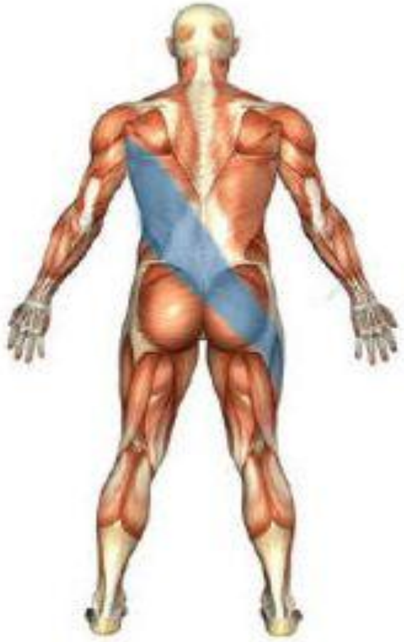
“Posterior Oblique Sling (POS)”

Gluteus maximus (GM)와 thoracolumbar fascia 를 통해서 contralateral latissimus dorsi (LD) 그리고 erector spinae (ES) 근육들로 구성되어 있다고 볼 수 있다.



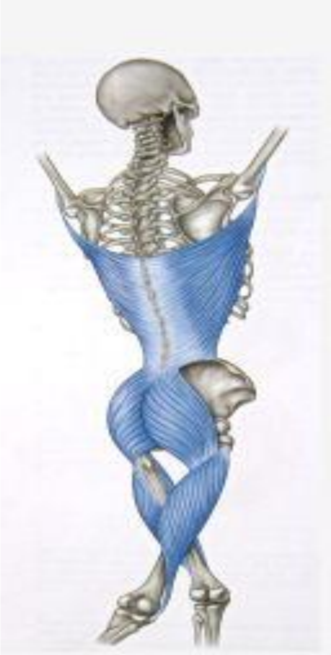
posterior oblique sling

이러한 구조는 신체의 Dynamic lumbopelvic stability 에 기여하고, 이 근육들의 훈련은 Sacroiliac joint 의 Force closure 에 도움을 주기 때문에 결과적으로 Lumbopelvic region 의 stabilization에 기여 한다고 이 논문에서 말하고 있다.

그렇다면, 어떻게 POS가 Lumbopelvic region 의 stabilization에 기여 하는지 좀 더 알아보자 .

Muscle weakness, poor neuromuscular control 그리고 unbalanced muscle activity 는 lumbopelvic region 의 불안정성에 가장 큰 영향을 줄 수 있다.

일반적으로 local(deep,intersegmental) 그리고 global (large, superficial) muscle 들은 lumbopelvic stability 유지에 각자의 역할을 수행한다.

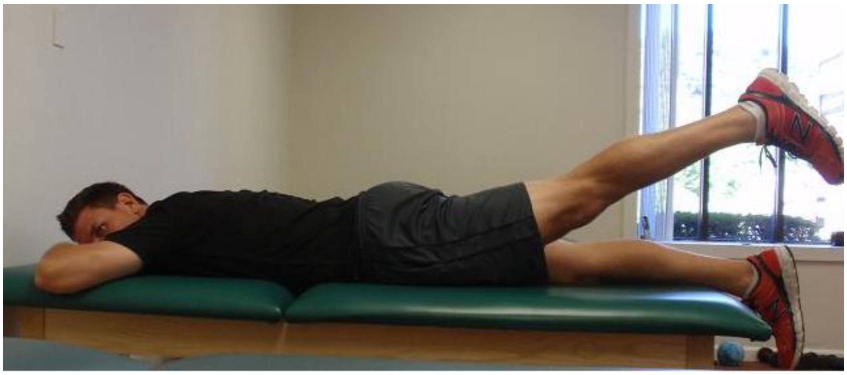


이 때, global muscle들은 movement가 일어나는 동안에 spine에서 leg 로 직접적으로 하중을 전달하는데 큰 역할을 한다.

따라서 movement 를 수행하는 동안에 POS 가 활성화 된다면, local muscle 들과 함께 Dynamic lumbopelvic stability 에 기여한다고 볼 수 있다.

따라서 이 연구에서는 다음과 같은 실험을 진행하였다.

일반적인 Prone hip extension (PHE) 을 서로 다른 환경에서 진행하도록 한다.



1. 바르게 눕는다.
2. 무릎을 편 채로 Dominant leg 를 hip extension 10도까지 올리도록 한다.
3. 이와 같은 동작을 5초간 유지한다.
4. 총 3번을 반복하고 사이에 1분씩 쉬도록 한다.

1. 위와 같은 방식으로 foam roll 위에서 진행하도록 한다.

그렇다면, 어떤 조건에서 하는 PHE 운동이 POS 의 근활성도가 증가되는 운동일까?

이 연구에서는, POS 의 근활성도 증가를 위해서 PHE on stable surface 보다 PHE on foam roll 이 더 효과적이라고 말하고 있다.

밑에 제시한 표는 각각의 다른 조건에서 PHE 운동을 실시하였을 때 LD, ES, GM 그리고 BF 근육의 근활성도를 나타내는 테이블이다.

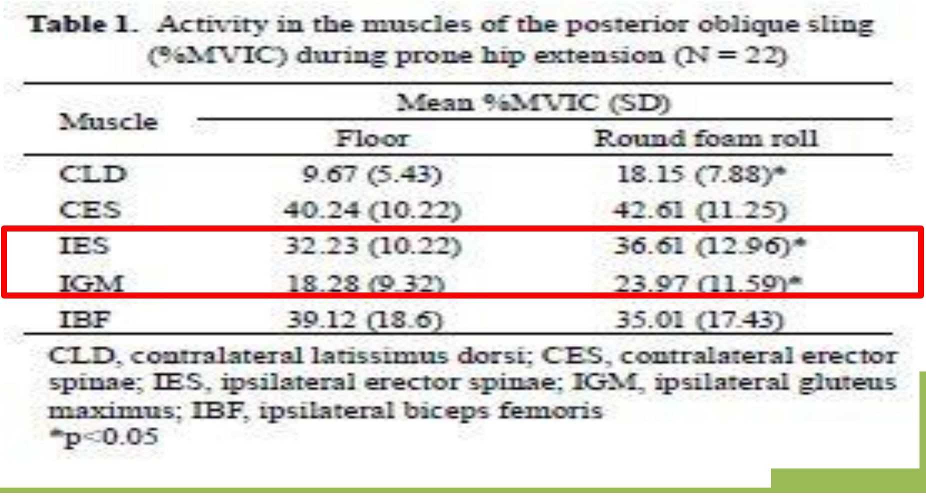


Table 1. Activity in the muscles of the posterior oblique sling (%MVIC) during prone hip extension (N = 22)

Muscle	Mean %MVIC (SD)	
	Floor	Round foam roll
CLD	9.67 (5.43)	18.15 (7.88)*
CES	40.24 (10.22)	42.61 (11.25)
IES	32.23 (10.22)	36.61 (12.96)*
IGM	18.28 (9.32)	23.97 (11.59)*
IBF	39.12 (18.6)	35.01 (17.43)

CLD, contralateral latissimus dorsi; CES, contralateral erector spinae; IES, ipsilateral erector spinae; IGM, ipsilateral gluteus maximus; IBF, ipsilateral biceps femoris

*$p < 0.05$

따라서 POS 의 근활성도를 높이기 위한 운동으로

여러 가지 방법을 시행할 수 있지만,

정확한 평가가 선행된다면

PHE 운동이 필요할 때,

“Stable surface 보다 form roll 과 같이 unstable surface 가

POS 의 근활성도를 좀 더 증가시킬 수 있다”

라고 제안하는 것이 운동에 도움이 될 것이다.

-KEMA 책임 연구원 전인철-

-문의사항은 KEMA 홈페이지 기사에 댓글로 남겨주세요-