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Kinetic Ergocise based on Movement Analysis

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Original article

The effect of pain relief on dynamic changes in lumbar curvature

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ABSTRACT

Lumbar curvature is important in the assessment of low back pain (LBP). It is often reported that changes in curvature seen in LBP sufferers are an adaptive response to pain. Studies investigating this hypothesis employing an experimental pain relief model have failed to isolate pain relief in their interventions. Therefore the purpose of this study was to investigate the immediate effects of pain relief on dynamic lumbar curvature.

Twenty acute and 20 chronic LBP sufferers had their dynamic curvature measured using a novel fibre-optic device during flexion, extension and lifting before and after administration of oral analgesics. Peak curvature changes were examined using paired *t*-tests, numbers of responders to pain relief and changes in lumbar curvature sequencing were compared between groups using Chi-squared testing.

A significant reduction in movement evoked pain was achieved. A significant reduction in kyphosis at end range flexion and lifting was identified for the acute LBP group following pain relief. No significant differences were observed for the chronic low back pain (CLBP) group. Neither the acute nor chronic LBP group were more likely to respond to pain relief by demonstrating alterations in peak curvature or in lumbar sequencing behaviour.

These results demonstrate simple targeted pain relief did not result in gains in peak curvature challenging the assumption of movement alteration being possible through pain relief. Dynamic changes in curvature as displayed by sequencing showed that neither acute nor chronic LBP sufferers were more likely to respond to pain relief.

1. Introduction

Lumbar curvature measurement has been proposed to be an important component of the physical examination of low back pain (LBP) sufferers (O'Sullivan, 2000, 2005; Dankaerts et al., 2006, 2007). It is evident that lumbar curvature can affect the activation levels of the trunk muscles (O'Sullivan et al., 2002, 2006) and the line-of-action of the erector spinae musculature (McGill et al., 2000; Singh et al., 2011). It is also understood that the degree of load sharing across a motion segment is affected by curvature as is the load tolerance of specific anatomical structures (Adams and Hutton, 1980, 1982; Adams et al., 1980; Gallagher et al., 2005). Therefore measuring curvature is important to understanding the function of the lumbar spine.

Recently a novel fibre-optic device has been used for curvature measurement which is able to provide a continuous representation of spinal shape in the sagittal plane. This can be achieved within the clinical environment and the device has been shown to be valid and reliable in the measurement of spinal curvature (Williams et al., 2010, in press-a) as well as being able to determine sequencing of curvature change (Williams et al., in press-a).

These studies are in agreement with those investigating range of motion (ROM) in LBP sufferers, demonstrating that LBP sufferers often display reduced lumbar ROM or curvature (Shum et al., 2005a,b, 2007a,b; Williams et al., 2010, in press-a-b). This has been suggested to represent an adaptive response to minimise pain provocation (Shum et al., 2005a). If this were the case then the elimination or reduction of pain should result in a restoration of ROM or curvature. Previous authors have demonstrated little or no effect of pain relief on ROM (Lilius et al., 1989; Davis and Kotowski, 2005). In contrast to these findings Jarzem et al. (2005) demonstrated that transcutaneous electrical nerve stimulation (TENS) induced pain relief resulted in significant gains in flexion and extension ROM. Unfortunately they failed to adequately report the

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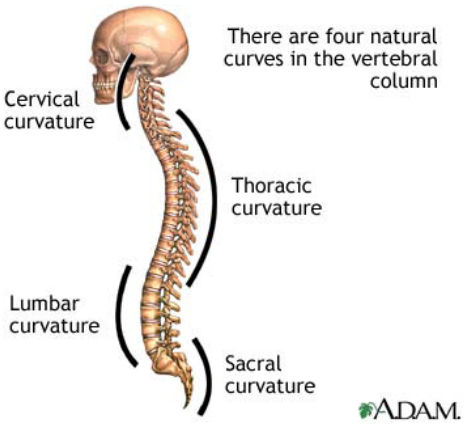
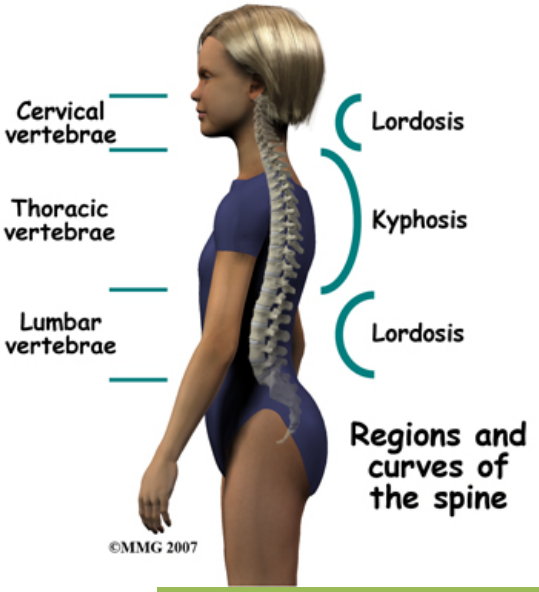
통증 완화가 요추 굽이의 변화에 미치는 영향

The effect of pain relief on dynamic changes in lumbar curvature

◆ 요추 굽이(lumbar curvature)는 요추 통증 환자들의 평가에 있어서 중요하다. 요추의 굽이는 몸통 근육들과 척추기립근의 활성도에 영향을 미칠 수 있고 특정 분절에만 하중이 부과되게 할 수도 있다. 특히, 요추 굽이의 변화는 요추 통증 환자들에게서 통증에 대한 적응성 반응으로써 쉽게 볼 수 있는 현상 중 하나이며, 이전의 많은 연구들이 통증 완화에 따른 요추 굽이의 정상화에 대해 많은 가설들과 그를 뒷받침 할 수 있는 연구들을 하여왔다. 그러나, 정확한 의미의 통증 완화를 적용하기 힘들었기에, 이전의 연구들은 부족한 부분이 많았다. 따라서, 이 연구는 급성 허리 통증 환자와 만성 허리 통증 환자에게 진통제 복용으로 허리 통증을 완화시켰을 때 허리 굴곡, 신전과 들기(lifting) 시 요추의 시상면 굽이를 조사하려 한다.





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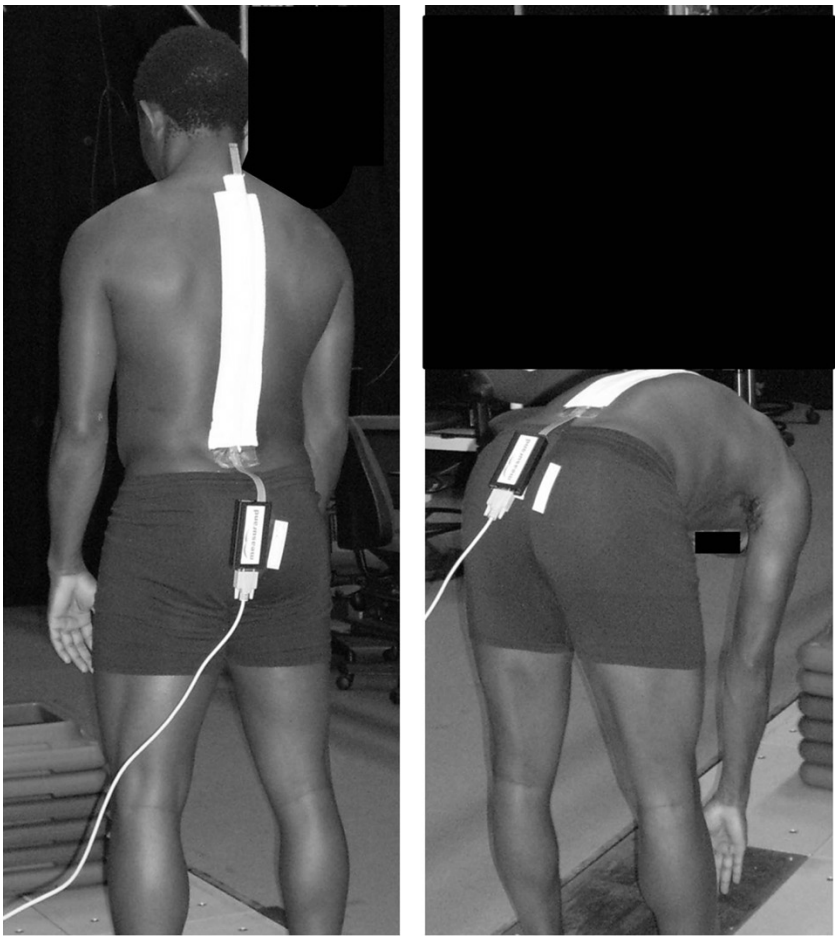
실험 방법

◆ 급성 허리 통증 환자군과 만성 허리 통증 환자군 각각 20명

◆ 각 대상자들이 바로 선 자세, 완전 허리 굽힘, 완전 신전, 그리고 3kg 물체를 드는 동안 L1~L3의 움직임 측정 ➔ 움직임에 따라 발생되는 통증 정도를 기록 ➔ 이후 진통제를 경구 복용 ➔ 45~60분 휴식 후 다시 바로 선 자세, 완전 허리 굽힘, 완전 신전, 그리고 3kg 물체를 드는 동안 L1~L3의 움직임 측정

◆ 복용한 진통제 – Ibuprofen (22명), Paracetamol (10명), Co-cpdamol (1명), Naproxen (1명), Dicloflex (1명), 복합복용(7명)

◆ 통증 기록 – 시각상사척도(visual analog scales, VAS) 사용



실험 방법

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실험결과

1. 급성, 만성 허리 통증 환자들 모두 경구 진통제 복용 후 통증이 유의하게 감소.
2. 통증 완화에 따른 요추 굽이의 변화는 만성과 급성 통증에 따라 다른 변화를 보임.
    1. 급성 환자의 경우, 요추 굴곡과 들기 시 후만증이 유의하게 감소하였으나, 신전의 변화는 없음
    2. 만성 환자의 경우, 어떠한 움직임에도 변화가 없었음.

Table 3

진통제 복용에 따른 통증 완화 효과 ➔ 대상자 모두 진통제 복용 후 통증이 유의하게 감소하였음.

	급성 환자			만성 환자		
	Pre VAS (mm)	Post VAS (mm)	*p*	Pre VAS (mm)	Post VAS (mm)	*p*
Flexion	44 (23)	21 (24)	0.005	39 (18)	9 (18)	0.004
Lifting	35 (19)	6 (13)	<0.000	64 (19)	36 (27)	0.001
Extension	43 (17)	16 (20)	0.000	52 (22)	24 (24)	<0.000

	Whole lumbar spine			Lower lumbar spine		
	Pre	Post	Diff	Pre	Post	Diff
ALBP						
Flexion						
Curvature (°)	**−5.4 (9.8)**	**−2.3 (9.8)**	**3.1 (2.1)***	−3.3 (7.0)	−2.2 (6.2)	1.1 (2.0)
Lifting						
Curvature (°)	**−1.3 (13.5)**	**1.4 (12.9)**	**2.7 (2.6)#**	**−0.8 (8.0)**	**1.4 (8.5)**	**2.2 (2.9)‡**
Extension						
Curvature (°)	40.1 (17.5)	45.3 (16.6)	5.2 (9.9)	26.3 (11.3)	29.7 (12.8)	3.4 (9.7)
CLBP						
Flexion						
Curvature (°)	−13.1 (8.1)	−12.7 (7.7)	0.4 (4.8)	−6.4 (4.9)	−6.7 (5.7)	−0.3 (3.4)
Lifting						
Curvature (°)	−13.5 (9.4)	−11.8 (11.9)	1.6 (3.6)	−5.7 (6.5)	−5.2 (9.0)	0.5 (3.6)
Extension						
Curvature (°)	46.5 (11.9)	45.7 (12.2)	−0.8 (6.0)	30.0 (14.7)	29.3 (14.4)	−0.6 (5.5)

통증 완화에 따른 요추 굽이의 변화

요약

◆ 이 연구는 경구 복용 진통제에 따른 통증 완화가 허리 통증 환자들의 요추 굽이에 어떠한 영향을 미치는지를 알아보았습니다. 그 결과, 급성환자들의 경우 진통제 복용 후 유의하게 굽이가 변화한 반면, 만성 환자들에게는 변화가 없었습니다. 또한 급성 환자들의 요추 굽이의 변화된 각도 역시 유의하지만, 변화 각도는 매우 미미하였습니다. 이와 같은 결과는, 허리 통증 호소 환자들에게 차별화된 접근법을 수립해야 한다는 것을 알려줍니다. 진통제의 효과가 만성 통증에는 매우 미미함을 환자들에게 제시할 수도 있을 뿐만 아니라, 통증 완화가 있더라도 근본적으로 비정상적인 요추 굽이의 변화는 그대로라는 것을 주지할 수도 있을 것입니다. 더 나아가, 운동 치료를 더욱 열심히 할 수 있는 동기를 부여할 수도 있을 것으로 생각됩니다.

-KEMA 책임 연구원 정성대-

-문의사항은 KEMA 홈페이지 기사에 댓글로 남겨주세요-

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