IMMEDITATE EFFECT OF POSTERIOR TO ANTERIOR LUMBAR MOBILIZATION IN SUBJECTS WITH ACUTE LOW BACK PAIN: CORRELATION BETWEEN CLINICAL OUTCOMES AND VARIATION OF THE APPARENT DIFFUSION COEFFICIENT MEASURED BY MRI

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BACKGROUND

Today, after spinal mobilization in patients with acute low back pain, we are far to understand all the mechanisms explaining pain reduction and improvement in range of motion.

The free diffusion of unbound water in the intervertebral disc could provide a post-mobilization explanatory mechanism for linking pain reduction and improvement in range of motion.

PURPOSE

The objective of this non randomized single-center trial is to compare the clinical outcomes and the diffusion of water in the lumbar intervertebral discs following a single session of postero-anterior spinal mobilization of lumbar vertebrae in patients with acute low back pain, using diffusion-weighted magnetic resonance imaging .

SUBJECTS

16 adults (11 women / 5 men), aged from 20 to 85 years, suffering from idiopatic acute low back pain with a period of less than 6 consecutive weeks of pain and pain not radiating below the knee.

PROCEDURE AND TREATMENT

Patient care informed consent and questionnaires

FIRST MRI T2-Weighted and ADC map

Physical examination : metric measure

Anamnesis, clinical analysis

Spinal mobilization by postero-anterior pressures (MAITLAND)

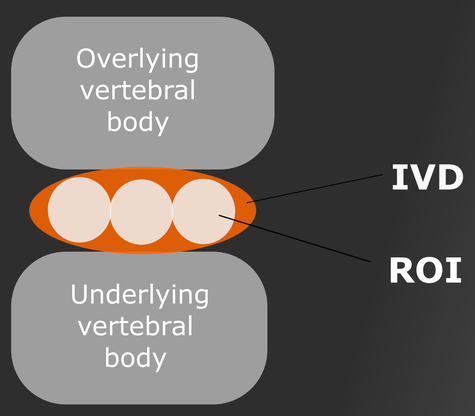
Reassessment

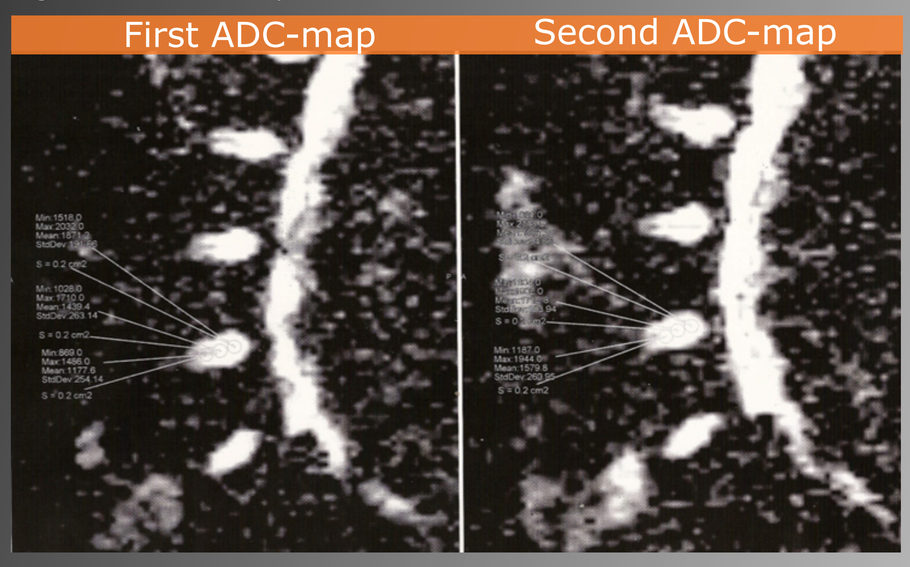
Second MRI T2-Weighted and ADC map

Comparison of MRI and clinical data

IMAGE ANALYSIS

Apparent Diffusion Coefficient (ADC) were computed from 3 specific regions of interest (ROI) of 0.2 cm² surface that were selected respectively in the anterior, middle and posterior portions of intervertebral discs. Diffusion sequences were acquired to quantify the "micro" movements of water molecules within the intervertebral discs. The ADC was computed and provides the images of the mobility of water molecules.





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RESULTS

One-way RM ANOVA was used to compare the visual analogue scale and oral analogue scale between before and after the mobilization. A two-way RM ANOVA (treatment and level) with Holm Sidak method for pairwise multiple comparisons was performed to examine the effect of the mobilisation in range of motion and ADC results.
A Principal Components Analysis was also realized to show the correlation between the measures.

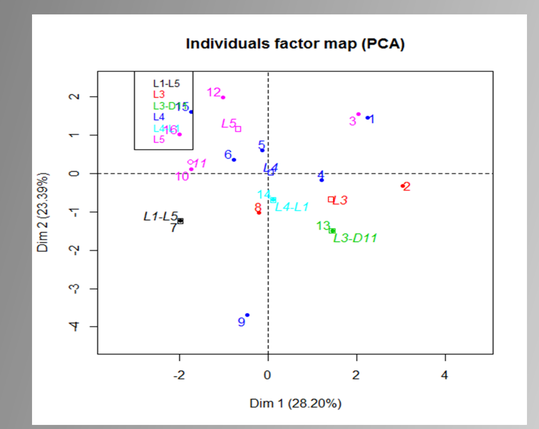
Clinical results of trunk motion and pain before and after mobilization

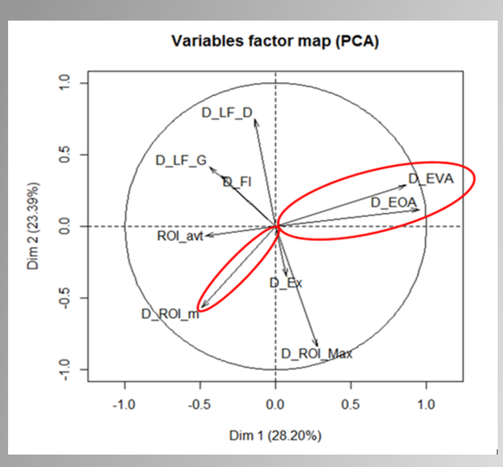
	Before mobilization (mean ± SD)	After mobilization (mean ± SD)	P value	Effect size (η^2)
Flexion (cm)	27,7 ± 14,7	19,0 ± 13,4	**0,003**	**0.90**
Extension (cm)	61,7 ± 4,9	56,6 ± 5,7	**0,002**	**0.91**
Left lateral flexion (cm)	49,7 ± 6,3	44,5 ± 5,9	**<0,001**	**1.13**
Right lateral flexion (cm)	48,8 ± 7,8	43,9 ± 4,7	**0,002**	**0.95**
VAS	5,5 ± 1,9	2,1 ± 1,5	**<0,001**	**2.0**
OAS	5,5 ± 1,5	2,2 ± 1,7	**<0,001**	**2.0**

Apparent diffusion coefficient results, stratified according to intradiscal location

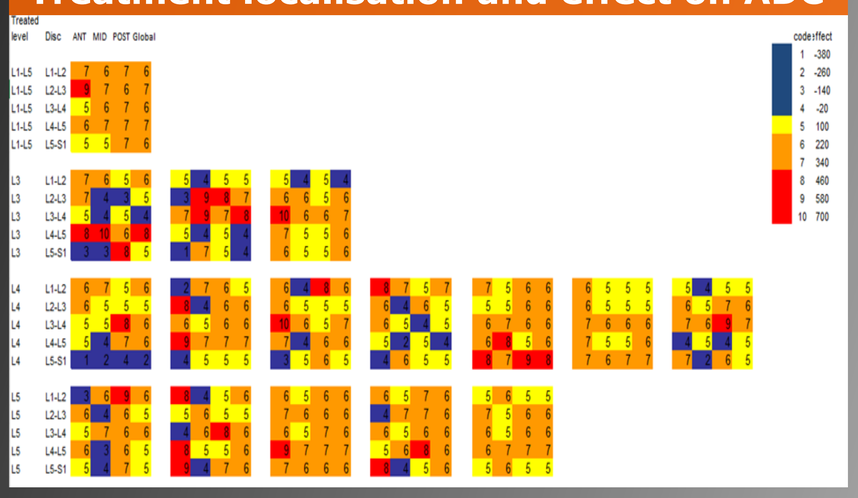
	Before mobilization (mean ± SD) *	After mobilization (mean ± SD) *	P value	Effect size (η^2)
Whole disc	**1351** ± 327.9	**1485** ± 334.4	**< 0,001**	**1.2**
Anterior portion	1206 ± 328.5	1358.9 ± 336	**< 0,001**	**0.7**
Middle portion	1462.9 ±340.3	1552.5 ±341.1	**< 0,001**	**0.5**
Posterior portion	1384.1 ±400.1	1544.5 ± 383.3	**< 0,001**	**1.1**

Apparent Diffusion Coefficient is expressed as $mm^2 s^{-1}$





Treatment localisation and effect on ADC



A negative correlation was observed between increase of ADC and pain reduction. However, only a weak correlation between pain reduction and increase in ROM was observed

CONCLUSION :Diffusion of unbound water in the intervertebal discs is a potential post-mobilization mechanism. It seems that the process responsible for healing mechanisms are complex and multiple. The correlation between clinical outcomes and Apparent Diffusion Coeficient (ADC) needs larger sample to be interpretable. Clinicians have to be aware that PA mobilisation are effective in the management of acute low back pain if based on clinical reasoning.