LUMBAR PAIN MEASUREMENT AND EVALUATION

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Abstract

This study aimed to validate the lumbar pain measurement utilizing cross-modal matching. The psychophysical methods utilized were magnitude estimations and line-length estimations. Studies were performed on sixty patients who exhibited low lumbar pain secondary to the spinal hernia disc, and they were divided into two groups. The first group received a solution of local anesthesia and corticoid, and the second group, received a saline solution of 0,9 %, and corticoid by means of peridural block anesthesia. The pain was evaluated prior to the block, 30 minutes, 6, 12 and 24 hours after the pain. Comparing the groups, there was a significant statistical difference in the magnitude scales and line-lengths for all of the events evaluated. The calculations for the exponent functions for all of the evaluations ranged from 0,72 to 1,02, as predicted. It was concluded that pain management for the first group is efficient; the psychophysical scale is valid and consistent.

Lumbar disc disease which is characterized by symptomatic disc herniation, or typical sciatic, is a great challenge for health care. The prevalence of this disease was studied as part of a research performed on 7000 Finnish adults. The diagnosis of lumbar disc syndrome, grounded on medical history , symptoms and physical examination was carried out in 5.1% of the men, and in 3.7% of the women. One third of the patients with disc pain were previously hospitalized, in which one fifth of these underwent lumbar surgery (Hurri and Karppinen, 2004).

More than half of the patients with discogenic lombosciatalgia reported a decline in their daily activities and ability to work.Intervertebral disc herniation is one of the most common causes of lumbosacral radiculopathy and 10 to 15% of these patients must eventually undergo surgery. Historically, corticoide peridural injections have been utlized as an aide in the treatment for sciatica, since it holds a success rate of 20 to 100% (average is 67%) (Vad et al., 2002).

In the past decade, a definitive tendency has occurred for non-surgical management of lower lumbar discogenic with radicular symptom, alongside supporting research for the following concepts: 1) readsorption of the herniated lumbar disc; 2) a pathological event of the assymptomatic lumbar disc, including herniation; 3) presence of an inflammatory component in the lower lumbar and/or radicular pain. One of the implications of these observations is that the inflammatory reaction is necessary to precipitate the syptoms even with the presence of mechanical compression. An obvious evidence is that controlling inflammation can diminish clinical symptoms which consequently can reduce the patient´s dysfunctions and disabilities. Self immune basis or drugs for radicular pain were postulated in 1977. In the past decades, data have been published revealing that the enzimatic deregulation is the potential catalizer of lower lumbar and radicular pain. Phospholipase A2 (PLA2) is released after the intact intervertebral disc has been injured, and in vitro, a PLA2 has neurotoxic properties. PLA2 propagates an inflammatory cascade by releasing a rachidonic

acid resulting in chemotaxis response, and it is not mediated by the cells through the prostoglandins and leukotrienes .Inflammatory substances in the peridural space may directly or indirectly induce the increase of the vascular permeability of the endoneural blood vessels (Weinstein and Herring , 2003).

Levobupivacaine((S)-1-butyl-2-piperidylform-2',6'-xylidine hydrochloridrate), which is a pure s(-) enantiomer of racemic bupivacaine, contains local anesthetic properties and efficacy similar to racemic bupivacaine, but it has shown a lower cadiotoxic potential than R-enantiomer or racemic bupivacaine. Moreover, the enantiomers of bupivacaine have demonstrated pharmacokinetic differences in animals and humans (Simon et al., 2004).

Objectives

- to determine the absolute pain threshold for each participant by means of serial exploration.
- to compare the efficacy of both of the solutions in the peridural space for lower lumbar disc pain treatment.
- to verify if the degree ranks of pain derived from both of the methods utilized (magnitude estimations and cross-modal matching with line-length response modalities) are similar to each other.
- to validate the ratio scale for a non-metrical continual of lumbar pain perception utilizing cross- modal matching.
- to verify stability and/or equivalence of the ratio scales generated by both modalities of different responses, whether they be numerical without limits (magnitude estimates) or visual (line-lengths).

Experiment 1- Task to determine the pain thresholds

In this experiment the determination of the absolute threshold (lesser intensity of the stimulus, in continual perceived pain) for pain was the result of the experimental pain induction.

Method

Participants. Sixty patients with lumbar disc pain, ranging from 18 to 65 years of age, of both sexs, who have no structural alterations in the lumbar spine which hinders accomplishing the perdural technique, or that have insufficient cognition to understand the protocol presented.

Material. Notepads containing specific instructions on the method utilized on the first page; a pen , and a pneumatic magnometer.

Procedure. Serial exploration was the scaling method utilized which functions by gradually increasing and decreasing the intensities of a stimulus up to the perception limit or the perceptive distinction to determine the thresholds. Pain induction was performed by an established garroting pressure on the upperleft limb based on the areterial systolic pressure utilizing a pneumatic magnometer cuff which is used to check the arterial pressure. The pressure level was the one maintained after the inhibition of the arterial pulse; this one having a considerable safety margin according to the criteria related to the pressure on the upper limb.The pain intensity in the applied method does not cause injury to the uper limb. The clients´ task was to signal after they had determined pressure time with the lowest perceived pain stimulus to set the absolute threshold. A total of three attempts were carried out in series for perceived pain, and the time was registered in seconds. The absolute threshold was the outcome of the arithmetic mean of the three attempts.

The different stimuli were presented in series according to varied time of the constant pressure. After designating the standard stimulus, it received a score of 100 (module) for the magnitude estimations method, and a score of 50cm (module) for the cross- modal matching with the line- lengths response modality. The task to determine the threshold was performed immediately prior to the anesthestic technique via peridural. The absolute threshold was the result of the arithemtic means of the three attempts.

Results and discussion

The absolute pain threshold for each participant was obtained in seconds, and each participant presented individual set time in order to determine their thresholds. The arithmetic mean for the sixty patients in the first time was 162,37 seconds, in the second time it was 146,60, and in the third time it was 160,08 seconds. The general mean for the three times was 158,53 seconds. The physiological and psychological aspects are evidence that pain is a unique and individual experience.

Experiment 2 – Lumbar pain measurement and evaluation

In this experiment, lumbar pain measurement was evaluated utilizing magnitude estimations method and cross- modal matching with line-lengths response modality.

Method

Participants. Sixty patients with lumbar disc pain who participated in Experiment 1. The participants were divided into two groups: Group I received levobupivacaine and methylprednisolene anesthetic , and Group II received a saline solution of 0,9% and methylprednosolene. The peridural block was the technique utilized to manage the medication.

Material. Two notepads were utilized with sepcific instructions about each psychophysical method on the first page, and in the following pages enough space to register the pain evaluation schedule, a pen and a measuring tape 3m/10´(Lufkin) of lenght/width.

Procedure. The psychophysical methods utilized were magnitude estimations and cross- modal matching involving a continual line-length response.

Regarding the magnitude estimation methods, each participant was to assign a number socre for each pain complaint that was proportional to the pain intensity felt. In this manner, had the participant deemed that one given pain (standard stimulus applied in the period previous to the anesthetic technique via peridural - Experiement 1) he should assign a score twofold greater than the induced pain. Had he judged a given pain had half of the intensity of the induced pain, then he should assign the number score that was half of what was attributed to that induced pain.

As far as the cross modal matching involving continual line-length responses, the participants were to match a line-length to each pain complaint which was proportional to the pain intensity they felt. Therefore, had the participant deemed that a given pain was twofold greater the intensity than the induced pain (standard stimulus applied in the period prior to the anesthetic technique via peridural – Experiment 1) he should match a line-length twofold greater.Had he deemd that a given pain was half the intensity of the induced pain, he should match a line-length which was half the score attributed to that induced pain.

The different pain sensations were evaluated in different events by the described psychophysical methods, immediately prior to the anesthetic block, and 30 minutes, 6, 12, and 14 hours after the block.

Results and discussion

For the comparison among the drugs, in every gauging event, the difference for the Mangnitude scale and for the Line-lengths was significant.It was observed in the reuslts of Table 1 that for each 30 minutes after the Magnitude Estimation , Group 1 (of 341,8 to 76,56) had a more evident improvement than did group II (from 225,7 to 107,73).

With relation to Line-lengths, there are events in which the geometric mean for Group I were greater than for Group II, and the events in which the geometric mean for Gourp II were greater than for Group I, however, the compared means before the blocks in the fifth gauging done before discharge from the hospital, the geometric means were also lesser for Group I, coinciding with the magnitude scales.

Table 1: The Geometric means and the Standard Deviation of the geometric means of the magnitude estimates and the line-length estimates before the block, 30 minutes, 6, 12, and 24 hours after the block and Student´s t test between two independent means.

		Before the Block		**30 min after**		**6 hours after**		**12 hours after**		**24 hours after**	
		Mean	**sd**	**Mean**	**sd**	**Mean**	**sd**	**Mean**	**sd**	**Mean**	**sd**
Magnitude estimation	**Group I**	341,8	6,34	76,56	5,85	91,37	6,56	61,16	7,57	52,81	6,08
	Group II	225,7	3,36	107,73	4,51	56,2	6,76	44,53	7,51	57,41	5,86
	p	< 0,0001		< 0,0001		< 0,0001		< 0,0001		0,0042	
Line-lengths	**Group I**	79,11	3,78	34,00	3,92	33,58	4,45	26,98	5,57	18,40	5,28
	Group II	89,65	2,16	47,91	2,95	23,22	5,04	18,6	5,46	26,2	4,44
	p	< 0,0001		< 0,0001		< 0,0001		< 0,0001		< 0,0001	

Pearson´s coefficient of correlation was calculated to compare the magnitude estimates and the line-length estimates for the sixty participants. The results showed there was significant statistical correlation between the methods utlized in both of the studied groups, except for the vlaues before the peridural block.

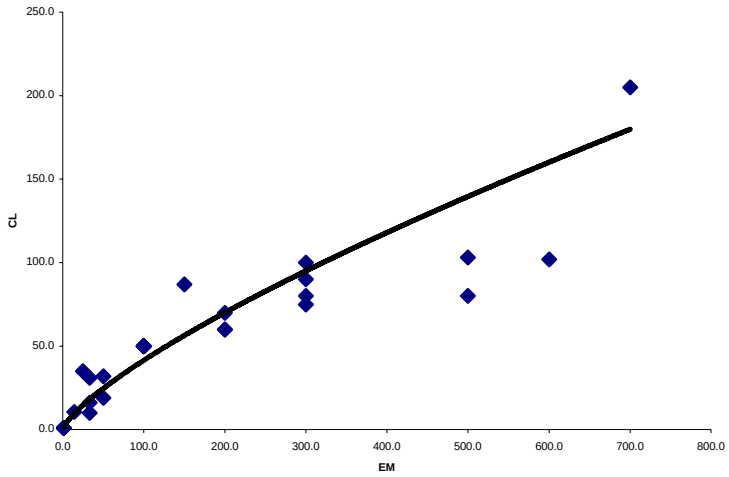

Figure 1- The geometric mean logarithms of the line-length estimates and the magnitude estimates for Group I, 30 minutes after the peridural block.

The exponents were calculated for each event of pain sensation evaluation. For Group I, the exponents were : before the block – n=0,68; 30 minutes after the block – n=1,00; 6

hours after the block – n=0,86; 12 hours after the block – n=0,92 and 24 hours after the block – n=0,85. Figures 1 and 2 present a graph referring to the exponent calculations, for Group I, 30 minutes after the peridural block.

For Group II, the exponents were: before the block – n=1,01; 30 minutes after the block – n=1,00; 6 hours after the block – n=0,93; 12 hours after the block – n=0,94 and 24 hours after the block n=0,93. Figures 3 and 4 present the graphs referring to the exponent calculations for Group 2 in 30 minutes after peridural block.

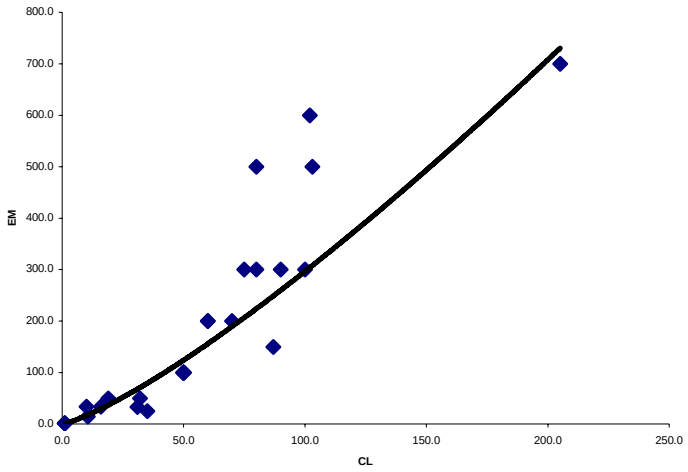

Figure 2- The geometric mean logarithms for the magnitude estimates and the line-length estimates for Group I, 30 minutes after the peridural block.

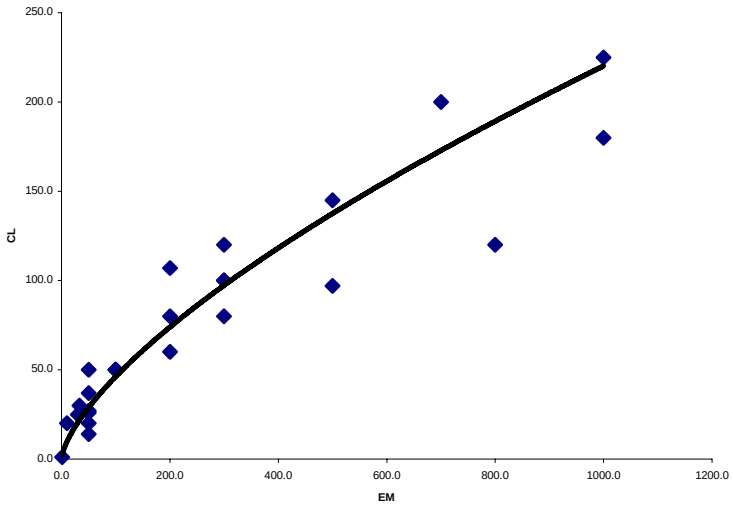

Figure 3 – The geometric mean logarithms of the line-length estmates and the magnitude estimates for Group II, 30 minutes after the peridural block.

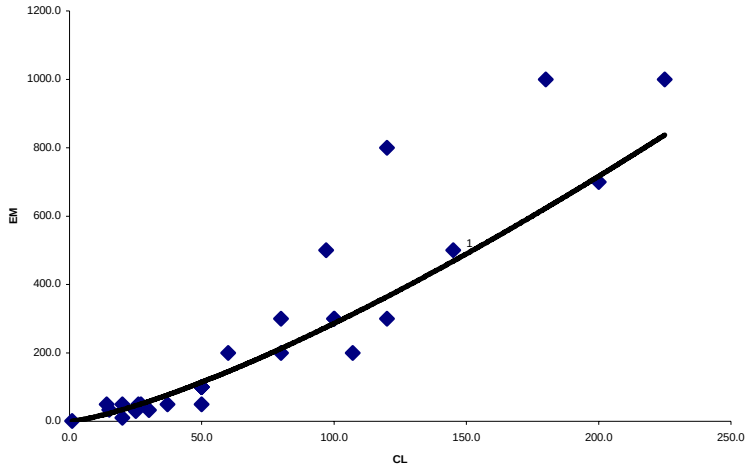

Figure 4 – The geometric mean logarithms of the magnitude estimates and the line –length estimates for Group II, 30 minutes after the epidural block.

Conclusions

It was concluded that pain management for the group I is the most efficient rather than group II; the psychophysical scale is valid and consistent.

The psychophysical scale for magnitude estimations in line-length estimations in the lumbar pain measurement were validated, in which the exponents for the different events and Groups were very near 1,00, as was predicted (Stevens, 1957).

References

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