

# Effects on lumbago of therapeutic equipment “SONOTRON” for pain abatement

By: Chiaki Wada

Yasuo Nakamura

Tetsuo Muramatsu

Koji Sato

Kentaro Mimatsu

# Effects on lumbago of therapeutic equipment “SONOTRON” for pain abatement

Chiaki Wada <sup>a)</sup> Yasuo Nakamura <sup>a)</sup>  
Tetsuo Muramatsu <sup>b)</sup> Koji Sato <sup>b)</sup>  
Kentaro Mimatsu <sup>c)</sup>

## Introduction

In our daily clinical life, pain is one of the problems that continues to keep us worrying. Although there are researches on the mechanism of pain and its occurrence, neither a very effective medication nor therapeutic equipment has yet to be found. <sup>2)6)</sup>

In 1987, A.D.M Tronics in America developed a new therapeutic equipment called “SONOTRON” with the objectives for pain abatement. <sup>4)</sup> (Refer to Picture 1).

This equipment is operated with an alternating current of 100V with a modulation sound wave of 3KHz to 5KHz and radio frequency of 430 KHz as energy source. The output is adjustable from 0 to 10W. The resulting energy of this combined wave is emitted through a radiation antenna called an applicator for 15 seconds each time. In this treatment, the applicator is applied and rotated clock-wise to the affected part of the body. Compared to the current ultra short waves and laser, this equipment uses less frequency and on top of that, it is unique as the output can be adjusted.

We had the opportunity this time to use SONOTRON and to report on the results of our trial test of this equipment.

## Test subject

The subjects of our test were orthopedic surgery patients suffering from lumbago. Thirteen male patients and seventeen female patients, totaling up to thirty cases. Four patients were in their 30s, three in their 40s, eleven in their 50s, four in their 60s, seven in their 70s and one in his 80s. The mean age was 58.

Thirteen patients were suffering from acute cases of herniated lumbar disc (hereinafter called “Lumbar Disc Herniation”) with the mean age of 46, while seventeen patients were suffering from chronic degenerated lumbar vertebrae (hereinafter called “degeneration syndrome”) with the mean age of 63.

## Methodology

The patients were placed in sitting positions and the radiation location set at around four centimeters from the center of the patients’ backs. Four locations were identified as the area of pain. The patients were exposed to the output for 15 seconds each time for 8 times via the applicator applied by the attending physician. The required time for this treatment took approximately 3 minutes per session. This treatment was conducted twice a week for 2 weeks and during the treatment period, the patients were

<sup>a)</sup>Chiaki Wada, Yasuo Nakamura: Department of physical therapy, Tokai municipal Hospital

<sup>b)</sup>Tetsuo Muramatsu (MD), Koji Sato (MD): Department of Orthopedics Surgery, Tokai municipal Hospital

<sup>c)</sup>Kentaro Mimatsu (MD): Department of orthopedics Surgery, Nagoya University School of Medicine

Table 1: Own Pain Evaluation

Date

Patient name:..... Physician in charge:.....

**Own Pain Evaluation Table**

	A little painful		Painful		Very painful		Excessively painful			
	1	2	3	4	5	6	7	8	9	10
Before radiation										
After radiation										

## 2. Lumbago therapy evaluation table

I. Subjective symptom 9 points	A. Back pain					
	a. No back pain at all				3	
	b. Slight back pain				2	
c. Usually slight back pain, sometimes intense back pain				1		
d. Intense back pain				0		
	B. Pain at lower limb					
	a. No numbness nor pain at lower limb				3	
	b. Sometimes slight lower limb pain and numbness				2	
	c. Usually slight lower limb pain and numbness, sometimes intense lower limb pain and numbness				1	
d. Usually intense lower limb pain and numbness				0		
	C. Walking ability					
	a. Able to walk normally				3	
	b. Able to walk more than 500m but feels pain, numbness and lack of energy				2	
	c. Experience pain, numbness, lack of energy and not able to walk when walking less than 500m				1	
d. Experience pain, numbness, lack of energy and not able to walk when walking less than 100m				0		
II. Objective symptom 6 points	A. SLR (including tight hamstring)					
	a. Normal				2	
	b. Above or below 70°, distinct left and right difference				1	
	c. Below 30°				0	
	B. Sense					
	a. Normal				2	
b. Experience slight sense defect (patient unaware of this defect)				1		
c. Distinct sense defect (patient aware of this defect)				0		
	Muscle Strength (tested on the more injured joint)					
	a. Normal				2	
	b. Slight decline in muscle strength (level 4)				1	
c. Distinct decline in muscle strength (below level 3)				0		
III. Daily life movement 14 points			Extremely difficult	Slightly difficult	Easy	
	a. To turn while sleeping		0	1	2	
	b. To stand up		0	1	2	
	c. To wash face		0	1	2	
	d. Maintaining a stooping position or straight position		0	1	2	
	e. Long period in sitting position		0	1	2	
	f. To lift and carry something heavy		0	1	2	
g. Walk		0	1	2		
IV. Bladder function -6 points	a. Normal				0	
	b. Slight urination difficulty (frequent urination, delay urination)				-3	
	c. Extreme urination difficulty (feeling of full bladder, incontinence of urine)				-6	
					Total points	

not administered any other medication nor therapy.

### Evaluation and Judgment

The evaluation of pain was judged by the patients themselves with the ten levels we have come up with in the Own pain evaluation table (hereinafter called "own evaluation") which were put to use before and after each radiation. The attending physician added up the total points for subjective symptom, objective symptom and daily life movement points with full points of 29 points as stated in the Standard for Judgment of Lumbago Therapy Results (hereinafter called "J.O.A. Score) by the Japan Orthopedic Surgery Society as shown in Table 1.

The judgment of own pain evaluation was conducted before and after the first treatment session, before and after the first week's treatment session and the second week's treatment session. However, JOA score was tabulated before every treatment session, before the first treatment session as well as before the first and second week's treatment sessions. Statistics t-test was then performed on the results.

### Results of test

The own pain evaluation table for the 30 cases as stated above, showed that the pain score before the first treatment session was 4.1, became 3.0 after the treatment session. The pain score was 2.5 before the first week's treatment session and became 1.6 after the first week's treatment session. The pain score was 1.9 before the second week's treatment session and became 1.1 after the second week's treatment session. The results showed that the pain decreased after each treatment session and over the two weeks, the pain gradually lessened. (Refer to diagram 1)

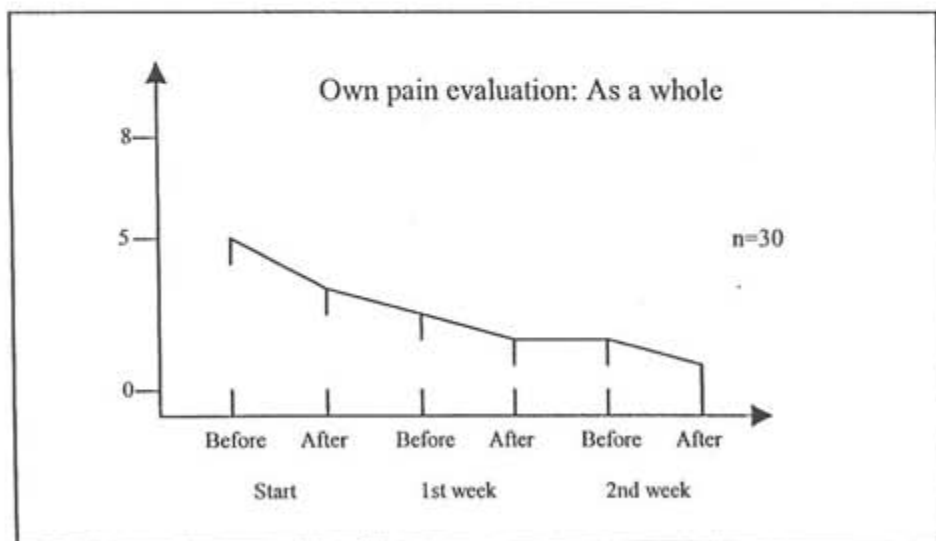


Diagram 1

The JOA score for the 30 cases showed that after the first treatment session, the total points was 18.9, after the first week's treatment the total points was 22.5 and after the second week's treatment, the total points was 24.3. Hence, from the total points tabulated, it was observed that the pain has significantly improved. (Refer to diagram 2)

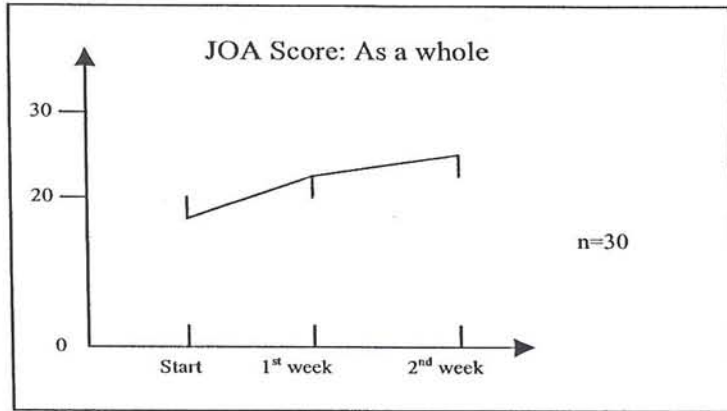


Diagram 2

On the progress of Lumbar Disc Herniation and degeneration syndrome, the own pain evaluation table for the patients suffering from Lumbar Disc Herniation showed that before the first treatment session, the pain score was in the middle level at 4.1, and was 3.4 after treatment. After the first week's treatment session, the pain score decreased from 2.3 to 1.5 and after the second week's treatment session, the pain score decreased from 1.5 to 0.9. Similar to the hernia symptom, patients suffering the degeneration symptom also experienced less pain over the period of two weeks' treatment sessions. (Refer to diagram 3 and 4)

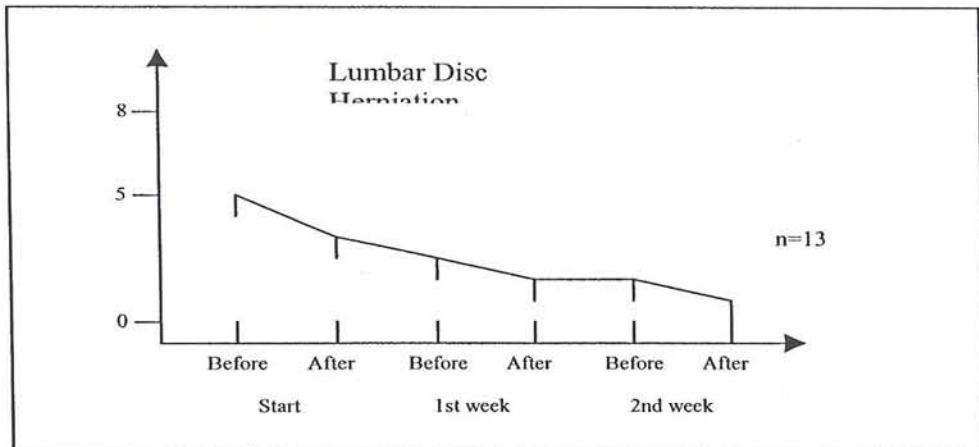


Diagram 3

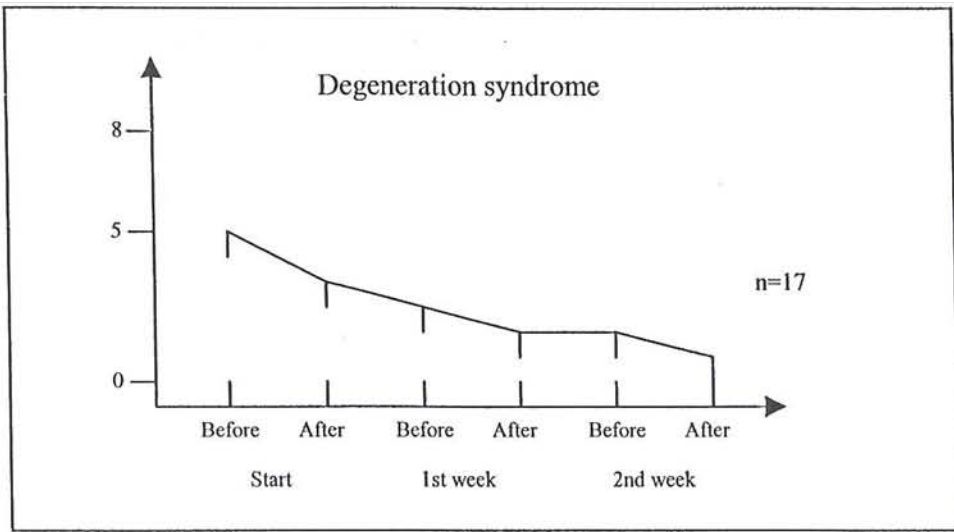
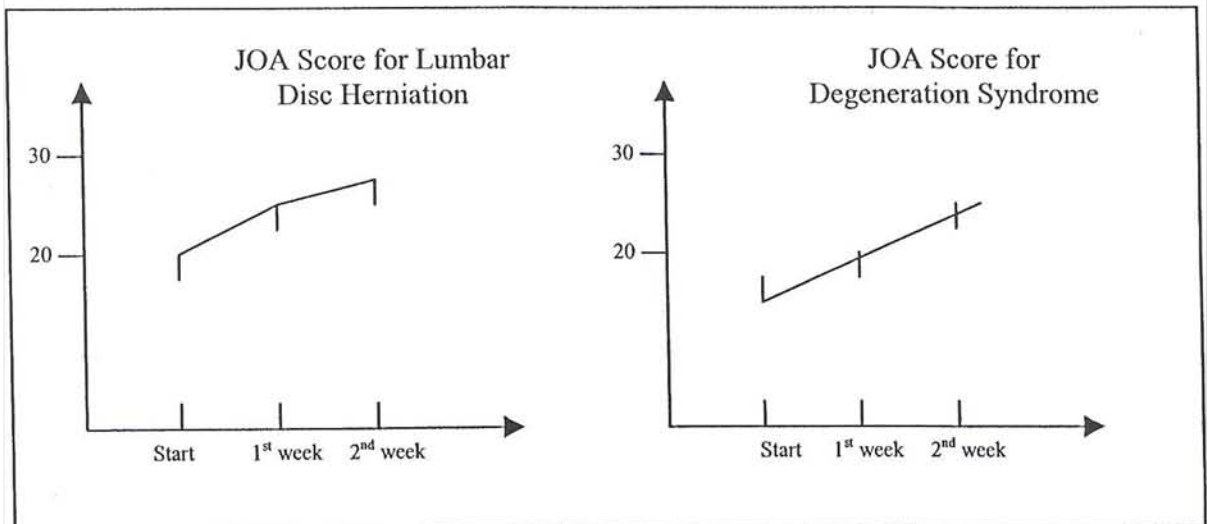


Diagram 4

Comparing the two syndromes on the JOA score, before the commencement of the first treatment, the Lumbar Disc Herniation showed total points of 19.7, 24.7 points for the first week, and improved to 25.7 points for the second week. The degeneration syndrome showed total points of 18.3 before the first treatment, 20.8 points for the first week, and 23.3 points for the second week. Hence, the results showed that the patients suffering from both syndrome experienced less pain after the treatment sessions. The Lumbar Disc Herniation showed better improvement on pain abatement by the first week compared to degeneration syndrome but by the second week, both syndromes showed similar trends of improvement which showed the effectiveness of this therapy. (Refer to diagram 5)



The JOA score based on the Daily life movement section showed an improvement from 9.3 points after the first treatment session to 11.4 points in the first week of treatment session to 12.2 points in the second week of treatment session. The decrease in pain affected the improvement of physical movement, hence via this treatment the damage to daily life activities is lessened. (Refer to diagram 6)

There were no cases of symptoms worsening nor any distinct differences in objective symptoms category.

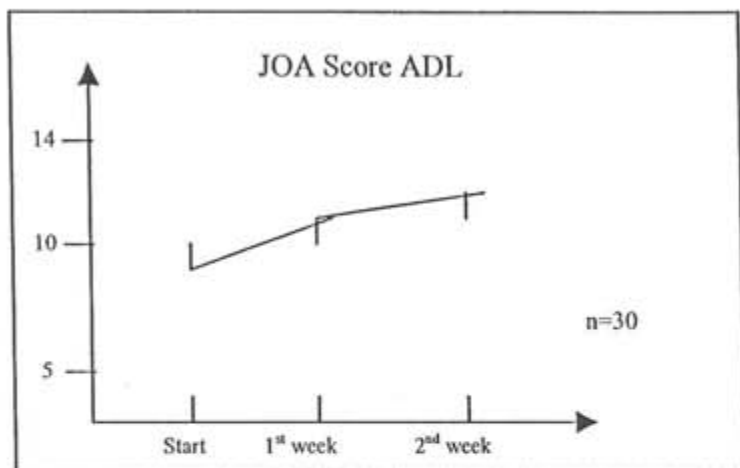


Diagram 6

### Observations

It was noticed that the Lumbar Disc Herniation showed distinct improvement by the first week and it is believed that this improvement was due to early pain abatement cases being included in this acute pain category. By the second week of treatment, both syndromes showed almost similar trend of improvement. Compared to laser treatment and micro treatment which takes around 15 minutes, SONOTRON treatment is shorter by several minutes. Although there were cases where no effects were noticed, as a whole, in a short period of time, this treatment was able to lessen pain and on top of that, no side effects were observed.

It is observed from this experiment that the mechanism of this equipment on the human body increased temperature on tissues. Although this is primarily due to heat effect, it is unclear whether the mechanism produced a stimulating effect or directly influenced the nervous system.

Although we know that the corona discharge occurred within the housing of the applicator and that the voltage and the electrical current or the sound wave of 3KHz to 5KHz and radio frequency of 430 KHz was produced, questions like how it relates to the reaction of the entity or how it works or the frequency of treatment or the good and bad of radiation method, should be pursued in future researches. Unlike the current therapeutic equipments which requires treatment conditions to be set up only once, and then just leave it to the equipment convenience, this equipment needs to be attended by the physician during treatment and even though, the treatment takes only several minutes, the physician cannot detach himself away from the treatment site during the treatment period.

## Summary

The new therapeutic equipment "SONOTRON" is found to be,

1. Effective for pain abatement in the case of acute and chronic lumbago.
2. Short treatment time.
3. Easy to operate, easy treatment.
4. A safe equipment, no worsening cases nor side effects.

## References \*

1. Koji Sato, " Effects on osteoarthritis of therapeutic equipment SONOTRON for pain abatement ", The Japanese Journal of Rehabilitation Medicine Vol. 30 (1993) p.303
2. Takahashi Terumasa, " Actual physical therapy", Nanzando 1975
3. Yoshimoto Ichi, "The Power of physical therapy",Baifukan 1977
4. Arthoronix Sonotron Manual: Version 1.0 October 1, 1991
5. Clinical Rehabilitation: Vol. 1 No. 5, Ishiyaku Publications Co. Ltd, 1992
6. Clinical Nursing 9 Vol. 18 No. 10, 1992

\* Note: The translations for the references are to the translator's best knowledge accurate but may not exist in English.