

[Original Paper]

Do we really need steroids in nerve root block for lumbar disc herniation ? – A randomized control study

Yoshinobu Hagihara¹⁾, Satoshi Ogata²⁾, Atsushi Chuma¹⁾

Shinobu Saitoh¹⁾, Tetsurou Nakazawa¹⁾ and Toshikazu Kunishi¹⁾

¹⁾Department of Orthopedic Surgery, Japan Community Health care Organization (JCHO) Joto Tokyo Hospital, Tokyo 136-0071.

²⁾Division of Physical Therapy, Department of Rehabilitation, Faculty of Health Care Sciences, Chiba Prefectural University of Health Sciences, Chiba, 260-0801.

(Received January 26, 2016, Accepted February 9, 2016)

SUMMARY

118 patients with nerve root pain (lumbar pain and lower limb pain) of lumbar disc herniation (LDH) who visited our Hospital, were randomly divided into two groups and selective nerve root block (SNRB) was performed: Group S(+): Received concomitant administration of steroids with local anesthetic at the time of nerve root block; Group S(-): Received administration of local anesthetic alone at the time of nerve root block. Subsequently, Visual Analog Scale and Present Pain Intensity scores obtained before SNRB, 1 day, 1 hour and 1 week after SNRB were compared between the two groups.

There were no statistically significant differences in Visual Analog Scale and Present Pain Intensity scores obtained before SNRB, 1 hour and 1 week after SNRB between the Group S(+) and Group S(-). But there were statistical significant differences in Visual Analog Scale and Present Pain Intensity scores obtained 1 day after SNRB between the Group S(+) and Group S(-). These results do not support the concomitant administration of steroids in SNRB of LDH.

Key words: lumbar disc herniation, selective nerve root block, steroids

I . Introduction

When selective nerve root block (SNRB) is conducted in vertebral disease with radicular pain, it is still unclear which we should select concomitant use of local anesthetic and steroid or use of local anesthetic alone.

In “Japanese Orthopaedic Association (JOA) Clinical Practice Guideline on the Management of Lumbar Disc Herniation”, it is described that “epidural injection of corticosteroid is effective for pain relief in the early phase after start of treatment as an option of conservative treatment,”[1]but the necessity of concomitant use of local anesthetic and steroid in implementation of SNRB has not been described.

In our previous study, in conducting SNRB 94 times on 69 Japanese patients with vertebral disease

Address correspondence to Dr. Yoshinobu Hagihara.
Department of Orthopedic Surgery, Japan Community Health care Organization (JCHO) Joto Tokyo Hospital, 9-13-1 Kameido, Koutou-ku, Tokyo 136-0071, Japan.
Phone: +81-3-3685-1431. Fax: +81-3-3637-2739.
E-mail: yoshi37919@hotmail.com

Abbreviations: selective nerve root block: SNRB, lumbar disc herniation: LDH, Japanese Orthopaedic Association: JOA, Visual Analog Scale: VAS, Present Pain Intensity: PPI

showing radicular pain, the group using local anesthetic and steroid concomitantly and the group using local anesthetic alone were compared. As a result, there was no statistical significant difference between two groups. It was therefore considered that (1) in conducting SNRB, it is not necessary to use local anesthetic and steroid concomitantly, and the use of local anesthetic alone is sufficient. (2) The efficacy of SNRB may be exerted rather as a result of blockade of vicious cycle of pain because of pharmacological effects of local anesthetic instead of elimination of nerve root inflammation with steroid[2,3].

Since the patient population of our former study was not consisted only by lumbar disc herniation, the present study focuses on the patients with lumbar disc herniation. Also, the number of patients of this study surpasses that of the former one.

II. Materials and methods

Among the patients who visited the outpatient department of our hospital because of nerve root pain with low back pain between August 2003 and September 2011, 191 SNRB sessions performed in 118 patients who were found to have lumbar disc herniation (LDH) on MRI (the mean number of SNRB sessions performed per patient, 1.6) were targeted. The study population consisted of 71 men and 47 women aged between 17 and 83 (mean 46.7) years. The follow-up period was between 1 and 94 (mean 18.0) months. Postoperative patients were excluded.

On completion of the final follow-up (mean 18.0 months), 33 patients (28.0%) proceed with operative treatment, while 85 patients (72.0%) did not.

The presence of LDH was confirmed with 1.5T MRI equipment (Siemens, Erlangen, Germany) after the patient's first visit to our hospital. Then, the subjects were divided into 2 groups in a random manner according to whether their patient-care number was even or odd, and each group underwent SNRB as follows: the even-number group (Group S(+)) received 3 mL of local anesthetic (lidocaine hydrochloride) and 1 ml (3.3 mg) of steroid (dexamethasone) for SNRB,

How severe is your pain?		
Select the one you think is the most appropriate.		
1. No pain	2. Mild pain	3. Discomforting pain
4. Distressing pain	5. Horrible pain	6. Excruciating pain



Each rating is converted into the corresponding score for analysis.

1→0 point	2→1 point	3→2 points
4→3 points	5→4 points	6→5 points

Fig. 1 Present pain intensity (PPI) and method of its evaluation

A patient selects a number, which is converted to the corresponding point and used for analysis.

1. No pain → 0 point
2. Mild pain → 1 point
3. Discomforting pain → 2 points
4. Distressing pain → 3 points
5. Horrible pain → 4 points
6. Excruciating pain → 5 points

while the odd-number group (Group S(-)) received 4 mL of local anesthetic (lidocaine hydrochloride) alone for SNRB. Subsequently, Visual Analog Scale (VAS) scores and Present Pain Intensity (PPI) scores obtained before SNRB, 1 hour, 1 day and 1 week after SNRB were compared between the two groups. On the PPI scale, a rating of no pain was converted to 0 point, a rating of mild pain to 1 point, a rating of discomforting pain to 2 points, and so forth for statistical analysis (Fig. 1).

Data were analyzed with Mann-Whitney's U test, chi-square test for independence, and Fisher's exact probability test. The level of significance was set at $P \leq 0.05$. Data were expressed as mean \pm standard deviation. We use the analyzing soft, Stat-view4.02, on a computer.

Consent was obtained from each participant after detailed explanation of the study.

III. Results

1. Characteristics of patients in the Group S(+)

There were 38 men and 28 women aged between 17 and 83 (mean 44.0 ± 16.8) years. SNRB was performed only once in 42 patients and twice or more in 24 patients (Table 1). A total of 99 SNRB sessions were performed in 66 patients. The mean number of SNRB sessions performed per patient was 1.5. The VAS scores

Table 1 Characteristics of the patients

	S(+)	S(-)
Number of subjects	66	52
(Men: Women)	(38 : 28)	(33 : 19)
Age	17-83 years	19-82 years
(mean)	(44.0 ± 16.8)	(50.1 ± 17.9)
No. of nerve block sessions performed		
(mean)	(1.5 times)	(1.8 times)
Once	42	29
Twice or more	24	23
Operative Treatment	19	14
Conservative Treatment	47	38

were 5.94 ± 1.96 cm before SNRB, 2.35 ± 1.95 cm at 1 hour after SNRB, 2.76 ± 1.78 cm at 1 day after SNRB, and 2.11 ± 2.43 cm at 1 week after SNRB (Fig. 2). The PPI scores were 2.64 ± 1.04 points before SNRB, 1.03 ± 0.80 points at 1 hour after SNRB, 1.33 ± 0.71 points at 1 day after SNRB, and 1.47 ± 0.86 points at 1 week after SNRB (Fig. 3). On completion of the final follow-up (mean follow-up period 17.7 ± 25.1 months), 19 patients (28.8%) proceeded with operative treatment, while 47 patients (71.2%) did not. (Table 1).

2. Characteristics of patients in the Group S(-)

There were 33 men and 19 women aged between 19 and 82 (mean 50.1 ± 17.9) years. SNRB was performed only once in 29 patients and twice or more in 23 patients (Table 1). A total of 92 SNRB sessions were performed in 52 patients. The mean number of SNRB sessions performed per patient was 1.8. The VAS scores were 5.79 ± 2.48 cm before SNRB, 3.16 ± 2.72 cm at 1 hour after SNRB, 4.21 ± 2.49 cm at 1 day after SNRB, and 2.91 ± 2.68 cm at 1 week after SNRB (Fig. 2). The PPI scores were 2.62 ± 0.99 points before SNRB, 1.50 ± 1.09 points at 1 hour after SNRB, 1.94 ± 1.00 points at 1 day after SNRB, and 1.85 ± 1.00 points at 1 week after SNRB (Fig. 3). On completion of the final follow-up (mean follow-up period 19.3 ± 26.0 months), 14 patients (26.9%) proceeded with operative treatment, while 38 patients (73.1%) did not. (Table 1).

3. Statistical study

There were no statistical significant differences in

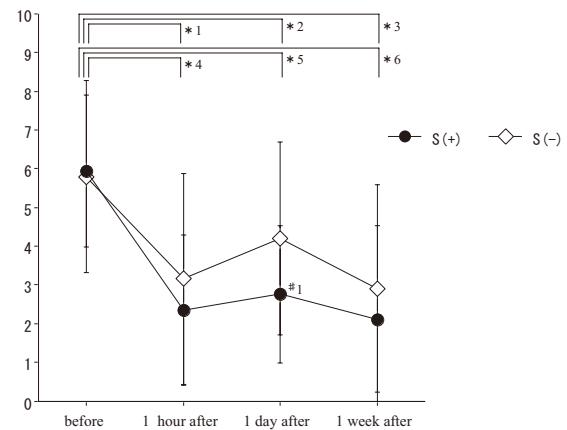


Fig. 2 Visual analog scale (VAS) score in all patients

● S(+): Time course of the VAS score in the Group S(+)

◇ S(-): Time course of the VAS score in the Group S(-)

No statistically significant differences were noted in the VAS scores between the Group S(+) and the Group S(-) before, at 1 hour or 1 week after lumbar selective nerve root block (SNRB), but statistically significant differences were noted in the VAS scores between the Group S(+) and the Group S(-) at 1 day after SNRB (#1). However, the VAS scores were significantly lower at 1 hour, 1 day and 1 week after SNRB than before SNRB in both the Group S(+) and the Group S(-) (*1, *2, *3 and *4, *5, *6).

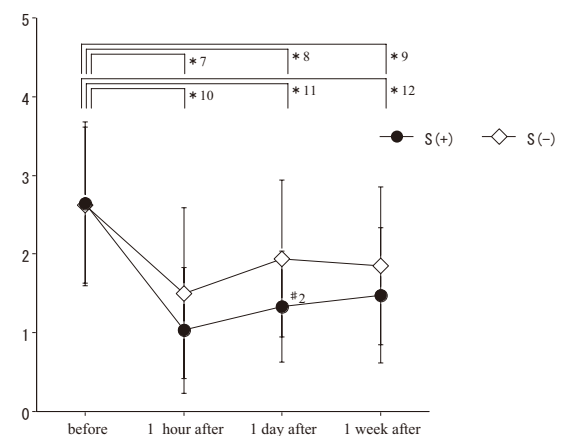


Fig. 3 Present pain intensity (PPI) scores in all patients

● S(+): Time course of the PPI score in the Group S(+)

◇ S(-): Time course of the PPI score in the Group S(-)

No statistically significant differences were noted in the PPI scores between the Group S(+) and the Group S(-) before, at 1 hour or 1 week after SNRB, but statistically significant differences were noted in the PPI scores between the Group S(+) and the Group S(-) at 1 day after SNRB (#2). However, the PPI scores were significantly lower at 1 hour, 1 day and 1 week after SNRB than before SNRB in both the Group S(+) and the Group S(-) (*7, *8, *9 and *10, *11, *12).

the male to female ratio, age, number of SNRB sessions performed, or VAS scores and PPI scores obtained before SNRB, 1 hour, and 1 week after SNRB between the Group S(+) and the Group S(-). But there were statistical significant differences in the VAS scores and PPI scores obtained 1 day after SNRB between the Group S(+) and the Group S(-).

There were no statistical significant differences in the follow-up period between the Group S(+) and the Group S(-). On completion of the final follow-up (mean 18.0 months), in the Group S(+), 19 patients (28.8%) were transferred to surgery, while 47 patients (71.2%) continued conservative therapy. In the Group S(-), 14 patients (26.9%) were transferred to surgery, while 38 patients (73.1%) continued conservative therapy. Again, there were no statistical significant differences.

The VAS and the PPI scores were significantly lower at 1 hour, 1 day and 1 week after SNRB than the scores before SNRB in both the Group S(+) and the Group S(-) (Figs. 2 and 3).

IV. Discussion

In conducting selective nerve root block (SNRB) on vertebral diseases showing radicular pain, it is still unclear which to select concomitant use of local anesthetic and steroid or use of local anesthetic alone.

The following reports have so far been available on the significance of the use of steroids for SNRB: (1) Among patients with radicular pain who had been recommended to undergo surgery, significantly fewer of them were transferred to surgery after receiving steroids in combination with local anesthetic than after receiving local anesthetic alone.[4] (2) Among patients with radicular pain, a group receiving local anesthetic in combination with steroids was compared with a group receiving local anesthetic in combination with physiological saline. It was found that the combination of medication was more effective on leg pain at 2 weeks after SNRB, while there were no significant differences at three months after SNRB.[5] (3) Patients with radicular pain who had unilateral symptoms who failed

conservative management were randomized for single injection with bupivacaine and methylprednisolone or bupivacaine only. There is no statistical significant difference in the outcome measure between the group of 3 months, no change of the Oswestry Disability index, no change in VAS in back pain and leg pain, no change in walking distance.[6] (4) It was reported in 40 Japanese patients with lumbar disc herniation that, when the group using local anesthetic and steroid concomitantly and the group using local anesthetic alone were compared, there was no significant difference in lower limbs VAS, SF12, and the Roland-Morris questionnaire about lumbago-related dysfunction after 3 months[7].

In the present study, the Group S(+) showed significantly better result at only 1 day after implementation in both VAS and PPI scores. There was no statistical significant difference in the VAS and PPI at the last time point of follow-up after 18.0 months on the average. From this point, it is considered that steroid is relatively short-acting and local anesthetic is relatively long-acting.

Moreover, there was no statistical significant difference in the frequency of SNRB and the proportion of therapeutic method at the last follow-up after 18.0 months on the average. That is, even if local anesthetic and steroid were used concomitantly at SNRB and even if local anesthetic was used alone, no difference occurred in therapeutic results.

From these points that have mentioned before, it is considered desirable to use local anesthetic and steroid concomitantly in expecting short-term pain relief and unnecessary to use these drugs concomitantly in expecting long-term therapeutic effect. Therefore, at SNRB expecting therapeutic result, it is considered unnecessary to use local anesthetic and steroid concomitantly but assumed sufficient to use local anesthetic alone.

On the mechanism of the onset of the therapeutic effect of SNRB without steroids, following studies are available: an increase in the blood flow in nerve roots caused by SNRB[8], an anti-inflammatory effect of local anesthetic[9], pain relief and interruption of the vicious cycle of pain by sensory nerve block[10], and

an anti-inflammatory effect. However, there are still unclear points.

It is also unknown why the use of local anesthetic alone provides prolonged relief. The pharmacological effects of local anesthetics last 5 to 6 hours at the most. Therefore, it is unlikely that the prolonged effect of SNRB is only attributable to the pharmacological action of local anesthetics.

Moreover, it is empirically considered that the clinical course of lumbar disc herniation is not bad. In “Japanese Orthopaedic Association (JOA) Clinical Practice Guideline on the Management of Lumbar Disc Herniation”, it is described that “the long-term natural course with no intervention of the treatment of lumbar disc herniation is unknown in a strict sense.” [11] During the present study period, spontaneously relieved lumbar disc herniation is also considered to be present, but since its natural course is unknown, this study was conducted assuming that the therapeutic effect of SNRB was reflected.

Pain stimuli are transmitted to the cerebrum involved in the perception of pain via afferent sensory nerves, while they excite efferent motor nerves and sympathetic nerves. They cause vasoconstriction and thus local ischemia temporarily with the defense mechanism of muscle tone and increased catecholamine secretion caused by stimulation of the adrenals. If pain stimuli continue for some time, they cause tissue hypoxia and an increase in cell membrane permeability, resulting in cytoclasis and release of algescic substances, such as prostaglandin and histamine, thereby increasing pain. This is the vicious cycle of pain [12]. Local anesthetics, with their pharmacological effects, affect sensory nerves and eliminate pain, act on motor nerves and reduce vellication, and affect sympathetic nerves and increase local blood flow. In short, local anesthetics break the vicious cycle of pain. [12] This mechanism seems to provide pain relief and help the body restore natural healing power, generating prolonged therapeutic effect.

The present study was conducted focusing on lumbar disc herniation for a relatively long period as about 8 years. In this study, as in the previous study, there was no difference in the relatively long-term therapeutic

result between the group using local anesthetic and steroid concomitantly at implementation of SNRB and the group using local anesthetic alone. It is therefore assumed that it is not necessary to use local anesthetic and steroid concomitantly at implementation of SNRB for lumbar disc herniation but use of local anesthetic alone is sufficient.

References

- 1) The Japanese Orthopaedic Association: Japanese Orthopaedic Association (JOA) Clinical Practice Guideline on the Management of Lumbar Disc Herniation, The Japanese Orthopaedic Association, Tokyo: Nankodo Co., Ltd, 2011: 53-6.
- 2) Hagihara Y, Hirayama H, Koyama T, Watanabe E. A study of the effect of steroids in lumbar nerve-root block. *Seikei-Geka* 2007; 58: 125-30 (in Japanese).
- 3) Hagihara Y, Ogata S, Hirayama H, Koyama T, Watanabe E. Why use steroids in lumbar selective nerve root block ? – A randomized control study. *Chibaigaku* 2009; 85: 71-6.
- 4) Riew KD, Yin Y, Gilula L, Bridwell KH, Lenke LG, Lauryssen C, Goette K. The effect of nerve-root injections on the need for operative treatment of lumbar radicular pain. A prospective, randomized, controlled, double-blind study. *J Bone Joint Surg* 2000; 82-A: 1589-93.
- 5) Karppinen J, Malmivaara A, Kurunlahti M., Kyllonen E, Pienimäki T, Nieminen P, et al. Periradicular infiltration for sciatica: a randomized controlled trial. *Spine* 2001; 26: 1059-67.
- 6) Ng L, Chaudhary N, MARS, Sell P, FRCS, MRCS. The Efficacy of Corticosteroids in Periradicular Infiltration for Chronic Radicular pain. *Spine* 2005; 30: 857-62.
- 7) Yabuki S, Kikuchi S. Nerve root infiltration and sympathetic block. An experimental study of intradiscal blood flow. *Spine* 1995; 20: 901-6.
- 8) Konno S, Kikuchi S. Therapeutic effect on nerve root block for patients with lumbar disc herniation. *J. Lumbar Spine Disord* 2003; 9: 89-94 (in Japanese).
- 9) Yabuki S, Kawaguchi Y, Nordborg, Kikuchi S, Rydevik B, Olmarker K. Effects of lidocaine on nucleus pulposus-induced nerve root injury. *Spine* 1998; 23: 2383-89.
- 10) Hasue M. Pain and the nerve root. *Spine* 1993; 18: 2053-58.
- 11) The Japanese Orthopaedic Association: Japanese Orthopaedic Association (JOA) Clinical Practice Guideline on the Management of Lumbar Disc Herniation, The Japanese Orthopaedic Association, Tokyo: Nankodo Co., Ltd, 2011: 7-17.
- 12) Tokuhashi Y, Matuszaki H, Nemoto Y. Nerve Block for Low Back Pain. *Spine & Spinal cord* 2000; 13: 614-20 (in Japanese).