

요추간반 탈출증에서 적외선 체열 촬영과 통증 척도와의 상관 관계

장호열 · 진동규 · 조용은 · 김영수

= Abstract =

Correlation between Pain Scale and Infrared Thermogram in Lumbar Disc Herniations

Ho-Yeol Zhang, M.D., Dong-Kyu Chin, M.D.,
Yong-Eun Cho, M.D., Young-Soo Kim, M.D.

Spine Center, Department of Neurosurgery, Yongdong Severance Hospital,
Yonsei University College of Medicine, Seoul, Korea

Back pain and radiating leg pain due to compression of the nerve root by the lumbar disc herniation are subjective symptoms. Objective evaluation of pain site and severity is important for the diagnosis and the treatment. We evaluate the correlation between the severity of pain and the temperature changes in the patients of lumbar disc herniations using infrared thermograms.

174 consecutive patients who underwent operation or chemonucleolysis for single level unilateral disc protrusion with ipsilateral leg pain were included in this study. Subjective pain was divided four groups(Group Ⅰ; mild pain, Group Ⅱ; moderate pain, Group Ⅲ; severe pain, Group Ⅳ; intractable pain). Thermal differences of each group were as follows; Group Ⅰ was 0.26, Group Ⅱ was 0.39, Group Ⅲ was 0.60 and Group Ⅳ was 0.98. Disc protrusions were divided three groups. Thermal differences of each group were as follows; mild protrusion group was 0.52, moderate protrusion group was 0.79 and severe protrusion group was 0.95. Duration of symptom was divided four groups and each thermal differences were as follows; under 2 months was 0.87, 2 to 6 months was 0.71, 6 to 12 months was 0.50 and more than 12 months was 0.47. All these data were statistically significant in $p < 0.01$.

In conclusion, infrared thermal imaging can demonstrate the subjective pain objectively. The discogenic pain is the more severe, or the disc herniation is the more protruded, or the symptom duration is the shorter, the thermal difference between the both legs is the more significantly prominent. Thermal difference between both legs is a useful pain scale in the herniated lumbar disc patients. Infrared thermal imaging is effective in the evaluation of lumbar discogenic pain.

KEY WORDS : Infrared thermogram · Lumbar disc herniation · Pain scale · Thermal difference.

서 론

가 가

가 가

가 .

¹⁾,

CT

가
 21) mm
 2)6)21) 가
 12) 가
 1956 가
 13) 가
 2)3)10)11)15)19)22) 가
 (thermatome) 9)11) 가
 10) 가

대상 및 방법

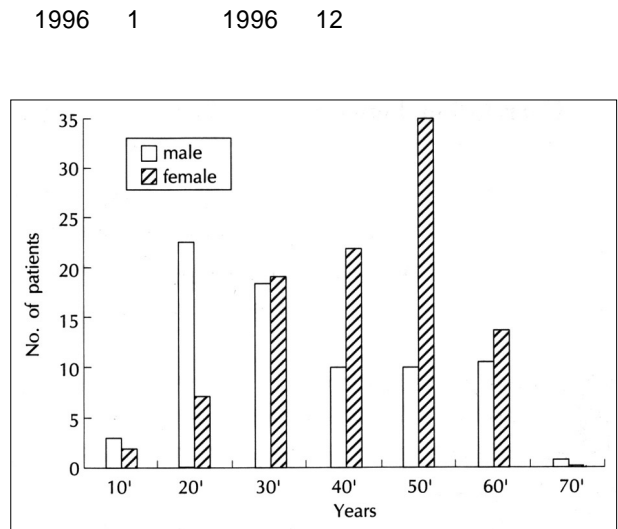


Fig. 2. Painful areas were drawn with color pens and pointed numeric scale at the pain chart. 8 points is included Group (severe) pain. Lumbar CT shows that L4/5 disc herniation is included in moderate disc protrusion group. DITI shows severe right leg hypothermia especially right calf. Thermal difference between the point A and B(A : 24.75 , B : 23.99) is 0.76 .

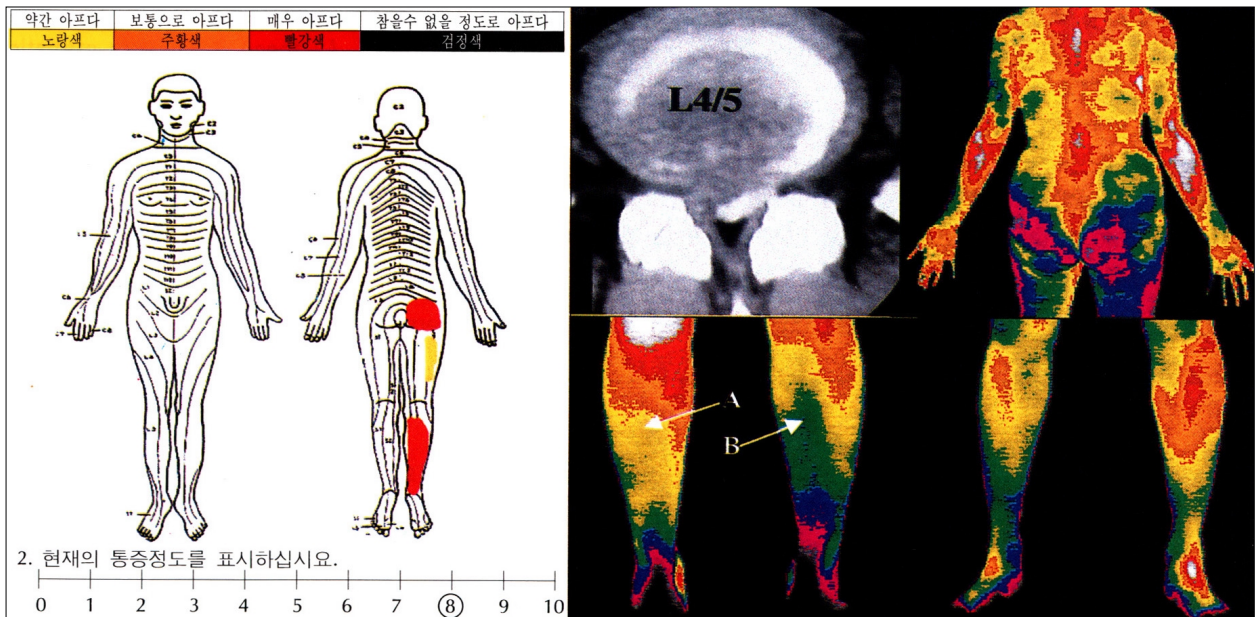


Fig. 1. Patients demographics shows 174 consecutive patients who underwent operation or chemonucleolysis for single level unilateral disc protrusion with ipsilateral leg pain(mean age : 43.4 years, range of age : 15-72 years, 72 males and 102 females).

174
43.4 (72)
102 , : 15 72) (Fig. 1).

1. 적외선 체열 촬영 및 온도 측정

1) 적외선 체열 촬영

가 19
21
(Dorex Inc, West Collins, U.S.A.)

15

2) 온도 측정

가 가 가
(Fig. 2).

2. 환자의 주관적 통증에 따른 분류

(Fig. 2) 가 가
가 (: 0 , : 10)
4 (mild pain) Group (0, 1, 2),
(moderate pain) Group (3, 4, 5),
(severe pain) Group (6, 7, 8) (intractable pain) Group (9, 10)

3. CT 혹은 MRI 소견에 따른 분류

CT MRI
(mild protrusion ; 1/3),
(moderate protrusion ; 1/3 1/2

Table 1. Thermal difference with subjective pain(p<0.01)

Group	No. of patients	Thermal differences (mean ± SD,)
Group	29	0.26 ± 0.10
Group	57	0.39 ± 0.19
Group	68	0.60 ± 0.26
Group	20	0.98 ± 0.41
Total	174	0.51 ± 0.32

(severe protrusion ; 1/2)

4. 증상의 기간에 따른 분류

4 , 2
, 2 6 , 6 12 , 12 4

5. 분석

가
paired t - test

결 과

1. 온도차와 환자의 주관적 통증

가 4
(Table 1). Group 29 (17%) , Group 57 (33%), Group 63 (39%) Group 20 (11%)
가 Group 0.26 ± 0.10
, Group 0.39 ± 0.19 , group 0.60 ± 0.26 , Group 0.98 ± 0.41 (Fig. 3).
가
가 (p<0.01). 2.

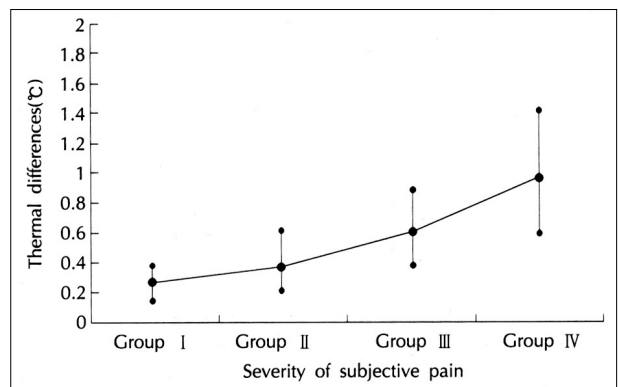


Fig. 3. Thermal differences with subjective pain. These data show that the discogenic pain is the more severe, the thermal difference between the both legs is the more significantly prominent. These were statistically significant (p<0.01).

Table 2. Thermal difference with degree of disc protrusion (p<0.01)

Disc protrusion	No. of patients	Thermal differences (mean ± SD,)
Mild protrusion	46	0.52 ± 0.21
Moderate protrusion	71	0.79 ± 0.31
Severe protrusion	57	0.95 ± 0.42

3 (Table 2).
 46 (26%), 57 (33%)
 0.79 ± 0.31
 0.95 ± 0.42 (Fig. 4).
 가
 (p<0.01).

3. 온도차와 증상의 기간

4 (Table 3).

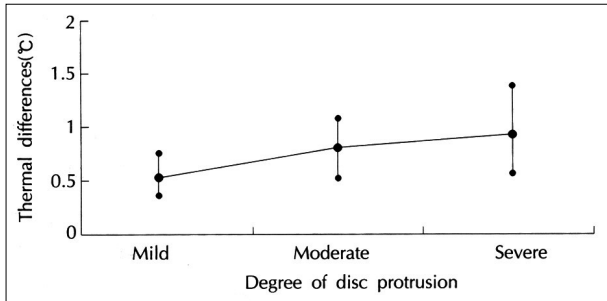


Fig. 4. Thermal differences with degree of disc protrusion. These data show that the disc herniation is the more protruded, the thermal difference between the both legs is the more significantly prominent. These were statistically significant (p<0.01).

Table 3. Thermal difference with duration of symptoms

Duration (months)	No. of patients	Thermal differences (mean ± SD, °C)
<2	27	0.87 ± 0.45
2 ~ 6	51	0.71 ± 0.43
6 ~ 12	49	0.50 ± 0.21
12 <	47	0.47 ± 0.19

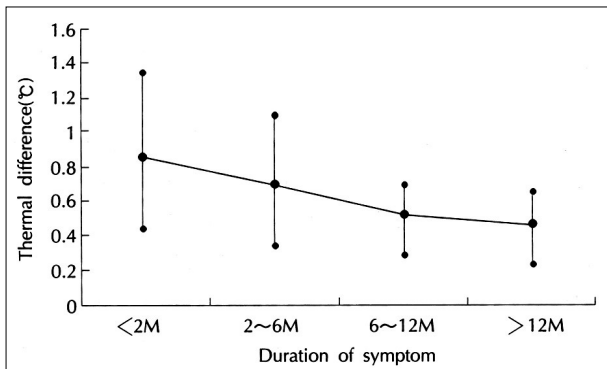


Fig. 5. Thermal differences with duration of symptom. These data show that the symptom duration is the shorter, the thermal difference between the both legs is the more significantly prominent. These were statistically significant (p<0.01).

2 27 (15.5%)
 6 51 (29.3%), 6 12 49
 (28.2%), 12 (27.0%) 47
 가 2 가
 , 2 6 0.71 ±
 0.43 , 6 12 0.50 ± 0.21 , 12
 0.47 ± 0.19 (Fig. 5).
 가
 (p<0.01).

고 찰

16)17)20). 가
 , CT MRI
 가
 가
 1).
 가
 (disc-ography) 가
 1948 Lindblom
 14).
 (pain provocation rate)
 76.3% 가³⁾ , Holt 37%
 (false positive) 7)
 Mooney 17)24)
 가
 가 가
 가
 10
 (denervation potential)가
 18),

(sweat gland)

18)

11) 가 가

4)8) 3, 7, 9 10 가

(level) 가

가 가 (autonomic reflex arc)

가 가 (receptor) (input)

10) 가 가 (reflex arc) (vi-

2)3)10)11)23) 가 (sceromotor activity)

가 가

(afferent input) (output)

(efferent output) 가 가

2)6)21)

(antidromic stimulation)

(recurrent meningeal nerve)

(somatosympathetic reflex)

11) 가 가 4)

(ventral ramus)

11) 가 가 5)8)

Duus 4) (spinal gan - (secondary gain),

glion) (somatic motor neu -

ron) (white rami com - 5)8)

municans) (sympathetic trunk) 8)

(postgang - 가

lionic neuron) (synapse)

(level)

(gray rami communicans)

(dermatome) 가 가

6 12 12

가
6
결 론

1) 가
2) 가
3) 가
4) 가
가
가
• : 1998 11 21
• : 1998 12 21
• : 404 - 230 가 511 - 6
: 032) 572 - 7501(225)
: 032) 582 - 7888
E - mail : daehan@snu.ac.kr

References

1) Boden SD, Davis DO, Dina TS, et al : *Abnormal magnetic-resonance scans of the lumbar spine in asymptomatic subjects. A prospective investigation. J Bone Joint Surg (Am)* 72 : 403-408, 1990
2) Cho J, Moon CT, Nah JH, et al : *Postoperative evaluation of lumbar disc herniation using digital infrared thermographic imaging. Journal of Korean Neurosurgical Society* 20 : 528-534, 1991
3) Cho YE, Kim YS, Zhang HY : *Clinical efficacy of digital infrared thermographic imaging in multiple lumbar disc herniations. Journal of Korean Neurosurgical Society* 27 : 237-245, 1998
4) Duus P : *Topical Diagnosis in Neurology. Translated Lindenberg R. New York : George Thieme Verlag, 1983, pp293-299*
5) Fields HL, Basbaum AI : *Central nervous system mechanisms of pain modulation, in Wall PD, Basbaum AI(eds) : Textbook of pain, ed 2. Edinburgh, Churchill Livingstone, 1994, pp243-257*
6) Gandhavadi B, Rosen JS, Addison RG : *Autonomic pain. Fe-*

atures and methods of assessment. Postgrad Med 71 : 85-90, 1982
7) Holt EP Jr : *The question of lumbar discography. J Bone Joint Surg (Am)* 50 : 720-726, 1968
8) Hooshmand H : *Chronic Pain : Reflex Sympathetic Dystrophy. Prevention and Management. CRC Press, 1993, pp33-55*
9) Jinkins JR, Whittemore AR, Bradley WG : *The anatomic basis of vertebrogenic pain and autonomic syndrome associated with lumbar disk extrusion. Am J Roentgenol* 10 : 219-231, 1989
10) Kim YS, Cho YE : *Pre- and postoperative thermographic imagings in lumbar disc herniations. Journal of Korean Neurosurgical Society* 22 : 71-82, 1994
11) Kim YS, Cho YE, Zhang HY : *Thermatomes of the Lumbosacral Nerve Roots. Journal of Korean Neurosurgical Society* 24 : 33-46, 1995
12) Lawson C : *The validation of thermology. The American Chiropractor* 2 : 1-6, 1987
13) Lawson R : *Implications of surface temperatures in the diagnosis of the breast cancer. Canad M Ass J* 75 : 309-310, 1956
14) Lindblom K : *Diagnostic puncture of intervertebral disc in sciatica. Acta Orthop Scand* 25 : 195-212, 1948
15) Mills GH, Davis GK, Getty CIM, et al : *The evaluation of liquid crystal thermography in the investigation of nerve root compression due to lumbosacral lateral spinal stenosis. Spine* 11 : 427-432, 1986
16) Mooney V : *When is surgery appropriate for patients with low back pain? J Musculoskel Med* 7 : 61-85, 1990
17) Mooney V, Saal JA, Saal JS : *Evaluation and treatment of low back pain, in Moore TH, Bean KJ(eds) : Clinical Symposia 48 (4), Ciba-Geigy Co., 1996, vol 48 (4), pp17*
18) Oh SJ : *Clinical electromyography : Nerve conduction studies, ed 2. Williams and Wilkins, 1993, pp26-38*
19) Pochaczewsky R, Wexler CE, Meyers PH : *Liquid crystal thermography of the spine and extremities. Its value in the diagnosis of spinal nerve root syndromes. J Neurosurg* 56 : 386-395, 1982
20) Saal JA, Saal JS : *Nonoperative treatment of herniated lumbar intervertebral disc with radiculopathy. An outcome study. Spine* 14 : 431-437, 1989
21) Snellen JW : *Mean body temperature and the control of thermal sweating. Acta Physiol Pharmacol Neer* 14 : 99-104, 1966
22) Takahashi Y, Takahashi K, Moriya H : *Thermal deficit in lumbar radiculopathy. Correlations with pain and neurologic signs and its value for assessing symptomatic severity. Spine* 19 : 2443-2449, 1994
23) Uematsu S : *Thermography, in Youmanns(ed) : Neurological Surgery, ed 3. Saunders, 1990, pp500-503*
24) Walsh TR, Weinstein JN, Spratt KF, et al : *Lumbar discography in normal subjects : a controlled prospective study. J Bone Joint Surg (Am)* 72 : 1081-1088, 1990