

Benefits of the Various Pain Procedures as Therapeutic Option in Low Back Pain

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Objective : The authors retrospectively evaluate the benefits of the various pain procedures for the treatment of low back pain unresponsive to conservative management.

Methods : Over a period of 2 years from May 2002 and June 2004, the authors had performed various pain procedures on 106 patients with low back pain. Epidural block, facet joint block, sacroiliac joint block, and myofascial block were included among various pain procedures. The pain improvement, period of analgesic use, and degree of satisfaction were evaluated 1 day, 4 weeks, and 6 months after injections. The outcome of pain procedures was analyzed by using a modified Macnab criteria.

Results : Sixty-four patients had a single procedure with no combination and 42 patients (39.6%) received the combination of the various pain procedure. Regardless of the single or combination cases of procedure, combination of appropriate spinal level on each procedure was conducted in 104 (98.1%). Mean follow up period was 12.2 months. Eighty-two patients (77.4%) experienced significant pain relief and overall analgesic medication was reduced in 91 patients (85.8%) at 6 months after procedure. Unfavorable results were demonstrated in 10 patients. Permanent procedural complications did not occur.

Conclusion : The various pain procedures are the possible therapeutic option for low back pain unresponsive to conservative management including medication or physical therapy.

KEY WORDS : Low back pain · Combined nerve block.

Introduction

Low back pain is one of the most common pain disorders^{1,7-9,18}. The causes of low back pain are various^{3,6,9,10}. Low back pain can originate from several sources, such as discs, ligaments, muscles, lumbar facet joint, and sacroiliac joints^{3,16}. Various treatments have been applied according to each cause⁸. However the effects of the treatment have not been satisfactory so far especially in the old age groups. Factors such as benefit-risk and cost-effectiveness must be carefully considered in choosing a therapeutic option of physical therapy, pain procedures, or surgery for low back pain⁶.

There are many pain procedures attempted in relieving low back pain of these patients. Epidural block⁵, facet joint injection¹¹, epidural and facet block combination⁸, percutaneous radiofrequency neurotomy⁷, and routine combined nerve block⁹ have been introduced. The authors had hypothesis that the outcome would be better if the various pain procedures

could be specifically applied to each patients. We thought low back pain could be better controlled by the various pain procedures such as epidural steroid injection, facet joint block, sacroiliac joint block, and myofascial block depending on the each patient's symptoms and signs, and other factors such as radiologic findings. In this study, we have evaluated benefits of the various pain procedures.

Materials and Methods

Patient population

One hundred-nine patients had undergone the various pain procedures in our hospital between May 2002 and June 2004. Three patients were excluded because they required surgery less than 6 months after pain procedure. Two underwent partial hemilaminectomy and one, vertebroplasty. Therefore, the study was comprised of 106 patients. The subjects were 43 men (40.6%) and 63 women (59.4%), with a mean age of

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64.2 years, ranging from 29 to 91 years. Seventy-three patients (67%) were over 60. The total number of the facet joints receiving injections was 806 during 126 sessions. All patients were observed for a period of more than 6 months (mean 12.2 months) after the last injection.

The patients who had suffered from persistent low back pain with or without leg pain in spite of drug medication or physical therapy more than 4 weeks were included. The patients who had neurologic deficits or definitive surgical indications were excluded. The patients who had serious medical problems such as chronic obstructive pulmonary disease, myocardial infarction, uncontrolled DM, refuse operation, or elderly (more than 65 years) when they had only pain without neurologic deficits although they had surgically correctable structural spinal pathology were included. Underlying spinal pathology was lumbar spondylosis (27/106, 25.5%), lumbar stenosis (18/106, 17.0%), facet syndrome (16/106, 15.1%), degenerative disc disease (14/106, 13.2%), herniated lumbar disc including bulging type and protruded type (13/106, 12.3%), osteoporotic compression fractures (7/106, 6.6%), myofascial pain syndrome (6/106, 5.7%), failed back surgery syndrome (3/106, 2.8%), and degenerative spondylolisthesis (2/106, 1.8%).

Various pain procedures

Facet joint block : Patients were placed in prone position and prepared aseptically. The 23-gauge spinal cannula was introduced approximately 5 to 8cm laterally from the spinous process at the target level. Radiological documentation was performed during all injections using fluoroscopy. We preferred to use a 5.5cc mixture of combination (5cc of 0.5% of bupivacain and 0.5cc of 80mg methylprednisolone acetate) per one level.

Epidural block : The patient was placed in decubitus position. Using fluoroscopy for guidance, we directed 23-gauge spinal needle to the epidural space. The syringe was slowly pushed intermittently to find out the exact epidural space. When we met the moment of the sudden negative pressure with feeling of the syringe, we injected the mixture (3cc of 0.5% of bupivacain, 0.5cc of 80mg methylprednisolone acetate, and 5cc of normal saline) per one level.

Sacroiliac joint block : A 23-gauge spinal needle was directed to the sacroiliac joint using fluoroscopic guidance into the joint¹⁵⁾. One or both sides of joints could be injected depending on location of pain.

Myofascial block : Trigger points which are extremely sore points occurring in taut bands throughout the body were investigated on physical examination and they were injected.

All procedures were monitored for possible side effects, and changes of vital signs and symptoms during the whole process. The patient was observed for 1 hour.

Combination of the various pain procedures

All patients were examined thoroughly before the procedure and discussed about the selection of the procedure and level at the conference. Lumbar CT scans including bone-window sequences were taken in all patients to identify the structural abnormalities. According to the finding of the each patient, various combination of procedures or the appropriate level were selected.

The procedure was chosen depending on patient's symptom preferentially. Epidural block was preferred in the patient with leg pain predominantly rather than back pain. We preferred facet joint block in the patient who complained of low back pain more than leg pain primarily. When they had pain on getting up or extension and transitional movement and radiating pain on buttock and /or posterior thigh, facet joint block was chosen. When they complained of prominent local tenderness (the trigger point) of low back area, myofascial block was chosen. Sacroiliac joint block was done to the patient with buttock musculature or sacroiliac joint tenderness.

The appropriate spinal level was also localized depending on symptoms and signs. The interspinous tenderness on physical examination was chosen for the target level of facet block. If the tender level was multiple, the multiple target were chosen. It was helpful to select the target level whether symptomatic level is compatible with the structural abnormality in lumbar CT scanning such as disc space narrowing, vacuum facet, vacuum disc, or facet hypertrophy.

Analysis method

The response of the pain procedures was analyzed according to a questionnaire given to the patient after the injection. Items included a self-rating assessment of the pain improvement, period of analgesic use, and degree of satisfaction. We used a modified Macnab criteria for evaluating the results¹²⁾. This system requires each patient to be assigned to one of four categories, each of which is defined by the description of residual pain and the capacity for normal activity. To analyze the data numerically, each of these categories was assigned a value from 1 (poorest grade) to 4 (best grade). The results of the various procedures were classified as follows : Excellent (4) - Minimal pain, minimal restriction of activity, return to normal work and activity ; Good (3) - Relief of presenting symptoms, return to modified work or his capacity to enjoy himself in his leisure hours ; Fair (2) - Some improved functional capacity, but handicapped by intermittent pain of sufficient severity to curtail or modify work or leisure activities ; Poor (1) - No improvement or insufficient improvement to enable increase in activities and further operative intervention required. Age, the duration of hospitalization, and amount of used steroid dose were investigated. In a statistical analysis of the data we performed the

paired t-test or analysis of variance(ANOVA), with significance set at a probability value less than 0.05.

Results

Pain procedures

The whole procedure took 15 to 33 minutes (mean 24.2 minutes). The injection was performed once in 91 patients (85.9%), twice in 10 patients (9.4%), and three times in 5 patients (4.7%) (Table 1).

Sixty-four patients (60.4%) had a single procedure with no combination (2 epidural block, 58 facet joint block, 2 myofascial block). Among them, one spinal level was performed in 11 patients (2 epidural block, 9 facet joint block). Most of them (49 patients) were operated on multiple spinal level in the single procedure of facet joint block. The combination of various procedures was operated on 42 patients (39.6%). On

Table 1. Summary of the various procedures

Procedure	Number		
	1st	2nd	3rd
E	2	—	—
F	58	6	2
M	4	2	—
E + F	4	1	—
E + M	1	—	—
F + M	15	2	2
F + S	17	4	—
S + M	2	—	—
E + F + M	1	—	—
E + F + S	1	—	—
F + M + S	1	—	1
Total	106	15	5

E : Epidural block, F : Facet joint block, M : Myofascial block, S : Sacroiliac joint block

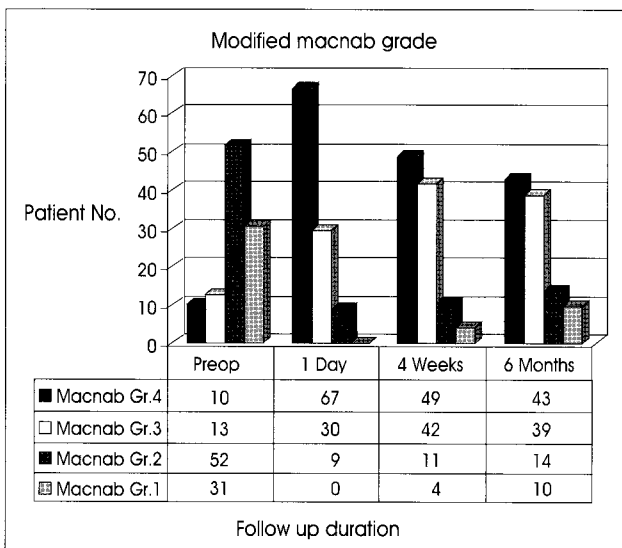


Fig. 1. Result of the various pain procedures (n=106).

second session, the injection was performed twice in 10 (9.4%), and three times in 5 patients (4.7%).

The most common procedure was the facet joint block at multiple spinal level (49/106, 46.2%). The most common combination of various pain procedures was the facet joint block and the sacroiliac joint block (16.0%). The spinal level treated was most common in L4-5 and L5-S1 (56%), second was L3-4, L4-5, and L5-S1(31%).

Pain improvement

Outcome was analyzed in the 106 cases in which 6 months follow-up data were collected and determined by applying a modified Macnab criteria. The mean Macnab grades before procedure and at 6 months follow-up period were 2.02 and 3.08 (p<0.05). At postoperative 1 day, a grade of 4 was assigned to 67 cases (Fig. 1). Six months later 27 cases out of 67 were changed to followings : 20 cases to grade 3, 4 cases to grade 2, 3 cases to grade 1. Eighty-two patients (77.4%) experienced Macnab grade 3 and Macnab grade 4 at 6 months after procedure. Ten patients (9.4%) have poor results. Although seven of them had repeated procedures, any of them was not improved.

Overall analgesic medication was reduced in 91 (85.8%) of 106 patients after various pain procedures. Twenty-two patients (20.8%) gave up analgesics medication and 31 (29.2%) patients decreased on half dose medication. According to the questionnaires, pain of half patients were maintained with same dose medication. Pain improvement was not significantly different according to the underlying disease (p=0.46). Impressively 5 cases of compression fracture were able to stand up and walk independently within 1 week after procedure.

Analysis of poor responder

At 6 months follow-up, 10 patients had modified Macnab grade 1 (Table 2). Three patients had taken procedure once. Five had taken procedure twice and 2 of them had three times. Most of them did not respond to multiple procedures. They had mostly underlying condition such as hypertension, diabetes mellitus, asthma, malignancy, and manic depressive disease. Seven of 10 patients were over 60 years old. The remainders were compression fracture caused by metastatic spinal tumor, manic-depressive disorder, industrial disaster insurance, and spondylolisthesis with mild segmental instability.

Risk and benefit

Hospital day : Mean hospital day was 8.2 days. Ninety-one patients (86.8%) were hospitalized during less than 8.2 days (mean duration of admission). Fifteen patients (14.2%) were stayed in the hospital more than 3 weeks. These patients had medical disease, insurance, or economical problem.

Table 2. The clinical features of 10 patients with poor outcome (Macnab grade 1)

Case	Diagnosis	Age/Sex	Symptom and sign	Associated condition	Macnab grade		
					1 day	4 weeks	6 months
1	FBSS	M/65	Localized LBP	L-instrumentation	2	2	1
2	FBSS	M/70	Localized LBP	L-instrumentation	2	3	1
3	Compression Fx	M/45	Diffuse LBP	Manic depressive disorder	3	2	1
4	Compression Fx	M/48	Uncontrolled LBP	Bony metastases	3	2	1
5	Spinal stenosis	F/76	Chronic LBP	DM, HTN, RA	3	3	1
6	Spinal stenosis	F/73	LBP, NIC	COPD, CRF	4	2	1
7	Spondylolisthesis	M/76	Chronic LBP	Asthma	3	2	1
8	Spondylosis	M/80	LBP	Pulmonary tuberculosis	4	3	1
9	Spondylolisthesis	F/56	Chronic LBP, NIC	CHF	4	3	1
10	Compression Fx	F/75	Chronic LBP	COPD	2	3	1

FBSS : failed back surgery syndrome, Fx : Fracture, LBP : low back pain, DM : diabetic mellitus, HTN : hypertension, RA : rheumatoid arthritis, NIC : neurogenic intermittent claudication, COPD : chronic obstructive pulmonary disease, CRF : chronic renal failure, CHF : congestive heart failure

Cost : Mean cost was approximately as 20~25% of physical therapy including hot pack, ultrasonography, and transcutaneous electrical nerve stimulation for 2 weeks. It took 1/20 -1/24 of the total cost of the one-level hemilaminectomy.

Radiation exposure : C-arm (Philips medical system®) was used for fluoroscopic guidance during procedure. The mean value of beam-on time (time during which radiation is applied to the patient) was 7.3 seconds (range 0 - 62 seconds). The operator and an assistant had been shielded with apron, and neck shielding. Any side effect have not been identified such as cataract, dermatologic problems, malignancies during follow up periods.

Steroid dose : We used 40~80mg dose of steroid (Depo-Medrol®) per one session in each injection. The serum glucose level in the diabetic was raised in 5 cases but no clinical symptoms were occurred. Elevated blood pressure, headache, or allergic reaction were not found in the patient¹³.

Complication : Permanent complications related to the procedure were not occurred. Five patients (4.3%) were reported a transient increase of pain directly after the injection. Two patients (1.7%) suffered from transient hypesthesia for 2 weeks. One patient experienced transient weakness during epidural block. But the patients recovered 12 hours later. Some minor complications were witnessed such as hot flushing in 2 patients, headache in 2 patients, and transient lower leg weakness in 1 patients, which lasted for a short period. Infection or symptomatic hematomas, or systemic complication such as pneumothorax, hemothorax, abscess, vasovagal reaction, and adrenal crisis were not occurred.

Discussion

Based on the research of the United States, 70~85% adults have experienced pain in their back⁵⁻⁷. This is similar

to Korea, as most of the patients suffer backache⁷. As old age population and the consumption of medical expenses increases, the society is focusing on the treatments of back pain and this treatment enables adults to have a successive society life^{8,9}.

Low back pain has various causes^{2,6-8,12}. The tissue damage or inflammation is likely to cause release of the content of the joint in which highly tissue-irritating properties affect the nerve endings in these joints, which results in low back pain^{1,3,4,8,10,16}. The pain can be generated either at the single origin or multiple causes^{8,9}. It is difficult to explain by only a single factor¹⁶. The causes of low back pain could not be often predicted clinically^{9,11}. Also there can be many different causes for a single person. Low back pain is frequent with multiple causes simultaneously in old age group⁸. Therefore multiple approaches are needed to multiple causes^{4,6,7,9,12}. It makes sense that when the patients have multiple causes of low back pain, the combinations of multiple pain procedures will be effective. To increase the success rate of the treatments when the patients have multiple causes of low back pain, combinations more than one existing methods are acceptable.

Treatment modality for low back pain includes from conservative management to invasive surgery^{7,10,17}. Surgical therapy for low back pain patients included fusion, artificial disc, percutaneous radiofrequency neurotomy, and intradiscal electrothermocoagulation. However, there are many limitations to apply all of the patients. Some patients complain chronic low back pain without definitive surgical abnormalities even the continuous conservative management. The surgical option is mostly not satisfactory in the old age group¹⁴.

Some advocate that selective procedure such as selective nerve block is fit for selective person or disease^{7,11,15}. This is acceptable on the premise that one person has one cause of low back pain. Others insist that combined nerve block^{9,14} is more effective when multiple procedures is routinely applied to everyone. Of course, it is assuming that one person has more than two cause of low back pain. Especially in the old age groups with chronic low back pain have tendency of having multiple causes. We tried to add the concept of 'the selectiveness' to combined nerve block. The selectiveness meant the combination of the levels or procedures to fit for each patients. The authors thought if the treatment method should be properly selected in each patients the outcome would be better. The

key was that combination of various pain procedures or appropriate spinal level was properly fit for each patients. We made efforts to set up the principles on the combination of the levels or procedures to fit for each patients. Repeated history taking and physical examination, and special radiologic study (three dimension computed tomography) helped us to choose the better selection of the procedure and the appropriate spinal level¹¹. The procedure might be possible option to satisfy many needs of the patients who suffer from chronic low back pain.

The combination of various pain procedures could be preferred before the spinal surgery. According to the authors' opinion, the merits of the various pain procedure are prominent in old age groups. Mooney et al.¹¹ reported that the success of facet joint injection achieved in 14 patients (28.0%) with total relief of pain at six months. The effect of routine combined nerve block was reported to 68.0% of overall rate of improvement⁹. According to the our study, 77.4% of patients after selective combination of various nerve block had pain improvement. But this therapeutic option has been not satisfactory to all of the low back pain patients. In our study, 24 patients (22.6%) had not be satisfied. Especially, patients who had failed back surgery syndrome and structural spine pathology such as spondylolisthesis or compression fracture showed poor results (Table 2).

The procedure had some advantages and can help the patients in many ways. They are simple, minimal invasive, and saving the cost^{1,7-9,11,14}. They have low possibility of complication. During these procedures the exact origin causing pain would be found⁶. The patients may feel comfortable when they are informed that the treatment is simple. This procedure can be done repeatedly. Because it is focused on the alleviation of pain and physical improvement such as walking, sleeping and reduction of drug taken, it eventually intends to help patients have a normal life and leisure. This can be a recommended at the aged group who good results can not be predicted with surgery. Even with 2 procedures in one session, the time for the treatment did not increase. We took 15 to 33 minutes (mean 24.2 minutes) for pain procedure. It is not difficult to decide 2 procedures. In this way, it can save a lot of trouble for the patients. Especially, Spinal 3D-CT (GE light speed plus[®]) was very helpful^{15,16}. This study takes only 3-5 minutes. The patients who has difficulty to lie for a long period such as claustrophobia are easy to take this examination than magnetic resonance image.

However, the single or combination of various pain procedures has many pitfalls and other developing problem. First, selection of pain procedure or appropriate level can not be objective because the choice can be based on subjective experiences. Also, we tried hard to set up the correct principle of selective combination of procedures or levels. However, it

still seems to be subjective. Nevertheless, the improvement of the selection principle is inevitable to increase the efficacy of these procedures rather than other routine combined nerve block. Second, it is not therapeutic trial of underlying disease but the means of symptom relief. This treatment can't be the optimal solution in case of changed anatomical structures. It is only limited as adjuvant therapeutic modality. Third, the procedure skill is required. Despite carefulness in inserting the spinal needle, the risk of dura puncture is possible. In our study, all except 2 epidural block and 6 myofascial block were performed by fluoroscopic guidance. It requires the prone position compressing chest content. There are many cases of having numerous medical problems in the old age group. The patients who suffer from compression fractures that cannot even lean, or have serious medical problems such as chronic obstructive pulmonary disease, congestive heart failure, or myocardial infarction should be operated quickly. At this point operator's experience and skill are things to be considered.

The use of steroid should be monitored. The authors used the intermediate acting steroid (Depo-Medrol[®]). Most common side effect was temporary increase in pain, which occurs in 1 ~ 2% of steroid injection and appears to be related to the injected volume of solution. Effect on various pain lasted for from 4 weeks to several months^{1,8,9}. The steroid volume used in pain procedure is diverse and wide. There are no studies aiming at standardizing the most adequate and correct volume to be used¹³.

Both the patient and the operator have been exposed to radiation. The effects of radiation dose can be reduced by attention of the operator. Exposed values of clinicians during lumbar facet joint procedures is 30uSv per procedure without lead protection². Theoretically, if the personal protection devices (apron and neck shielding) were used during procedure, the total radiation dose to the doctor was minimally the mean 0.0248mSv/hr¹⁹. If operators must have their hands near the patient during imaging, the use of x-ray attenuating surgical gloves should be used. Risks associated with exposure can be minimized by shielding everything directly involved in the examination^{2,19}.

Conclusion

The various pain procedures are helpful as the possible therapeutic option for low back pain unresponsive to conservative management including medication or physical therapy.

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Commentary

In this manuscript, authors have well described the usefulness of various pain procedures (significant pain relief in 77.4% of patients at 6 months) alone or in combination for the treatment of low back pain unresponsive to conservative treatment. This is a very important information to the readers especially when these patients represent mixture of population who in common to have suffered with more than 4 weeks of conservative treatment without effect. However, there are several questions to be answered before making a justification of its

use as generally accepted therapeutic guidelines. First, two of procedures that authors have used, namely facet block and epidural block, are currently not generally accepted as the most ideal techniques and that they are not “specific” or “selective” target oriented methods. As average age of patients they treated were 64.2 years the degenerated facets do not usually have more than 0.5~1cc of volume of space for the injectate to be filled. However, authors injected 5.5cc of mixture per one level which could mean that most of injectate would have diffused surrounding the facets that might mask the effect of true “facet block”. This is one of reasons that current standard injection target for the treatment of facet syndrome is medial branch of posterior primary ramus (with injection of 2~3cc of injectate) which innervate not only facets but multifidus, midline ligaments and fascia as well. This would be the same target for the radiofrequency facet rhizotomy when there are multiple recurrent pain episodes after good response from initial nerve blocks. Second, type of epidural block authors have performed was midline approach technique. Although authors have used fluoroscopic guidance for correct placement of needles, this type of epidural approach is not ideal in many situations, especially when there are significant diffuse bulging of disc or when pain is radicular in nature that comes from single or one sided root(s) compression, because literature indicates that only about 10~30% of injectate will selectively reach these “specific” appropriate regions to provide enough therapeutic actions to take place and majority will be misplaced due to compressions coming from anterior spinal or foraminal space. Third, information authors used for the choosing the appropriate target may sound not so “appropriate”. For example, it is difficult to understand that authors have used interspinous tenderness to choose the target level of facet block because palpation and percussion tenderness on PVM overriding the facet joint is known to be more appropriate and levels of injections would include medial branch of that location, one above, and one below due to anastomosing branches from above and below. Fourth, although they have analysed the degrees of improvement using modified Macnab grading system, there were no descriptions about the baseline pain and functional status (VAS and various surveys such as Oswestry and SF-36). These baseline information are very important especially when there are mixture of population with many underlying pathologies. Lastly, the conclusion authors have addressed is too vague, and dose not present any new remarks. It should be more specifically focused to provide a clear message when and in whom such procedure is considered useful.

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