Efficacy and Validity of Radiofrequency Neurotomy for Chronic Lumbar Zygapophysial Joint Pain

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Study Design. A prospective audit.
Objective. To establish the efficacy of lumbar medial branch neurotomy under optimum conditions.
Summary of Background Data. Previous reports of the efficacy of lumbar medial branch neurotomy have been confounded by poor patient selection, inaccurate surgical technique, and inadequate assessment of outcome.
Methods. Fifteen patients with chronic low back pain whose pain was relieved by controlled, diagnostic medial branch blocks of the lumbar zygapophysial joints, underwent lumbar medial branch neurotomy. Before surgery, all were evaluated by visual analog scale and a variety of validated measures of pain, disability, and treatment satisfaction. Electromyography of the multifidus muscle was performed before and after surgery to ensure accuracy of the neurotomy. All outcome measures were repeated at 6 weeks, and 3, 6, and 12 months after surgery.

Results: Some 60% of the patients obtained at least 90% relief of pain at 12 months, and 87% obtained at least 60% relief. Relief was associated with denervation of the multifidus in those segments in which the medial branches had been coagulated. Prelesion electrical stimulation of the medial branch nerve with measurement of impedance was not associated with outcome.

Conclusions. Lumbar medial branch neurotomy is an effective means of reducing pain in patients carefully selected on the basis of controlled diagnostic blocks. Adequate coagulation of the target nerves can be achieved by carefully placing the electrode in correct position as judged radiologically. Electrical stimulation before lesioning is superfluous in assuring correct placement of the electrode. [Key words: back pain, lumbar zygapophysial joint, radiofrequency neurotomy, treatment] Spine 2000; 25:1270–1277

The prevalence of chronic lumbar zygapophysial joint pain ranges from 15% in younger patients15 to as high as 40% among elderly patients.17 The only proven treatment for this source of back pain is radiofrequency medial branch neurotomy. This operation is not a placebo. Van Kleef et al19 showed clearly, under double-blind controlled conditions, that patients treated with sham lesions did not obtain relief of pain. However, in patients treated with active neurotomy, Van Kleef et al obtained only modest results. The mean pain scores of their patients decreased only slightly, from 5 on a 10-point scale to 3. A minority of their patients obtained complete pain relief.

The rationale of lumbar medial neural neurotomy is that patients with zygapophysial joint pain should obtain complete relief of their pain if the nerves that innervate the painful joint are coagulated. The failure of Van Kleef et al19 to secure this outcome consistently can be attributed to either of two factors: First, they selected their patients on the basis of single, diagnostic blocks, whereas controlled studies have shown that single blocks carry a false-positive rate of 38%.16 Therefore, patients without true zygapophysial joint pain may have been treated. Second, they placed the electrodes at an angle to the target nerve, whereas laboratory studies have shown that the electrode must lie parallel to the nerve if the nerve is to be maximally and optimally coagulated.3 Consequently, in some of their patients, Van Kleef et al may have failed to coagulate the target nerve adequately. In their study, adequate coagulation of the target nerves was not assessed with segmental electromyography of the multifidus.7

The current study was undertaken to document the efficacy of lumbar medial branch neurotomy under optimal conditions. Patients were selected on the basis of controlled diagnostic blocks to ensure that they had zygapophysial joint pain, and electrodes were placed meticulously to optimize coagulation of the target nerve. Furthermore, measures were taken to ensure that the nerve was indeed coagulated. The anatomy of the medial branches of the lumbar dorsal rami is such that each supplies a unique and accessible band of the multifidus muscle.4,11 Consequently, if the nerve is successfully coagulated, its respective band of multifidus should show signs of denervation. Accordingly, postoperative electromyography was performed to check for successful coagulation of the target nerves.

Methods

Although lumbar medial branch neurotomy could be applicable to other types of patients, stringent inclusion and exclusion criteria were applied in the current study to evaluate the efficacy of lumbar medial branch neurotomy in patients in whom comorbidity and psychosocial factors were not likely to confound the results. Accordingly, approval was obtained from the institutional review board for medical ethics at the East Texas Medical Center (Tyler, TX) to recruit and treat patients who met...
stringent selection criteria. To be eligible, patients had to be literate, be aged between 18 and 80, and have chronic low back pain of longer than 6 months' duration. They had to exhibit clinical features consistent with possible lumbar zygapophysial joint pain, such as pain and tenderness over not more than two lumbar segments bilaterally or three segments unilaterally; had to be able to understand and tolerate diagnostic blocks; and ultimately, had to be positive for lumbar zygapophysial joint pain after controlled diagnostic blocks. Exclusion criteria were pregnancy, prior low back surgery, concurrent cervical or thoracic pain or pain in these regions lasting longer than 2 weeks during the previous 6 months, compensable disability or work injury, ongoing litigation, prior treatment with radiofrequency neurotomy, and discogenic pain verified by controlled discography.

Four-hundred and sixty people responded to invitations to participate circulated throughout the local medical community and announced through local newspapers, radio, and television. Candidates were interviewed by telephone (by BH) to determine eligibility. After the interview, 138 patients remained potentially eligible, and a physical examination was performed by either of two investigators (AJ or PD). At this time, the patients completed a pain drawing and a Beck Depression Inventory. If plain radiographs less than 1 year old were not available for review, anteroposterior and lateral plain radiographs were obtained. The physical examination was designed to detect or rule out secondary exclusion criteria, including sources of pain ostensibly not in the lumbar spine; pain in the hip or knee, even if lumbar pain was present; leg pain greater than back pain; obvious inappropriate pain behavior during physical examination; neurologic deficits; a positive straight leg raising result; any features of an upper motor neuron lesion; and gait abnormality not attributable to spinal pain. Additional exclusion criteria included spinal stenosis evident on prior computed tomogram (CT) or magnetic resonance image (MRI), spondylolysis or spondylolisthesis, a more than 75% narrowing of a disc space on plain radiographs, spondylarthropathy, presence of denervation in the multifidi established by electromyography, and a score higher than 20 on the Beck Depression Inventory.

After physical examination, 41 patients remained potentially eligible and proceeded to lumbar medial branch blocks. These were performed according to contemporary, validated methods, by the same investigator (PD). The segmental levels to be blocked were determined by the location of sites of maximum tenderness over putative painful joints, assessed under fluoroscopy. Patients underwent a modified comparative block protocol. At all times, the patients remained blind to the nature of the agent injected. For the first diagnostic block, 0.5 mL of 2% lidocaine was used to anesthetize each target nerve. In patients with tenderness ostensibly restricted to one joint, both nerves that innervate that joint were anesthetized. In patients with bilateral pain and tenderness, both joints at the same segment were anesthetized. In patients with more extensive pain, blocks were performed at consecutive levels up to a maximum of four nerves (three joints) in patients with unilateral pain, and three nerves bilaterally (two joints bilaterally) in patients with bilateral pain.

Once blocks were completed, patients were allowed to ambulate briefly and then to rest seated for 20 minutes, after which they were allowed to move ad libitum while remaining at the clinic. At 20 minutes after the procedure and hourly for 1 to 6 hours, the subjects rated their percentage relief of pain in 10% increments in a self-reported pain diary. Nineteen patients who reported less than 80% relief of pain were excluded from further investigation.

The 22 patients who reported at least 80% relief of pain for longer than 1 hour after the lidocaine blocks returned the following week for confirmatory blocks using 0.5% bupivacaine. In seven patients, the pain failed to respond to these blocks, and they were excluded from further study. Fifteen patients who obtained at least 80% relief of pain for longer than 2 hours, after the bupivacaine blocks, were offered radiofrequency neurotomy. Their clinical features are summarized in Table 1.

Before undergoing neurotomy and 1 week after the completion of diagnostic blocks, the patients completed baseline testing. This required completion of a counterintervention inventory that included prescription analgesic medications, a visual analog scale (VAS) covering present pain and weekly average, a McGill pain questionnaire (MPQ), a Roland–Morris inventory, the SF-36 general health questionnaire, the North American Spine Society treatment expectations, isometric push and pull, lift tasks, a dynamic floor-to-waist lift, and isometric above-shoulder lifting tasks. All functional assessments and written assessments were administered by one investigator (BH). Additionally, all patients underwent electromyography of the L2–L5 bands of multifidi to assess the presence or absence of denervation. All electromyograms were performed by one investigator (KP).

Radiofrequency medial neurotomy was performed with the patient prone on a fluoroscopy table. Intravenous, conscious sedation was used, if deemed necessary for patient comfort. The skin over the lumbar region was prepared in a sterile fashion. For each target nerve, a 22- or 25-gauge, 90-mm spinal needle was introduced as for a medial branch block, but instead

<table>
<thead>
<tr>
<th>Feature</th>
<th>Number or Median [Range]</th>
</tr>
</thead>
<tbody>
<tr>
<td>All patients</td>
<td>15</td>
</tr>
<tr>
<td>Males</td>
<td>10</td>
</tr>
<tr>
<td>Females</td>
<td>5</td>
</tr>
<tr>
<td>Duration of back pain</td>
<td>4.4 [1.3–6.0]</td>
</tr>
<tr>
<td>From lidocaine</td>
<td>4.9 [2–6.0]</td>
</tr>
<tr>
<td>Duration of relief (hours)</td>
<td>5</td>
</tr>
<tr>
<td>Working</td>
<td>10</td>
</tr>
<tr>
<td>Retired or not working, but not because of pain</td>
<td>5</td>
</tr>
</tbody>
</table>
of being positioned over the midpoint of the dorsal surface of
the transverse point (or the ala of the sacrum, in the case of L5),
the needle was positioned to access the nerve more proximally,
at the superior edge of the transverse process (or the superior
edge of the ala). Once placed, these needles were not used to
anesthetize the target nerve but were used to guide the place-
ment of the radiofrequency electrode.

For the introduction of the radiofrequency electrode, the
C-arm of the fluoroscope was rotated laterally some 15° from a
conventional posteroanterior orientation and angled caudad
by approximately 20° to allow viewing of the target region
somewhat from below, not unlike the pillar view in cervical
spine radiography. This view at an angle from below shows the
transverse process on edge, and demonstrates the groove be-
tween the transverse process and superior articular process
along which the target nerve runs. When properly achieved,
the view shows the tip of the guide needle resting on bone in the
groove, pointing to the location of the nerve (Figure 1). For the
L5 dorsal ramus, less transverse rotation of the C-arm was used
so that the iliac crest did not obstruct the path of the electrode.

A puncture point was selected on the skin over the target
groove, as seen on the declined view. This point was anesthe-
tized with an intradermal injection of lidocaine and punctured
with a 16-gauge needle, to more easily admit the radiofre-
quency electrode. The electrode used was a 16-gauge, Ray elec-
trode (Radionics, Burlington, MA) with a 5-mm exposed, ac-
tive tip. The electrode was introduced through the puncture
point and the back muscles, toward the target groove, aiming
initially to contact the caudal edge of the transverse process.
Once contact was made, the electrode was readjusted to allow
it to pass over the dorsal surface of the transverse process,
passing snugly along the groove, so that medially it abutted
against the root of the superior articular process, and ventrally

Figure 1. The lumbar spine view from below along a 20° caudad
tilt with 15° of rotation, showing a block needle in place, pointing
to and resting on the superior location of the L3 medial branch
nerve at the L4 transverse process. A radiofrequency probe is
aimed directly at the tip of the needle along the imaged groove
between the transverse process and superior articular process.

Figure 2. Posteroanterior radiograph of the lumbar spine showing
a radiofrequency electrode correctly in place for coagulation of
the L4 medial branch nerve as it crosses the root of the L5
transverse process. The block needle is also placed on the L4
medial branch nerve at its proximal position.

it glanced along the dorsal surface of the transverse process.
The electrode was advanced until it was estimated to have
reached the superior edge of the transverse process. Posteroan-
terior views were used to ensure that the electrode was placed
snugly against the superior articular process (Figure 2). Lateral
views were used to ensure that the tip of the electrode had not
ventured beyond the transverse process toward the interverte-
bral foramen, and oblique views were used to check that the
needle was oriented parallel to the estimated course of the tar-
get nerve (Figures 3 and 4). If the tip of the electrode projected
within the silhouette of the foramen, it was withdrawn until its
tip was immediately dorsal and caudal to the edge of the fora-
men, coinciding with the position of the tip of the block needle.

With a radiofrequency generator (Model 3FG-3C, Radion-
ics), the electrode was used to stimulate the target nerve, with a
pulse of 1-msec duration at 5 Hz. The physician performing the
neurotomy (PD) noted the minimum voltage required to elicit a
palpable and visible twitch of the multifidus at the segmental
level treated. If this did not occur at 0.5 V or less, the electrode
was repositioned until a twitch was elicited at this threshold,
provided that the position of the electrode still appeared satis-
factory on the three radiographic views. This usually required
the electrode to be moved slightly more medially and occasion-
ally dorsally—that is, up the wall of the superior articular pro-
cess. If a multifidus twitch could not be elicited despite reposi-
tioning, the final placement of the electrode was based on the
physician’s judgment that it was in a satisfactory location, as
seen in the three radiographic views. Once the electrode was in
a satisfactory position, 0.75 mL of 2% lidocaine was injected
through the guide needle to anesthetize the target nerve and the
tissues surrounding the active tip of the electrode. After the
anesthetic was administered, the block needle was withdrawn
by a few centimeters so that it was not in contact with the
electrode, and to prevent its acting as an antenna for the forth-
coming radiofrequency current. Posteroanterior, oblique, and

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lateral films were obtained to record the final position of the electrode. Impedance was noted before lesioning.

A lesion was made by raising the temperature of the tip of the electrode to 85°C for 90 seconds. Thereafter, the electrode was withdrawn along its path for approximately 4–5 mm (i.e., for the length of its exposed tip), and a second lesion was made using the same parameters (Figure 5). In this manner, the target nerve was coagulated 8–10 mm along its length, from where it first crossed the transverse process to where it passed under the mamilloaccessory ligament.

The same procedure was repeated at whatever segmental level was required. The nerves to be coagulated were defined by the previous response to diagnostic blocks. If diagnostic blocks of the L₄ and L₅₁ nerves had relieved the pain, those nerves were coagulated. If additional nerves had to be blocked to achieve complete pain relief, those nerves were also coagulated.

After neurotomy, patients were provided with 20 tablets of 5 mg hydrocodone (1–2 tablets every 8 hours) for relief of postoperative pain attributable to the trauma of the electrode insertion and the thermal lesion around the target nerve. Patients were allowed to be absent from work for the day of and day after the procedure.

The first follow-up was conducted 6 weeks after the neurotomy. At this appointment, the patients underwent another electromyogram to determine the presence or absence of denervation potentials. The electromyographer (KP) was blind to the side or levels that had been treated in each patient. The patients repeated the lifting tasks under the direction of the same investigator (BH) and completed the same written outcome assessment tools that were administered before the neurotomy. In addition, they completed the treatment satisfaction scale and the expectations-met scale of the North American Spine Society outcome instrument. At this follow-up, patients were discouraged from seeking any alternative health care for residual symptoms. Except for the electromyogram and lifting tasks, identical assessments were repeated at 3 months, 6 months, and 12 months.

Median scores and interquartile ranges of all outcome measures were calculated. The Friedman, 2-way analysis of variance was used to determine differences and changes between baseline and the 6-week, 3-month, 6-month, and 12-month outcome data. The Wilcoxon paired test was used to assess any significance of differences between preneurotomy and postneurotomy data from the lifting tasks. Spearman correlation coefficients were used to assess for any correlation between impedance, minimum voltage required to obtain a multifidus twitch at the time of neurotomy, and the presence or absence of multifidus denervation after neurotomy. The proportions of patients obtaining selected grades of pain relief at progressively longer periods of follow-up were calculated.

**Results**

No patient had any complications. All fully completed all follow-up visits. Statistically significant differences
were observed between the pretreatment and posttreatment scores in nearly all outcome measures (Table 2). Although performance in lifting tasks and push–pull tasks improved slightly, the changes were not statistically significant. In every other measure, however, statistically significant clinical improvement was seen. The improvements in VAS scores were dramatic and profound and correlated with improvements in the MPQ, SF-36, and Roland–Morris scores.

When group scores were compared, improvements were maintained throughout the follow-up period. Scores were not significantly different at 6 weeks, 3 months, 6 months, and 12 months. Patients’ satisfaction remained stable throughout the period of follow-up without significant differences, and there was no significant difference between patients’ expectation and expectations met at follow-up, including 12 months after neurotomy.

A somewhat different picture emerges, however, when the history of individual patients after neurotomy is considered (Figure 6). At 6 weeks, all but one patient exhibited dramatic reduction in pain. Nine patients rated the pain as 1 or less on the VAS, and a further three rated it as 2 or less. Another patient scored 4 at 6 weeks but continued to improve to a level of nearly 0 by 3 months. The best results were seen at 3 months when all patients had VAS scores of 2.1 or less. Thereafter, nine patients maintained or improved the reduction in pain until the 6- or 12-month follow-up. Between 6 months and 12 months, two patients experienced relapse from levels of 0.0 and 1.1 to levels of 1.1 and 2.5, respectively. Curiously, five patients reported a rebound of pain at 6 months but dramatic restitution of previously good levels of pain relief by 12 months. On inquiry, these rebounds were found to be attributable to concurrent causes of pain unrelated to the previously diagnosed zygapophysial joint pain. One patient had herpes zoster. One had trochanteric bursitis, and another had sacroiliac joint pain, with both conditions responding to diagnostic blocks of the painful structures. These patients were aggressively treated for these conditions. Another patient experienced depression after a life crisis. Allowing for these episodes of concurrent illness, the individual histories of the patients are consistent with the group median scores. Once established, pain relief from lumbar medial branch neurotomy remained stable for at least 6 months. The majority of patients remained stable for up to 12 months, but some showed gradual return of pain, consistent with regeneration of the coagulated nerves.

The degree of improvement obtained by all patients is summarized in Table 3. Some 47% of patients obtained an absolute reduction of at least 5 of 10 in the VAS, and 60% obtained a reduction of at least 3. Some 60% of patients obtained a relative reduction of at least 90% in VAS, and 87% obtained a reduction of at least 60%. Two thirds of the patients scored 1.1 or less on the VAS at 12 months, and 6 of 15 scored 0.0 or 0.1.

Fourteen of the patients used no treatment cointerventions during the 1 year of follow-up. One patient had 18 visits to a chiropractor at 10–12 months after neurotomy for residual back pain (rated as 1.8 on the VAS), and this same patient used opioids (30 mg codeine alternat-

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### Table 2. Outcome Measures and Scores After Lumbar Radiofrequency Neurotomy in 15 Patients

<table>
<thead>
<tr>
<th>Outcome Measure</th>
<th>Pretreat</th>
<th>6 Weeks</th>
<th>3 Months</th>
<th>6 Months</th>
<th>12 Months</th>
<th>P-Value</th>
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<td>Roland–Morris McGill Total word count</td>
<td>7.0 [2–18]</td>
<td>1.0 [0–9]</td>
<td>1 [0–7]</td>
<td>2 [0–12]</td>
<td>2 [0–13]</td>
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<tr>
<td>VAS (0–10) Present pain</td>
<td>12 [5–40]</td>
<td>4 [0–21]</td>
<td>3 [0–13]</td>
<td>4 [0–21]</td>
<td>9 [0–21]</td>
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<tr>
<td>Weekly average</td>
<td>6.0 [0–16]</td>
<td>3.0 [0–12]</td>
<td>3.0 [0–12]</td>
<td>3.0 [0–10]</td>
<td>3.0 [0–17]</td>
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<td>Floor to waist lift</td>
<td>58 lbs</td>
<td>63 lbs</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>0.091</td>
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<tr>
<td>Above shoulder lift</td>
<td>99 lbs</td>
<td>112 lbs</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>0.95</td>
</tr>
<tr>
<td>Push</td>
<td>80 lbs</td>
<td>89 lbs</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>0.13</td>
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<tr>
<td>Pull</td>
<td>75 lbs</td>
<td>74 lbs</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>0.091</td>
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<tr>
<td>Satisfaction (range: 1.2–5.8)</td>
<td>4.3 [3.0–5.0]</td>
<td>4.0 [2.6–5.0]</td>
<td>4.2 [2.6–5.0]</td>
<td>3.8 [2.5–5.0]</td>
<td>4.0 [2.3–4.8]</td>
<td>0.12</td>
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<td>Expectations (pretreatment)</td>
<td>5.0 [3.0–5.0]</td>
<td>5.0 [3.0–5.0]</td>
<td>5.0 [3.0–5.0]</td>
<td>5.0 [3.0–5.0]</td>
<td>5.0 [3.0–5.0]</td>
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</table>

BDI = Beck depression inventory; VAS = visual analog scale.
ing with 5 mg of hydrocodone, every 8 hours) for resid-
ual back pain, but only at the 12 month follow-up visit.

Of the 64 medial branches targeted, 90.5% were as-
sessed by electromyogram to have been coagulated. Of
the 15 patients, 11 had a 100% denervation rate, and
four had a partial denervation rate, with an average of
65% of targeted nerves having been coagulated. There
was no correlation between impedance values just before
neurotomy and the presence or absence of denervation
\( r = 0.10; P = 0.725 \). There was no correlation
between the minimal voltage required to elicit a multifidus twitch and the presence or absence of
denervation \( r = 0.61; P = 0.83 \). Nor was there any
correlation between the rate of successful denervation
and the proportion of patients achieving any selected
degree of pain relief. Noncorrelation was due to the high
rate of successful denervation. As assessed by electro-
myogram, denervation was achieved in virtually all pa-
tients, all of whom obtained some degree of relief. In 11
of 15 subjects, there was denervation seen in every seg-
mental multifidus muscle (100%) that pertained to the
targeted nerves. In the remaining 4 subjects, there was
denervation in 83%, 83%, 75%, and 17% of the seg-
mental multifidi muscles that pertained to the targeted
nerves. The one patient in whom relief was the poorest
was the patient with the lowest (17%) denervation rate
on post- versus preradiofrequency neurotomy segmental
multifidi electromyogram.

**Discussion**

The current study differs in several respects from all pre-
vious studies of lumbar medial branch neurotomy. Fore-
most, it is the first prospective study to have treated only
patients with zygapophysial joint pain verified with con-
trolled diagnostic blocks. Next, it is only the second
study in which an operative technique was used that is
anatomically and technically accurate. Third, it is the
only study to have shown accurate and adequate coagu-
lution of the target nerve by objective means. Fourth, it is
the only study in which multiple, subjective, and objec-
tive outcome measures were recorded during a pro-
longed follow-up period.

Under these conditions, lumbar medial branch neu-
rotomy offered profound and lasting relief of back pain.
In this regard, the results of the current study comple-
ment and extend those obtained by Van Kleef et al19 in
their controlled trial. If patients are rigorously selected,
and if accurate surgical techniques are used, some 60%
of patients can expect at least a 90% reduction in pain,
and 87% can expect at least a 60% reduction, lasting 12
months. The results of the current study do not validate
the efficacy of medial branch neurotomy performed in
any way other than as described herein.

The electromyogram data from the current study in-
dicate that the operative technique used was effective in

<table>
<thead>
<tr>
<th>( \Delta \text{VAS} )</th>
<th>N</th>
<th>( \Sigma \text{N} )</th>
<th>% Improvement</th>
<th>N</th>
<th>( \Sigma \text{N} )</th>
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<td>10</td>
<td>0</td>
<td>0</td>
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<td>&gt;9</td>
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<td>90–100</td>
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<tr>
<td>&gt;8</td>
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<tr>
<td>&gt;7</td>
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<td>1</td>
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<td>&gt;3</td>
<td>1</td>
<td>9</td>
<td>30–40</td>
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<tr>
<td>&gt;2</td>
<td>3</td>
<td>12</td>
<td>20–30</td>
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<td>14</td>
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<tr>
<td>&gt;1</td>
<td>1</td>
<td>13</td>
<td>10–20</td>
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<tr>
<td>&gt;0</td>
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The evolution of the weekly average visual analog scale
(VAS) pain scores of 15 patients treated by lumbar medial branch
neurotomy: 0, before surgery; 6W, 6 weeks; 3M, 3 months; 6M, 6
months; and 12M, 12 months after surgery. The dotted lines refer
to patients who reported temporary pain during follow-up of
causes other than zygapophysial joint pain.

Table 3. Numbers of Patients and Cumulative Numbers
(\( \Sigma \text{N} \)) Obtaining Specified Changes in Visual Analog
Scores (\( \Delta \text{VAS} \)) and Percentage Improvements in Visual
Analog Scores (Weekly Pain Ratings) at 12 Months After
Lumbar Medial Branch Neurotomy
coagulating the target nerves. The relief of pain obtained by the patients is concordant with the demonstration of postoperative denervation in the respective bands of multifidus and is fully consistent with the rationale for medial branch neurotomy. However, the results of the current study dispel some of the myths and conventions concerning the performance of medial branch neurotomy. The use of preliminary electrical stimulation of the medial branch nerve to verify electrode placement appears to be superfluous and an unnecessary consumption of operative time. Adjusting the electrode position to minimize the threshold for evoked activity in the multifidus does not improve outcome. The essential requirement is that the electrode be placed in an anatomically sensible and accurate position, which can be judged radiologically and by the operator’s sense of the needle in the target osseous groove.

A modified comparative block protocol was used to identify symptomatic zygapophysial joints. Comparative blocks involve anesthetizing the target joint on two separate occasions using different local anesthetic agents. When tested against placebo blocks, comparative blocks yield valid responses. They are highly specific (i.e., have few false-positive responses) when optimum criteria are applied, which are that the patient obtains long-lasting relief when the longer acting agent is used but shorter lasting relief when the shorter acting agent is used. These criteria, however, reduce the sensitivity of the test (i.e., not all patients with zygapophysial joint pain are detected). If the criteria are relaxed so that the patient obtains complete relief of pain on each occasion when the joint is blocked, but regardless of the relative durations of effect, the sensitivity increases with some loss of specificity, but sufficient specificity remains for practical purposes.

For the current study, specificity was sacrificed in the interest of sensitivity. The objective was to maximize the yield of eligible patients. Accordingly, the criteria for a positive response using this modified comparative block protocol was that the patient obtained 80% or more relief of pain on the occasion of each block, and provided that they obtained more than 1 hour of relief after lidocaine and more than 2 hours of relief after bupivacaine. Moreover, patients were monitored until relief ceased or for 6 hours, whichever was the lesser.

Although use of sensitive but less than optimally specific criteria theoretically threatens the validity of the inclusion criteria, this risk was taken premeditatedly in the interest of securing putatively positive patients expeditiously. The risk was that if patients returned false-positive results, they would not respond to treatment. The results show that this was not the case.

The results of the current study, however, sound a warning against the wholesale implementation of lumbar medial branch neurotomy. The 15 patients described were selected from an initial population of 460. The procedure, therefore, may be applicable only in a minority of patients with back pain. Substantial exclusion criteria were applied to select patients with pure zygapophysial joint pain, to maximize the possibility of success. Whether the procedure may work in patients with other types of pain remains to be demonstrated. Coupling the results of the current study with those of Van Kleef et al indicates that in carefully selected patients with back pain uncomplicated by comorbidity and psychosocial factors and with the use of meticulous surgical technique, lumbar medial branch neurotomy can provide marked relief to patients with verified zygapophysial joint pain.

Key Points

- Lumbar radiofrequency neurotomy for chronic zygapophysial joint pain is an effective treatment.
- Adequate coagulation of the target nerves is technically feasible.
- Electrical stimulation before lesioning is superfluous in assuring correct needle electrode placement.

References

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