Repeat Percutaneous Radiofrequency Facet Joint Denervation for Chronic Back Pain: A Prospective Study

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ABSTRACT. Objective: To investigate whether repeat lumbar percutaneous radiofrequency facet joint denervation [RFJD] is an efficacious ongoing treatment for chronic low back pain [LBP] using the Low Back Outcome Score [LBOS] and subjective measures of patient satisfaction.

Methods: A prospective open-label, single intervention study was carried out on a consecutive series of patients undergoing repeat lumbar RFJD performed by a single operator in 2007. Patients with an initially successful RFJD procedure were selected for the study excluding patients with greater than four procedures in total. Lumbar medial branch neurotomy was conducted using a 20-gauge silicone-coated probe inserted under fluoroscopic control and neuroleptic intravenous sedation with radiofrequency thermal energy applied for 90 seconds per joint at a maximum probe tip temperature of 90°C. The patients completed a LBOS questionnaire before and 12 months following the repeat RFJD procedure. They were also asked about their satisfaction with and the duration of pain relief related to their repeat procedure.

Results: Sixty-two patients completed the study. At 12-month follow-up, clinical outcomes were improved with the proportion of patients with poor rating according to LBOS decreasing from 69.4 percent pre-procedure to 41.9 percent after repeat RFJD [P < 0.01]. Overall, 69.3 percent of patients were satisfied with the procedure with a median average duration of eight to nine months for pain relief. There were no complications in this series.

Conclusion: Repeat lumbar RFJD, in this cohort of appropriately selected patients, achieved a high level of satisfaction and improved LBOS score, and may be a valid option for ongoing treatment for patients with chronic LBP. It would appear that a blinded, randomized, sham treatment-controlled clinical trial would be warranted.

KEYWORDS. Percutaneous radiofrequency facet joint denervation, facet joint rhizolysis, low back pain, low back outcome score, repeated
INTRODUCTION

Low back pain [LBP] is a common cause of morbidity and a significant economic burden in developed countries worldwide (1–3). It is estimated that lumbar facet joint-related problems account for around 15 to 40 percent of patients who have chronic LBP (4, 5). Percutaneous facet joint denervation [neurotomy] using radiofrequency thermal energy was initially described by Shealy (6) in 1975 and has continued to be widely used, as for nonoperative treatment of chronic LBP attributable to facet joints conservative measures have failed. While there are various modifications upon the original technique, it essentially involves the percutaneous placement of an insulated, small-diameter needle under fluoroscopic guidance and use of radiofrequency energy to create a small area of tissue coagulation that lesions the lumbar medial branch nerve adjacent to the facet joint identified as contributing to the patient’s pain symptoms (7, 8). Compared with operative options, it is considered a relatively safe and less complicated technique; its recognized adverse effects only being transient radiculopathy and a case report of skin burn due to poor earthing (7, 9–11). Extensive literature exists on this technique with a number of randomized controlled studies suggesting its efficacy against placebo (10, 12–16), while other studies have questioned its efficacy (8, 9, 11, 17, 18). Evaluation of evidence regarding this technique has often drawn criticism for the lack of volume of high-quality studies for comparison because existing randomized controlled trials on this procedure have different diagnostic criteria and surgical techniques between them (17). Despite the debate regarding evidence of effectiveness of the procedure, lumbar percutaneous radiofrequency facet joint denervation [RFJD] appears to have gained popularity in recent times.

Little evidence or discussion exists, however, on the effectiveness of repeat RFJD in individuals in whom primary percutaneous facet joint denervation for LBP was successful and who subsequently had experienced recurrence of symptoms.

There appears to be only one report in the literature, a retrospective review of 20 patients by Schofferman and Kine (19), dealing specifically with outcomes of repeat lumbar RFJD. The only outcomes measured were duration of pain relief and success of the procedure in terms of patient satisfaction. The latter was assessed using both patients’ satisfaction expressed by the patient’s wish to have the RFJD repeated and patients reporting greater than 50 percent subjective pain relief as recorded clinically post-procedure when compared with the pre-procedure condition.

Other reports have mentioned that this technique appears to be effective for relief of pain derived from facet joints when repeated (20–22). However, none of the three reports cited here included a formal analysis of clinical outcomes of repeat RFJD, and all of these papers dealt specifically with the cervical area.

This report is a prospective analysis, using the Low Back Outcome Score (LBOS) of individuals treated by a single practitioner, undergoing repeat RFJD for chronic LBP. The LBOS is a scoring system developed by Greenough and Fraser (23) that takes into account effects of the pain experienced upon activities of daily living, function, need for treatment, and pain levels in the way of a visual analog scale [VAS].

Our prospective study revisits the efficacy of repeat RFJD for chronic LBP from a viewpoint that incorporates overall patient satisfaction, pain levels, and function using the LBOS.

MATERIALS AND METHODS

Approval of ethical conduct of the proposed study was obtained from the Ethics of Human Research Committee of The Queen Elizabeth Hospital, Woodville, South Australia, Australia.

Consecutive patients treated for LBP with RFJD by the senior author [Olo] between April 2007 and July 2007 were included in a prospective cohort analysis using VAS and the LBOS. This study included for analysis only those who had undergone a successful primary procedure and had previously undergone a successful diagnostic medial branch blockade [in both the cases success being defined as >50 percent subjective pain relief post-intervention with the former defined by the patient as being satisfied that the procedure was useful for them].

The study excluded patients who had other invasive or manipulative spinal procedures performed during the period of the study, and also those who, following the repeat RFJD procedure, would have had more than four procedures. The latter was decided in the study
design as the vast majority [more than 90 percent] of patients potentially in this series would belong within this range regarding number of overall procedures with the remaining minority of patients acting as outliers in the larger cohort. The study, however, did allow patients to continue other concurrent therapies [e.g., supervised back exercises and analgesia] and also patients with a compensation claim under law could or were potentially receiving financial compensation and provision for treatment related to their injury.

At a consultation prior to repeat RFJD, and following the informed consent process, participants entered into the study and completed an initial written LBOS questionnaire.

The method utilized for each repeat RFJD was based on the lumbar medial branch neurotomy method initially described by Bogduk and Long (7) and in keeping with the principle of coming into close parallel contact anatomically with the target nerve as described by Lau, Mercer, Govind, and Bogduk (24) as well as Gofeld and Factier (25). Neurotherm equipment was used with a 20-gauge silicone-coated probe inserted under fluoroscopic control and neuroleptic intravenous sedation. Radiofrequency thermal energy was applied for 90 seconds per joint at a maximum probe tip temperature of 90°C in the manner described.

Patients were then followed through approximately 12 months after the repeat RFJD via telephone questionnaire by the junior author [MGTZ].

Results of written questionnaires [collected before repeat RFJD] and telephone questionnaires [collected post-RFJD] were collated and analyzed. P-values were calculated using a t-test with employment of a statistical spreadsheet [paired two samples for mean values].

RESULTS

Sixty-two of the 65 participants who initially took part in this study completed the telephone questionnaire at follow-up. Of the three participants lost in follow-up, two were compensable [having had the procedure twice and three times in total] and one was noncompensable [having had the procedure twice].

The overall demographics of followed participants in the study are summarized in Table 1. Overall, females accounted for 58 percent and 70 percent of the total participants compared to 47 percent in the noncompensable and compensable groups, respectively. The overall median average age of participants at the time of repeat lumbar RFJD was 47 years with the median average age in the noncompensable and compensable groups being 51 years and 44 years respectively [range 31 to 62 years].

Thirty-two of the 62 patients who were followed through successfully had a compensation claim. Fifteen of the 32 patients with a compensation claim had undergone the RFJD twice before, compared to the 14 of the 30 patients in the noncompensable group, with the overall median average of three procedures in this group. The total number of RFJD procedures that participants had received is summarized in Table 1.

<table>
<thead>
<tr>
<th>TABLE 1. Demographics of Participants</th>
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<tbody>
<tr>
<td><strong>Demographic variable</strong></td>
</tr>
<tr>
<td>Sex</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Age [years]</td>
</tr>
<tr>
<td>Number of RFJD procedures [including repeat RFJD procedure in this study]</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Number of RFJD procedures [including repeat RFJD procedure in this study; median average]</td>
</tr>
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<td></td>
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</tbody>
</table>

RFJD = lumbar percutaneous radiofrequency facet joint denervation.
TABLE 2. Subjective Assessment of Duration of Pain Relief from Most Recent Radiofrequency Facet Joint Denervation Procedure

<table>
<thead>
<tr>
<th>Group</th>
<th>&lt;6</th>
<th>6–7</th>
<th>8–9</th>
<th>9–10</th>
<th>11–12</th>
<th>Still present at 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noncompensable</td>
<td>8</td>
<td>5</td>
<td>10</td>
<td>6</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Compensable</td>
<td>7</td>
<td>5</td>
<td>13</td>
<td>5</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>10</td>
<td>25</td>
<td>11</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Overall median average duration of relief = 8–9 months

RFJD = lumbar percutaneous radiofrequency facet joint denervation.
Subjective responses from patients. These particular results are not formally part of the low back outcome score.

No complications were reported in this study. The average pre-procedure LBOS score for participants was 28.45 compared to the post-procedure score of 33.75 \( P < 0.01 \), an improvement of 5.3, which correlates with an overall shift from poor to fair functional rating [according to LBOS scoring, an LBOS between 0 and 29 is defined as a poor function and between 30 to 49, it is a fair function]. The noncompensable group had pre-procedure and post-procedure overall LBOS scores of 29.95 and 32.8 \( P < 0.01 \), respectively, while the compensable group had pre-procedure and post-procedure overall LBOS scores of 26.5 and 34.25, respectively \( P < 0.02 \). Overall, 69.3 percent of patients had the impression that the repeat procedure was as helpful as the previous successful procedures with difference in satisfaction between the two groups being 5.2 percent [71.9 percent in the compensable group compared with 66.7 percent in the noncompensable group]. Improvements in LBOS scores were recorded after the repeat RFJD in most of the activities analyzed, including sleeping \( 0.31; P < 0.02 \), walking \( 0.73; P < 0.01 \), sitting \( 0.4; P < 0.02 \), traveling \( 0.39; P < 0.02 \), and getting dressed \( 0.3; P < 0.03 \). The sex life category showed minor improvement \( 0.1; P < 0.07 \). This category, however, is difficult to interpret due to the varying and incomplete answering rates among participants as some participants declined to comment or did not have a regular premorbid or current sex life for comparison. There was also an overall improvement in LBOS with regard to reduced need for pain medications \( 0.2; P < 0.03 \), decreased need to seek treatment for pain \( 1.06; P < 0.01 \), improved ability to do household chores \( 0.17; P < 0.05 \), and physical activities \( 0.38; P < 0.04 \).

Pain levels documented by VAS [0 to 10] showed improvement of 1.21 with an overall change in LBOS from 2.37 to 3.58 \( P < 0.03 \) points correlating with a shift from the VAS pain range of 5 to 6 to a pain range of 3 to 4. Other results are summarized in Tables 2–4.

**DISCUSSION**

Despite the widespread popularity of RFJD as a noninvasive treatment for chronic LBP, no
strong evidence exists on the clinical efficacy of repeat procedures. Clinical improvement with RFJD is typically self-limited and repeat treatments are common. Our study suggests that with appropriate selection and the technique described above, this procedure appears to lead to reliable and satisfactory results when repeated with most patients reporting a high degree of satisfaction and functional improvement.

Despite the established unfavorable prognostic significance of litigation (26), in this series patients claiming compensation for either a work-related and/or motor vehicle accident appeared to be in benefit compared to noncompensable group patients. It should be noted that there are differences of age and gender in the two groups, and may also imply that the noncompensable population may have had not only demographic differences but also different anatomical characteristics which may have influenced the outcome.

Evidence exists, in fact, that facet joint injections for LBP have better symptomatic effect in individuals with no or little facet joint osteoarthritis and are in younger age group (27, 28). In this series the average duration of relief was a median value of around eight to nine months, which is comparable with that of other published studies that often quote relief period of eight to 12 months (12, 19). The average degree of satisfaction in this series is 69.3 percent, which is comparatively favorable with the 85 percent satisfaction from repeat RFJD described by Schofferman and Kine (19). We are currently in the process of analyzing if such a trend exists in outcome with repeat procedures over time.

This study suggests that LBOS outcomes from repeat lumbar RFJD procedures in patients selected and treated with the methodology described above are likely to remain consistent and favorable. No outcome at present exists of either increased complications and/or lower symptomatic effects with repeat procedures. This study provides further evidence for use of repeat lumbar RFJD as an option for ongoing nonoperative treatment in patients with chronic LBP. A blinded, randomized, sham treatment-controlled clinical trial would seem to be warranted.

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