

Brief Research Report

The Effect of Repeated Zygapophysial Joint Radiofrequency Neurotomy on Pain, Disability, and Improvement Duration

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Abstract

Objective. To assess the effectiveness of repeated radiofrequency neurotomy (RFN) on pain, disability, and treatment effect duration.

Patients. One hundred-four patients who underwent repeat RFN for chronic neck or back pain were prospectively followed using a Pain Disability Questionnaire-Spine (PDQ-S). Complete data sets were available for 73, 73, and 36 patients for the 1st, 2nd, and 3rd RFN, respectively.

Results. Pain intensity, pain frequency, and patient-specific disability measures were significantly improved post-initial, second, and third RFN. Moreover, there was no statistically significant difference among the PDQ-S scores post-RFN 1, 2, and 3. There was no statistical significance between the duration of pain relief post-RFN 1 and pain relief post-RFN 2.

Conclusion. Repeated cervical and lumbar RFN reduces pain and disability with equal effectiveness for approximately 10 months in patients with facetogenic chronic neck and back pain.

Key Words. Radiofrequency; Denervation; Neurotomy; Repeat; Pain; Disability

Introduction

The prevalence of zygapophysial joint origin pain ranges between 15% in younger patients to as high as 40% in older patients with chronic low back pain [1,2]. The prevalence of zygapophysial joint origin pain is at least 25% of chronic neck pain [3].

Clinical assessment has limited capability to identify the presence and location of facetogenic pain. Thus, the current standard for diagnosis of zygapophysial joint pain is relief of the index pain after local anesthetic blockade of the medial branches of the posterior rami of the spinal nerves that supply the zygapophysial joints. This test is commonly referred to as medial branch block [4–6]. Furthermore, interventional algorithms promote standard controlled comparative blocks to maximize therapeutic value and cost-effectiveness [7].

Once it is determined that zygapophysial joints are the predominant pain generator, radiofrequency neurotomy (RFN) of the medial branch nerves that dually innervate each target zygapophysial joint can be performed. Dreyfuss et al. found that after the first RFN, 60% of patients experience 90% relief, and 87% experience at least 60% relief of pain for about 12 months [8]. Other authors have described similar durations of significant pain relief post-RFN [9,10]. Post-RFN pain recurrence is attributed to the regrowth of the medial branch nerves.

Two studies have investigated the effectiveness of repeat RFN. Both were retrospective reviews of a relatively small number of patients. RFN success was defined dichotomously (< or >50% pain relief) and by the patient's desire to have the RFN repeated. The effect of repeat RFN on disability was not described. One study focused on lumbar zygapophysial joint RFN. The mean duration of relief for the initial lumbar RFN was 10.5 months. Each repeat RFN was successful in 85% of the patients in whom the initial lumbar RFN was successful. The mean duration of relief after repeat lumbar RFN was 10.6 months, with little or no variation among several subsequent procedures [11]. A second study focused on cervical zygapophysial joint RFN. The mean duration of relief for the initial cervical RFN was 12.5 months. Each repeat RFN was effective in 95% of the patients in whom the initial cervical RFN was successful. The mean duration

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of relief after repeat cervical RFNs was 11.5 months, with little or no variation among several subsequent procedures [12].

The purpose of this study is describe, in a quantitative fashion, the effect of repeat cervical and lumbar RFN on both pain and disability, in a larger cohort of patients who were followed prospectively.

Methods

Ethical approval is from the University of Alberta Health Ethics Review Board. Our RFN selection criteria and technique are described elsewhere [9]. Repeat RFN was performed if clinically significant reduction in the index pain after the initial RFN was achieved (i.e., >3 points on visual analog scale), the index pain recurred and the patient was sufficiently satisfied with the previous RFN to request that it be repeated [11,12]. Outcomes were extracted from a prospectively gathered database of consecutive patients treated with RFN during the first 5 years of operation of the Central Alberta Pain and Rehabilitation Institute. Five hundred and ninety-six patients underwent facet RFN (118 cervical; 498 lumbar). On the day of their RFN, each patient completed a Pain Disability Questionnaire-Spine (PDQ-S.). An additional PDQ-S was also provided and the patient was instructed to complete it and send it back approximately 8 weeks postprocedure. Three hundred and eighteen correctly completed follow-up PDQ-S questionnaires were received. Of these, 104 (20 cervical; 84 lumbar) eventually underwent repeat RFN(s) of the same zygapophysial joint(s). Complete data sets were available on patients who completed RFN 1 (N = 73), RFN 2 (N = 73), and RFN 3 (N = 36). Follow-up PDQ-S questionnaires were received, on average, at approximately 8 weeks postprocedure although there was variability (post-RFN 1: 8.9 weeks [standard deviation (SD) 6.1], post-RFN 2: 7.8 weeks [SD 3.0], and post-RFN 3: 8.0 weeks [SD 3.1]). Absolute and change scores for the total PDQ-S score and the pain and disability subcomponents were analyzed using a repeated measures analysis of variance.

The outcome tool used in this study was the Pain Disability Questionnaire-Spine (PDQ-S). It quantifies pain intensity, pain frequency, and two pain-related patient-selected disabilities on an 11-point Likert scale.

The disabilities identified by the patient at the time of completion of the initial questionnaire were those used for each subsequent questionnaire. The PDQ-S has proven to be a valid and reliable tool for assessing pain and disability. It does have advantages over the McGill Pain and the Oswestry Disability Questionnaires including superior responsiveness to changes and ease of use [13].

Results

There were 73 patients: 33 women and 40 men. Mean age was 51.5 years (range 23 to 79 years, SD 12.1). Complete data sets were available for 73, 73, and 36 patients for the 1st, 2nd, and 3rd RFN, respectively. On average, each patient experienced 12.8 (SD = 0.5–48) years of chronic neck and back pain. RFN was performed at a singular articular level in 50 patients, and multiple articular levels in 23 patients. Bilateral RFNs were performed in 37 patients and 36 unilateral RFNs were performed. Finally, 15 RFNs were performed at the cervical spine level and 58 were performed at the lumbar spine level. The majority of interventions were performed at the lumbar spine level, which is atypical compared with other RFN studies, because of convenience bias of the referral population. Table 1 summarizes the absolute pre- and post-pain intensity, frequency, and disability values for the initial and two repeat RFNs. There was a significant drop in all domains following RFN on each occasion; however, the magnitude of drop was consistent with each RFN. Table 2 summarizes the change scores for pain intensity, frequency, disability and PDQ-S, and pain relief duration following each RFN. The change scores were not significantly different within each domain. Tables 3 and 4 are descriptive and demonstrate distribution of pain intensity scores and percent improvement stratified into quartiles.

Discussion

RFN can be an effective tool to provide clinically significant improvements in pain and disability in patients with cervical and lumbar zygapophysial joint pain [14–17]. Unfortunately, RFN is not typically a permanent solution. Pain usually recurs and RFN may need to be repeated. There are no studies that suggest a limitation on how many

Table 1 PDQ-S category scores pre- and post-radiofrequency neurotomies

	RF1		RF2		RF3	
	Pre (SD)	Post (SD)	Pre (SD)	Post (SD)	Pre (SD)	Post (SD)
Pain intensity	6.7 (1.8)	3.5 (2.0)	7.1 (1.6)	3.8 (2.2)	7.5 (1.5)	3.4 (2.2)
Pain frequency	8.7 (2.0)	5.5 (3.6)	8.7 (2.0)	6.3 (3.3)	8.6 (2.2)	5.3 (3.7)
Disability 1	7.2 (1.6)	3.5 (2.6)	7.5 (2.4)	4.3 (3.0)	7.9 (2.2)	4.2 (3.1)
Disability 2	7.1 (2.2)	4.3 (3.2)	7.0 (2.4)	3.9 (2.8)	7.2 (2.6)	3.3 (2.8)

RF = radiofrequency; SD = standard deviation.

Table 2 One-way analysis of variance for change scores

	RFN	Mean Change	SD	F	P
Pain intensity	1	3.2	2.3	2.2	0.1
	2	3.4	2.2		
	3	4.2	2.4		
Pain frequency	1	3.1	3.6	1.5	0.2
	2	2.3	3.1		
	3	3.4	4.2		
Disability 1	1	3.4	2.9	0.1	0.9
	2	3.3	3.0		
	3	3.6	3.5		
Disability 2	1	2.7	3.2	1.4	0.2
	2	3.3	3.0		
	3	3.7	3.8		
PDQ-S	1	12.3	8.9	1.2	0.3
	2	12.2	9.0		
	3	14.9	10.7		
Pain relief duration	1	9.9	5.3	1.2	0.3
	2	10.5	6.2		

RFN = radiofrequency neurotomy; SD = standard deviation; PDQ-S = pain disability questionnaire.

times this procedure can be done. Thus, it is important to know whether repeat RFNs are effective for pain relief and reduction of disability.

Pain intensity, pain frequency, and patient-specific disability measures were significantly improved post-initial, second, and third RFN. The magnitude of relief in this study was less than that reported in others. Two months postprocedure may not have captured the maximal eventual relief. Previous research has suggested that maximal improvement is experienced at 3 months post-RFN [9]. Additionally, although more accurate, prospectively gathered estimates of pain relief may be more conservative than those recalled retrospectively 9–12 months postprocedure. Moreover, there was no statistically significant difference among the PDQ-S scores post-RFN 1, 2, and

3. There was no statistical significance between the duration of pain relief post-RFN 1 and pain relief post-RFN 2. These results demonstrate that the amount and duration of pain relief and reduction of disability remains consistent with subsequent RFNs.

There are limitations to this study. The group is predominantly composed of lumbar RFN, which is a subject of controversy in the literature. However, the reproducibility of the therapeutic effects of RFN adds support to its validity as an effective treatment. Another limitation is that not all data are available for post-two-month follow-up of RFN 3. There are two reasons for this: firstly, the third RFN was performed too recently to collect a more complete data set for the publication of this paper; and secondly, on occasion, the patient could not be contacted, did not

Table 3 Effect of repeated cervical RFN on pain intensity

	Numerical Rating Scale Frequency Distribution										% Improvement				
	0	1	2	3	4	5	6	7	8	9	10	0–24	25–49	50–74	75–100
1st RFN															
Pre (N = 14)	0	0	0	1	0	3	1	3	4	1	1	5 (36%)	3 (21%)	2 (14%)	4 (29%)
Post (N = 14)	1	1	2	3	1	3	2	1	0	0	0				
2nd RFN															
Pre (N = 14)	0	0	0	0	0	0	6	3	3	1	1	3 (21%)	2 (14%)	5 (36%)	4 (29%)
Post (N = 14)	2	0	4	3	2	0	1	1	1	0	0				
3rd RFN															
Pre (N = 9)	0	0	0	0	0	1	2	2	1	2	1	1 (14%)	0 (0%)	3 (43%)	3 (43%)
Post (N = 7)	2	1	0	2	0	1	0	1	0	0	0				

RFN = radiofrequency neurotomy.

Table 4 Effect of repeated lumbar RFN on pain intensity

	Numerical Rating Scale Frequency Distribution										% Improvement				
	0	1	2	3	4	5	6	7	8	9	10	0–24	25–49	50–74	75–100
1st RFN															
Pre (N = 64)	0	0	1	2	5	7	11	14	18	2	4	9 (14%)	19 (31%)	23 (37%)	11 (18%)
Post (N = 62)	3	8	12	10	12	7	7	0	3	0	0				
2nd RFN															
Pre (N = 64)	0	0	0	1	6	8	4	12	23	7	3	17 (27%)	11 (18%)	24 (39%)	10 (16%)
Post (N = 62)	2	8	9	8	12	9	5	7	1	0	1				
3rd RFN															
Pre (N = 32)	0	0	0	0	2	1	3	9	8	8	1	4 (14%)	10 (35%)	12 (41%)	3 (10%)
Post (N = 29)	2	2	4	8	5	3	3	1	0	1	0				

RFN = radiofrequency neurotomy.

return, or did not correctly complete the mailed PDQ-S form. Lastly, our results are only generalizable to the 1st and 2nd repeat RFN.

There are strengths to this study. All data were collected prospectively and this is the largest cohort investigating the effectiveness of repeated RFN to our knowledge. All RFNs were performed by the same interventionalist. Also, inherent to the A-B-A-B design of the study, supports cause and effect, as each participant acts as his/her own control. Using a validated outcome tool, this is the first study to quantifying pain relief and disability improvement after repeated RFN in the cervical and lumbar spine.

In summary, repeated cervical and lumbar RFN reduces pain and disability with equal effectiveness for approximately 10 months in patients with facetogenic chronic neck and back pain.

Disclosure

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