

**WHIPLASH INJURIES AND NEUROTOMY:
A PAIN IN THE NECK FOR PATIENTS,
RESEARCHERS, CLINICAL PROVIDERS,
AND THE AUTOMOBILE INSURANCE INDUSTRY**

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WHIPLASH INJURIES AND NEUROTOMY: A PAIN IN THE NECK FOR PATIENTS, RESEARCHERS, CLINICAL PROVIDERS, AND THE AUTOMOBILE INSURANCE INDUSTRY

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BACKGROUND

The Insurance Corporation of British Columbia (ICBC), the major motor vehicle insurance provider in the province commissioned the BC Office of Health Technology Assessment to conduct an independent assessment of the effectiveness and safety evidence regarding percutaneous radio-frequency neurotomy (PRFN).

The focal condition of the present study is chronic cervical pain due to whiplash injury. It is commonly believed that whiplash injury is due to muscle or ligament strain. There is however evidence that in chronic cases, the injury is at times a lesion on the superior facet of the zygapophyseal joint (z-joint). The z-joints are paired synovial joints which bridge the vertebrae of the cervical spine. (**Figures 1 & 2**)

These lesions cannot be detected with either physical or radiological examination. Determining the presence of z-joint pain and the identity of the z-joint involved is made by injecting local anaesthetic either into individual z-joints or to the nerves that supply those joints.¹

PRFN is a palliative nerve-moderating heat-treatment that transiently interrupts peripheral nerve function. PRFN does not treat an underlying cause of pain. At best, it provides symptom relief while, ideally, healing takes place.

PRFN generates multiple localized heat-lesions that temporarily denature the nerve leading to the z-joint, and thereby reduces the neck pain associated with chronic whiplash.¹ To perform the procedure, a medical specialist locates a cannula with an exposed needle tip on the correct anatomical structure by using an image-intensifying x-ray machine. A radio-frequency current passes into surrounding tissues along the length of the un-insulated portion of the needle, and creates a lesion which encompasses the nerve.²

Figure 1: Vertebra and Related Nerves³

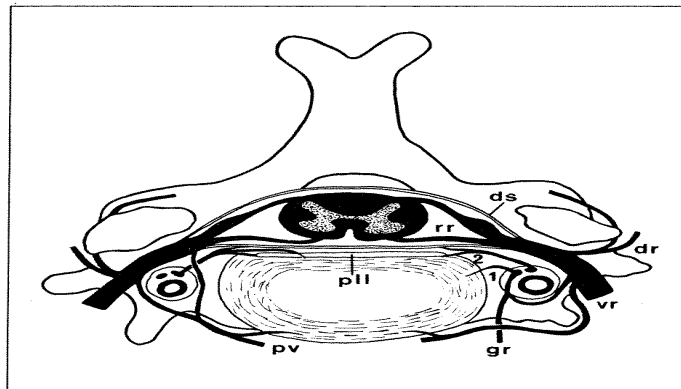


Figure 1. Top view of a typical cervical vertebra and its related nerves.
The dorsal and ventral roots (rr) of the spinal nerve are enclosed in the dural sac (ds) which blends with the epineurium of the nerve. The spinal nerve divides into a ventral ramus (vr) and a dorsal ramus (dr), whose medial branch curves around the articular pillar (cf Figure 2). Prevertebral branches (pv) of the ventral ramus innervate the prevertebral muscles, the anterior longitudinal ligament and the anterior aspect of the intervertebral disc.
Accompanying the vertebral artery are the so called vertebral nerves, formed by gray rami communicantes (gr) and branches of the ventral rami. Derived from the vertebral nerves are branches that directly innervate the lateral aspect of the intervertebral disc (1), and the sinuvertebral nerve (2), which enters the intervertebral foramen to innervate the dura, the posterior longitudinal ligament (pll) and the posterior aspect of the intervertebral disc.

Figure 2: Vertebra and Related Nerves³

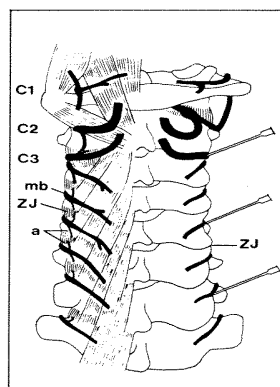


Figure 2. The C1 dorsal ramus and the medial branches of the other cervical dorsal rami.
On the left the medial branches (mb) are shown crossing the waists of the articular pillars where they supply articular branches (a) to the adjacent zygapophyseal joints (ZJ) before ramifying in multifidus. On the right target points suitable for anaesthetising individual medial branches are indicated by needles, placed as they would be on the radiological silhouette of the cervical spine.

RESEARCH QUESTION

Does scientifically valid effectiveness and safety evidence support PRFN treatment of chronic cervical pain arising from zygapophyseal joint injury following motor vehicle accidents?

PURPOSE

- (1) Systematically to gather and critically appraise the scientific evidence regarding PRFN versus: no treatment; placebo; or other interventions.
- (2) To estimate the British Columbia population health impact of PRFN.

METHODS

A systematic review was conducted aimed at identifying and assessing the available scientific evidence on effectiveness of PRFN.

- Relevant studies were identified by searching computerized bibliographic databases and fugitive information sources.
- All randomized controlled trials and controlled trials were critically appraised if they: compared any form of PRFN, used any type of control intervention; reported at least one health outcome; and had a minimum observational period of 4 weeks.

A review of the literature on the epidemiology of whiplash was conducted. Studies were reviewed if they examined incidence or prevalence of whiplash or the time-to-recovery of subjects with whiplash; and study subjects suffered a neck injury in a motor vehicle accident (other causes excluded).

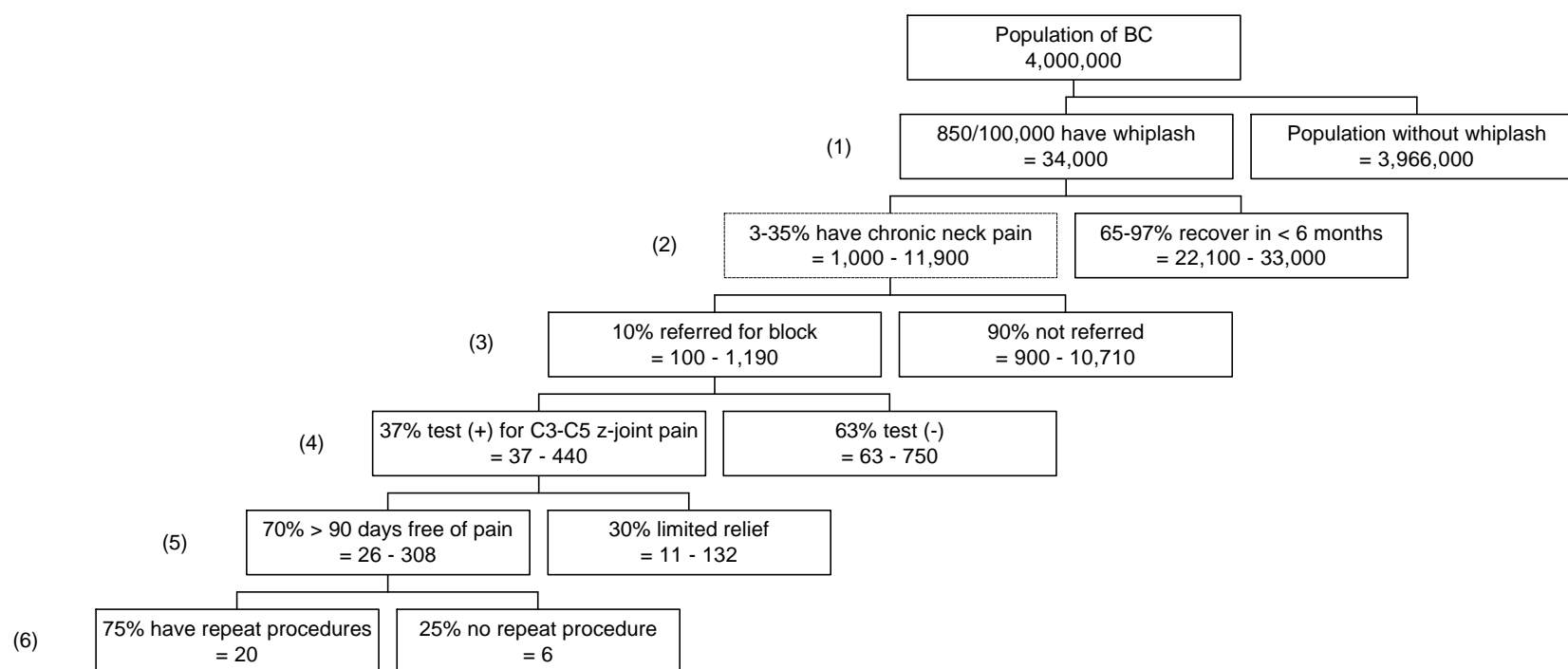
An expanded evaluative framework was used to assess the scientific evidence put forward in support of neurotomy testing and treatment strategies along seven dimensions:

1) the population at risk; 2) test performance; 3) clinical management; 4) health outcome measures; 5) population health impact; 6) economic impact; and 7) social impact.

A model was developed based on this framework.

Figure 3: Diagram of findings

[Numbers in brackets indicate result headings]



RESULTS

The findings are shown diagrammatically in **Figure 3** (in which the following result headings are indicated).

(1) INCIDENCE OR WHIPLASH INJURY

Published ICBC data provides a population-based annual estimate of 850/100,000.⁴

Applying this estimate to the BC population of approximately 4 million people results in a total of 34,000 whiplash injuries per year.

(2) INCIDENCE OF CHRONIC NECK PAIN

The subset of the population eligible for PRFN can be estimated from time-to-recovery data. The subset of interest are whiplash injury patients with cervical pain symptoms persisting beyond twelve months from the time of injury. The potential PRFN referral population is estimated at 3% of the total whiplash-injury population.⁵⁻⁶ This would potentially result in approximately 1,000 patients per year in BC referred to a cervical spine pain-treatment centre for evaluation following automobile accidents.

(3) REFERRAL TO PAIN CLINIC

Only a portion of patients eligible for referral will actually be referred to a chronic-pain clinic. Referral will depend on several factors including patient and physician interest in and awareness of PRFN, cost to the patient, as well as availability and location of the services. Current services in BC would allow as few as 10% (100) of the estimated 1,000 people eligible for PRFN referral, are actually referred.

(4) POSITIVE BLOCK

The total positive diagnostic tests is estimated at 36% - 38%. If 100 patients are referred, 50 will have predominant neck pain and 50 will have predominant headache. Of the 50 with predominant neck pain, approximately 25 will have 'positive diagnostic tests'. Of the 50 with predominant headache, approximately 12 will have a 'positive diagnostic test'.⁷

(5) INITIAL PAIN RELIEF

Approximately 70% of these patients that elected to have neurotomy would have > 90 days free of pain. In the BC model of 100 patients referred, 37 would be median nerve anaesthetic diagnosis-positive for z-joint levels below C2/C3 and about 70% (26 patients) would achieve this level of benefit. It should be recalled that the 70% efficacy estimate applies only to patients with z-joint levels below C2/C3. In a non-randomized trial, the efficacy of therapy at the C2/C3 level was not considered adequate to justify treatment at this level.⁸

(6) ONGOING RELIEF

Prolonged pain relief, through repeat procedures, can be anticipated in about 75% of patients achieving initial benefit. A study by McDonald⁹ shows that repeat procedures are possible and also that they are likely to be effective if the initial response lasted greater than 30 days. Considering the BC model, approximately 20 will achieve prolonged pain relief through repeat procedures.

Limitations of health impact estimate

The health impact estimate provides, at best, a crude estimate of the number of patients who may be referred for PRFN assessment. The estimate is rudimentary because it requires as yet unconnected insurance and clinical data.

The randomized control trial estimates of benefit are based on the technical capability of one 'senior' individual working under extremely strict research conditions. "In principle, technical problems may affect the efficacy of the procedure. An inaccuracy of 1mm in electrode placement is sufficient for the target nerve to escape adequate coagulation."⁹

CONCLUSIONS

- PRFN has been shown effective versus placebo in one RCT involving 24 very carefully-selected patients with chronic neck pain following whiplash injury. This research establishes a higher standard for outcome research in the area of chronic cervical pain management. The burden of proof now rests with alternate treatment programs to show benefits versus PRFN.
- PRFN is at a critical stage in public policy formulation. Promising clinical findings are counter-balanced by investigational concerns over lack of effectiveness (as opposed to efficacy) evidence. Given the concerns, rapid diffusion of this technology would be inappropriate. On the other hand to limit the technology unnecessarily would restrict proven pain relief efficacy for certain individuals. A balance is needed, in which training and resource allocation may properly proceed, but with dissemination made conditional on further outcome research.
- Further outcome research requires a treatment and a control group to determine benefit versus harm in a particular setting, such as BC.
- In addition, the work of Lord *et al* and Bogduk may have set a higher standard for outcome research than the level otherwise available in the field of whiplash injury. More generally, efficacy evidence from a randomized control trial is likely to help legitimate whiplash injury as a clinical entity, rather than what has been cynically referred to as the clinical manifestation of a litigious insurance opportunity. [REF]

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