

# Occipital neuralgia treated by intradural dorsal nerve root sectioning

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## Cephalalgia

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The term occipital neuralgia was first used in 1821 to describe a characteristic pain in the region innervated by the greater occipital nerve. Since that time numerous authors have failed to reach a consensus concerning the presentation, cause, and treatment of this entity. Review of these previous works reveals that the term occipital neuralgia encompasses a collection of signs and symptoms which develop secondary to a variety of different disease processes. We have treated nine patients suffering from severe occipital pain with associated  $C_2$  hypesthesia, unilateral retro-orbital pain, and occipital or  $C_2$  tubercle trigger points by intradurally sectioning the  $C_1$ - $C_4$  dorsal rootlets ( $C_4$  if shoulder pain existed). All patients had been treated previously with various modalities without success. This paper discusses the results obtained in these patients. || *Intradural selective dorsal rhizotomy, occipital neuralgia*

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Beruto y Lentijo and Ramos first used the term occipital neuralgia (ON) in 1821 (1). Despite numerous papers devoted to the presentation, treatment, and anatomical basis for ON, there remains no clear consensus regarding its etiology and proper management. Here we describe our experience with intradural  $C_1$ - $C_3$  and  $C_1$ - $C_4$  dorsal rhizotomies in nine patients with ON in whom previous treatment was unsuccessful. These results are discussed together with the previous literature.

## Methods

### *Patient population and selection*

Between 1988 and 1992 we carried out intradural  $C_1$ - $C_3$  and  $C_1$ - $C_4$  selective dorsal rhizotomies in 9 patients (2M, 7F) with intractable ON (Table 1). Symptoms included hypesthesia, paresthesias, hyperesthesia or dysesthesia in all patients in the distribution of the greater and lesser occipital nerves. All patients suffered with a constant ache which was punctuated intermittently by sharp, lancinating, electric shock-like sensations. Nuchal trigger points could be identified in each case. Six patients (nos 2-6, 9) experienced unilateral or bilateral retro-orbital pain. One patient (no. 4) reported nausea, vomiting, photophobia, and visual blurring in association with ON. The period of time between the development of ON and our treatment ranged from 9 months to more than 20 years. In at least six cases this period represented the time between development of initial symptoms and first attempts at therapy.

In seven patients a presumptive cause of ON was obtained. Three cases were felt by the patients to be related to motor vehicle accidents (MVA), one case anteceded an assault, one case followed an episode

of meningitis, one case developed shortly after a retromastoid craniectomy with the lesser occipital nerve (LON) injured at the point of the incision, and one case was related to an injury suffered while coal mining, in which a pile of bricks fell onto the back of the patient's neck.

Each patient responded to marcaine and depomedrol injections either in the deep scalp and cervical muscles overlying the GON or LON, or near the  $C_2$  facets. The response to these blocks was in many cases initially beneficial for days to weeks. In all cases, however, the beneficial periods gradually shortened. No patient with less than a one-year history of ON was offered a surgical procedure and all demonstrated an absence of meaningful benefit from physical therapy. As indicated in Table 1, six patients underwent procedures such as neurolysis, neurectomy, and neuroma excision prior to the performance of an intradural selective dorsal rhizotomy. Relief from these initial procedures lasted anywhere from zero to two years, although the vast majority of procedures provided a modicum of relief for less than five months.

## Procedure

Following induction of general anesthesia the patient was placed in the prone position and the head secured with skull pins and a rigid head holder. A midline cervical incision was used to expose unilaterally the  $C_1$  ring and the lamina of  $C_2$ - $C_4$ . These structures were removed to expose the underlying dura which once open was tacked to the overlying muscle so as to improve exposure and minimize soiling of the cerebrospinal fluid with sanguinous run-in. The operating microscope was then used to identify the  $C_1$ - $C_4$  dorsal nerve roots as they exit

Table 1. Intradural C<sub>1</sub>-C<sub>3</sub> or C<sub>1</sub>-C<sub>4</sub> selective dorsol rhizotomies in nine patients with intractable occipital neuralgia.

Patient	Etiology	Previous procedures/ time post-development occipital neuralgia	Outcome	Follow-up
1	MVA (C <sub>1/2</sub> fracture)	nerve blocks neurolysis/3y extradural GON section/3y C <sub>2-4</sub> dorsal rhizotomy/9m recurrence	temporary relief < 1m relief 5m relief complete relief	16m
2	MVA	nerve blocks extradural GON section/3y C <sub>2-3</sub> dorsal rhizotomy/4y	temporary relief 2w relief complete relief	48m
3	MVA	nerve blocks/11y neurectomy GON/11y extradural section GON/12y C <sub>2-3</sub> dorsal rhizotomy/13y	temporary relief 1m relief 2y relief 1y complete relief/acute recurrence to no relief	51m
4	meningitis?	nerve blocks C <sub>2-3</sub> dorsal rhizotomy	temporary relief 9m complete relief/acute recurrence to no relief	51m
5	?	nerve blocks neurectomy GON C <sub>2-3</sub> dorsal rhizotomy	temporary relief 2w relief complete relief ON (some residual HA)	20m
6	GON/LON entrapment	nerve block/9m neurolysis GON/9m excision of neuroma/14m C <sub>2-3</sub> dorsal rhizotomy/55m	temporary relief no relief no relief 30% relief	39m
7	?	neurectomy distal GON C <sub>2-3</sub> dorsal rhizotomy MVD CN 5, 7, 9, 10 C <sub>2-3</sub> dorsal rhizotomy (additional rootlets cut) excision occipital neuroma at transverse process C <sub>2/3</sub>	1w relief reduction in pain (amount?) throat/facial pain decreased/no change occipital pain minimal relief ?	No FU
8	trauma	nerve blocks C <sub>2-3</sub> dorsal rhizotomy/20y	temporary relief 60% relief at 7m 40% relief	13m
9	trauma	nerve blocks/8y C <sub>2-4</sub> dorsal rhizotomy/9y	temporary relief complete relief	12m

their respective foramina. While identification is generally straightforward, it is important to confirm the dorsal position relative to the dentate ligament of any structure prior to its excision. A careful search must be made for small branches which may interconnect and exit with the C<sub>1</sub>-C<sub>4</sub> dorsal rootlets, for each of these must be sectioned in order to be sure that the occipital region is truly deafferented. These interconnections, as well as the dorsal C<sub>1</sub> rootlets, may simulate arachnoid in their appearance (2). It is important to be sure that ascending accessory nerve fibers are not mistaken for the interconnecting sensory fibers. Having completed the selective dorsal rhizotomy, the dura and wound were closed in a water-tight fashion. Drains were not routinely placed.

Post-operatively the patient was kept in the intensive care unit for one evening. If there was no post-operative complications they were discharged in three to four days.

## Results

Eight of our nine patients received follow-up consisting of routine office appointments. One patient (no. 7) has been followed sporadically owing to work which takes her out of the country for prolonged periods of time. Her overall results, however, have been documented through detailed letters. The eight patients residing in the country were each called prior to the tabulation of Table 1 and asked about their initial symptoms, the relief they received following their rhizotomy, and the level of current relief. These levels and the corresponding follow-up period can be seen in Table 1.

Four patients have received complete relief from their ON at 12, 16, 20, and 48 months' follow-up. Two patients subjectively received 40% and 30% relief at 13 and 39 months, respectively. Two patients experienced complete relief for 9 and 12 months; however, both had sudden recurrences and

Table 2. Summary of 28 articles on occipital neuralgia and its treatment.

Author	No. of patients	Etiology	Procedure	Outcome	Follow-up
Blume	114	trauma 76 anatomically abnormal 82 non-traumatic 38 normal anatomy 32	radio-frequency	73.7%; complete relief (excellent) 4.4%; transitory pain (good) 4.4%; 50% reduction (fair) 17.5%; no relief (none)  traumatic etiology: 72%; excellent 6.6%; good 5.3%; fair 16%; none  non-traumatic etiology: 76%; excellent 24%; good  anatomically normal: 90%; excellent 3.5%; good 6.5%; fair 68%; excellent 6.1%; good 2.4%; fair 23%; none	6-24m
Chambers	35	?	dorsal rhizotomy	10/22; complete relief 6/22; 75% improvement 6/22; < 75% relief	3m-6.5y
Cox	490	spasm (?#)	scaleneotomies; 395 neurectomies; 95	scaleneotomies excellent 30% good 56% poor 14%  neurectomies: excellent 15% good 71% poor 9% (meaning of categories?)	?
Cusson	4	non-traumatic 4/4	dorsal rhizotomy	complete relief	5w-1y
Dugan	10	instability/ miscellaneous	9; collar 1; no treatment	3; complete relief 7; partial relief/no relief	?
Ehni	7	C <sub>1-2</sub> arthrosis	5; fusion/decompression	surgical; complete relief conservative; partial relief	6m-10y
Gayral	3	Barre-Lieou osteoarthritis; 2 fracture C <sub>3-4</sub> ; 1	conservative therapy injections/traction	3/3; complete relief	1-4y
Graff-Radford	3	myofascial pain; 2 trauma; 1	injection/traction	2/3; relief (myofascial patients) 1/3; residual pain (trauma patient)	1-2y
Anthony		86	injection	75/86; complete relief	mean HA free days 31
		60	GON neurectomy	42/60; complete relief	mean HA free days 244
Hammond	23	trauma; 15 spondylosis; 3 rheum, arthritis; 2	injection; 14 neurectomy; 4 collar; 5 neurostimulation; 2 medication; 9  external carotid ligation; 1	poorly defined	< 1w-1y

erative damage it may also be a combination of peripheral nerve entrapment and a more central pain syndrome not completely relieved by the microvascular decompression. The dorsal rhizotomy may be responsible for the 30% reduction in pain, while the remaining 60% could be attributed to another mechanism. Patient no. 7 has an odd history of diffuse craniofacial discomfort, and while procedures aimed at interruption of transmission along the occipital nerve were well meaning in the face of a confusing symptomatology, she clearly could have been misdiagnosed.

Although our series is small, it is interesting to note that of the five patients with a history of cervical trauma, three experienced complete relief and one received 40% relief. Trauma-induced splenius capitis spasm and subsequent nerve compression may be the etiology of ON in such cases (37, 38). Sectioning the nerve intradurally, therefore, would be an effective means of interrupting afferent impulses. From these results, one might consider operating only upon those patients with a history of trauma unless bony compression of the nerve roots can be well documented on radiologic examinations. Because of poor documentation it is difficult to ascertain from the literature how the percentage of patients with a history of trauma responded to therapy as opposed to patients without such a history. One paper by Blume (25) demonstrated a 72% excellent outcome in patients with a history of trauma treated by radio-frequency lesions. However, this same study showed a 76% excellent outcome in those patients without a history of trauma who were treated in the same way.

At this point in time we feel most patients with ON should be managed conservatively for at least one year to ascertain whether or not the entity will resolve on its own or respond to nerve blocks or physical therapy or both. Should the patient continue to have pain without evidence of upper cervical spondylosis and foraminal nerve encroachment we recommend intradural selective dorsal rhizotomy as described above. This procedure provides denervation by interrupting the nerve at its origin. Such intervention should theoretically eliminate the effects of more distal neuromas or entrapments which can be difficult to localize and relieve. Perhaps results from this procedure will improve if it is used as a first line surgical therapy, thus abating the pain syndrome before alternative, as yet poorly understood, pathways are established.

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