DELAYED ACTION POTENTIALS IN THE TRIGEMINAL SYSTEM OF CATS

DISCUSSION OF THEIR POSSIBLE RELATIONSHIP TO TIC DOULOUREUX*

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A. Historical Development of Therapy in Tic Douloureux. The alleviation of pain10 is one of the most important and frequent tasks undertaken by the neurosurgeon.164 Pain involving the region of the head167 occupies a major position in this field. Unfortunately, the role of the surgeon in the treatment of headache54,117 and the many varied facial neuralgias18,112,113 remains even today confused and discouraging.123 But one syndrome of great neurological interest stands out clearly separated from the rest in most instances—tic douloureux.

This term is usually associated with its most frequent and classical form, primary trigeminal neuralgia.38,42 Yet it must be remembered that occasionally other cranial nerves may be involved in what is apparently a true tic syndrome. Thus the nervus intermedius (nerve of Wrisberg) portion of the facial nerve,83,120,129,166 the glossohypoglossal nerve,1,16,148,163 and possibly also the uppermost fibers of the vagus nerve125,150 to the external auditory meatus may be involved in the tic-pain syndrome. It is not settled whether the highest cervical nerves may also rarely be the site of similar pain. Even though peripheral causalgias105,110 and the thalamic syndrome may produce severe dysesthesia to touch stimuli, the true tic syndrome does not occur outside this bulbar area where the aforementioned nerves pour their incoming general somatic afferent impulses into a common pool—the descending trigeminal tract and nucleus.22,32,165

The history of therapeutic attempts in cases of tic douloureux is long and varied.31 Unfortunately, there is still no satisfactory medical treatment. Trichlorethylene,59 vitamin B-124,45,144 and stilbamidine136,168 have been utilized, but the results generally have been disappointing. The various forms of surgical intervention for relief of pain, therefore, comprise the major portion not only of the past,111 but also of the present treatment.

Originally, the facial nerve was often attacked surgically. Then, over one

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hundred years ago, Bell\textsuperscript{13} demonstrated that the trigeminal, and not the facial, was the sensory nerve of the face. As peripheral neurectomies and avulsions,\textsuperscript{142} as well as alcohol blocks,\textsuperscript{118,116} were of only temporary benefit in most cases.\textsuperscript{64,160} the surgeon soon looked for a procedure that would offer more permanent relief.

Removal of the gasserian ganglion\textsuperscript{93,111} was perfected to a high degree by Cushing.\textsuperscript{24} Later Spiller and Frazier introduced posterior root section.\textsuperscript{48} The technique was improved to spare the motor root.\textsuperscript{3,49,79,115} Finally, only a partial sensory root section was found necessary in most cases.\textsuperscript{49,140} The surgical approach in such a craniotomy was usually performed extradurally through the temporal route with control of the middle meningeal artery. Others, such as Dandy,\textsuperscript{96} preferred a posterior fossa approach, which is still used by some today.\textsuperscript{160} Other methods of permanent destruction of the trigeminal ganglion or root have been advocated, including electrocoagulation,\textsuperscript{92} and injection of alcohol\textsuperscript{67} and boiling water.\textsuperscript{86}

In an attempt to obviate the undesired postoperative facial anesthesia, Sjöqvist\textsuperscript{134} in 1938 reported his technique of trigeminal medullary tractotomy and made a major contribution to the understanding of the central connections of the trigeminal system. Walker described mesencephalic tractotomy\textsuperscript{159} and others improved medullary tractotomy further.\textsuperscript{47,53,121,173} These procedures, however, were considered by most either to be too major an undertaking for routine utilization, or to produce too high a percentage of dysesthesias,\textsuperscript{40,66} and the Frazier operation remained the standard procedure in spite of the postoperative facial anesthesia and the risk of corneal complications in a small percentage of cases.

Then Taarnhøj\textsuperscript{147–149} in 1952 introduced a procedure for decompression of the trigeminal posterior root. This procedure was given further trial and various decompression techniques were carried out through several approaches.\textsuperscript{26,28,53,103–106,120,139,170} Apparently, some were led to believe that compression might be an underlying etiological factor since decompression seemed to help tic pain.\textsuperscript{55}

At the same time that Taarnhøj was decompressing the posterior root, Shelden and Pudenz were obtaining equally good results by decompressing the peripheral maxillary and mandibular branches at the foramen rotundum or ovale, also without postoperative anesthesia, and with no significant operative complications. The operative trauma to the trigeminal nerve or root seemed the most likely common factor involved in these two types of “decompression” procedures. Perhaps trauma was also an explanation of relief of pain in some of the earlier partial root sections, even when Dandy’s posterior fossa approach was used. In 1955, Shelden et al.\textsuperscript{132} reported a series of 29 patients* treated by operative compression of the trigeminal posterior

\* Drs. Shelden and Pudenz (personal communication) now have a series of over 100 patients who have had the compression procedure. The longest follow-up is 5 years. There has been a recurrence rate of approximately 9 per cent. While more recurrences are certainly to be expected as time passes, it must always be remembered that even trigeminal rhizotomy has a significant rate of recurrence.\textsuperscript{81}