

## NEURALGIA OF DENTAL ORIGIN\*

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Many methods have been advocated down through the years for the relief of pain in the head but less consideration has been given to the etiologic factors involved. Trephined skulls of ancient people have been uncovered and it has been assumed that operations were performed to allow confined demons to escape. Drugs also were used for the relief of headaches, and, in the Ebers Papyrus, frankincense, cumin, and goose grease are mentioned as specific remedies. These empirical methods, however, were gradually replaced when rational and scientific thinking directed efforts toward elimination of the causative factors. During this period, the teeth assumed increased importance in regard to etiologic factors; indeed, at times, they were given a place of too great prominence. The studies in 1829 of Sir Charles Bell were of great importance and to him we are indebted for an understanding of some forms of pain in the head, particularly of facial neuralgia which is due to disorders of the fifth rather than of the seventh nerve as was previously thought.

The anatomical relationships of the fifth nerve, which is the largest of the cranial nerves, are interesting in relation to the problem of pain in the head. This is the great sensory nerve of the head and face and the motor nerve of the muscles of mastication. The trigeminal nerve emerges from the lateral aspect of the pons, near its upper border and courses forward to the apex of the petrous portion of the temporal bone where it forms a large ganglion. The motor root passes beneath the gasserian ganglion to transmit motor impulses to the muscles of mastication. Three large branches are given off at this point. The ophthalmic branch is the first and smallest of the three; it passes anteriorly through the middle fossa and is located beneath the dura mater, making its exit from the cranial cavity through the superior orbital fissure. Before it emerges, however, it gives off communicating branches to the oculomotor, trochlear, and abducens nerves. Its terminal branches consist of the frontal, lacrimal, and nasociliary.

The maxillary nerve, or second division, is a sensory nerve. From its origin in the ganglion, as a flattened plexiform band, it passes forward horizontally, leaving the skull through the foramen rotundum. In crossing the pterygopalatine fossa, it gives rise to two of the smallest nerves of the body, connecting with Meckel's ganglion; it then enters the orbit through the inferior orbital fissure. Thence it transverses the

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infra-orbital groove and canal in the floor of the orbit and appears upon the face at the infra-orbital foramen. Its terminal branches spread out upon the side of the nose, lower eyelid and upper lip, joining with filaments of the facial nerve. Immediately before and during the passage of the nerve in the infra-orbital canal, it gives rise to three branches forming a so-called outer nerve loop which supplies the teeth and soft tissues of the buccal mucosa. The nerves arising from Meckel's ganglion, which has a communicating branch to the facial nerve, course forward and downward to form an inner nerve loop which supplies the hard and soft palate, the nasal tract, and the tonsillar fossa.

The third division or mandibular nerve supplies the teeth and soft tissues, the skin of the temporal region, and the lower part of the face including the lower lip and anterior two-thirds of the tongue. It is the largest of the three divisions and is made up of two parts, a large sensory and a small motor root. The two parts unite after passing through the foramen ovale. A small branch goes to the internal pterygoid muscle. It there divides into an anterior and posterior trunk. The anterior division supplies the muscles of mastication. The posterior is the larger and for the most part sensory, receiving a few filaments from the motor root. It subdivides into the auriculotemporal, lingual, and inferior alveolar nerves. The auriculotemporal branch winds around between the condyle of the mandible and the stylomandibular ligament, anterior to the external auditory canal. It is believed that this nerve is often involved in dyscrasias of the temporomandibular articulation. It is this intricate interrelationship which often makes the etiology of neuralgia difficult to trace and discover.

The symptoms of neuralgia are commonly divided into two groups, according to the intensity of subjective symptoms and clinical manifestations. Tic douloureux has been described as an acute, intense, sharp, sudden paroxysm of pain which emanates from a trigger zone and leaves the patient quite exhausted after the period but apparently free from further discomfort until the next attack. While the etiologic factor cannot be demonstrated, medical and surgical treatment is available which relieves the condition. In atypical neuralgia, the symptoms are much less severe and consist of a dull burning, boring, or throbbing sensation of a continuous nature. Very often the continuous factor of the discomfort appears to be more important to the patient than the actual pain. In this group more definite etiologic factors may be demonstrated, but this is not always true. It is in such cases that the teeth may be a factor. Other factors which must be considered are sinusitis, foreign bodies, malignancies along the pathway of the fifth nerve, disorders of the

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temporomandibular articulation, involvement of the nerve pathway by sclerotic bone, galvanism, and those disorders not demonstrable clinically such as a neuroma and possible sclerotic nerve tissue which is the result of injection of a local anesthetic into the nerve trunk proper.

The intimate relationship between septic teeth and general symptoms including headache and facial neuralgia has been established. Two distinct types of pain may be associated with septic teeth and their investing tissues—neuralgia or odontalgia, a referred pain, and localized pain.

Neuralgias referable to the teeth or odontalgias may involve one or more branches of the trigeminal nerve and, when such symptoms are present, clinical and roentgen examinations usually show definite evidence of pain-potential teeth. In the presence of infection of the pulp, the pain at the onset and throughout the various stages of pulpitis, is usually of a general reflex variety, involving all the teeth in the region supplied by that particular branch of the fifth nerve. Pain may also be referred to the other branches but, in this case, it is always unilateral. The neuralgia, a primary odontalgia, becomes acutely intense and is localized to a particular tooth when the inflammation includes the entire pulp tissue. Such inflammation is followed by a necrosis ending in a putrefactive process with the formation of ammonia, carbon dioxide, hydrogen sulfide gases, peptones, ptomaines, and aromatic and fatty acids as the end products.

At this stage, heat and cold therapy are of little value. Heat actually may increase the symptoms, and reclining also tends to make the pain more severe. Direct relief can be afforded only by making an opening into the tooth to expose the pulp tissue and release the pressure. As the gangrenous process gradually progresses to involve the apical tissues, a second type of pain is evidenced. This is more of a continuous pain which increases with pressure due to mastication and it is confined exclusively to the affected tooth which often feels extruded from the socket. Such pain is a definite indication of involvement of the peridental membrane and periapical tissues. Brashear<sup>1</sup> has recently pointed out that pain sensation is peculiar to the pulp of the tooth, while pressure sensation is registered entirely by the investing peridental membrane. The latter type, or localized pain may also be experienced as the organisms reach the periapical tissue by way of the surrounding periodontal tissues as in pyorrhea alveolaris.

Percussion is a most useful diagnostic sign in the early stage, vitality testing is of some value, and the roentgenograms may show the beginning of periapical change.

The occurrence of a secondary pulpitis with neuralgia is not rare.

In the majority of cases, the underlying disturbance is due to infection such as acute nasal catarrh involving the antrum or other general diseases which affect the mucous membrane of the nose and the circulation as a whole. General diseases of noninfectious type such as leukemia, locomotor ataxia, anemia, chlorosis, or increased intradental blood pressure should be considered. Many sound teeth have been sacrificed because of this condition. A chronic dental septic condition in which no local subjective symptoms are present should always be considered in migraine headaches. The lessened virulence of the organism and resistance of the host precludes an acute attack, but the dissemination of toxic material, i.e., ptomaines and bacterial proteins, through the system may result in tissue sensitization or manifestations of allergy which may be responsible for a chronic headache or neuralgia.

Pulp stones are sometimes considered as etiologic factors in head pain of dental origin. I do not believe that pulp stones *per se* are the cause of neuralgia, because their presence can be demonstrated too frequently even in perfectly sound teeth and when no symptoms of neuralgia are present. If the entire histories were carefully reviewed in those cases of relief attributable to the removal of pulp stones, it would probably be shown that the questionable teeth contained fillings or had given some discomfort previously; in other words, they would fall under the classes already described under septic teeth. Hatton and others<sup>2</sup> have demonstrated the presence of pulp abscesses or circumscribed, walled-off areas of infection in otherwise normal pulps. Such teeth respond to the vitality test, appear negative especially to roentgen study, but usually show a large restoration which approximates the pulp, and pulp stones are present. These workers believe this condition is the only primary source of dental focal infection and is more prevalent today due to the overzealousness on the part of the dentist to prevent devitalization or loss of the tooth.

All the symptoms of neuralgia which originate from the dental structure as the result of irritations of the fifth nerve do not necessarily develop from dental sepsis.

Traumatic occlusion in conditions where the teeth have been lost gradually and have not been replaced may possibly result in neuralgia referable to teeth if unusual stress is placed upon them. It has been estimated that a leverage of 250 pounds per square inch can be exerted on the teeth by the muscles of mastication. The leverage on teeth weakened by loss of adjacent members results not only in neuralgia but in abnormalities of the fundamental structures as evidenced by drifting or tipping of the teeth. This naturally has a tendency to increase the pain, and the tooth may subsequently be lost due to weakened founda-

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tion, or the impaired nutrition of the tooth may result in a devitalized pulp.

Where direct pressure, such as that due to an impacted tooth, a supernumerary tooth, an osteoma, or a cyst, is exerted at a foramen or directly on the mandibular canal, all the symptoms of neuralgia may follow. Main<sup>3</sup> cites the case of a man 50 years of age who had almost complete relief from chronic headaches following removal of an impacted cuspid. In one of our cases, the removal of an unerupted cuspid in the upper left arch resulted in relief of a dull occipital pain that had persisted over a long period of time. Main has demonstrated the relief of some cases of otalgia by the removal of unerupted and impacted lower third molars, and the relief of headaches by the removal of supernumerary teeth. He points out that unerupted upper third molars apparently have little bearing on neuralgia, but that the lower third molars may often be the etiologic factor. This is due to their proximity to the mandibular canal.

The following six cases illustrate these etiologic factors.

*Case 1:* A woman, 50 years of age, presented herself for roentgen study of the jaws. For many years she had experienced a sharp, stabbing, paroxysmal type of pain and a diagnosis of true tic douloureux had been made although there appeared to be no definite trigger zone. Both arches were edentulous, the teeth having been removed in an effort to lessen the pain.

Radiographic examination disclosed an unerupted lower right bicuspid lying horizontally in the mandible in close approximation to the mental foramen. In removal of the tooth, the mental foramen was uncovered and the mental nerve exposed due to the marked alveolar bone resorption that had occurred.

Following the removal of this tooth, there appeared to be complete relief from symptoms. This was so pronounced that shampoos no longer gave any uncomfortable reaction, although they formerly had caused severe pain which closely simulated the form of trigger zone stimulae.

*Case 2:* A man, fifty years of age, had been wearing dentures for many years, but for several months preceding our examination he had had a dull, throbbing pain in the lower left mandible. Examination revealed a small, hard, smooth surface in the region of the ramus, and roentgen examination disclosed an unerupted third molar and a residual area in the bicuspid region on the same side. Following the removal of the tooth and the residual area, the symptoms disappeared.

*Case 3:* A woman, 35 years of age, complained of neuralgia behind the ear and in the ramus of the left jaw. This pain at times appeared to center in the lower left second molar which was a crowned tooth and acted as a bridge abutment. Clinical and roentgen examinations of this tooth revealed no abnormalities. The persistent pain, however, prompted us to remove the bridge and crown whereupon the molar tooth was found to have extensive caries which apparently involved the pulp. The removal of this tooth eliminated the pain for a period of time, but several months later the patient returned with neuralgia of the left side of the face. Examination of the nose and throat gave essentially

normal findings as did a roentgen survey of the oral area. It was noticed that inflation of the eustachian tube gave some relief. Relief was also experienced when the vertical dimension of the relationship of the jaws was slightly increased, thus changing the temporomandibular articular relationship. Unfortunately, economic conditions were such that permanent measures were not adopted.

*Case 4:* A young woman, 25 years of age, complained that severe paroxysms of pain developed following the removal of an unerupted and apparently impacted lower right third molar. This tooth had been extracted for prophylactic measures. The paroxysms of pain were intermittent in character and there was an area of tenderness posterior to the ear on the affected side. Roentgen examination revealed what appeared to be a retained root in contact with the mandibular canal. No particular rarefaction involved the former. Following a second operation for the removal of the root apex, there has been no further discomfort.

*Case 5:* The patient was a child 15 years of age who complained of persistent headache. The anterior deciduous teeth had been lost as the result of an automobile accident at the age of three years. Examination of the lateral teeth showed marked hyperplasia of the enamel, incomplete formation of the root canals and the response to the vitality test was weak. A diagnosis of bilateral radicular cystic formation of the maxilla, apparently originating from the lateral teeth, was made, and following complete enucleation of the cystic membranes, the headaches disappeared completely.

*Case 6:* This patient had a severe pain in the pterygomandibular region and suspected that a tooth might be the cause. A radiographic negative devitalized bicuspid tooth with the root canal well filled was revealed. Removal was deferred at that time, but extraction was advised if the pain persisted and no other positive findings were discovered. The following day, while the patient was in the hospital and his temperature ranged from 100° to 103°F., a definite bulging of the mucosa appeared in the retromolar area, almost obscuring the third molar. This had not been observable the previous day. The condition rapidly became worse and the patient expired four days later. The diagnosis of cavernous sinus thrombosis was established at autopsy, and the probable etiologic organism was a *Staphylococcus albus*. This organism was also found on culturing the devitalized tooth which was removed at autopsy.

This case is mentioned because symptoms referable to the teeth were marked early in the course of the disease but they were not the primary cause. Removal of the tooth undoubtedly would have been followed by the inevitable sequence and possibly would have carried out the resultant cure.

In regard to the temporomandibular disarticulations with pain which Goodfriend<sup>4</sup> describes as dysarthrosis, subarthrosis, and subluxation, the essential value of maintained normal occlusion is emphasized, and strong arguments are advanced for the replacement of the missing teeth in order that the masticating function may be maintained and loss of vertical dimension prevented. Costen<sup>5</sup> reported the cases of 125 patients who had headache and symptoms referable to the ear. He states that improvement followed restoration of the normal occlusional planes in functional activity and correction of the vertical relationship, thus bringing the temporomandibular articulations within the normal range.

Another factor to be considered in determining the etiology of neu-

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ralgia is described by Mead<sup>6</sup> as primary chronic osteomyelitis. "The process of primary chronic osteomyelitis is an insidious one, and the symptoms are often vague and indefinite. In fact, the symptoms may be so slight and so ill-defined that the patient is not aware that any disease is present. It is therefore a chronic inflammatory process of long standing. The objective symptoms are occasionally a bulging or swelling of the buccal or lingual plate or in some rare cases there is an escape of pus or purulent matter from a small fistula in the mouth. The subjective symptoms are usually the diagnostic factor in bringing to the operator's attention the presence of this type of disease. The patient may complain of an indefinite or ill-defined pain radiating back of the ear, above or below the eye, or complain of a dull, heavy, uneasy sensation of the particular region involved." I have not been able to demonstrate this type clinically, but such a condition has been suspected in two cases of broken-down septic areas.

Pain may also be associated with a galvanic current, the marked electrical flow between dissimilar metals in a saline or acid media. This subject has been investigated by Lain<sup>7</sup> who has used a small galvanometer to measure the flow between restorations composed of different metals occupying a wide position in the electromotive series range. He has estimated that about 33.7 per cent of the patients examined exhibited mild electric shock. This simulates a pulpitis and is often referred to other teeth.

In the injection of novocaine into the tissues for local anesthesia, the tonicity of the solution may be a factor in facial neuralgias, particularly in nerve block injections where the solution is placed in close proximity to, or involves, one of the divisions of the fifth nerve. With the use of hypotonic solution, a process of endosmosis results in which the solution diffused into the cells will cause a ballooning and possible bursting of those cells. A hypertonic solution, on the other hand, produces an exosmosis, with resultant shrinkage and death of the cells. Either solution may conceivably be the cause of a sclerosis of nerve tissue or adjacent tissue with possible pain reflex.

In conclusion, it should be emphasized that a complete oral examination as well as a physical examination is necessary to rule out all possible causes of neuralgia. The roentgen examination is not sufficient, and an investigation should be made from the standpoint of occlusion of teeth, restorative measures, and a complete history in regard to the time, method, and reason for the extraction of any missing teeth. In

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the diagnosis and treatment of such conditions, the closest cooperation must exist between the medical and dental professions.

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