Posttraumatic Temporomandibular Disorders

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The development of facial pain in general and temporomandibular disorders (TMD) in particular has often been described as multifactorial in origin.[1] Predisposing, precipitating, and perpetuating issues and events all contribute to the onset and chronic nature of this condition. It has been demonstrated that the signs and symptoms of an idiopathic TMD are quite similar to those of a posttraumatic TMD (pTMD), that is, one resulting from a motor vehicle accident (MVA) or some other type of head trauma.[2] However, the unique aspects of the latter condition deserve attention.

Epidemiologic evidence has indicated that there are indeed variations in both the response and the elicited number of modalities of treatment to successfully resolve the pTMD patient's pain.[2,3] Furthermore, differences in various parameters that test memory and cognitive ability have also been demonstrated.[4] Consequently, unique treatment approaches must be applied to the pTMD population to deal more effectively with the numerous factors that influence the resultant chronic pain behavior.

Trauma and the Temporomandibular Joint

The role of physical trauma (ie, a MVA) as a precipitating factor in the development of TMD may appear to be quite obvious. Concepts attempting to explain the role of mandibular hyperextension-flexion ("mandibular whiplash") have been put forth, suggesting that during the cervical hyperextension phase, stretching and/or tearing of the posterior attachment tissue of the temporomandibular joint (TMJ) can occur, based on the inherent inertia of the mandible.[5] It was presumed that during the flexion phase, the injured posterior attachment tissues were crushed between the mandibular condyle and the glenoid fossa. However, this concept was based on post-MVA arthrographic and surgical assessments and was speculative at best. This concept also presumed that a resulting disc displacement had a direct effect on symptom development. More recent literature has refuted this concept.[6–8]

Howard et al[9] suggested that "at no time in the extension-flexion maneuver is there an absolute rearward motion of the head and no significant tensile forces are generated in the temporomandibular joint."[9p1211] This hypothesis was confirmed during a low-velocity impact study that measured the linear and moment

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forces generated at the TMJ complex.[10] It was determined that forces generated in a low-impact collision constituted a minor fraction of the force generated during normal physiologic function and could not in fact account for "injuries" attributed to an MVA.

Heise et al[6] reported a study of 155 MVA victims, 63 of whom had radiographic evidence of cervical spine injury, and showed that none had signs of TMJ clicking at the initial examination. Only 2 subjects developed clicking within 1 year of the MVA. The same observation was made in the non–cervical spine injury population. A retrospective study of records from the Victoria (Australia) Transport Accident Commission identified subjects involved in an MVA in 1987.[7] The total number of subjects associated with a TMD, identified from 20,673 reported MVAs, was 28. As well, only 1 of the 237 subjects sustaining a mandibular fracture required treatment for a TMD. It certainly appears that the incidence of TMJ symptoms following a whiplash injury is quite small, such that whiplash should not be regarded as the sole factor in the development of symptoms associated with a TMD.

More recently, the issue surrounding head and jaw position at the time of impact has been studied to determine their roles in the development of symptoms. Burgess[11] studied 219 subjects who identified an MVA as a contributing factor in the development of their facial pain symptoms. He looked at each patient's recollection of impact speed, head and jaw position, type of restraint, and whether or not there was a direct impact on the jaw or TMJ. It was observed that head position (right/left position) at the time of impact was significantly associated with increased pain, as recorded by the McGill Pain Questionnaire. Jaw position (open/closed) or type of restraint did not reveal any association with the development of TMD symptoms. Although the implications of jaw position at the time of impact are far from understood, it appears that the development of chronic TMD-related symptoms following an MVA is more complex than was originally hypothesized by Weinberg and Lapointe.[5]

Treatment of the Posttraumatic Temporomandibular Disorder Patient

Symptomatic patients who are routinely seen in a craniofacial pain unit following an MVA are often presumed to be refractory to treatment, or else unlikely to improve. Although this is not the case, the response to treatment is quite different when the idiopathic (iTMD) and posttraumatic (pTMD) populations are compared. Brooke and Stenn[3] demonstrated that those patients presenting as a result of an MVA did not recover as well as those with pain not associated with an MVA. In a review of 194 cases, they found that 80% of the latter patients were sufficiently improved that no further treatment was required. However, when patients whose symptoms were thought to result from an MVA, as many as 60% of patients were still experiencing symptoms that required further treatment.

In a similar study, Romanelli et al[2] looked retrospectively at 104 age- and sex-matched patients. Fifty-two presented with signs and symptoms of pTMD subsequent to an MVA, while 52 had iTMD. Patients were subclassified, based on their clinical signs, into 3 categories consisting of primary joint pain (TMJ), primary musculoligamentous pain (MPD), or a combination of the 2 (TMJ/MPD). The outcome of treatment was based on a "better" or "same/worse" self-assessment of the primary pain complaint. Of the 52 subjects in the iTMD population, 39 (75%) reported their condition to be "better." However, of those in the pTMD population, only 48% reported that their symptoms were "better." Not only did the precipitating event appear to have an influence on outcome, but the site of pain also differentiated the outcome of response to treatment. Eighty percent of those in both the pTMD and iTMD group who presented with primary symptoms associated with the TMJ alone showed improvement after treatment. This was significantly different from the patients who presented with MPD (71%) and combined TMJ/MPD (65%). The fact that there were no patients in the MVA population who presented with TMJ symptoms alone was also interesting. This was confirmed by other studies, which indicated that no TMJ signs alone were present.[3,4,11] In fact, it was noted that the pTMD population was characterized by a combination of joint and muscle signs, as well as more cervical muscle pain. As for those patients who did show signs of improvement, the number of modalities required to achieve this was significantly higher in the pTMD population than in the iTMD population. The lower response rate observed in the pTMD population coupled with the use of similar treatment modalities as the iTMD population suggests that the pathophysiology of TMD in the 2 populations was different. This may, in fact, further refute the issue surrounding so-called "mandibular whiplash."

Psychopathology and Posttraumatic Temporomandibular Disorders

In addition to their pain complaint, as many as 60% of the pTMD population in the Romanelli et al study[2] suffered from symptoms associated with affective disorder (pain, weakness, sleep disturbance, loss of libido, poor concentration, anxiety, or memory impairment), as compared to only 14% in the iTMD population. This, along with other studies, indicates that there are likely a number of "non-organic" components that lead to the chronic nature of the pain in the posttraumatic population.[12–17]

The development of memory and concentration problems is often seen in people who have been in major MVAs where severe trauma and loss of consciousness has occurred. Yet in the population that commonly presents for treatment of a TMD following an MVA, often no loss of consciousness is reported and no neurologic deficits are present. Neuropsychologic deficits can be characterized in the severe head injury post-MVA population[18]; yet until recently this had not been explored in the post-MVA TMD population.

To quantify these differences in the pTMD population, our group performed a battery of neuropsychologic tests on patients presenting with signs and symptoms consistent with a chronic TMD. Thirteen subjects whose signs and symptoms were thought to be associated with a pTMD and 14 iTMD patients were compared to one another.[4] Tests that exploited the presumed differences in memory and concentration were utilized to characterize the 2 population groups. These tests included reaction time tests involving both simple and complex stimuli,[19] short- and long-term memory tests (California Verbal Learning Test),[20] and tests of memory with interference (Peterson-Peterson Consonant Trigram Test).[21]

When the pTMD and iTMD groups were compared in terms of their reaction time, a statistically significant difference was present in both simple and more complex reaction time tests. Interestingly, it was noted that the posttraumatic patients tended to fatigue faster following the completion of the test battery, in that the difference between the first reaction time test and the final reaction time test was significantly slower, whereas there was virtually no difference in first test/final test reaction times in the nontraumatic group. This fatigue factor may be an indication as to the memory and concentration problems demonstrated by and large in the pTMD population.

The memory and concentration problems were also demonstrated in the other neuropsychologic tests undertaken. In particular, the pTMD population performed significantly worse on memory tasks in conjunction with a verbal interference. As well, immediate recall of a 16-item "shopping list" was significantly worse in the pTMD patients as compared to the iTMD population. There was also a trend that indicated that both short-term and long-term memory were poor in the posttraumatic group.

It is interesting to note that many of the symptoms are consistent with those commonly seen in patients who have suffered a closed head injury.[19,22–24] However, all patients, prior to being tested, were assessed by a neurologist and found to be neurologically intact.

Litigation

In every discussion surrounding pTMD, the issue of litigation is frequently suggested as a reason for the chronicity of the condition. However, numerous authors regard the issue surrounding litigation as still somewhat controversial. In their study, Kolbinson et al[8] suggested that although the sample size was small, there was no difference in treatment outcome between patients whose litigation was settled and those whose litigation was not settled. In an earlier review, Kolbinson et al[25] also noted that most unsuccessfully treated cases do not return to work, even after the settlement of their litigation. As well, during our study, the presence of no-fault insurance in the Province of Ontario minimized the issue of litigation for secondary gain following an MVA, suggesting that the results of the study were not biased by this issue.[4]

Conclusions

Chronic facial pain is a complex entity that has many factors contributing to its development. Research by our group and others has demonstrated that the development of chronic facial pain in association with an MVA is rare. Yet those who do develop long-term symptoms are unique from both a clinical and psychologic perspective. Due to this, it is imperative that practitioners develop and implement a treatment program that takes into account the multiple facets that may contribute to the condition. Along with the conservative and reversible dental treatment strategy,[1] an interdisciplinary medical/dental approach is often required

to deal with this condition. Cognitive behavioral therapy,[26] rapid eye movement desensitization techniques (personal communication, Dr Peter Moran, Staff Psychiatrist, Wasser Headache and Facial Pain Clinic, Mount Sinai Hospital, Toronto, Canada), and pharmacotherapy (tricyclic antidepressants)[27] are some of the various therapies that may be employed in conjunction with the more routine dental approaches.

Research in the field of pTMD must continue to look for improved treatment strategies to deal more effectively with this pain population. Furthermore, research must continue to explore the differences between the pTMD and iTMD population from a cognitive perspective. Several vexing questions have arisen from these observations. For example, might a patient's pain perception change following an MVA? Does a person's ability to differentiate between "important" and "unimportant" pain become altered following an MVA? Addressing such questions may help to shed more light on this unique and therapeutically challenging group of people.

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