

The Relationship Between Cervical Whiplash and Temporomandibular Joint Injuries: An MRI Study

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ABSTRACT: Temporomandibular joint (TMJ) symptoms are a common finding in motor vehicle accident (MVA) patients with hyperextension/hyperflexion injuries of the cervical spine (cervical whiplash). The relationship between cervical whiplash and TMJ injuries was documented with magnetic resonance imaging (MRI) in 87 consecutive MVA cervical whiplash patients who presented with TMJ symptoms and had sustained no direct trauma to the face, head or mandible and had no TMJ complaints prior to the MVA. One hundred sixty-four TMJ patients were evaluated for internal derangement, effusion and inflammation, utilizing T1 and T2 weighted images. A high percentage of the TMJ patients demonstrated abnormal findings: disk displacement with reduction (DDR), 118/164 (72%); disk displacement without reduction (DDNR), 25/164 (15%); effusion, 113/164 (69%); inflammation or edema, 84/164 (51%); total TMJ abnormalities, 156/164 (95%). The high percentage of TMJ abnormalities in this study significantly illustrates the proximate relationship between cervical whiplash and TMJ injuries.

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Temporomandibular joint injury resulting from direct trauma to the mandible is a well-established phenomenon.¹⁻⁵ Injuries to the temporomandibular joints occurring during vehicular accidents have been attributed to direct impact of the mandible with hard structures, as well as direct impact with a deployed air bag.⁶⁻⁹

The relationship between vehicular accidents and hyperextension/hyperflexion injury to the cervical spine (cervical whiplash) has also been well established.¹⁰⁻¹²

This same hyperextension/hyperflexion phenomenon, cervical whiplash, has been implicated in injuries to the temporomandibular joints that occur in motor vehicle accidents where there is no direct trauma to the mandible. This type of indirect injury to the temporomandibular joints has been termed mandibular whiplash injury.¹²⁻²¹

The mandibular whiplash injury has been described as being conditioned on the following factors: 1. the vector of forces acting on the mandibular symphysis through the supra-hyoid musculature, the hyoid bone, the infra-hyoid musculature, and the anterior shoulder girdle; and 2. posterior rotation of the cranium. During a rear-end collision, there is immediate hyperextension of the cervical spine which causes posterior rotation of the cranium and a rapid, involuntary, inverted mouth opening as the mandible remains relatively fixed and the cranium and maxilla move away from the mandible. This movement causes hyper-translation of the condyles which are unprotected anteriorly due to the lack of a sturdy anterior capsular ligament.^{12,15} Condylar hyper-translation can cause: 1. stretching and/or tearing of the retrodiskal tissue and diskal ligaments which result in disk displacement;^{12, 14, 15, 17, 21} 2. injury to the masseteric