Peripheral nerve entrapment caused by motor vehicle crashes

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FROM ABSTRACT:

During the era before seatbelts and air bags, extensive injury was common after motor vehicle collisions (MVCs).

Yet upper extremity peripheral nerve problems, other than the brachial plexus injury, have not been ascribed previously to MVCs.

Seven hundred twenty-five patients with the diagnosis of carpal tunnel syndrome (CTS), cubital tunnel syndrome (CT), and radial sensory nerve (RSN) entrapment in the forearm were reviewed.

The number of MVC-caused nerve entrapments was 157 (68 for CTS, 64 for CT, and 25 for RSN). \[157 / 725 = 22\%\]

In 25% of the patients, the nerve entrapment was bilateral.

The most common pattern was for the injured person to be the driver, to have the injured hand or hands on the steering wheel, to be hit from the front or rear, and to develop a sudden onset of nerve compression symptoms within 1 week.

Awareness of this causal relationship may allow early recognition and treatment.

THESE AUTHORS ALSO NOTE:

“The time of onset for the nerve entrapment varied considerably, but generally formed two distinct subpopulations: those with an acute onset of symptoms typically beginning within the first week after the MVC, and those with a prolonged delay in the onset of symptoms [months].”

The speeds of the vehicles “did not show a specific trend.” [Important]

“The most common pattern of injury was for the occupant to be in the driver’s position, to have the injured hand on the steering wheel” and to be hit either from the front or from the rear.”
“The proposed mechanism is for a direct blow or compressive force between the palmer aspect of the wrist and the steering wheel and dashboard, causing the wrist to hyperextend, the median nerve to stretch, and a traction injury to the ulnar nerve within the post-condylar groove from hyperflexion of the elbow.”

Nerves are resistant to slow gradual stretching, but are injured from acute stretching.

Acute nerve stretch causes “nerve edema, and synovial edema/hemorrhage which combine to produce chronic scarring with subsequent diminution in blood flow to the nerve.” [Important, the Fibrosis of Repair]

Within 30 – 90 minutes from onset of ischemia there is a deterioration of nerve function.

“With lesser degrees of pressure or stretched/traction, the development of perineural fibrosis is more chronic, causing the patient to become aware of paresthesia at intervals up to 2 years after injury.” [Extremely Important]

An early diagnostic sign of peripheral nerve dysfunction is alteration of vibration sense.

Patients injured in motor vehicle collisions should be assessed for numbness in the extremities that includes “vibratory testing of the index and little finger, and the big toe.”

In this study, of the peripheral nerve syndromes caused by motor vehicle collisions:

42% were carpal tunnel syndrome.
41% were cubital tunnel syndrome.
16% were radial sensory nerve entrapment.

91% of the time the patient was the driver with hands on the steering wheel.
5% of the time the patient was the front seat passenger.
4% of the time the patient was a rear-seat passenger.

43% developed symptoms within 1 day of the collision.
Symptoms were delayed for 1 week in 27%.
Symptoms were delayed for 1 month in 11%.
Symptoms were delayed for 6 months in 14%.
Symptoms were delayed for more than 6 months in 2%.

Impairment of nerve blood flow occurs at 8% elongation.
Complete arrest of nerve blood flow occurs at 15% elongation.
Nerve rupture occurs at 70% elongation.
KEY POINTS FROM DAN MURPHY

1) Approximately 22% of upper extremity peripheral nerve syndromes are caused by motor vehicle collisions.

2) The most common types of motor vehicle collision upper extremity peripheral nerve syndromes are carpal tunnel syndrome (42%), cubital tunnel syndrome (41%), and radial sensory nerve entrapment (16%).

3) In 25% of the patients with motor vehicle collision nerve entrapments, the entrapment is bilateral.

4) Vehicle speeds are irrelevant in the development of upper extremity peripheral nerve syndromes.

5) The mechanism of injury for upper extremity nerve syndromes from motor vehicle collisions is extension of the wrist with simultaneous flexion of the elbow. This occurs over 90% of the time in the driver with his/her hand on the steering wheel.

6) Acute nerve stretch causes “nerve edema, and synovial edema/hemorrhage which combine to produce chronic scarring with subsequent diminution in blood flow to the nerve.” [Important, the Fibrosis of Repair]

7) “With lesser degrees of pressure or stretched/traction, the development of perineural fibrosis is more chronic, causing the patient to become aware of paresthesia at intervals up to 2 years after injury.” [Extremely Important: lesser injuries can initiate the progressive Fibrosis of Repair, which may not produce symptom until 2 years after injury]

8) An early diagnostic sign of peripheral nerve dysfunction is alteration of vibration sense.