

Initial assessment of whiplash patients

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According to the Quebec Task Force (28), whiplash is an acceleration-deceleration mechanism of energy transfer to the neck. It may result from rear-end or side-impact motor-vehicle collisions, but can also occur during diving or other mishaps. The impact may result in bony or soft-tissue injuries (whiplash injury), which in turn may lead to a variety of clinical manifestations, referred to as whiplash associated disorders (WADs).

The frequency of WADs varies from country to country and region to region (e.g. Saskatchewan). WADs may also develop some time after the event, as patients may not report to emergency units immediately or leave the area of the accident through which they happened to travel. According to BARANCIC (1), the female to male ratio is 1:5.

On the influence of seat belt wearing there are contradictory reports. TUNBRIDGE (31) observed a two-fold increase after introduction of their compulsory use in Scotland, while SALMI ET AL.(26) and VERSTEEGEN ET AL.(34) found no difference in France and the Netherlands, respectively.

More recently, dynamic headrests have been introduced (Volvo, Saab, Renault etc), yet their effects on the epidemiology of WADs are still unknown.

In the long term, the incidence of neck pain is not different in WAD patients from the non-injured population. Yet, insurance claims are known to have a negative effect on the recovery rate after an accident. True malingering, however, is rare and chronic WAD patients are not cured by a verdict.

Consequences of injury such as persisting pain, sleep disturbances, litigation etc, may induce secondary psychological factors that in turn participate in the chronicity of the symptoms while creating distress and illness behaviour (BENOIST [3]). Psychological symptoms in posttraumatic conditions are not the cause but rather the consequence of somatic symptoms (RADANOV [23,24]).

That the outcome of treatment strongly depends on the initial medical care is obvious for severe trauma. This has now also been generally accepted for WADs, underlining the importance of a proper initial assessment in all cases of even less severe trauma.

The general rules concerning the initial assessment of major trauma at the accident scene consist of ascertaining the level of consciousness, the ability to move and the establishment of pain localization and evaluation of associated injuries. In this topic it is important to bear in mind that 10% of spine fractures are multilevel.

The initial treatment of major trauma at the accident scene comprises the preservation of life (oxygen/shock etc), the prevention of further damage to spine and cord (careful intubation) and the preservation of spinal function (Methylprednisolone – US NASCIS II / US National Acute Spinal Cord Injury Study)(7). Instability of the spine must be assumed until the contrary has been proven. Once the victim has been transferred to an emergency room, new priorities arise: vital functions must be maintained, soft-tissue injuries and acute traumatic central cord syndrome (ATCCS) must be excluded and skeletal radiographs have to be taken (C-spine: AP/lateral/odontoid).

Acute traumatic central cord syndrome (ATCCS) is a complex spinal cord syndrome presenting with incomplete neurological deficits: motor impairment predominates in upper extremities (can walk, cannot move hands), diffuse sensory loss (burning hands) and bladder dysfunction (retention). MRI shows generally involvement of the white matter without haemorrhage. It is thought to be caused by severe cervical hyperextension injuries with squeezing of the spinal cord in a spinal canal narrowed by bulging flava and bony (Fig. 1). The prognosis is generally good with progressive resolution of symptoms (17).

If the initial radiographs show a fracture, further treatment is obviously required (traction, surgery etc). If, however, the radiographs are normal in an otherwise conscious patient without neurologic deficit but presenting with major pain, pillar and oblique views must be taken as well as swimmer's views for distal C-spine and a CT-scan if radiographs are inadequate or insufficient (25).

If the images using these techniques also remain normal, then a hard collar is applied and flexion/extension views and MRI scans are taken within 24-48 hours in order to rule out ligamentous injury. Dynamic MRI scans are not routinely possible, but this may become a standard procedure with time.

There are pitfalls when examining cervical radiographs. On AP open-mouth views, superposition of maxillary incisors on dens may create vertical lucency over the dens (Fig. 2). This must not be mistaken for a vertical schisis (Fig. 3). Also, superposition of the posterior arch of C1 on the dens may simulate a horizontal dens fracture or an os odontoidium (Fig. 4).

On neutral lateral films, the atlas-dens axis distance is maximum 3 mm, yet in flexion or in children this can be more. The dens usually extends vertically from the body of C2. It may, however, incline backwards as much as 30° to 40° and still be

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Figure 1

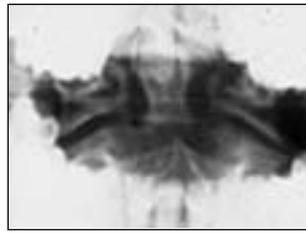


Figure 2



Figure 5

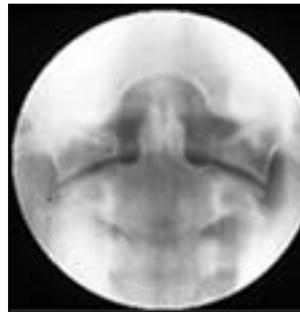


Figure 3

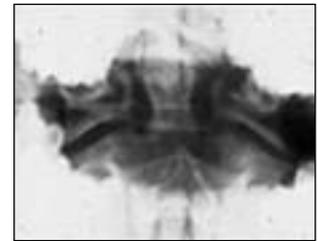


Figure 4



Figure 6



Figure 7

normal (Fig. 5). Hypoplasia or aplasia of the posterior arch of C1 is not uncommon and has to be differentiated from fractures (Fig. 6).

On lateral view, the internal cortical bone at the base of the spinous processes forms the spinolaminar line. From C3 downward, the interspinous distance is mostly constant even if the size and shape of the spinous processes may vary. Anterior translation (especially in flexion) of the vertebral bodies is gradual and should not exceed 4 mm (Fig. 7).

CT or MRI scans are made in the supine position and do not give any information concerning posture.

The initial assessment of WAD is essential, as patients presenting with neck pain on palpation, muscle pain, headache, pain or numbness radiating from neck to arms, hands or shoulders are expected to have a longer course of recovery and should therefore be targeted for early intervention (29).

Once major injury has been excluded and the diagnosis of WAD been established, the initial treatment of WAD in the emergency room can be started. There are four key points to remember:

- Reassure patient about evolution
- No soft-collar
- NSAID
- Early mobilisation

Depending on the local set-up, initial orientation of WAD patients from the emergency room can be an orthopaedic outpatient department (OPD), a trauma OPD, a general practitioner or a multidisciplinary team. During the first follow-up visit, further reassurance and 'whiplash' demystifying must be undertaken. A personal and family history, as well as a detailed accident history, must be made, taking into account the possi-

ble medico-legal implications of WAD.

Personal history is very important, as the very first contact with a physician after injury might reveal anamnestic data related to previous history of headache or neck pain, which might later be unconsciously suppressed in the light of the new symptoms (27). Pre-existing headache and older age are predictors of unfavourable outcome (22).

During an early follow-up visit, it is very important to take an in depth personal history including a psychological assessment such as Minnesota Multiphasic Personality Inventory (MMPI) in order to exclude psychopathology. This personal history must be complemented with a detailed personal accident history: Was the accident anticipated? Was the subject standing still? Or was the subject moving? And at what speed? Was the accident with a rear-end, front-end or side impact? Did the subject wear a seat belt? Was there a head restraint? Which type? What was the position of the head at moment of impact?

70% of injured patients report immediate occurrence of symptoms: cervical pain, painful spine rotation, shoulder pain, lumbar pain, disturbance of consciousness, dizziness. Clinical examination may show upper limb paraesthesia and muscle weakness, neck stiffness and painful and restricted rotation of the head. At a later stage, visual disturbances, fatigability, concentration impairment, sleep disturbances, irritability or anxiety-depression may be reported. When evaluating these patients it is important, however, to bear in mind that the incidence of chronic neck syndrome in the overall population has been reported from 9.5% to 34.4% (6,14) and that no significant difference in chronic symptoms was found at three years between whiplash accident victims and controls in control cohort study (27). Other studies found that between 14% and 42% of WAD patients develop chronic neck pain of which 10% is severe neck pain².

Quebec Task Force WAD classification according to clinical presentation:

Grade	Clinical presentation
0	No neck complaints & no physical sign(s)
I	Neck pain, stiffness or tenderness & no physical sign(s)
II	Neck complaint & musculoskeletal sign(s)
III	Neck complaint & neurologic sign(s)
IV	Neck complaints & fracture or dislocation

As for every medical condition, there has to be a consistent message towards the patient. The initial emergency room statements and treatment should be repeated and conformed with reassurance about the evolution of the condition, with most cases recovering within a few weeks to a few months (3). There is no place for soft collars in the treatment of WAD (28).

Some specialised approaches to WAD need to be mentioned: cognitive behavioural training appears to have promising results (32), the usefulness of manipulation is not proven (16), and there are no valid studies supporting the use of epidural or intrathecal medication. BARNESLEY ET AL. (2) found that intra-articular steroids were not effective. Yet, BOGDUK (4) used intra-articular local anaesthetic and percutaneous neurotomy to show that zygapophyseal joint pain is the single most common basis for chronic neck pain after whiplash. Subcutaneous sterile water injections at trigger points have been reported to be effective but painful (8).

The usefulness of early administration of nonsteroidal anti-inflammatory drugs (NSAIDs) in WAD has clearly been shown by SZPALSKI ET AL (30) in a randomised, double-blind parallel group study. An early NSAID treatment in whiplash helps the patient move with less pain, enabling earlier and easier mobilisation. This is important, taken into account that an early activation program improves long term outcome (15,18). Besides, early suffering and impairment of function may affect the later feeling of sickness behaviour. In a prospective, randomised, double-blind study, PETERSSON and TOOLANEN (21) found that high-dose methylprednisolone prevents extensive sick leave after whiplash injury.

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There is sufficient evidence indicating that rest and a cervical collar have a detrimental effect in the early management of WAD (5,15,18,28). There is sufficient clinical, epidemiological and biomechanical support for early mobilisation in WAD (20).

Electrophysiological exploration in the assessment of WAD is not commonly used. Yet, NEDERHAND ET AL.(19) showed that trapezius muscle surface EMG (decreased ability to relax) can distinguish WAD Grade II from healthy subjects. KLEIN ET AL.(12), on the other hand, found WAD patients appeared unable or unwilling to rotate the head to the point where SCM muscle activity rises steeply on surface EMG as in healthy subjects (elastic zone). For them, pain or fear of pain keeps WAD patients in the 'neutral zone'. Little is known of sensory and motor evoked potentials in WAD patients (10).

Range of movement is a useful tool to measure cervical spine impairment in WAD. It must, however, be related to age (12). Not only range of movement out of neutral position, but also rotation out of flexion and extension has to be examined to assess function of the upper and lower C-spine separately (11). Proprioceptive exploration demonstrates that WAD patients may have an inaccurate perception of head position (deficit in ability to reproduce target position of the neck)(13).

Other more sophisticated examining techniques address eye movement disorders. VAN NECHEL (33), examined 50 WAD patients referred to a neuro-ophthalmological unit and found that near-sight, pursuit, saccade and accuracy impairments were long-drawn-out deficits after a whiplash injury. According to this author, attention dysfunction and hemispheric arousal deficits probably explain these impairments. Neurolinguistic and attention disorders in WAD may include word finding difficulties, pseudo-stuttering, dyslexic type sequence errors and inability to express elaborate thoughts, auditory filtering inefficiency (cocktail-party effect) as well as reading and writing difficulties (9). Classic neurolinguistic and neuropsychological tests are not helpful in these WAD cases, as the source of the disorder is located at a general attention level. Therefore, attention evaluation tests (AET) such as the ocular motility test, appear helpful in WAD.

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