

Biomechanics

- Hyperextension + Hyperflexion
- SCM most affected
- Myofascial damage
- Head rotates into hyperextension, anterior cx muscles stretched - muscles at their tension limit - remaining forces p fibres of the annulus fibrosis
- CN affected - 2nd
- Flexion - Damage in suboccipital region of the spine - muscles suboccipital and occipitofrontalis are more traumatised
- PTSD occurs

Mechanisms of Injury

- Rear end collisions mainly - linear + angular rearward motion of the head to the torso

Shear, compression, tension and torque

- Shearing is vertical in vertebral column + horizontally on the spine, more likely to occur during the head extension stage, more likely at C5-C7
- Compression - head is accelerated downward towards the spine/tissues are compression during extension phase. compressive forces to posterior structures and tensile forces to anterior structures
- Tension - Extension phase, anterior neck muscles, compression of posterior neck structures
- Torque Small force at the end can create a larger force at the base - rotational acceleration of the head on the fulcrum

Classifications - WAD

0 - No Neck complaints and NO physical signs	Rarely presents to clinicians
I - Neck complaints of stiffness, pain or tenderness but with no physical signs	Very minor muscular damage
II - Neck complaints AND MSK signs	Limited ROM and point tenderness
III - Neck complaints AND Neuro signs	Decreased/absent DTR, weakness and
IV - Neck complains AND fracture/Dislocation	REFER IMMEDIATELY

most patients are Grade II WAD



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Injury Severity

- There are factors and variables that could make people susceptible to severe injury:	- Angle of the collision - More of an angle = more
- Speed & Size of vehicles - Moving rear end collision	- Road conditions - wet/icy roads
- Occupant Head position - pt looking straight forward? Head turned? - Head turn = more severe	- Gender - women more than men, anatomy/seati
- Occupant awareness of impact - bracing	- Head Restraints - should be at back of the head restraints can act as a pivot during hyperextensio
- Seat Belts - Body held in place, momentum transferred to head and neck, head twists during flexion phase due to one shoulder being restrained	- Direct body impact - Head or other parts of the t collision
- Loss of consciousness - Severe G forces	- Medical Hx - cx spine degeneration, history of H worse injury
- Pain onset - immediate onset of pain, more likely to have pain post injury	

History

- Neck Pain - myofascial damage	TMD
Dysphagia	Dizziness
Deafness	Tinnitus
Nausea	Fatigue
Visual symptoms	Memory Loss
Poor Concentration	Superficial tenderness of the scalp
Psychological symptoms - anxiety, depression, anger	PTSD- PTSD questionnaire - 4 or more on a seven point scale, refer to a mental h

Examination

- MAKE SURE IT IS SAFE	Cx spine orthopaedic exam
Neurological involvement	Signs of myelopathy
Potential causes of other symptoms	

Prognosis

Higher probability of prolonged disability: Women, Multiple injuries, Older People, Rear end collisions

Delayed functional recovery: High initial pain intensity, More symptoms, Greater initial disability

Psychological S&S Slower recovery - Passive coping style, Depressed mood, fear of movement



Management

Acute Phase (2wks after injury)

Education - explain, reassure, coping strats

Rest with mild, gentle ROM

Exercises should start within 4 days of injury

Cryotherapy

NSAIDs - 400-600mg 4 times a day for first 4 days

Gentle mobilisation (away from painful & restricted ROM)

Soft Tissue Techniques

Encourage return to normal activities when possible

TENS

Subacute phase (>2-12 weeks)

Pain control - 1g Paracetamol four times a day

Active exercise - DNF + posture training , Isotonic, Isometric, Ice + Heat after exercise

Mobilisation - traction/ gentle manipulation

Modalities (US, TENS)

Soft Tissue Techniques

Nutritional Support

Advice and coping strats

Chronic (>12 weeks)

Manipulation/mobilisation + active Exercise

Proprioceptive retraining

Advice and coping strats

Strengthening exercises

Extension retraction exercises for cx spine

Late Whiplash

Resist pressure to over treat and over investigate

Encourage return to normal activities

Motivational interviewing

Reduce influence of compensation claims

CBT

