Whiplash injuries
- the clinical perspective

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Case studies

THE IRISH TIMES

Woman ‘jogging’ on day she told doctor of pain after crash

Judge throws out personal injuries case and says claimant ‘was telling blatant lies’

Esther Lamidi: was driving unaccompanied on a provisional licence at the time of the incident. Photograph: Collins Courts
Case studies

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Esther Lamidi: was driving unaccompanied on a provisional licence at the time of the incident. Photograph: Collins Courts

**THE IRISH TIMES**

Male stripper loses damages claim over rear-ending injury
Nauris Zeps danced his way through three years of alleged back pain, court hears

Nauris Zeps aka Blade performing on stage in 2015. Photograph: Collins Courts/Facebook
Objectives

- What is whiplash?
- Anatomy
- Initial clinical evaluation
- Investigations
- Treatment
- International literature review
- Medical report evaluation
Whiplash

“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 driving or other mishaps”

Spizer et al, Spine 1995
Anatomy of the spine

- Spinal column
  - Vertebrae
  - Ligaments
  - Muscles
  - Intervertebral discs
  - Spinal cord
  - Nerve roots
Anatomy
Initial Clinical Evaluation

- History
- Examination
- +/- investigations
History

- **Accident details**
  - Mechanism of injury
  - Light/moderate/heavy impact?
  - Secondary impact?
  - Speed involved?
  - Seatbelt usage?
  - Airbag deployment?
  - Degree of vehicular damage?
  - Repair costs?
History

- **Symptoms**
  - Neck pain*
  - Low back pain*
  - Headache
  - Dizziness, tinnitus
  - TMJ pain
  - Neurological symptoms*
  - Psychological – flashbacks/nightmare/anxiety/depression

- Previous medical/accident history - ? additional effect
Spinal examination

▪ **Look**
  - General demeanour
  - Gait
  - Posture

▪ **Feel**
  - Tenderness

▪ **Range of movement**
Limb Neurological Exam

- Tone
- Power
- Sensation
- Reflexes
# Myotomes & Reflexes

<table>
<thead>
<tr>
<th>Upper Limb Myotomes</th>
<th>Lower Limb Myotomes</th>
<th>Reflexes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoulder abduction</td>
<td>Hip Flexion</td>
<td>Ankle</td>
</tr>
<tr>
<td>C5</td>
<td>L1,2</td>
<td>S1,2</td>
</tr>
<tr>
<td>Elbow Flexion</td>
<td>Hip Extension</td>
<td>Knee</td>
</tr>
<tr>
<td>C5,6</td>
<td>L5, S1</td>
<td>L3,4</td>
</tr>
<tr>
<td>Elbow Extension</td>
<td>Knee Flexion</td>
<td>Biceps</td>
</tr>
<tr>
<td>C7</td>
<td>L5, S1</td>
<td>C5,6</td>
</tr>
<tr>
<td>Wrist Extension</td>
<td>Knee Extension</td>
<td>Triceps</td>
</tr>
<tr>
<td>C7</td>
<td>L3,4</td>
<td>C7,8</td>
</tr>
<tr>
<td>Wrist Flexion</td>
<td>Ankle Dorsiflexion</td>
<td></td>
</tr>
<tr>
<td>C8</td>
<td>L4</td>
<td></td>
</tr>
<tr>
<td>Finger Extension</td>
<td>Ankle Plantarflexion</td>
<td></td>
</tr>
<tr>
<td>C7</td>
<td>S1,2</td>
<td></td>
</tr>
<tr>
<td>Finger Flexion</td>
<td>1st Metatarsal Extension</td>
<td></td>
</tr>
<tr>
<td>C8</td>
<td>L5</td>
<td></td>
</tr>
<tr>
<td>Finger Abduction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T1</td>
<td></td>
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</tr>
</tbody>
</table>
Nerve root tension signs
The Canadian C-Spine Rule

For alert (GCS = 15) and stable trauma patients where cervical spine injury is a concern

1. Any High-Risk Factor Which Mandates Radiography?
   - Age ≥ 65 years
   - Dangerous mechanism*
   - Paresthesias in extremities

   **Yes** → **No**

2. Any Low-Risk Factor Which Allows Safe Assessment of Range of Motion?
   - Simple rear end MVC **
   - Sitting position in ED
   - Ambulatory at any time
   - Delayed onset of neck pain ***
   - Absence of midline c-spine tenderness

   **No** → **Yes**

3. Able to Actively Rotate Neck?
   - 45° left and right

   **Able** → **No Radiography**

   **Unable**

---

* Dangerous Mechanism:
  - Fall from elevation > 3 feet / 5 stairs
  - Axial load to head, e.g. diving
  - MVC high speed (>100km/hr), rollover, ejection
  - Motorized recreational vehicles
  - Bicycle collision

** Simple Rear end MVC Excludes:
  - Pushed into oncoming traffic
  - Hit by bus / large truck
  - Rollover
  - Hit by high speed vehicle

*** Delayed:
  - i.e. not immediate onset of neck pain
Plain X-ray
MRI
Degeneration in the spine

Table 2: Age-specific prevalence estimates of degenerative spine imaging findings in asymptomatic patients

<table>
<thead>
<tr>
<th>Imaging Finding</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
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</thead>
<tbody>
<tr>
<td>Disk degeneration</td>
<td>37%</td>
<td>52%</td>
<td>68%</td>
<td>80%</td>
<td>88%</td>
<td>93%</td>
<td>96%</td>
</tr>
<tr>
<td>Disk signal loss</td>
<td>17%</td>
<td>33%</td>
<td>54%</td>
<td>73%</td>
<td>86%</td>
<td>94%</td>
<td>97%</td>
</tr>
<tr>
<td>Disk height loss</td>
<td>24%</td>
<td>34%</td>
<td>45%</td>
<td>56%</td>
<td>67%</td>
<td>76%</td>
<td>84%</td>
</tr>
<tr>
<td>Disk bulge</td>
<td>30%</td>
<td>40%</td>
<td>50%</td>
<td>60%</td>
<td>69%</td>
<td>77%</td>
<td>84%</td>
</tr>
<tr>
<td>Disk protrusion</td>
<td>29%</td>
<td>31%</td>
<td>33%</td>
<td>36%</td>
<td>38%</td>
<td>40%</td>
<td>43%</td>
</tr>
<tr>
<td>Annular fissure</td>
<td>19%</td>
<td>20%</td>
<td>22%</td>
<td>23%</td>
<td>25%</td>
<td>27%</td>
<td>29%</td>
</tr>
<tr>
<td>Facet degeneration</td>
<td>4%</td>
<td>9%</td>
<td>18%</td>
<td>32%</td>
<td>50%</td>
<td>69%</td>
<td>83%</td>
</tr>
<tr>
<td>Spondylolisthesis</td>
<td>3%</td>
<td>5%</td>
<td>8%</td>
<td>14%</td>
<td>23%</td>
<td>35%</td>
<td>50%</td>
</tr>
</tbody>
</table>

a Prevalence rates estimated with a generalized linear mixed-effects model for the age-specific prevalence estimate (binomial outcome) clustering on study and adjusting for the midpoint of each reported age interval of the study.
Nerve Conduction Studies

- To confirm/refute peripheral neurological issue
- Will identify level of lesion
Treatment

- Analgesia
- Soft collar
- Physio, Osteopathy, Chiropraxis, Acupuncture
- Pain Specialist interventions
- Counselling/CBT
- Psychoactive medication
# Soft Collar

<table>
<thead>
<tr>
<th>Number randomised</th>
<th>Interventions</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rosenfeld 2006</strong></td>
<td>Author</td>
<td>Active intervention grp experienced reduced pain and costs</td>
</tr>
<tr>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Schnabel 2004</strong></td>
<td>Grp 1 – use a collar</td>
<td>Early exercise therapy superior to collar use in reducing pain intensity and disability</td>
</tr>
<tr>
<td>200</td>
<td>Grp 2 – Active exercises</td>
<td></td>
</tr>
</tbody>
</table>
Physiotherapy

Emergency department treatments and physiotherapy for acute whiplash: a pragmatic, two-step, randomised controlled trial

“Our trial confirms physiotherapy packages that include exercise and manual therapy are effective in accelerating recovery of function, reducing pain in the short term, and reduce work absence. We report no effect on longer term recovery (6–12 months), although this is at odds with a pre-existing study. The benefit of a package of physiotherapy is modest by comparison with provision of a single advisory session with the physiotherapist, and, accounting for other sources of provision, is not cost effective from an NHS perspective.”

Sarah E Lamb et al, Lancet 2013
Pain Specialist Interventions
Therapeutic Interventional Techniques for neck pain

- Radiofrequency neurotomy
- Medial branch blocks
- Facet joint injections

“… evidence for cervical radiofrequency neurotomy is fair …. for cervical medial branch blocks is fair, …. for cervical intraarticular injections with local anaesthetic is limited.”
Therapeutic Interventional Techniques for neck pain – Botulinum A toxin

- “Current evidence fails to confirm either a clinically important or a statistically significant benefit of BoNT-A injection for chronic neck pain associated with or without associated cervicogenic headache. Likewise, there was no benefit seen for disability and quality of life at four weeks and six months”.

Peloso et al, 2011
(Cochrane Review)
Therapeutic Interventional Techniques – Botulinum A toxin for cervicogenic headaches

- A review considers the documentation on treatment with botulinum toxin in idiopathic and cervicogenic headaches to be inconclusive."
Therapeutic Interventional Techniques for back pain—steroid and local anaesthetic injections

- Trigger point injections
- Facet joint injections

“There is insufficient evidence to support the use of injection therapy in subacute and chronic low-back pain”.

Cochrane Database of Systematic Reviews
Injection therapy for subacute and chronic low-back pain
Cochrane Systematic Review - Intervention | Version published: 16 July 2008 | see what's new
https://doi.org/10.1002/14651858.CD001824.pub3
“The review authors found no high-quality evidence suggesting that RF denervation provides pain relief for patients with CLBP……. Overall, the current evidence for FR denervation for CLBP is very low to moderate in quality.”
Therapeutic Interventional Techniques for back pain – epidurals

- “… epidural corticosteroid injections probably slightly reduced leg pain and disability at short-term follow up in people with lumbosacral radicular pain….. The quality of the evidence ranged from low to moderate…”
Whiplash poor prognostic factors

- Severe initial pain
- Atypical neurological complaints
- Multiple initial symptoms
- Female gender
- Prior psychosocial issues
- PTSD
- Unemployment
Prognosis

- Literature review (Foy and Fagg, 2010)
  - 56% full recovery
  - 4.5% severe symptoms (not working)

- Common sense would dictate that, like other soft tissue injuries, whiplash victims should recover within a matter of days/weeks, particularly in low impact collisions, as there is no macroscopic structural injury.
Grade 2 hamstring tear
Effects of low impact collisions

- About 65% of the insurance claims involve velocity changes of up to 15 km/h.

- Low speed (<5 mph) rear end collisions did not cause damage to vehicles or cause injury. Slightly higher impacts damaged vehicles, but no injuries were sustained.
  
  *West et al, Accident Recon J, 1993*

- 5 volunteers impact speed 10mph (DV 5mph) - no injuries, even if had degenerative change on MRI.
  
  *Szabo et al, Soc of Auto Eng Tech Paper Series, 1994*
A Comprehensive Review of Low-Speed Rear Impact Volunteer Studies and a Comparison to Real-World Outcomes

- “The results of this study, using both experiment-based and real-world data, reinforce the general acceptance that human volunteers can be safely exposed to rear impacts of less than 18 kph without a meaningful risk of injury.”

- “Biomechanical research has shown that in order to produce a specific injury, a specific set of forces are required at the proper location and orientation. Experimental studies of the cervical and lumbar spine have demonstrated these mechanisms and have shown that spinal injury cannot be produced simply by being exposed to a motor vehicle collision.”

_Cormier et al Spine 2018_
Lithuania
Schrader et al, Lancet 1996

- 202 subjects
- 1-3 years on no patients symptomatic
- 31 patients acute/subacute neck pain
- 2 patients symptoms > 1 month
Lithuania
Obelieniene et al, J Neurol Neurosurg Psychiatry 1999

- 210 subjects
- 47% initial neck pain
  - 18% neck pain & headache
  - 19% headache alone
- Symptoms < 20 days
Greece
Partheni et al, J Rheum atol, 1999

- 130 patients
- 91% recovered at 4 weeks
- 100% recovered at 3 months
Greece
Partheni et al, Clin Ex Rheumatol, 2000

- 180 subjects
- 36.6% rear ended
- 35.6% lateral impact
- 27.7% frontal
- 42% seat belts
- Full spectrum impact severity

- 100% neck pain
- 47.8% headache
- 90.6% no neck pain at 4 weeks
- Remainder minor ongoing symptoms & returned to pre-accident activity with no additional treatment
Germany

- Excellent recovery at 3/52, 100% at 6/52
  Keidel M et al, 1999

- Full recovery at 6 weeks with physio
  Soft collar alone x 3/52 – recovered 12/52
  Bonk et al, J Musculoskeletal Pain, 2000
Demolition Derby Drivers
Alexander et al, Arch Phys Med Rehabil, 2005

- 40 drivers
- Mean 52 collisions in 30 career events
- Mean collision speed 26 miles/hr
- 2 reported their worst neck pain > months
- 1 lasted > a year
Chronic/disproportionate symptoms & signs

- Somatoform disorder
- Biopsychosocial
- Malingering
Somatoform Disorder –
no physical source

- Hyperalgesia, alldynia
- Non-anatomic pain/tenderness
- Other chronic pain syndromes – fibromyalgia, OA, endometriosis, chronic headaches, TMJ pain, IBS
- Psychological stress – PTSD 20%
Catastrophic thinking and abnormal health beliefs

Detect early

Psychological treatment earlier

Need Psychologists at Pain Clinics

Complex regional pain syndrome medicalises limb pain
Psychosocial factors may be more important than biomedical ones in type 1 disorder, writes Christopher Bass

Christopher Bass consultant liaison psychiatrist, John Radcliffe Hospital, Oxford OX3 9DU, UK

I am a psychiatrist who has worked in general hospitals and pain clinics since the 1970s and have assessed many patients given a diagnosis of type 1 complex regional pain syndrome (CRPS). The syndrome is often diagnosed by inexperienced junior doctors when confronted by patients with unexplained symptoms, especially pain in the hands and feet. CRPS was once called algodystrophy; then reflex sympathetic dystrophy; but by 1994 the sympathetic component was abandoned and the current term was introduced. CRPS is part of a larger diagnosis of chronic pain and reflects our lack of knowledge of causal mechanisms.

It has been my impression that increasing numbers of patients are being diagnosed with this disorder, and that incidence rates are increasing (estimates in 2007 of 50,000 new cases annually in USA). In my opinion excessive reliance on this so-called biomedical diagnosis for these patients is misguided. Has this occurred?

Several new diagnostic criteria have been proposed, but they are not sufficiently objective or reliable. For example, criteria such as “continuing pain that is disproportionate to the inciting event,” “allodynia (pain to light touch),” and weakness or numbness are common and non-specific. Any patient with these characteristics could attract a diagnosis of CRPS, even if “disproportionate pain” would be a more appropriate description. This conclusion not only misidentifies the symptoms with a “disease” label and has less potential for intragroup harm.

Others have described the diagnosis of CRPS as “best created as a reaction to injury, or to excessive, often intriguing, immunological activity” and, more recently, as “an illness construction rather than an actual disease.”

Not only is the diagnosis difficult to confirm but also it has been shown that brief immobilisation or prolonged casting of a limb can produce symptoms and signs that mimic CRPS. One of the unfortunate consequences of this diagnosis is that once established it has the potential to cause considerable disability, especially in vulnerable people. The “disease” label may also have a profound adverse effect on patients’ beliefs and behaviour: the adoption of a label such as CRPS affords legitimacy but may be disempowering and encourage the acceptance of the sick role. Although labelling can make sense of chronic and disabling symptoms, it may have adverse long term implications because the doctor may behave differently once the symptoms have been assigned a label. Some argue that clinicians are aware of this capacity for intragroup harm and “abnormal treatment behaviour.” As a consequence these patients often become excessively bodily focused and the suspicions of “disease” heightens bodily awareness and reinforces the belief that the patient is ill. Disability often ensues. Key psychosocial factors are ignored and another acknowledged or tackled by the interviewer. This is important, because considerable evidence now shows that catastrophic thinking and abnormal health beliefs and expectations are the main determinants of chronic pain after injury, as much of these cases are.”

These psychosocial factors can and should be systematically measured using simple scales before a person is labelled as having CRPS and subjected to invasive procedures. Measures of “somatic” and “depression” do not always detect these key antecedent factors. Indeed, abundant evidence now shows that it is these aspects of the psychosocial environment and not biological factors that are associated with a higher likelihood of developing chronic/painful disorders such as back pain,17 whiplash neck injury,18 and fibromyalgia or chronic widespread pain.19 It is the antecedent psychosocial factors, as well as beliefs or expectations about recovery after an injury, that are more likely to determine whether the pain becomes chronic, rather than the nature or severity of the injury. How can we rebalance our approach to the management of these patients?

Firstly, because these problems present in primary care, it is important for detection to occur at an earlier stage before it becomes a “chronic pain” problem. Primary care doctors routinely use the patient health questionnaire PHQ-9 to identify symptoms of anxiety and depression, so why can’t they be...
Biopsychosocial
(Ferrari & Schrader, J Neurol Neurosurg Psychiatry 2001)

- Patients expectation and knowledge
- ‘Normal’ complaints attributed to the accident
- Somatic component
- Multiple doctors (GP, Emerg Med, Ortho, Neurosurgery, Neurology, Pain Medicine)
- Doing x-rays and MRIs
- Attending with Therapists (Physios, Osteopaths, Physical Therapists, Chiropractors & “that fella in Carlow”)
- Multiple medications
- Pain Medicine interventions
Slip & Fall Injury?

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"EDDIE" JIMENEZ
Slip & Fall Injury Attorney

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Offices: Tampa

813-877-5548
2. Neck Injuries

Whiplash/Soft Tissue

The most common type of neck injury is called a “whiplash” injury which is an over extension or sprain often suffered in a motor vehicle accident or high impact slip/trip/fall type of accidents.

Whiplash injuries can involve a very minor sprain that heals within days or weeks or they can in extreme cases cause long lasting pain and permanent disability. Sometimes a neck strain can irritate or aggravate a pre-existing condition that may or may not have been treated before the accident. These can include disc lesions, spondylosis, osteoarthritis, spondylolisthesis.

<table>
<thead>
<tr>
<th>Minor – substantially recovered</th>
<th>up to €15,700</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor – a full recovery expected</td>
<td>up to €19,400</td>
</tr>
</tbody>
</table>

These injuries are minor soft tissue, whiplash injuries. Whilst the duration of symptoms will be of importance, there are also other factors that need to be considered when calculating the assessment. Such factors would include the nature of the neck injury, the intensity of the pain and extent of the symptoms, the presence of additional symptoms in the back or shoulder areas, the impact of the injuries on the persons ability to work and/or the extent of the treatment.

<table>
<thead>
<tr>
<th>Moderate</th>
<th>€20,400 to €30,200</th>
</tr>
</thead>
</table>

These injuries would be moderate soft tissue injuries where the period of recovery has been protracted and where there remains an increased vulnerability to further trauma. Also within this bracket would be injuries which may have accelerated or exacerbated a pre-existing condition over a period of time, usually no more than five years.

<table>
<thead>
<tr>
<th>Moderately Severe</th>
<th>€34,400 to €52,200</th>
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These injuries involve the soft tissue or wrenching type injury of the more severe type resulting in serious limitation of movement, recurring pain, stiffness and discomfort and the possible need for surgery or increased vulnerability to further trauma. This would also include injuries which may have accelerated and/or exacerbated a pre-existing condition over a prolonged period of time, usually more than five years resulting in ongoing pain and stiffness.

<table>
<thead>
<tr>
<th>Severe and permanent</th>
<th>€44,600 to €77,900</th>
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</thead>
</table>

The most severe category. These injuries will have also affected the structure of the neck and the discs, resulting in serious limitation of movement and the requirement for surgery. Little or no movement regained on a permanent basis resulting in ongoing pain and stiffness with the necessity to wear a collar for long periods in the day.
Effect of eliminating compensation

- Saskatchewan changed to no-fault from tort compensation in Jan 1995
- No further payments for pain and suffering
- Comparisons pre and post legislation
- 43% reduction in claims by men and 15% by women (28% reduction overall)
- Claims settled more quickly and so did symptoms (neck pain, reduction in functionality and depression)

- 301 consecutive patients
- 169 female 132 male
- Ave age 37 yrs
- 4 patients surgery
- 93% chronic neck pain > 6/12
- 58% assoc back pain
- All involved in litigation
- 3% returned after case settled.
Medical report issues

- Initial report format not uniform
- Mechanism of injury not properly taken into account
- Important details may be missing
- Non-disclosure by patient
- GP report conflict
- ‘Hired gun’ (pro-plaintiff v pro-defence)
- Do all doctors call it as it is?
- Absolutely vital that trained experts do PIAB/defence reports
Alarm bells - history

- Constant pain
- Not getting better
- Disproportionate complaints
- Anything & everything
- Atypical neurological symptoms – whole limb pain +/- numbness +/- giving way
- Coccyx pain
Waddell’s signs

- **Tenderness**
  - superficial, non-anatomic

- **Overreaction**

- **Regional disturbance**
  - cogwheel weakness
  - non-dermatomal sensory loss

- **Simulation**
  - axial loading, rotation

- **Distraction**
  - straight leg raising
Simulation – axial loading
Simulation – axial loading
Simulation - rotation
Distraction – straight leg raise
Distraction – straight leg raise
Distraction – straight leg raise
(bowstring)
Distraction – straight leg raise  
(bowstring)
Distraction – straight leg raise
(bowstring)
Additional Signs of Exaggeration

- Slow, deliberate movements with minimal range
- Trembling limbs
- Hip flexion restriction due to low back pain
- Forward flexion discrepancy
Additional Signs of Exaggeration

- Slow, deliberate movements with minimal range
- Trembling limbs
- Hip flexion restriction due to low back pain
- Forward flexion discrepancy
Forward flexion
Forward flexion
Conclusions

- WAD is a physical entity
- Open to abuse
- Expert opinion essential
- Mechanism of injury vitally important
- Examination must be thorough
- The combination of all the information should guide the medical opinion
- NB Treat all reports as if for the Court
Questions?

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T: 01 8375007
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▪ Textbook