M2 Post-class Quiz

1. Define a myotome and describe the key muscle weakness for the following myotomes:
   1. C1 and 2
   2. C4
   3. C5
   4. C6
   5. C7
   6. C8
   7. T1
   8. T2

Regardless of what the websites say C1 and 2 are specifically short neck flexion and C4 is levator scapulae not shoulder shrugging, which is done by trapezius a cranially innervated muscle.

A <https://teachmeanatomy.info/the-basics/embryology/myotomes/>

<https://quizlet.com/129390700/cervicallumbar-myotomes-and-dermatomesspinal-tests-flash-cards/>

1. A 40 year old female patient attends after a rear end MVA 5 days earlier in which she suffered no direct trauma. She was not wearing her seat belt. She complains of right mid-cervical moderate pain which appeared three days after the accident after she had driven for six hours (unusual). The pain has not worsened since and is exacerbated by looking over her right shoulder and sometimes in the morning, it does not disturb her sleep. There is no headache or dizziness nor any paresthesia or neuropathic pain. She has no past history of neck pain of consequence. On examination the following is found:

* Right rotation and extension are both limited by about 25% and both are painful locally with a an abrupt stop caused by guarding (not spasm) to the end feel. The other movements are full range but right side flexion is painful.
* PAs over C4 and 5 produce pain but normal end feels
* There are no central or peripheral neurological signs

Answer the following:

1. Is there anything in the presentation that presents a threat to the health of the patient
2. Did the MVA cause/trigger the neck problem
3. Did her not wearing the seat belt contribute to her injuries if you believe the MVA was at the root of them
4. Does she need an X-ray
5. What is your H1 and why
6. How will you treat this

A

1. Nothing that stands out. There is very little referred pain, the onset of pain was delayed so no severe tissue disruption such as fracture, the neck shows a partial articular pattern that suggest a biomechanical dysfunction as do the end feels and in particular there is no spasm. There are no signs or symptoms suggestive of neurovascular or neurological involvement.
2. If it didn’t this was one hell of a coincidence. It is likely that she had pre-trauma problems and the driving triggered the symptoms but if she hadn’t had the MVA it is possible that her neck would never had bothered her.
3. Seat belts are not effective in rear end collisions except to stop you going forward and doing damage in the second phase of the whiplash and as she suffered no direct trauma they would not have helped.
4. Not according to NEXUS or the Canadian Cspine Rules.
5. H1 = segmental dysfunction of the mid-cervical segment
6. Manual therapy after a biomechanical segmental examination and another to ensure that it is safe to do so.

<https://www.mdcalc.com/nexus-criteria-c-spine-imaging>

<https://www.physio-pedia.com/Canadian_C-Spine_Rule>

1. A 70 year old female complains of aching pain in the neck and both upper trapezius areas. This aching has become worse recently. She says that her neck feels stiff and is worse when she drives for more than thirty minutes. She has no tingling or feeling of weakness or clumsiness in the hands but has noticed that she has tripped a couple of times without obstacles and without falling. Your neurological examination is negative.
   1. What is your H1 and why
   2. Is the tripping related to H1 or is it due to balance problems or some other cause.
   3. How would you determine which

A

H1 spinal stenosis with myelopathy. This is a default hypothesis because of the potential consequences of missing it. The fact that there are no neurological signs or classical symptoms does not mean that it does not exist if we allow that the tripping might be a symptom. It may be that the minor myelopathy could cause the dorsiflexors in one or both legs to be weak but the weakness may not be apparent except as early fatigue. The correct test is to strength test again with more care and then try to fatigue the muscles with repeated contractions. If this is negative then there is nothing to back up H1 in which case H2 would be spinal stenosis without myelopathy and then you must search for a second H. Balance problems is reasonable so H1 for the tripping could be vestibular dysfunction. The fact that there are no other symptoms tends to argue against this but it is still best fit for the facts. Test balance, if nothing comes of it then treat the stenosis (if not diagnosed as such by the physician appropriate imaging is necessary) and refer back to find the cause of the tripping before she does fall.

<https://www.columbiaspine.org/condition/spinal-stenosis/>

1. A 65 yr old man co left dorsal wrist pain, right suboccipital neck pain and headache in the right frontal area attends four days a front end MVA with a delta velocity of 70 mph.

Symptoms:

1. The wrist pain started immediately but was worse the next day
2. the neck pain started about three hours later and was worse the next morning
3. headache didn’t start until the following day but has increased in intensity over the next three days

Which is your priority symptom:

1. the neck pain
2. the wrist pain
3. the headache

A a. the priority is the headache. This could be caused by chronic sub-dural hematoma and bleed and is suggested by the progressive headache and his age. Ask if the head pain is gravity dependent, in this case is it worse when he bends forwards to ties shoes, pick things up etc. if so it can be that the hematoma is being compressed against the skull. In any case it should be referred to the ER.

The wrist pain worsened the next day so is probably not a fracture and the same can be said of the neck. In any case unless you believe there is a cervical fracture the headache still poses the greatest threat to the patient.

<https://emedicine.medscape.com/article/1137207-clinical> .

1. A 50 year old woman attends five days after a rear end MVA complaining of right sub-occipital pain and occipital headache. She also complains of intermittent mild vertical that persists for 5-10 minutes after it is triggered, once it subsides she suffers type 2 dizziness for another 30 minutes. During the vertigo stage she experiences blurry vision. Here physician diagnoses it as BPPV or maybe cervicogenic vertigo. Do you agree and if not what is your H1 for the dizziness and how do you know proceed.

A Very carefully. H1 is central vertigo of unknown origin. The vertigo is mild and persistent and the blurry vision might be retinal slip but it is arguable that the vertigo is not sufficiently severe, it is more than possible that it could be nystagmus. At this point it would be prudent to refer to an ER or friendly ENT doc but you can try to elicit more information from the patient. A very specific history asking after central neurological symptoms would help as would a complete neurological examination particularly the cranial nerves but nothing that moves the head/neck.

<https://emedicine.medscape.com/article/794789-clinical>

1. A 14 year old boy attends complaining of severe upper central cervical neck pain 2 weeks after a front end MVA in which he was a belted rear seat passenger who suffered no direct trauma. The onset of the pain was immediate and hasn’t worsened but has not improved except that he has more periods where the pain is much less, typically when he is sitting partway up and fully supported. It is summer vacation and he is not able to leave the house to do boy things because of the pain. An X-ray taken at the time and another at two weeks were negative. On examination he has a right rotated torticollis that he is unable to correct and attempts by you to do so cause severe pain.
2. What is your H1 and and why
3. What questions and tests will be positive for it
4. What are the next most probable 3 DDx and their major signs and symptoms

A

1. H1 = High cervical fracture. Immediate onset of severe pain and the immediate torticollis suggest this. Collar and get to the ER by calling an ambulance.
2. There are no other questions and certainly no other tests, even the attempt at de-twisting the neck was dangerous and should not have been done.
3. AARF. Same presentation but if there is a history of recurrent upper respiratory tract infections then C1/2 instability is likely but your response should be the same as for a fracture, ie. Collar and ER. No other DDx, it needs an emergency response.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2899721/>

<https://journals.lww.com/jaaos/fulltext/2015/06000/Atlantoaxial_Rotatory_Subluxation_in_Children.8.aspx>

<https://www.orthobullets.com/spine/2050/atlantoaxial-rotatory-displacement-aard>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4616647/>

<https://www.ncbi.nlm.nih.gov/books/NBK441956/>

1. A 37 year old woman attends post rear end collision complaining of pain in the right mid and lower cervical regions and the right deltoid to elbow. Answer the following:
2. Do you think there is a single cause for her pain or multiple pathologies
3. How would you go about proving your hypothesis from the history
4. If there is a single pathology causing her pain which segment is mostly likely at fault

A

1. Given that there is no continuous pain between the neck and the shoulder my thought would be that the deltoid pain is not referred from the neck and the chances of proximal referral are not high, so two different pathologies.
2. You should ask questions that associates and dissociates the pains. If you can dissociate them then two pathologies are probably if you can’t then one.
3. If a single segment is the problem then it is likely to be in the C5 or 6 segment given the referral.
4. A 55 year old male attends two days following a rear end MVA complaining of pain in the left anterolateral neck and posterior right neck both at about the middle cervical level. The anterior pain was immediate and severe, the posterior neck was delayed until the next morning and is now a nuisance rather than a problem and is improving. His main complaint relates to the anterolateral pain.
5. What is your H1, why and how will you prove it
6. What are three differential diagnoses
7. As you examine the patient further you notice that the right pupil is a little larger than the left does this have significance and if so what

A

1. The pain is under the sternomastoid so the first thought must be damage to that or an underlying tissue. The tissue that underlies is is the carotid artery and this must take precedence but it is difficult to test that so H1 = sternomastoid tear. Carefully palpate the sternomastoid by pinching it from side to side not anteroposteriorly, if it is not tender then there is no tear but even if it is there may still be damage to the artery. You should look for damage to the artery and this is by way of assessing the cranial nerves and the sympathetic chain.
2. Carotid artery tear, rim lesion, tear drop fracture (unlikely but possible), anterior longitudinal ligament tear
3. The larger right pupil may actually be relative and the right pupil is smaller and part of the larger Horner’s syndrome that would indicate damage to the sympathetic chain and possibly the carotid artery. The signs of Horner’s are not always obvious. If the lower chain is affected then you might find absent sweating in the arm.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1344809/>

<https://jamanetwork.com/journals/jamasurgery/fullarticle/396906>

<http://prod.wiki.cns.org/wiki/index.php/Injury,_Sympathetic_Nerve>

1. Answer the following short questions:
2. A patient presents with a C6 radiculopathy do you perform an upper limb tension test and if it is possible what information have you gained.
3. Which is the most sensitive test for cervical spinal cord compression caused by traumatic compression from a disc herniation
4. What is your hypothesis if you find that elbow flexion is fatigably weak
5. What do you conclude if a patient presents with right lower neck and trapezius pain and the entire right arm is causalgic and hypoesthetic
6. What do you conclude if a during the subjective examination of a post-mva patient dizziness and headache were absolutely couple but de-coupled from the neck pain
7. What is your H if a patient you have been treating for moderate right upper neck pain attends complaining of severe pain on the temple and TMJ area whose onset was the day after you treated them.
8. What do you conclude if a patient complains of post-mva left neck pain and headache over the right side of the head . right sided neck pain.

A

1. I can’t see any point. You expect the ULTT to be positive if a radiculopathy is present. A negative result would be more intriguing.
2. Probably Hoffamann’s test, at least according to Sung (see below) but it is prudent to rely on no one test and do all of them.
3. You really shouldn’t have a hypothesis based on a single sign. The sign needs to have a context and for that you need symptoms. This weakness is fatigable and so probably neurological and could be caused by a C5 or 6 radiculopathy, musculocutaneous neuropathy, axoplasmic flow compromise, muscle disease etc.
4. A brachial plexopathy from whatever cause
5. The dizziness could easily be caused by VBI
6. That the TMJ was seriously inflamed. If jaw movements are seriously limited and painful the patient should be referred to the ER in case of septic arthritis. If the jaw movements are free and painless then you may well have screwed something up.
7. That the headache was not referred from the neck; it’s on the other side.

<https://www.ncbi.nlm.nih.gov/pubmed/11148648>

<https://emedicine.medscape.com/article/316259-overview>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1888193/> (contradictory to the above)

<https://emedicine.medscape.com/article/316888-overview>

<https://emedicine.medscape.com/article/236299-overview>

<https://www.msdmanuals.com/professional/dental-disorders/temporomandibular-disorders/arthritis-of-the-temporomandibular-joint-tmj>

1. Make a table consisting of the following bias’s together with their definition and methods of reducing them.
   1. Anchoring
   2. Framing
   3. Regression
   4. Availability
   5. Premature satisfaction

A

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| --- | --- | --- |
| Bias | Definition | Reducing Strategies |
| Anchoring | Sticking to a conclusion because of a single or multiple piece(s) of data despite evidence contradicting it | Test other hypotheses or differential diagnoses |
| Framing | Forming a conclusion of data based on previously obtained from unconsidered context | Imaging, lab tests, other opinions etc need to be considered after making the diagnosis |
| Regression | Over-estimating high probabilities and under-estimating low | You can use a high probability as H1 but bring low probabilities in the DDx |
| Availability | Over-dependence on recent or repeated experiences or teachings or in this case diagnosis | Chose unfamiliar DDx and understand them when testing |
| Premature Satisfaction | Finishing the assessment too early because you “know” the diagnosis | Make the diagnosis then do a complete assessment. SFD is very prone to this so do not ignore it. |
| Confirmation | Believing what we want to believe and ignoring contradictory evidence | Understand that there is no evidence for a belief and go with the evidence. Make DDxs that are outside of your comfort zone |
| Ambiguity | Favoring options where the outcome is known over those in which it is not or that takes extra effort. Keeping to familiar treatments and diagnoses | This leads to misdiagnosis and mistreatments. Diagnosing a medical condition means sending it back to the MD with all that that entails. Similarly an unfamiliar diagnosis means more thought to treatment than usual with unpredictable outcome |

<https://www.boardofinnovation.com/blog/16-cognitive-biases-that-kill-innovative-thinking/>

<https://en.wikipedia.org/wiki/List_of_cognitive_biases>