

Hands on C spine

Shoulder/Upper Limb pain

- Brief Overview of pain history & anatomy
- Problems of examination and diagnosis
- Take home pattern recognition of myofascial pain
- Take home exam and treatment options

EPIDEMIOLOGY

neck pain

- Point prevalence for acute 10 – 35%
- Lifetime prevalence for acute – 35 – 50%
- Lifetime prevalence for chronic - 14 %

Natural History of acute neck pain

- *Prognosis is largely favourable*
- *40% of patients can expect to recover fully*
- *25% will retain only mild symptoms*
- *7% will have severe disabling symptoms*

OF PATIENTS FOLLOWING WHIPLASH

- *80% can expect to recover rapidly and be fully recovered within one year*

Shoulder pain Bamji et al-1996

- **3 Rheumatologists achieved 46% agreement in diagnosis.**
- **All recommended injection of cortisone for almost everything**

Shoulder pain

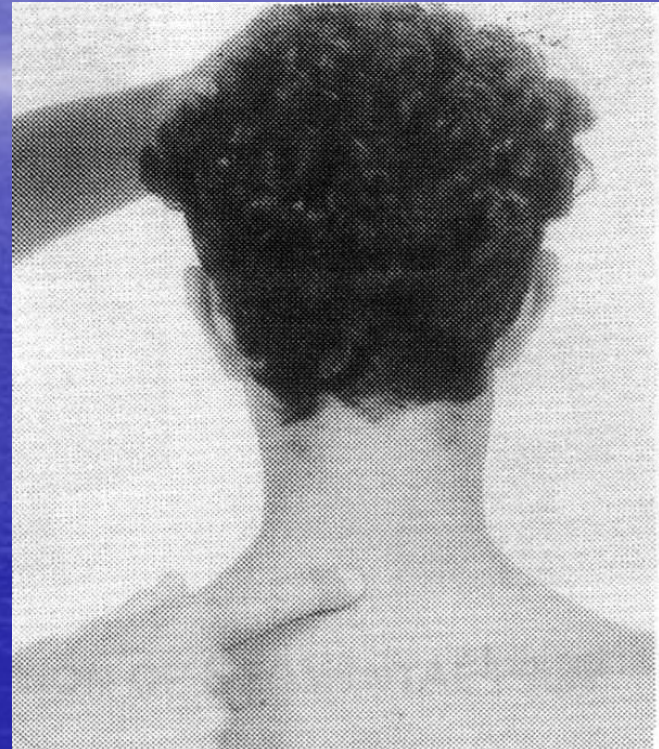
- **Third most common musculoskeletal complaint in general population**
- **Account for approximately 5 % of musculoskeletal consultations to general practitioners**

Considerable cost to public of NZ

Landmarks

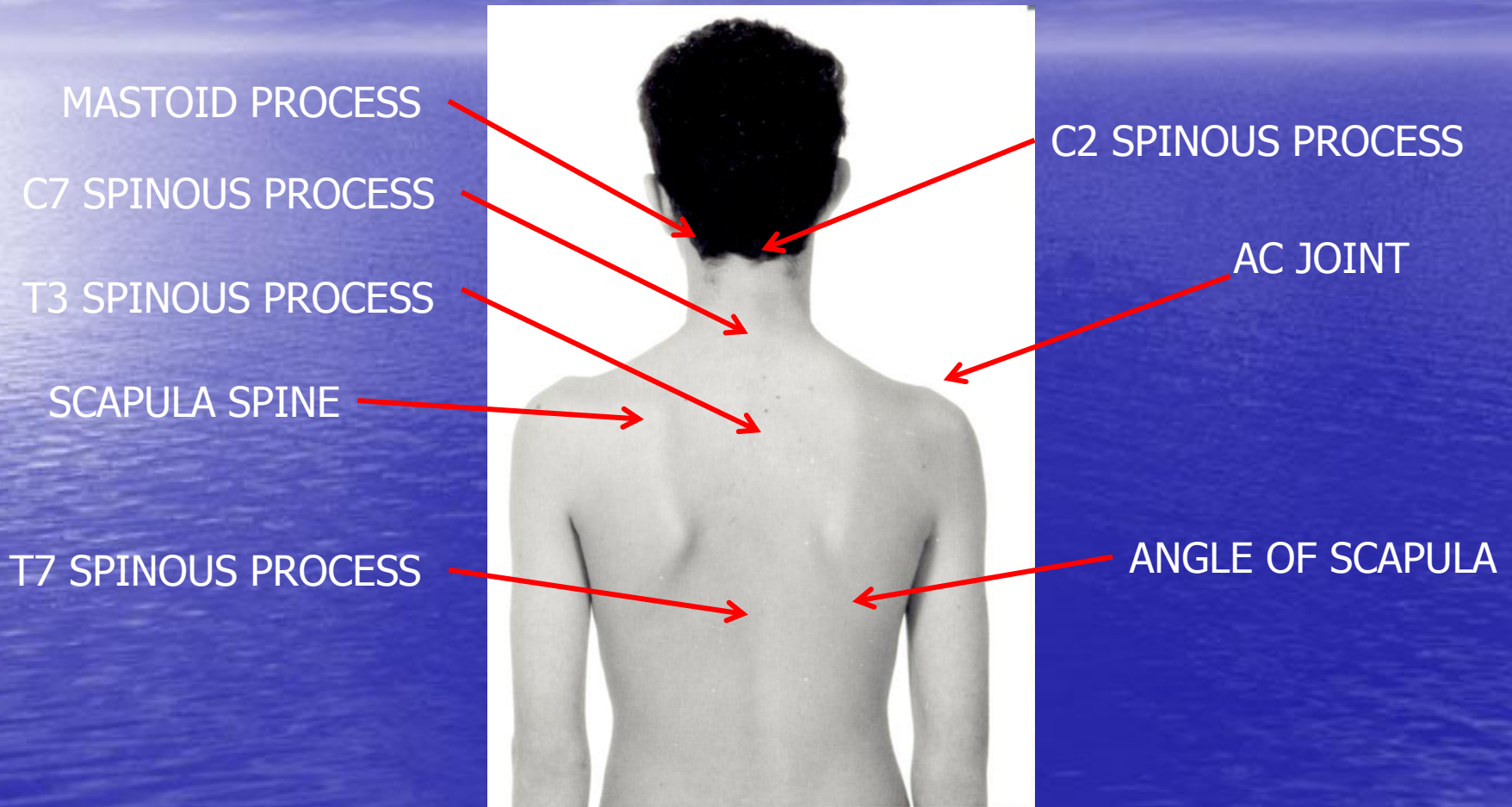


C2 Spinous process

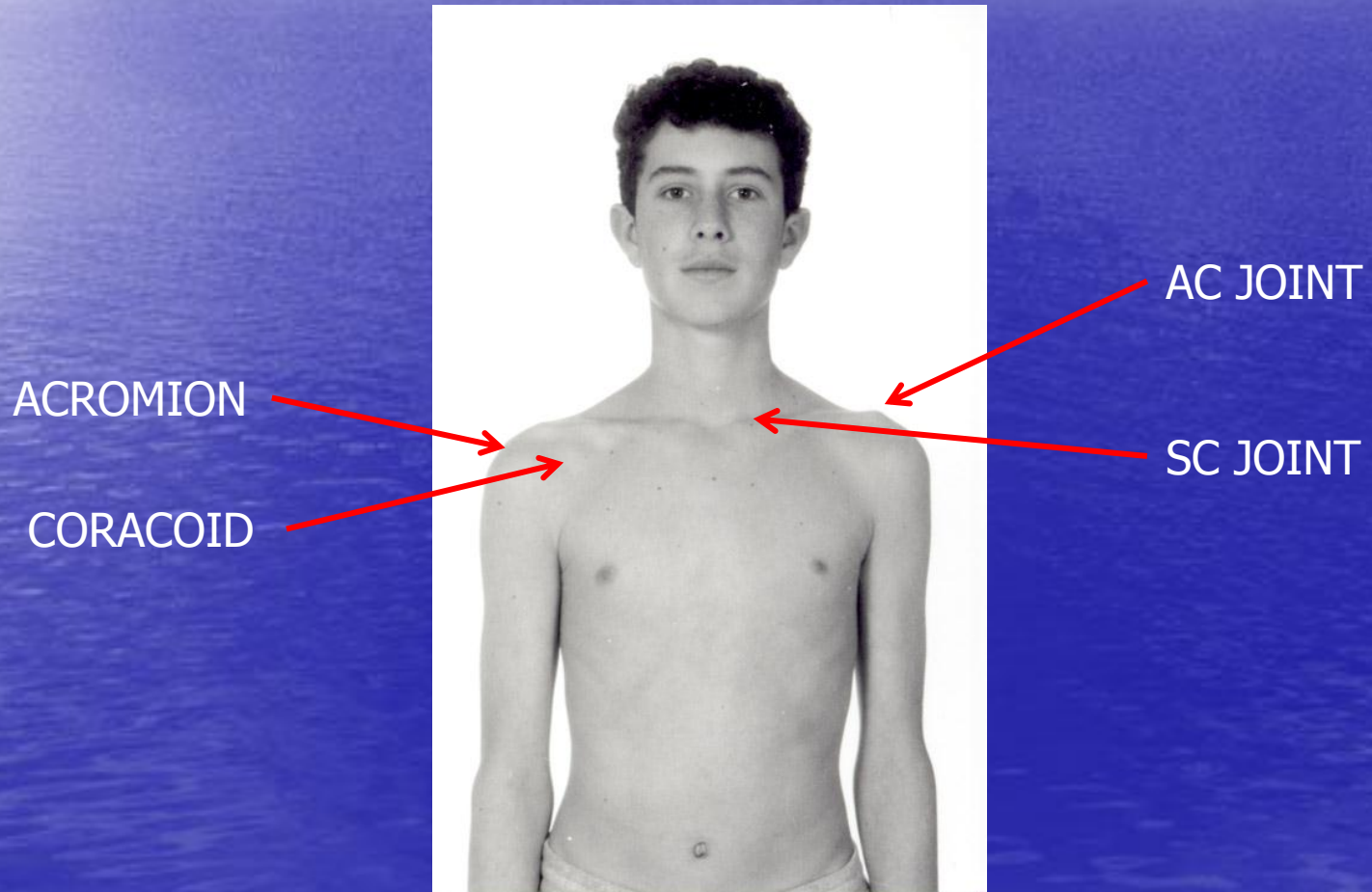


C7 Spinous Process

Surface anatomy (post)

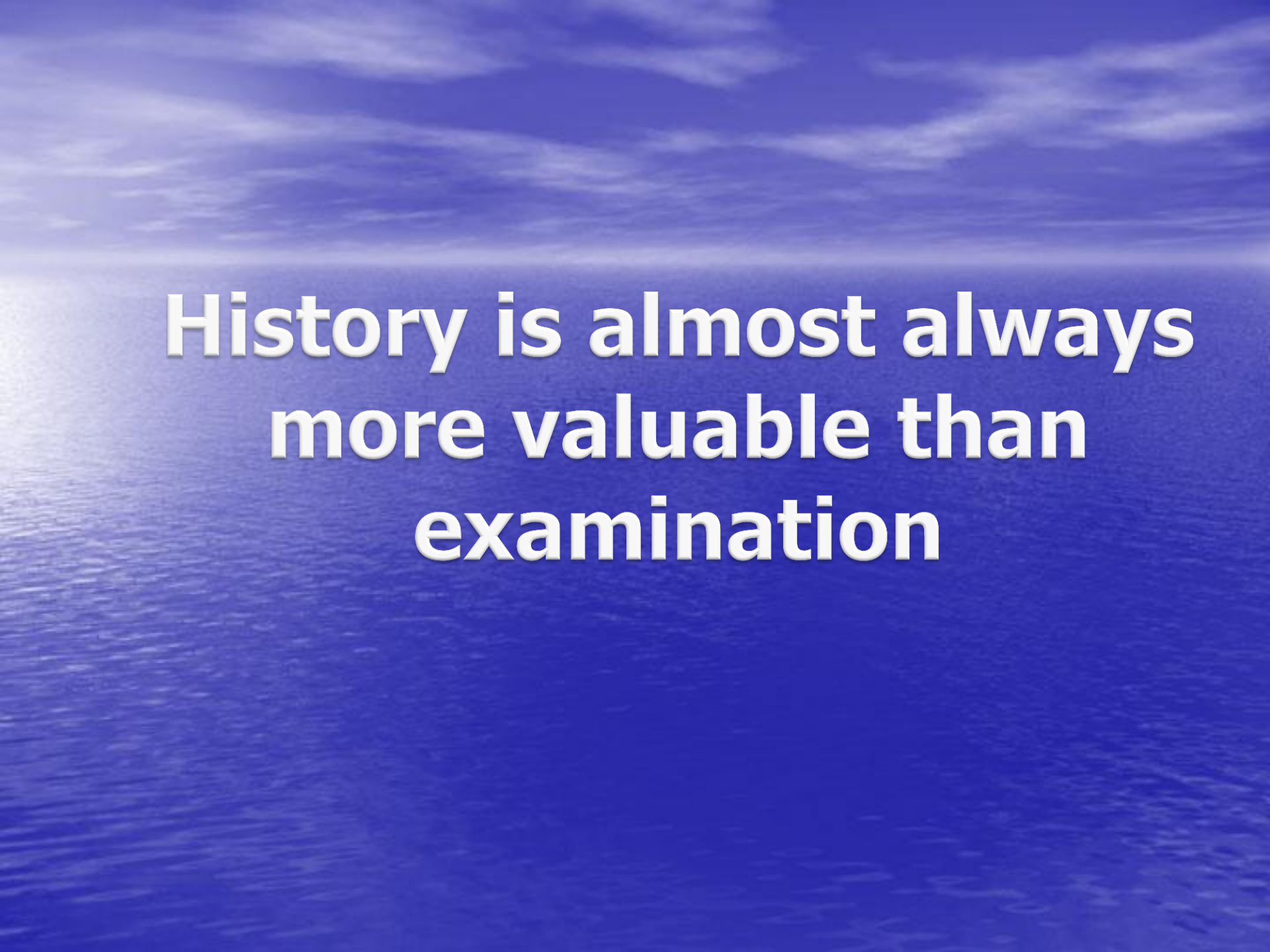


Surface anatomy (ant)



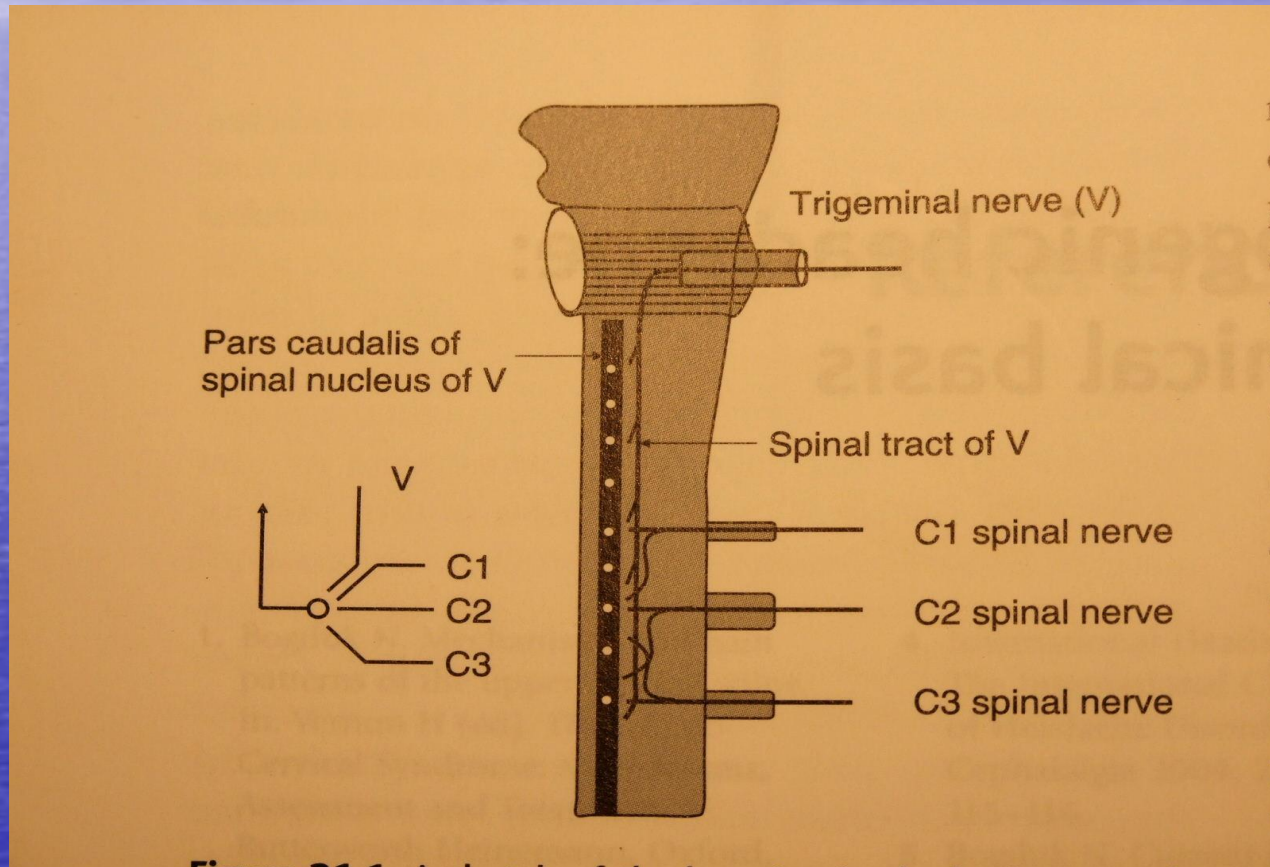
FUNCTIONS of the NECK and SHOULDER

- *Neck: hold up the head*
- *Neck: provide a safe conduit for the spinal cord and air to enter the lungs, food and water to the stomach*
- *Neck: hold up the shoulder and arms*
- *Neck: provide a mobile platform for the eyes...& to a lesser extent for the ears*
- *Shoulder: place the mobile grasper*



**History is almost always
more valuable than
examination**

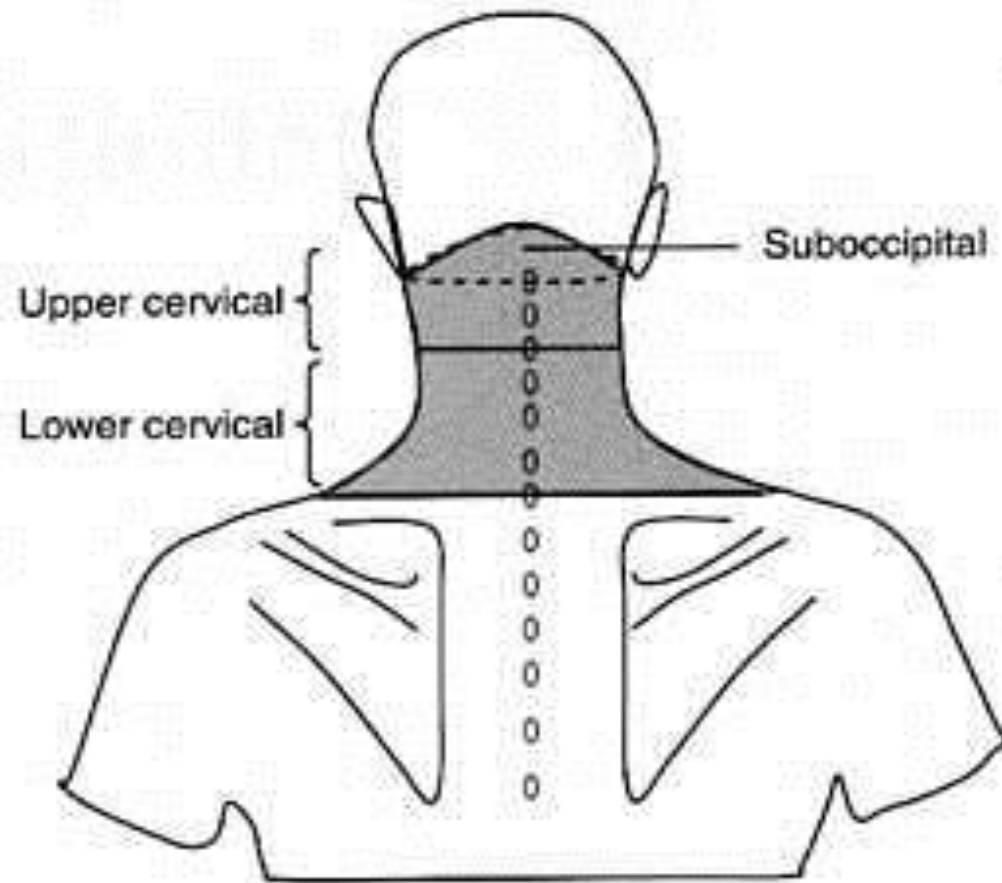
Cervicogenic Headaches



RADICULOPATHY

- *Lets us determine the level of involvement, when altered sensation, but does not apply to (radicular) pain*
- **C6**, *if the thumb is involved*
- **C7**, *if the middle finger*
- **C8**, *if the little finger*

Where is neck pain?



B

10 point history & red flag acronym

Socrates ad(s)

- Site
- Onset
- Character
- Radiation
- Alleviating factors
- Times of occurrence
- Exacerbating factors
- Severity
- Associated factors
- Disability scores
- Systems review gives.....

Vision

- Visceral/Vascular
- Infection
- Significant Fracture
- Inflammatory
- Other
- Neoplasm

Socrates ads vision

- **SITE**
- Assist patient to find main focus/ worst /most often.

Socrates ads vision

- Onset
- - **Duration**- acute /chronic
- **Mode**- gradual /sudden (think vascular)
 - spontaneous/traumatic
 - well/ill

(Spontaneous and ill think red flag-risk factors for spinal infection)

“ were you well or ill or stressed when it started”

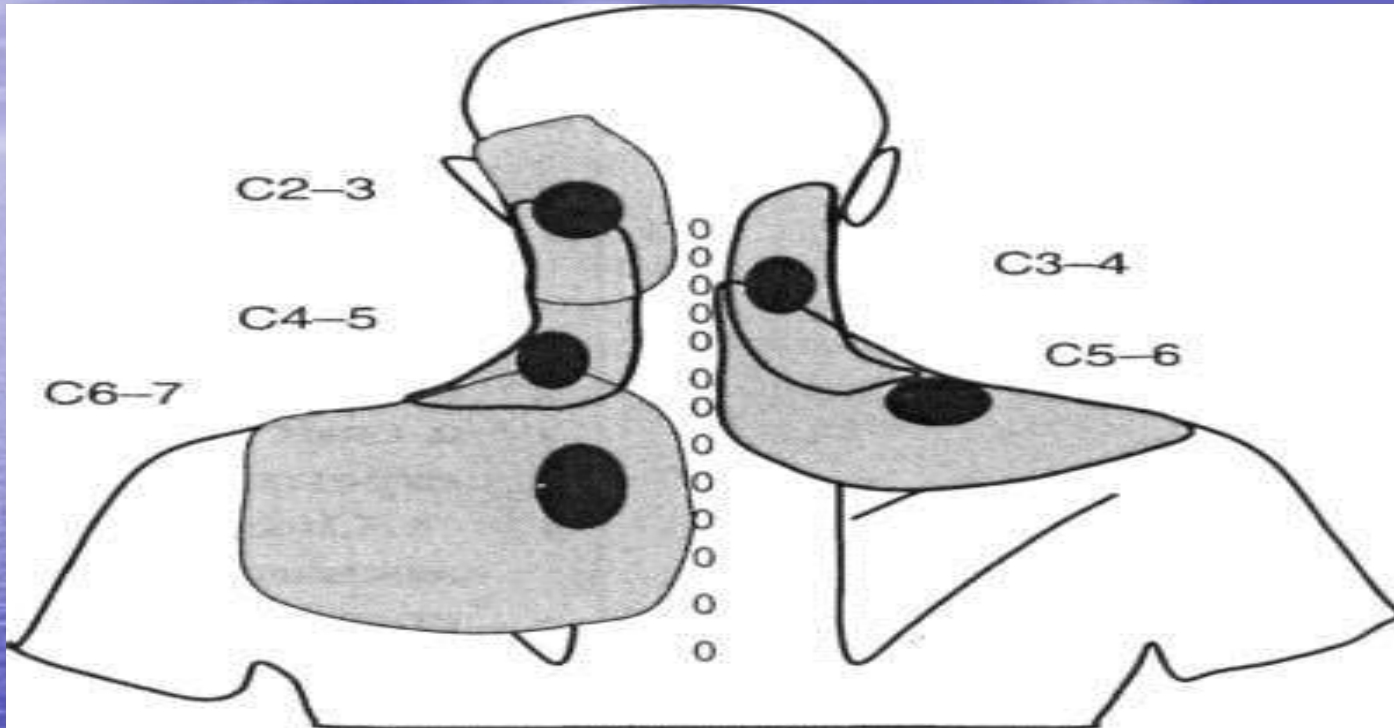
Socrates ads vision

- Character
- -deep spreading aching dull sore (think somatic)
- -superficial moving stabbing shooting burning (think radicular/neurogenic)

Socrates ads vision

- Radiation
- The most important issue is where pain is felt consistently not the extent of the radiation

Z joint pain maps



C2-3 suboccipital

C3-4 levator scap

C4-5 angle between neck and top of shoulder girdle

C5-6 supraspinatus fossa (radiate to deltoid)

C6-7 ss and is and gravitates to medial border scapula

Anatomy and Pain Pattern

Teres Minor



Teres Minor



Socrates ads vision

- **A**lleviating factors
 - posture
 - heat/cold
 - manual
 - drug (prescription or “natural”)

Socrates ads vision

- Times of occurrence
- night (think red flag especially if combined with spontaneous onset)

Socrates^e ads vision

- **E**xacerbation
- - movement/activity (if not think red flag)
- “if you're in pain what makes it worse”

Socrates ads vision

- Severity
- VAS Visual analogue pain score 0-10/10

Socrates **a**ds Vision

- **A**ssociated factors
- -nausea weakness parasthesiae etc

Socrates ads Vision

- Disability score

Socrates ad**s**

– **S**ystems review
is for the red flag check

- **V**isceral/Vascular
- **I**nfection
- **S**ignificant Fracture
- **I**nflammatory
- **O**ther
- **N**eoplasm

The red flags are: **V**ision

- Visceral
- Eg heart- on CVS systems review

The red flags are: vision:

Infection (omyelitis /septic arthritis) risk factors:

- fever (37.8) night sweats
- Diabetes
- recent/concurrent infection (eg UTI as per frequency dysuria) cirrhosis AIDS
- Immunosuppression: disease/drugs including steroid (prednisone 7.5 mg/d 3/12)
- body penetration (catheter injections surgical procedures)
- Social: illicit drug use, occupation/recreational/overseas travel eg hydatids
- Systems review: skin infection

The red flags are: Vision

Significant fractures

- Occur after trauma
- major trauma – falls
- minor trauma –corticosteroid (prednisone 7.5 mg daily for 3/12) , age >50y, known osteoporosis

The red flags are: vision

- **I**nflammation
- pain elsewhere invites systemic arthropathy or systemic inflammation
- RA, AS, Gout, Reiters, PMR

Socrates ads vision

- Other -Metabolic
- Hyperparathyroidism (can cause osteitis fibrosa which can be an occult cause of bone pain and there may be no other cues)
- Pagets
- Check Ca, PO₄, PTH, Vitamin D, ALP.

The red flags are: Vision

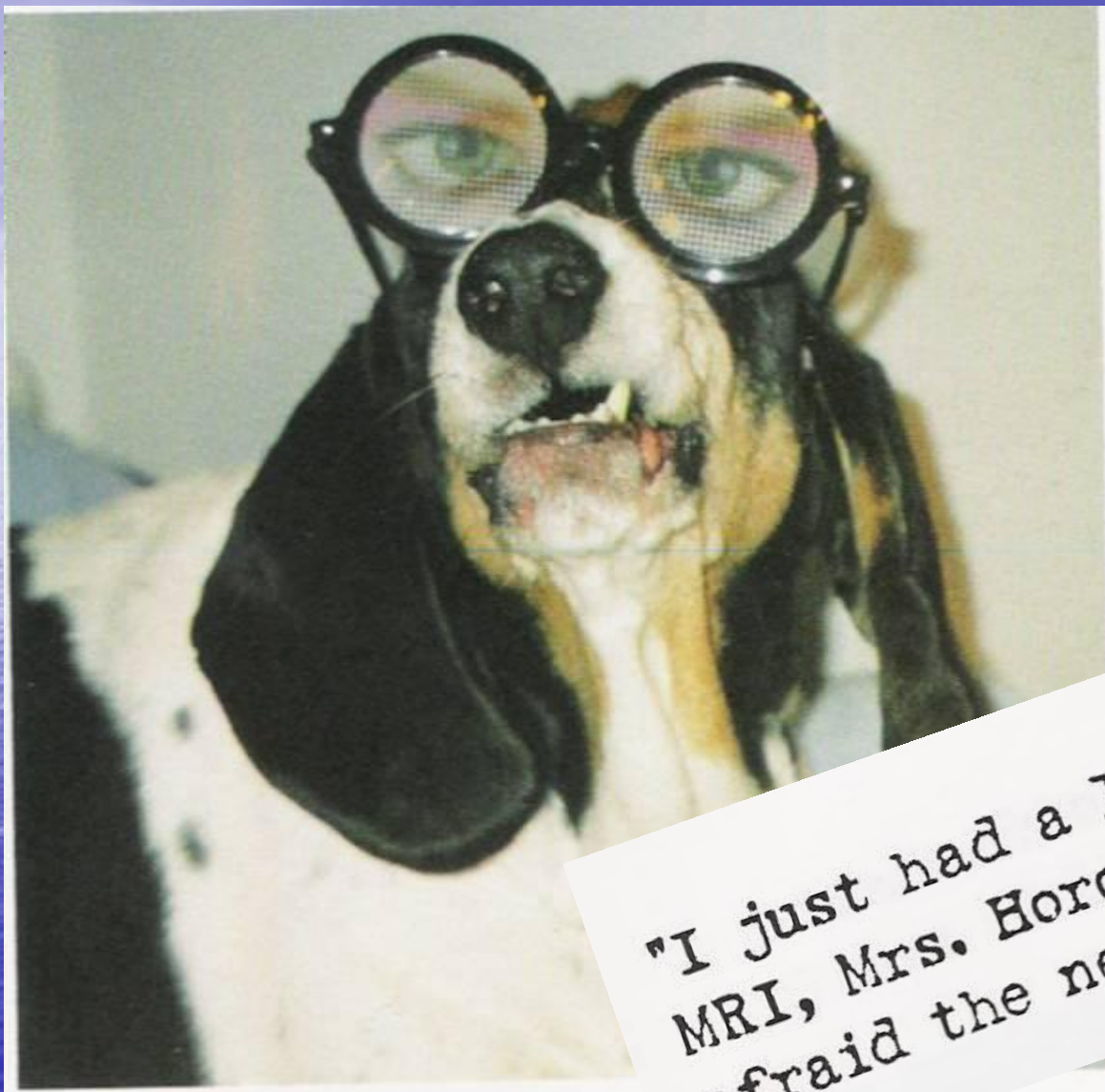
- Neoplasia
- Past present history of cancer
- wt loss (unexplained 4.5 kg in 6/12)
- Breast (mammogram Hx) uterus (menstrual hx)
Cervix (smear Hx) Bowel (change FOB) Prostate
(impaired stream male, psa and rectal) Lung
(cough smoking cxr/lung ca)
- Plain Xray missed 41 % metastasis- think MRI

Neoplasia continued

- CAFS acronym very sensitive, -ve rules out cancer
- Cancer history: -ve
- Age >50 : -ve
- Failure to improve after 1/12 :-ve
- Systemic Weight loss (4.5 kg in 6/12): -ve
- (remember SnNout and SpPin)

Take home point!!!!!!!!!!!!!!!!!!!!!!

- Socrates Ad(s) = pain history
- The red flags are **VISION** which are mercifully rare generally diagnosed by history and systems review+/- imaging
- By exclusion left with **SOMATIC FIBRO-MUSCULAR IMPAIRMENT OF THE SHOULDER or SOMATIC NECK PAIN**



"I just had a look at your
MRI, Mrs. Horowitz, and I'm
afraid the news isn't good."

EXAMINATION NECK

- ***Look** for asymmetry, restriction and abnormal breathing patterns (see later)*
- ***Move** the neck to check for restriction, both active and passive to determine level(s) of injury*
- ***Feel** for tenderness over facet joints and in cervical muscles, particularly feeling for trigger points (see later)*

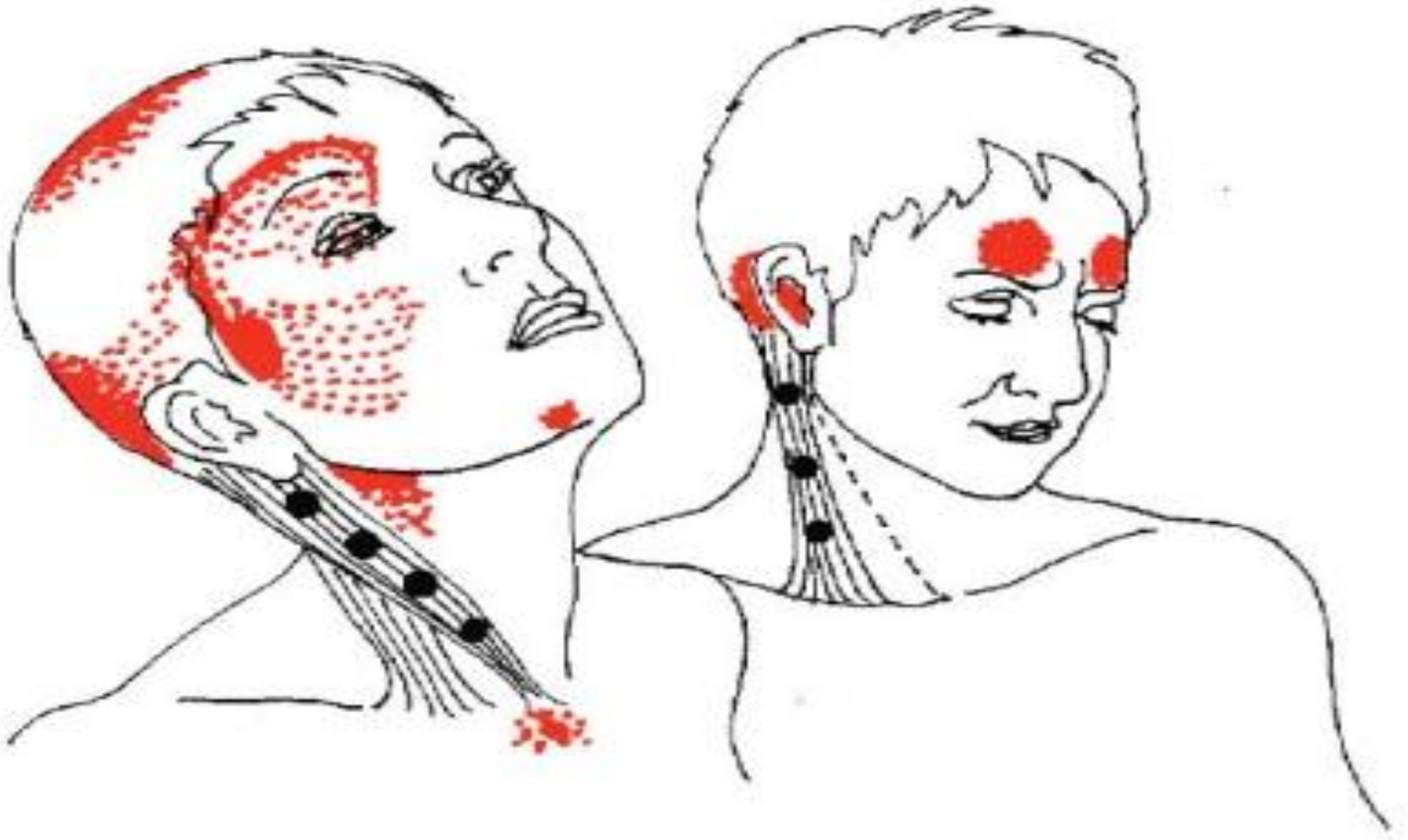
CERVICAL ROTATION

- *Upper cervical rotation, mainly C 1-2, is 50% (45 degrees). Examine in full flexion, which isolates to above C3*
- *Lower cervical rotation, from C3 to Th1 is also 50% (45 degrees). Examine in full extension, which excludes upper cervical rotation*

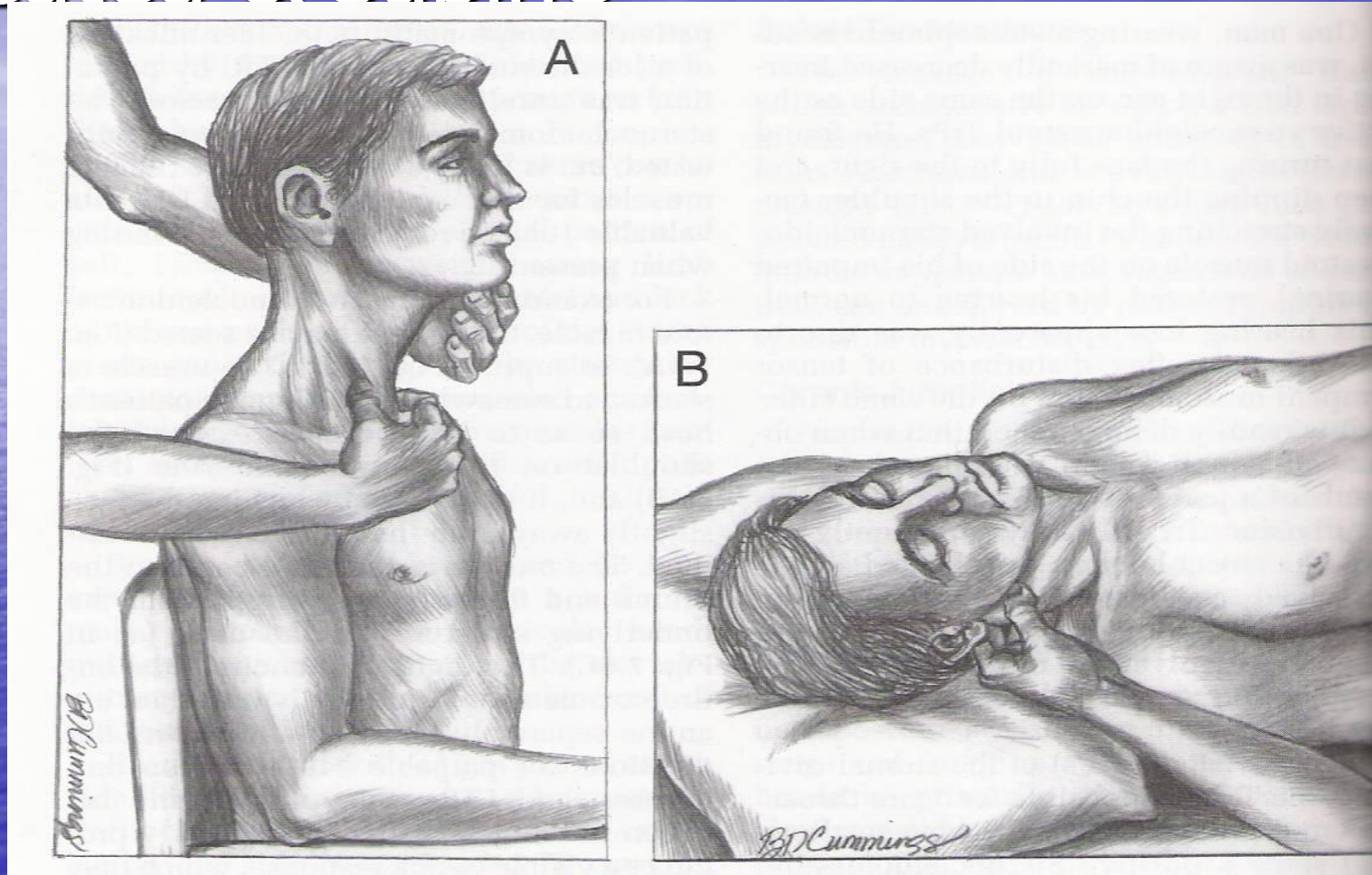
OTHER EXAMINATION

- *Assess the rest of the spine, as other areas may be involved and aggravating symptoms / preventing resolution*
- *Assess shoulder ROM, as restricted shoulder mobility may affect the neck*
- *Check breathing. Is it full diaphragmatic? or is the patient using accessory muscles, particularly trapezius, levator scapulae and excessive use of the scalenes*

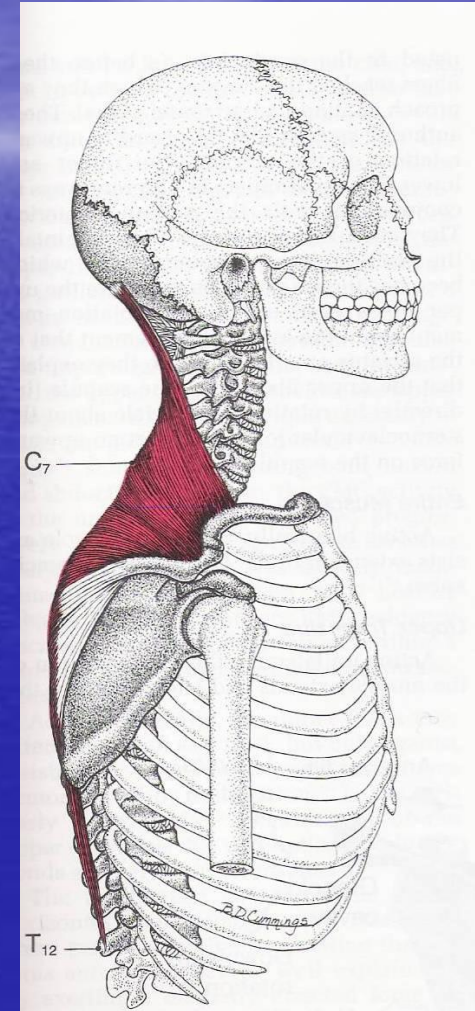
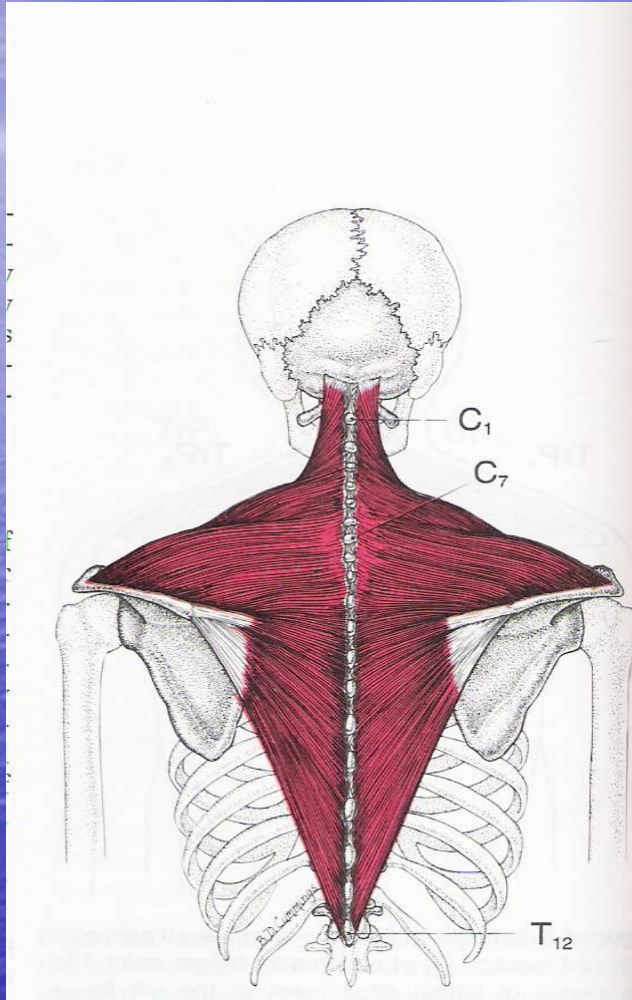
Sternocleidomastoid - referral patterns



Sternocleidomastoid examination - seated & supine

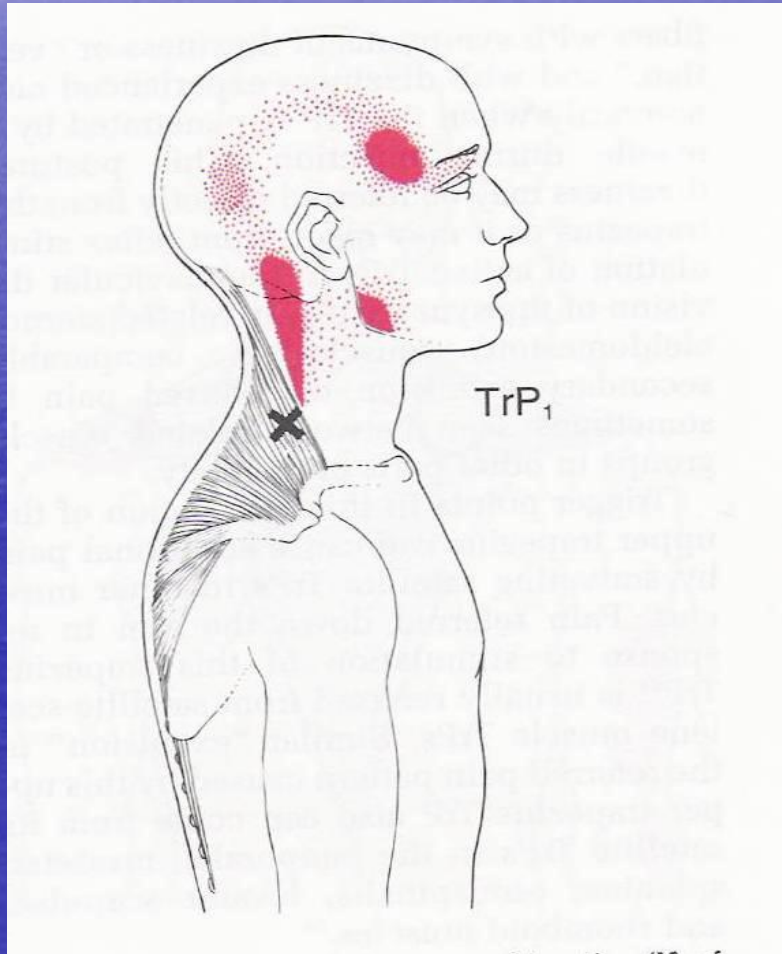


Trapezius- origin and insertion

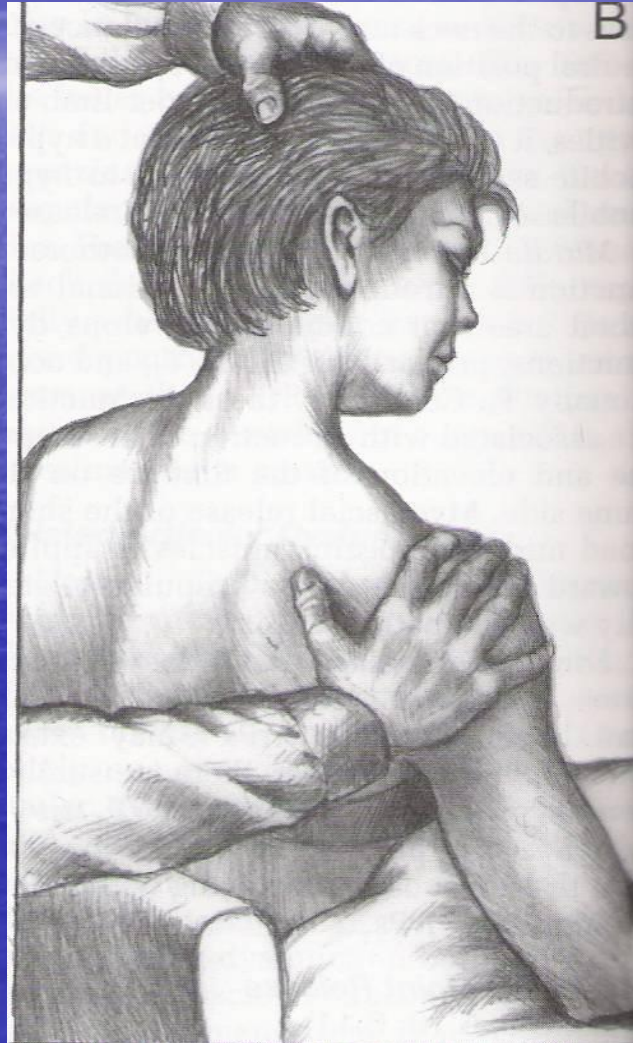


Trapezius (upper vertical fibres)

-referral pattern



Trapezius – exam and treatment

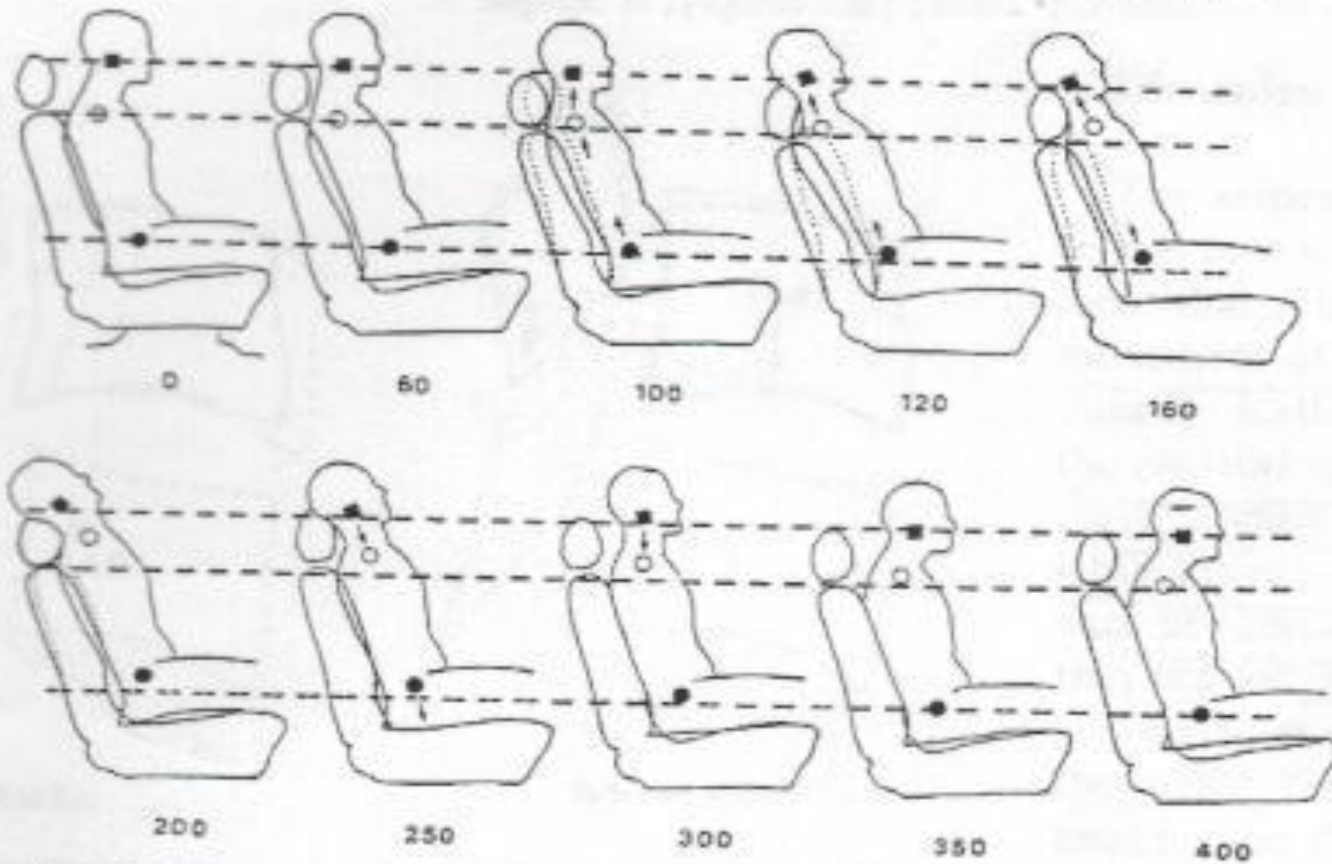


THE NON RESPONDER

- *What would you do?*
- *How long before referral?*
 - *No response to treatment / six weeks*
 - *New or changing symptoms*
 - *Concern about possible **Red Flags***

Whiplash

N. Bogduk, N. Yoganandan / Clinical Biomechanics 16 (2001) 267-275

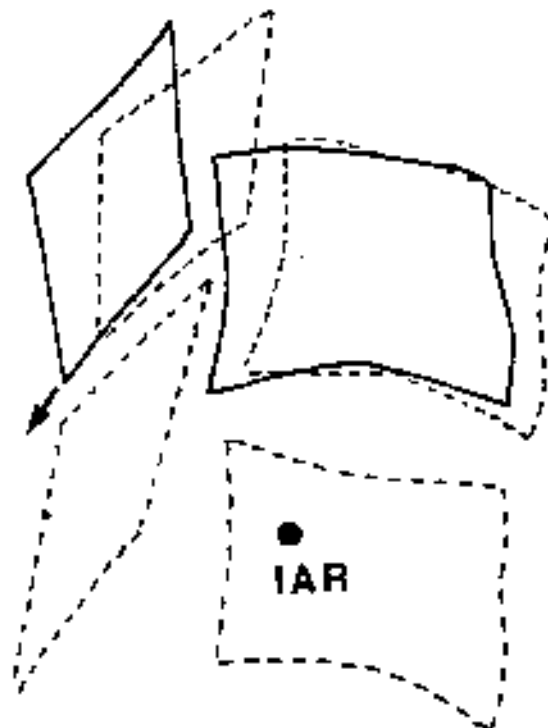


trunk and head after a rear-end collision

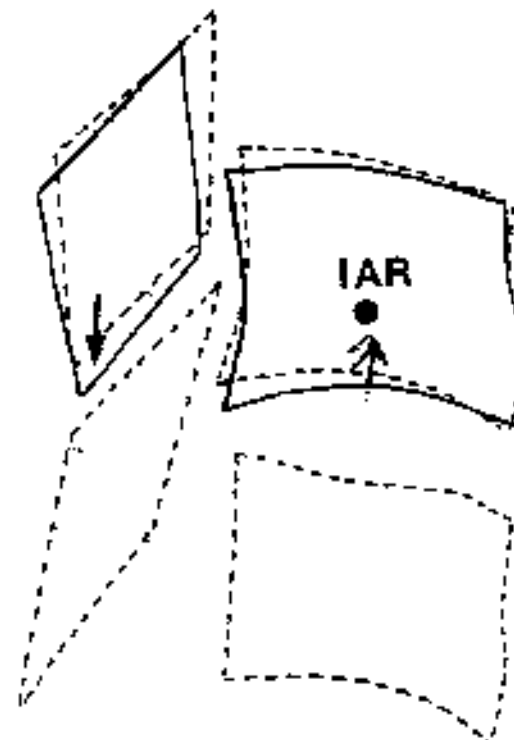
Mechanism of injury

N. Bogduk, N. Yoganandan / Clin Biomech 17 (2002) 271-282

272



NORMAL



WHIPLASH

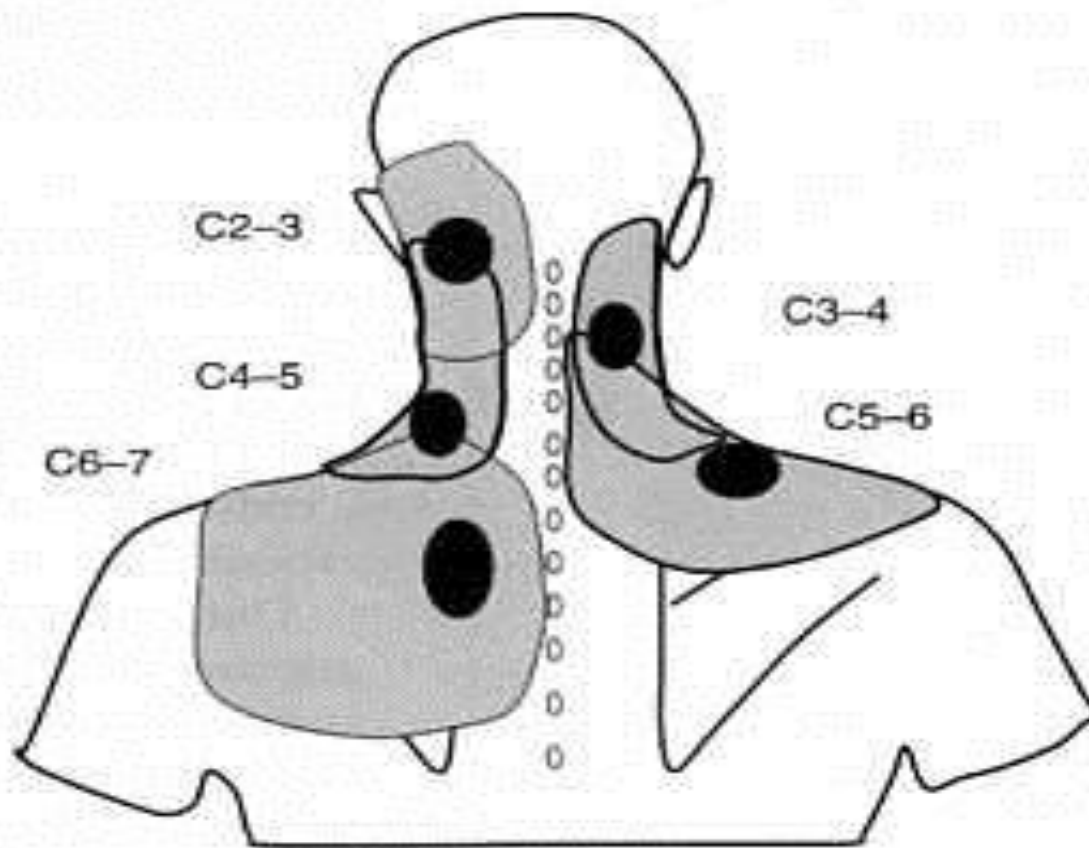


Figure 5.1 Centroids for the segmental origin of referred pain from the cervical spine. The shaded areas indicate the typical zones of referral, from the segments indicated, in normal volunteers and patients. The dark areas represent the centroids, or core areas, where patients feel the pain maximally when it arises from the segment indicated.

Incidence of pain arising from zygoapophyseal joints

- Z joint pain 45% in all cases of neck pain
(Bogduk and Aprill)
- 60% in patients with neck pain following whiplash (Barnsley et al)
- 88% in high speed car crashes (Lord and Barnsley)

WHAT ELSE CAN BE DONE?

- *Isolate the involved segment by Medial Branch Blocks (MBBs)*
- *If two concordant MBBs are positive then Radio Frequency Neurotomy can be considered*
- *This is selectively funded by ACC, but is extremely expensive (around **\$10,000**)*

Pathophysiology and the Cervical Spine

Diagram of injuries identified

Distraction injuries

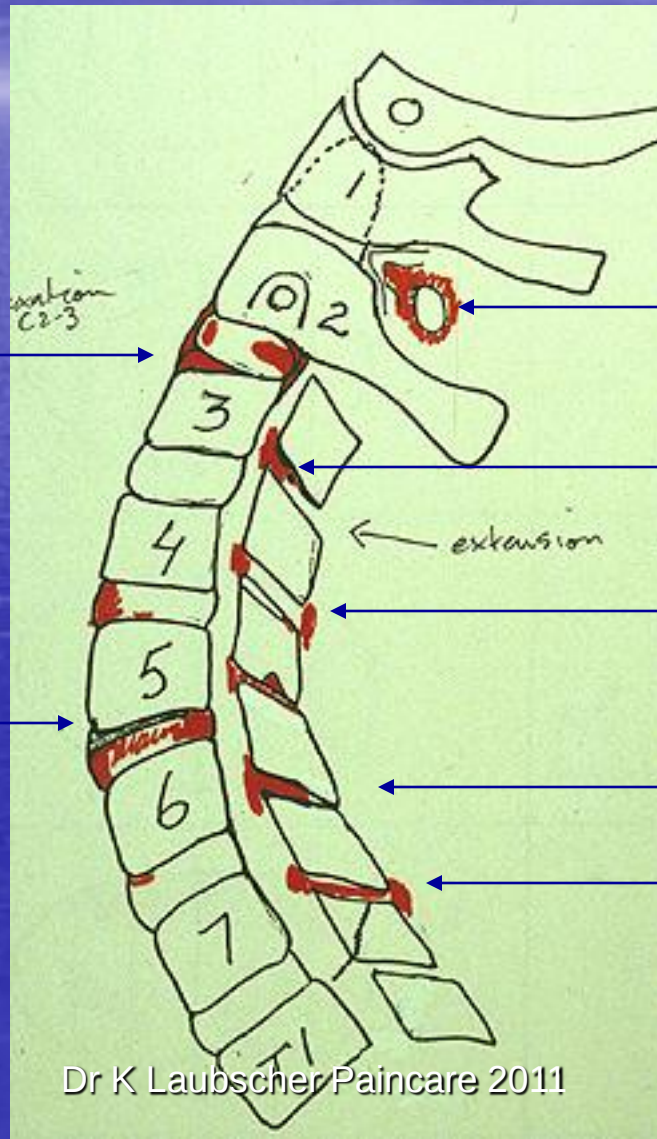
Compression injuries

Partial avulsions of discs from vertebral bodies, in extension

Haematoma around C2

Bruising of vascular synovial folds

Facet haemarthroses with # of C7



MRI

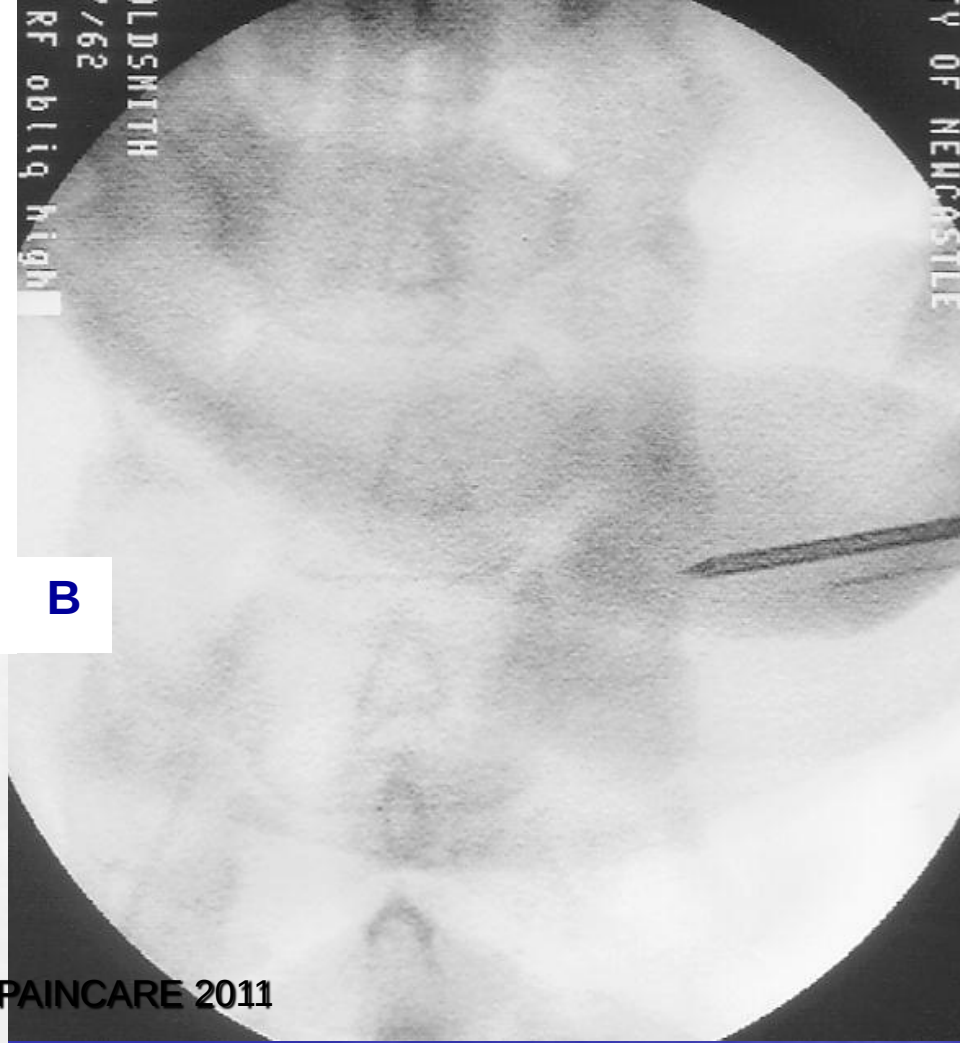
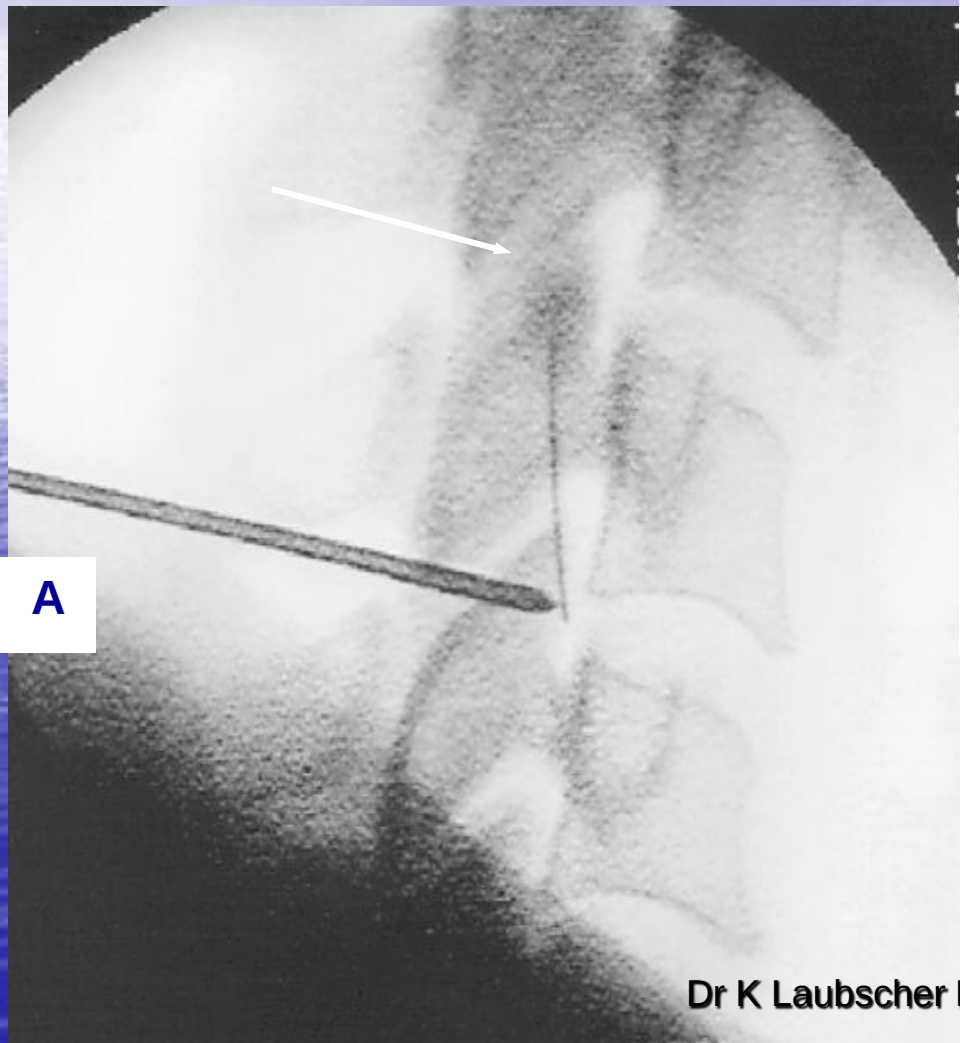
- *Only really useful in suspected neurological injury.*



Dr K Laubscher PAINCARE 2011



Radiofrequency denervation



Radiofrequency who where how & why

Who:

- “Spinal pain of unknown origin”
- Clinical pain pattern
- Pain >4/10

Where: **80%** C56, C67, C23

How: 80 degrees 90 sec

Why: Specific treatment is effective



SHOULDER COMPLEX

ANATOMY

- **Sterno-clavicular joint**
- **Acromio-clavicular joint**
- **Gleno-humeral joint**
- **Subacromial 'joint'**
- **Scapulo-thoracic 'joint'**



MOBILE

LACKS

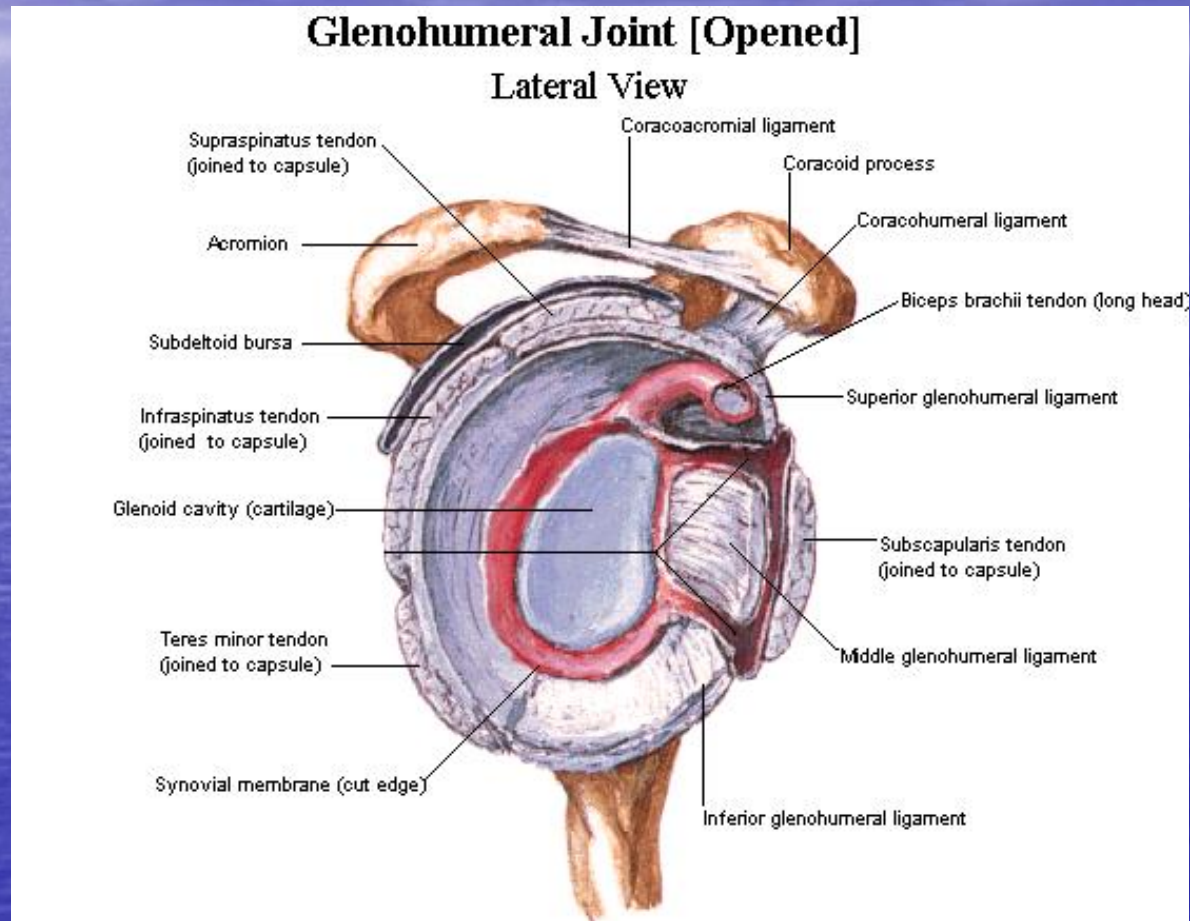
STABILITY

STABILITY

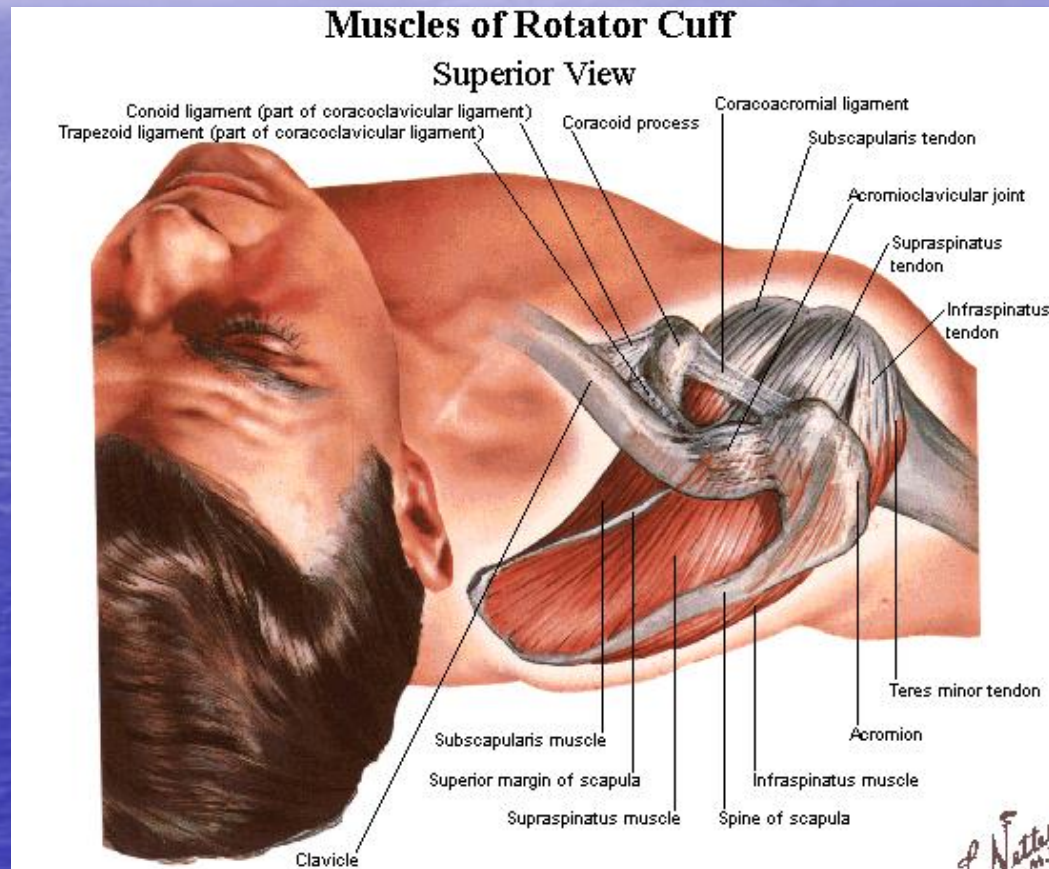
- **STATIC**

- **DYNAMIC**

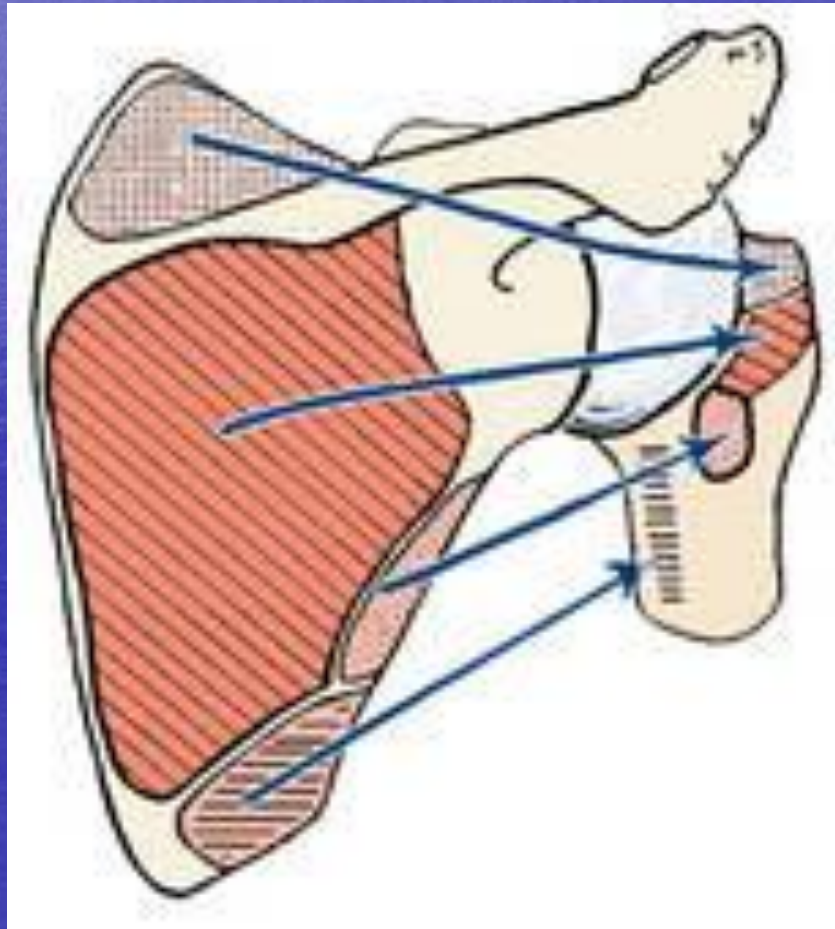
STATIC STABILITY



DYNAMIC STABILITY



SSITT acronym

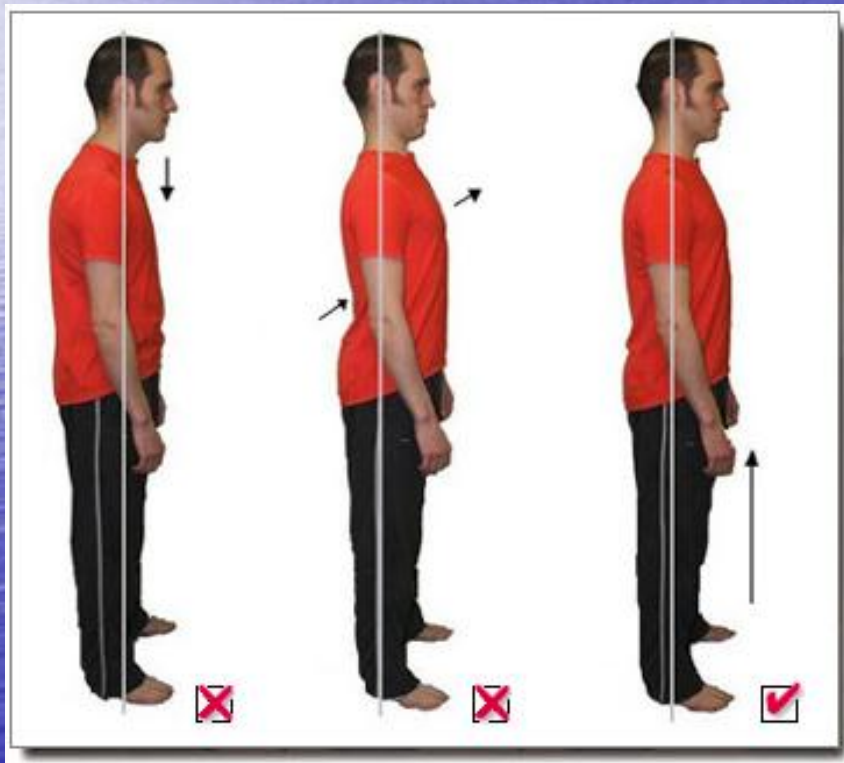


Examination

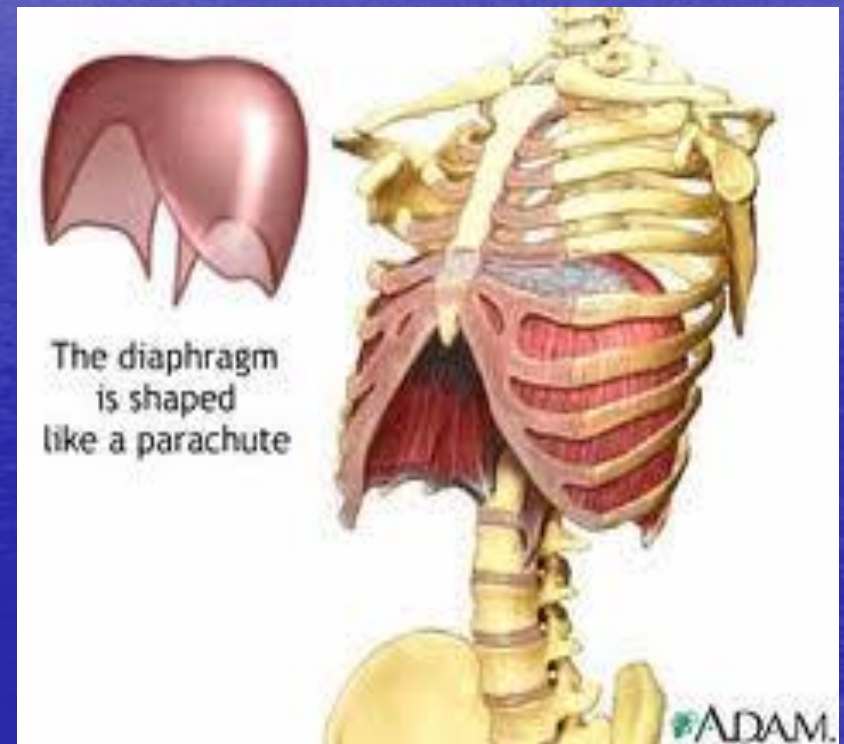
- Look: Posture and Breathing,
- Move : shoulder and C spine screen
- Feel : anatomy and myofascial pain patterns

LOOK

Posture



Breathing

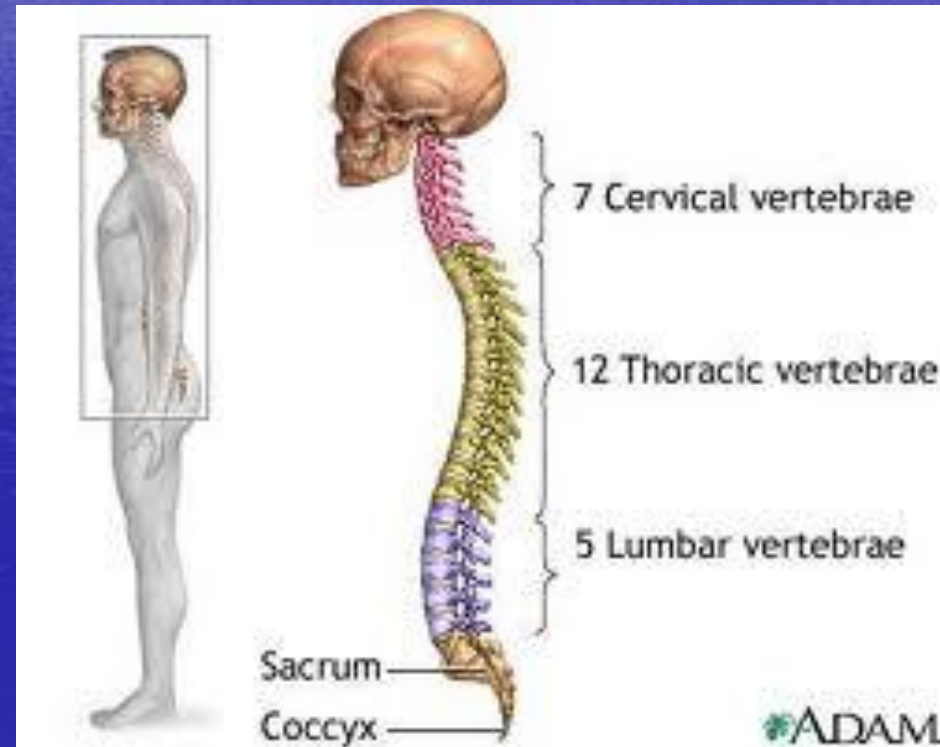


MOVE

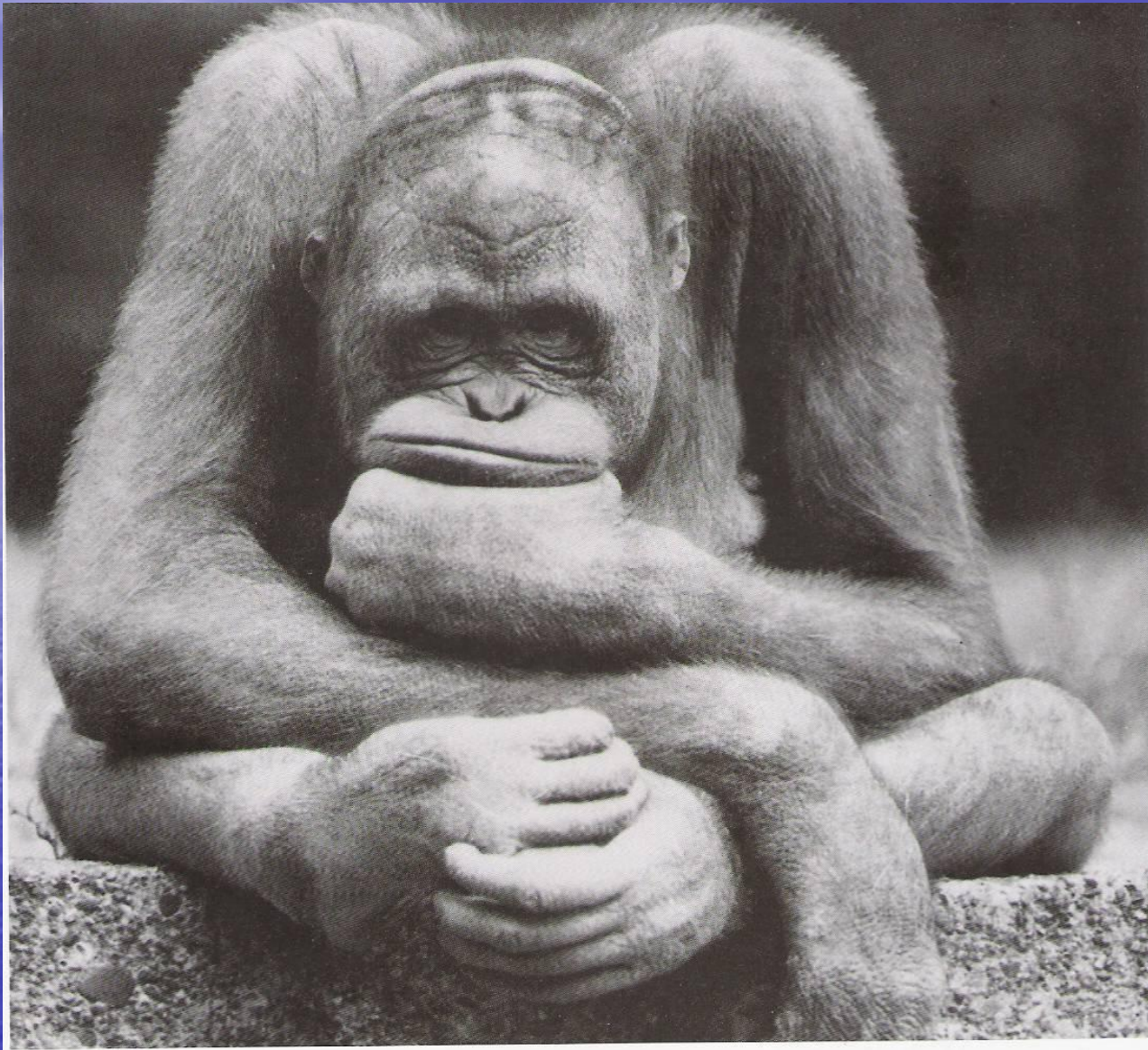
Shoulder movements

- Active passive resisted
- ?WHY
- Impingement and rotator cuff screening
- Don't forget scapulothoracic AC and SC joints

C and T spine Screen



The painful patient.....



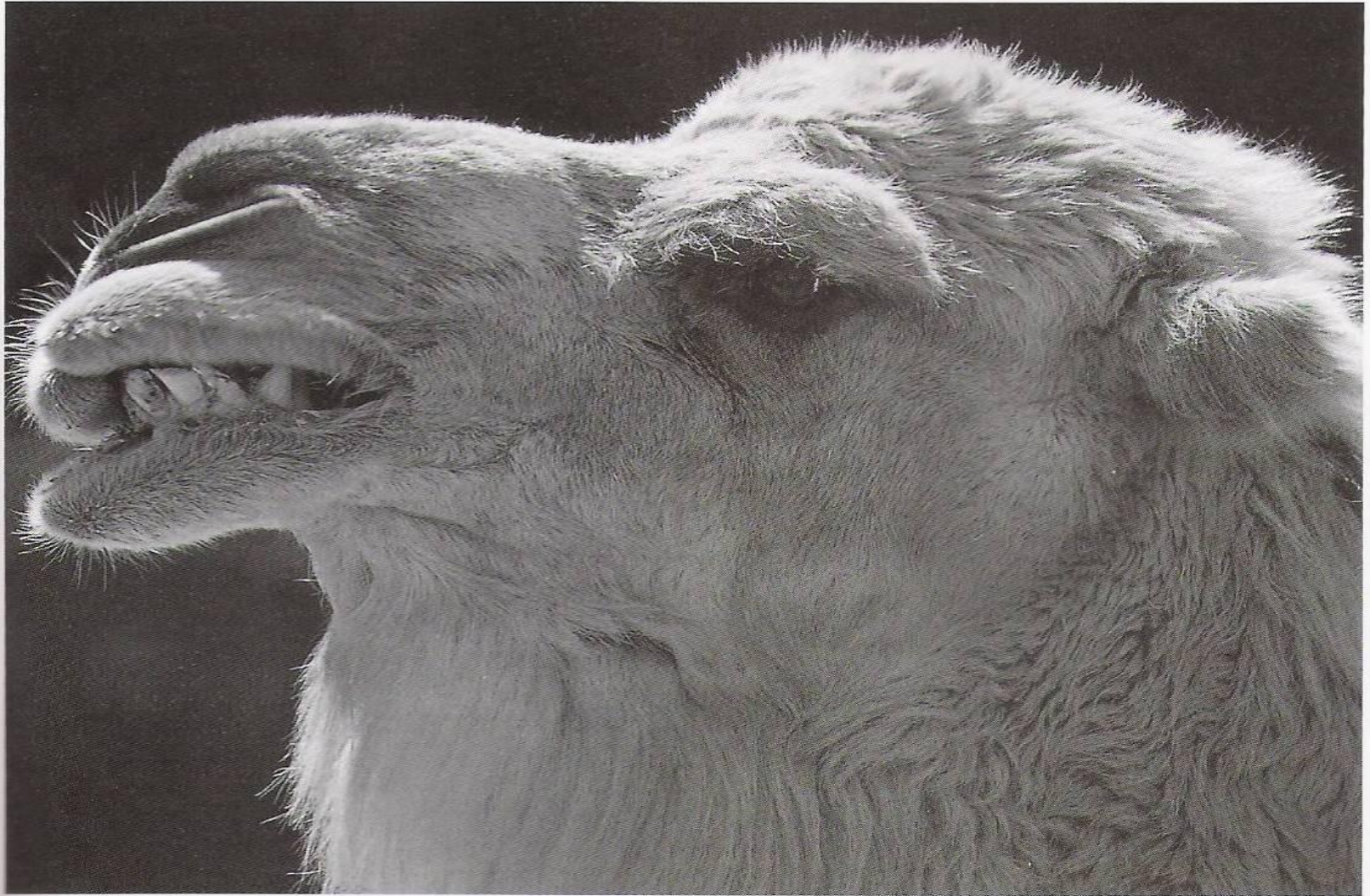
Oh what to do, what to doooo?



Well, if you're like most people, you'll hide behind a flimsy belief that everything will sort itself out.



Then you'll spend the rest of your life
looking over your shoulder, waiting for everything
to go wrong all over again.



All the while becoming crusty and cynical

EXAMINATION

- Various clinical tests described
- **None of the tests is absolutely diagnostic for one pathology only.**



Limitations of shoulder tests

- Various tests for **subacromial impingement** lack validity
- However combinations of tests may improve accuracy in diagnosis
- [Park et al Bone Joint Surg [Br] 2005;87A(7) 1446-55]

- Various tests for **rotator cuff tear** lack validity [Hughes et al Aust J Physiother 54:3,159-70]
- but may rule out a tear [Dinnes et al Health Technology Assess 7:29,iii, 1-166]

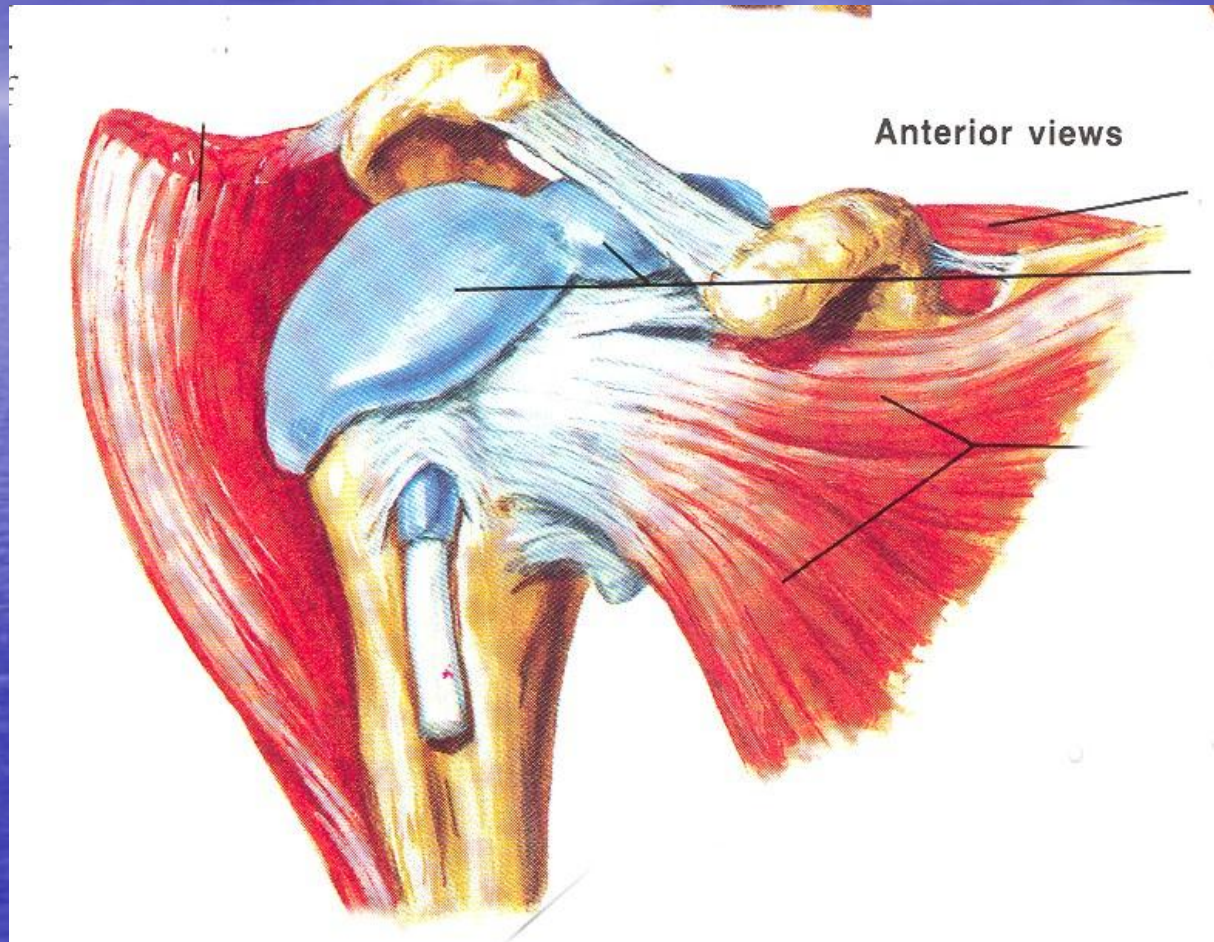
- However combinations of tests may improve accuracy in diagnosis
- [Murrell, GA et al The Lancet 357, March 10, 2001 769-770]

- Tests more helpful when abnormality more severe
- [Murrell, GA et al The Lancet 357, March 10, 2001 769-770; Park et al Bone Joint Surg [Br] 2005;87A(7) 1446-55]

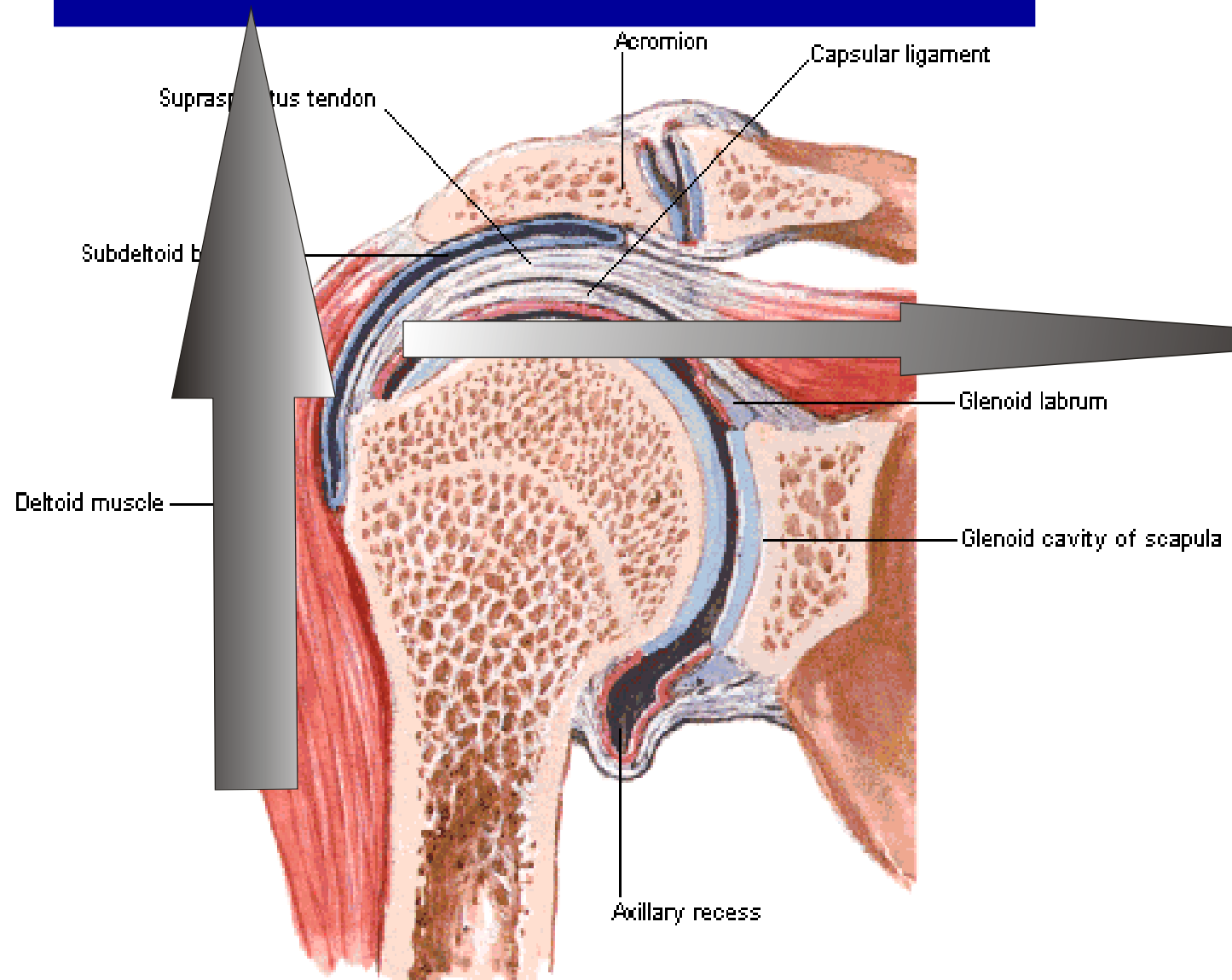
IMPINGEMENT

- **LOSS OF COUPLED MOTION**
- **'PAINFUL ARC'**

SUBACROMIAL SPACE



SUBACROMIAL "JOINT"



Impingement tests

Neer test

(Neer CS 2nd. Impingement lesions. *Clin Orthop Relat Res* 1983;183:70–7)

- Posture: patient seated or standing and the examiner standing.
- Fixation: ipsilateral scapula to prevent protraction
- Test: passive forward elevation of the arm
- Pay attention to: pain in the shoulder.
- The pain is relieved by injecting 10 ml of lidocaine (5ml 1% xylocaine) beneath the anterior acromion.
- Background: the greater tubercle impinges the degenerated supraspinatus and subacromial bursa against the acromion.

In stage I rotator cuff pathology sens 86%, spec 49%

In stage II sens 68%, spec 49% (Park et al 2005)

sens 79%, spec 53% (Hegedus)



Impingement tests

- **Hawkins-Kennedy test**

(Hawkins RJ, Kennedy JC. Impingement syndrome in athletes. *Am J Sports Med* 1980;8:151-8)

- Posture: seated or standing, with arm in 90° in forward elevation in the scapular plane.
- Fixation: stabilisation of the scapula to minimise upward rotation during performance of the internal rotation manoeuvre.
- Test: passive **internal rotation** of the shoulder until pain occurs; **external rotation in abduction**
- Pay attention to: pain with forced internal/external rotation.
- Background: the greater tubercle forces the supraspinatus tendon against the coracoacromial ligament.

Stage I pathology sens 76%, spec 45%

Stage II pathology sens 72%, spec 45% (Park et al 2005)

sens 79%, spec 59% (Powers 2010)



Jobe: used EMG to isolate use of specific muscles of rotator cuff

Devised Empty can test to isolate supraspinatus muscle

Impingement tests

Empty can test (thumb down)

- Posture: sitting or standing, shoulders in 90° abduction, 30° of horizontal adduction and full internal rotation.
- Fixation: the examiner places their hands on the upper side of the upper arm.
- Test: the patient maintains this position against downwards resistance.
- Pay attention to: primarily muscle **weakness**, less attention should be paid to pain.
- Background: strength test of the supraspinatus muscle. The subscapularis, infraspinatus and teres minor are electrically comparatively silent in this position.

Full can test (thumb up)

Reinold: modified Empty can test; found more supraspinatus EMG activity with Full can test



Empty can test

- Sensitivity 53%, Specificity 82% (Park et al 2005)

Full can test

- Sensitivity 86%, Specificity 57% (Kelly BT et al 2003; Itoi 1999)

Impingement tests summary

If patient weak in abduction **or** external rotation,
and
> 65 years old
>90% chance of a rotator cuff tear, and
a 28% likelihood of a full-thickness rotator cuff tear.

- Park HB, Yokota A, Gill HS, *et al.* *Diagnostic accuracy of clinical tests for the different degrees of subacromial impingement syndrome.* *J Bone Joint Surg Am* 2005;87:1446–55.

Rotator cuff tests

External rotation lag sign

Hertel R, Ballmer FT, Lombert SM, *et al.* *Lag signs in the diagnosis of rotator cuff rupture. J Shoulder Elbow Surg* 1996;**5**:307–13.

- Posture: seated with the back towards the examiner. The shoulder in 20° abduction, the elbow in 90° flexion and maximal external rotation minus 5° to avoid elastic recoil in the shoulder.
- Fixation: the examiner supports the elbow and holds the wrist in this position.
- Test: the patient is asked to maintain this position, while the examiner releases the wrist.
- Pay attention to: the capacity of the patient to hold the arm in the same position. When an angular drop (lag sign) occurs, the test is positive.
- Background: *a lag sign of more than 5° is suggestive of a (partial) tear of the infraspinatus or supraspinatus tendons.*
- The external rotation lag sign has a value as a specific test for the infraspinatus and supraspinatus muscles.

In stage I rotator cuff pathology the sens 98% and spec 98%
In stage II and III , sens 95% and spec 72%
(Walch et al 1998)



Rotator cuff tests

Drop arm test

Codman EA. *The shoulder: rupture of the supraspinatus tendon and other lesions in or about the subacromial bursa*. Brooklyn, New York, USA: G Miller & Co Medical Publishers, 1934:148–9.

- Posture: supine or sitting with the arm next to the body.
- Fixation: no fixation is applied.
- Test: the patient abducts the arm horizontally. Then, the arm descends actively to the horizontal position and further.
- Pay attention to: during the last 90° of descent to the anatomical position the patient may lean to the affected side and may lower the whole arm quite suddenly in abduction.
- Background: originally this test was designed for the assessment of supraspinatus tendon tears. Later on, the test was also used to assess infraspinatus injuries.
- The drop arm test produces few false-positive tests assessing the infraspinatus and supraspinatus muscles.



Rotator cuff tests

Supine impingement test

Litaker D, Pioro M, El Bilbeisi H, *et al.*
Returning to the bedside: using the
history and physical examination to
identify rotator cuff tears. J Am Geriatr
Soc
2000;48:1633–7.

- Posture: patient supine with arms on the table.
- Fixation: the examiner elevates the arm to full elevation.
- Test: the hand is supinated and the arm is adducted against the ear. The arm is then internally rotated.
- Pay attention to: the test is positive if the manoeuvre produces an increase in pain.
- Background: the test was designed to assess any rotator cuff tear. Pain results from narrowing and compressing the subacromial space.

The supine impingement test may be valuable as a screening tool to assess



Starting position



Ending position

Rotator cuff tests

Speed Test

(Crenshaw and Kilgore 1966)

- Posture: the patient holds arm in forward flexion with elbow extended.
- Fixation: the examiner places hand over lower forearm.
- Test: the patient maintains this position against downwards resistance.
- The test is positive when pain is localized to the bicipital groove
- Background: tests for pain arising from the long head of biceps. Confounded by impingement and joint effusion

Sens 40%, Spec 75%
(Park et al 2005)



Rotator cuff tests

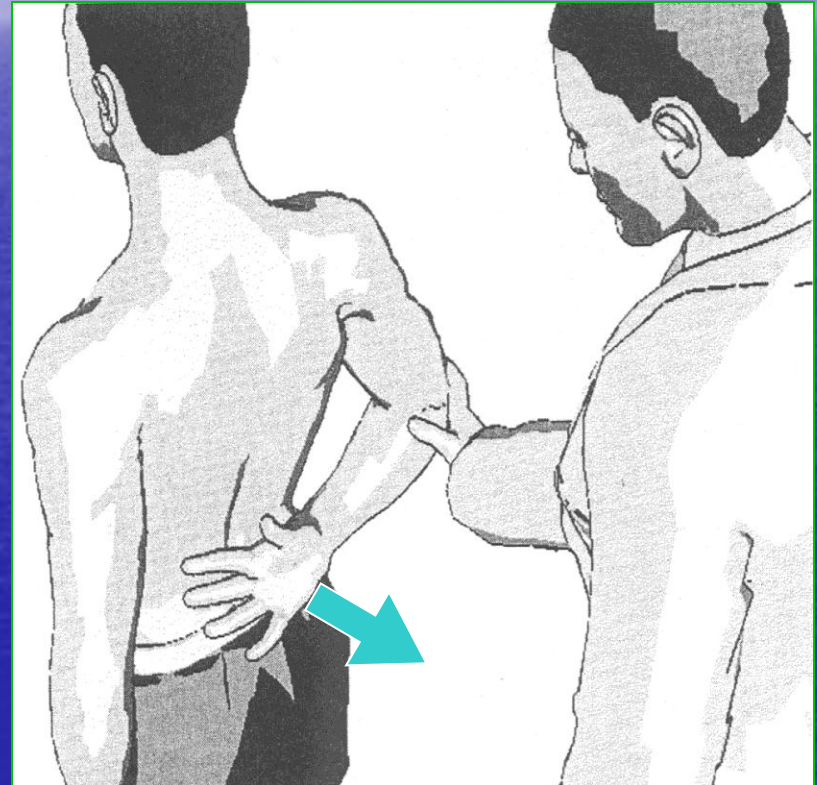
Subscapularis Lift-off test

(Gerber and Krushell 1991)

- Posture: patient is standing with the hand of the affected arm behind lower back.
- Fixation: examiner fixates elbow.
- Test: patient exerts lifts hand off back posteriorly
- Pay attention to: the patient feels weakness and cannot move hand posteriorly.
- Specific test for subacpularis tears.

Sens 18%, Spec 92%

(Barth et al 2006)



Rotator cuff tests

Belly press test

Gerber C, Hersche O, Farron A. Isolated rupture of the subscapularis tendon. *J Bone Joint Surg Am* 1996;78:1015–23.

- Posture: patient is sitting with the hand of the affected arm on the abdomen.
- Fixation: no fixation is applied.
- Test: patient exerts pressure on the abdomen with the hand until maximal internal rotation.
- Pay attention to: the patient feels weakness and cannot maintain maximal internal rotation. The elbow drops backwards, and internal rotation is lost. Pressure is exerted by extension of the shoulder and flexion of the wrist.
- Background: *the test was designed as an alternative to the lift-off test for shoulders that had decreased internal rotation.*
- The belly press test may be valuable as specific test to rule out subscapular tears.



rotator cuff tear summary

Prospective study, comparing results of 23 clinical tests from 400 patients (presenting with shoulder pain) with and without rotator cuff tears, confirmed by arthroscopy.

3 simple tests were predictive for rotator cuff tear:

1. supraspinatus weakness
 2. weakness of external rotation
 3. Impingement (using Hawkins-Kennedy test in int/ext rotation)
- When all 3 were positive, or if 2 tests were positive and the patient was aged 60 or older, the individual had a 98% chance (PTP) of having a rotator cuff tear
 - combined absence of these features excluded this diagnosis (actual = 5% chance).
 - If only one test positive, clinical testing is indeterminate; need imaging
 - *George A C Murrell, Judie R Walton. The Lancet, Vol 357, March 10 2001, 769-770*

FEEL

Structures

- Consider skin drag test and layers of palpation
- Don't forget
- AC joint
- SC joint
- Scapulothoracic

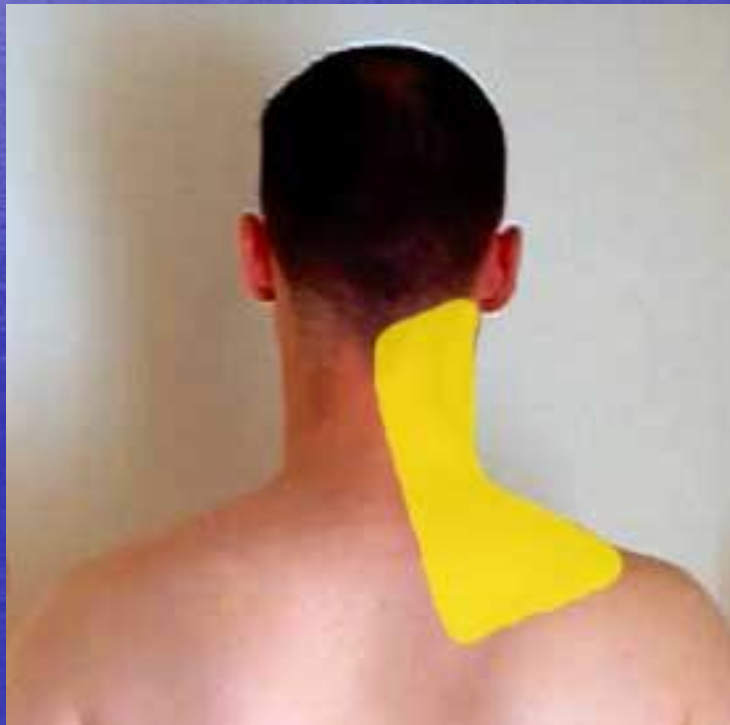
Myofascial Pain Patterns

- Common patterns as follows.....

Levator scapula Anatomy



Levator scapula pain pattern



Levator scap stretch



Anatomy Infraspinatus



Pain patterns Infraspinatus



Stretch Infraspinatus



Anatomy and Pain Pattern Teres Minor/Major

Anatomy



Pain Pattern



Stretch

Teres Minor



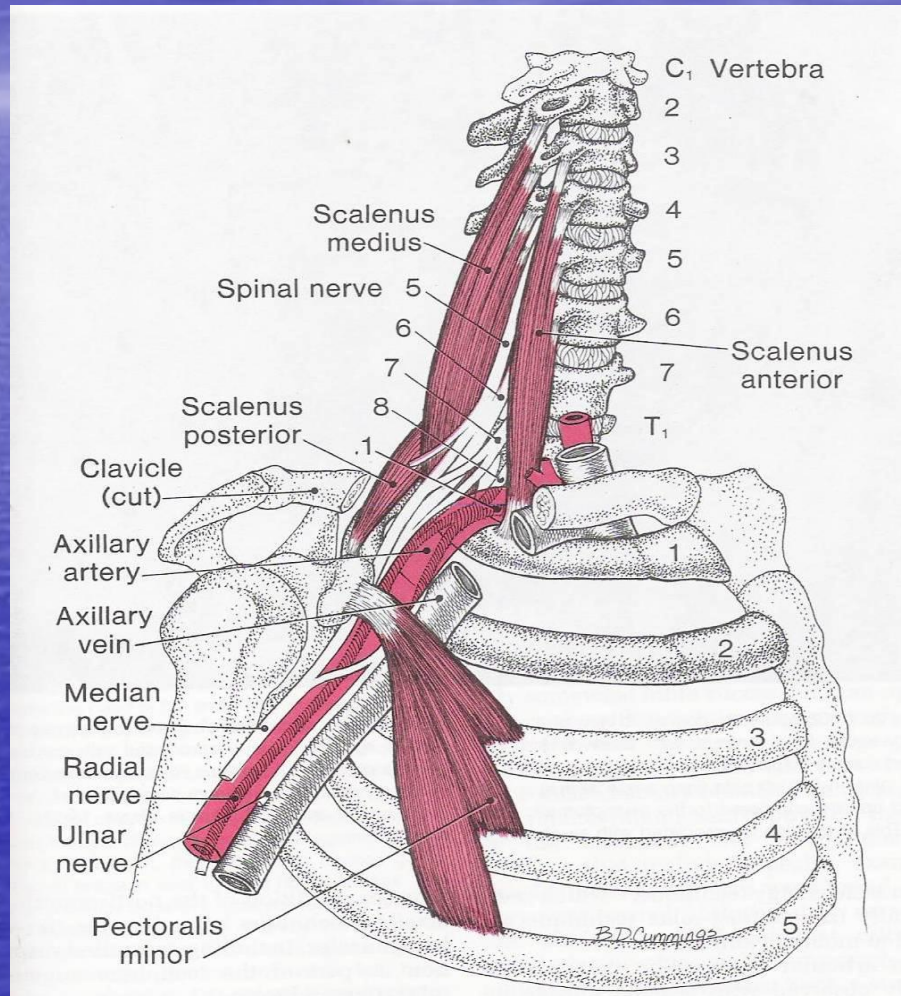
Anatomy and Pain pattern Supraspinatus



Anatomy Scalene



Scalenes – origin and insertion



Pain Pattern Scalenes



TAKE HOME POINT

Medial Border Scapula Pain

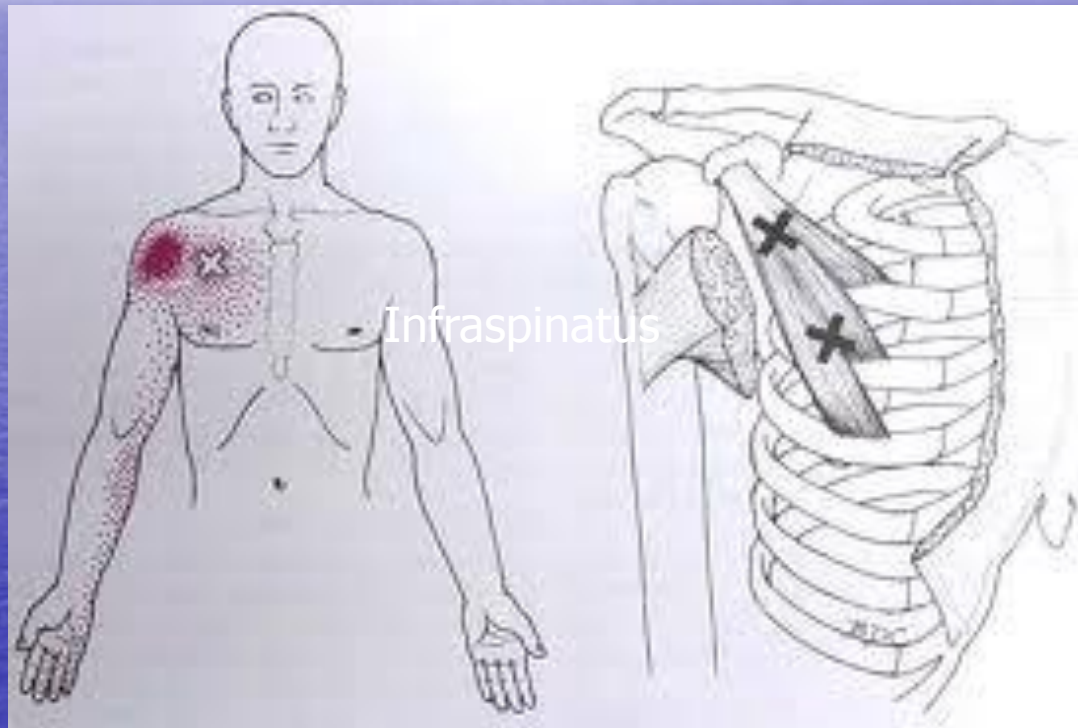
... think..

SCALENE

Stretch Scalene



Anatomy and Pain Pattern Pectoralis Minor



Stretch Pect Minor



Putting it together

- 7 muscles

- **Sternocleidomastoid**
- **Levator scap**
- **Scalene**
- **Trapezius**
- **Infra & Supraspinatus**
- **Pect Minor**

Quizzzzzzzz time

- Whats the 10 point pain history acronym?

Socrates ad(s)

- Site
- Onset
- Character
- Radiation
- Alleviating factors
- Times of occurrence
- Exacerbating factors
- Severity
- Associated factors
- Disability scores
- (Systems review gives..... red flags)



What are the red flags?



Oh what to do, what to doooo?

VISION

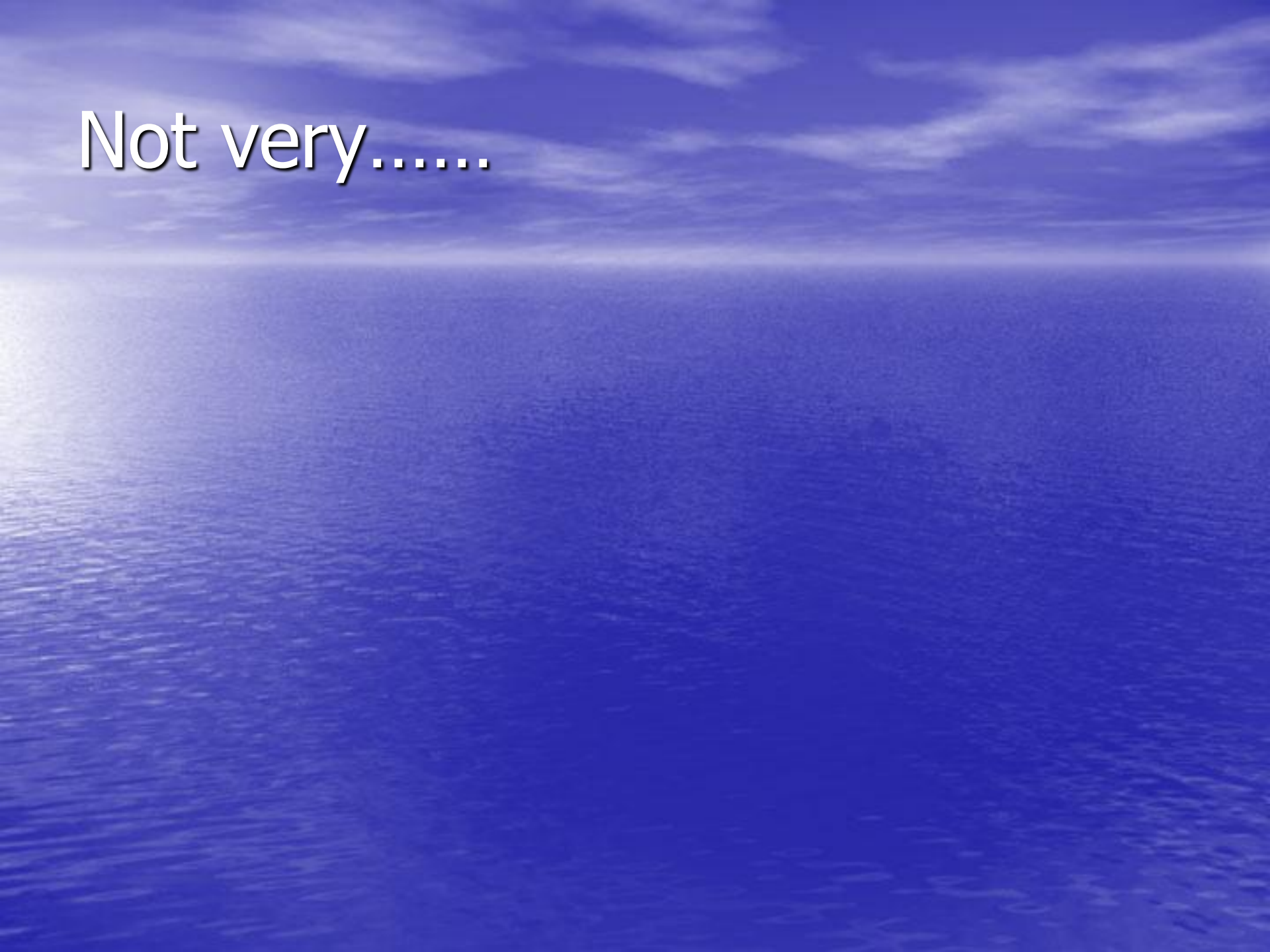
- Visceral/Vascular
- Infection
- Significant Fracture
- Inflammatory
- Other
- Neoplasm

Whats the best way to not miss red flags- history or exam?

History (+/- MRI)

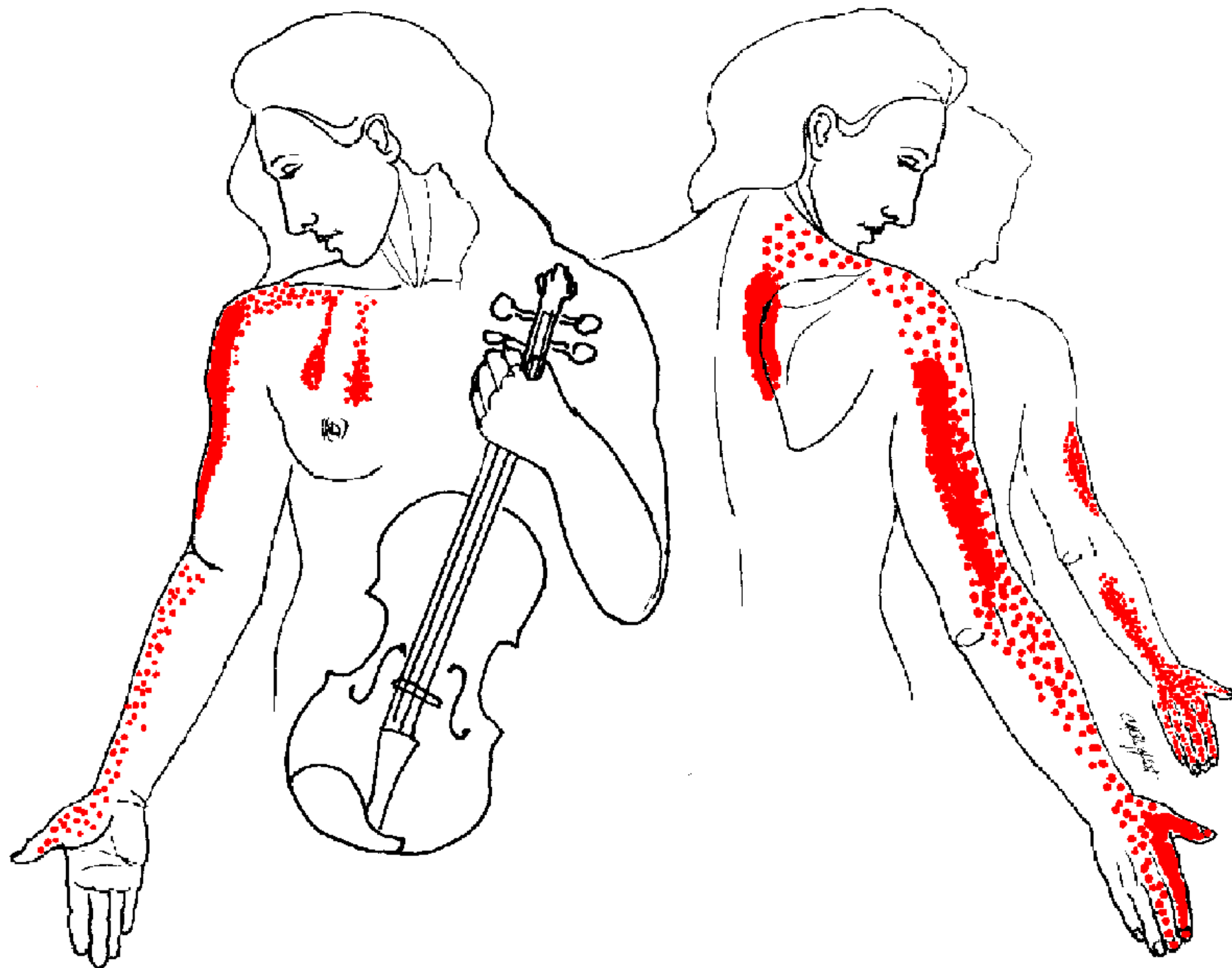
How accurate are impingement
and rotator cuff examination
examinations?

Not very.....

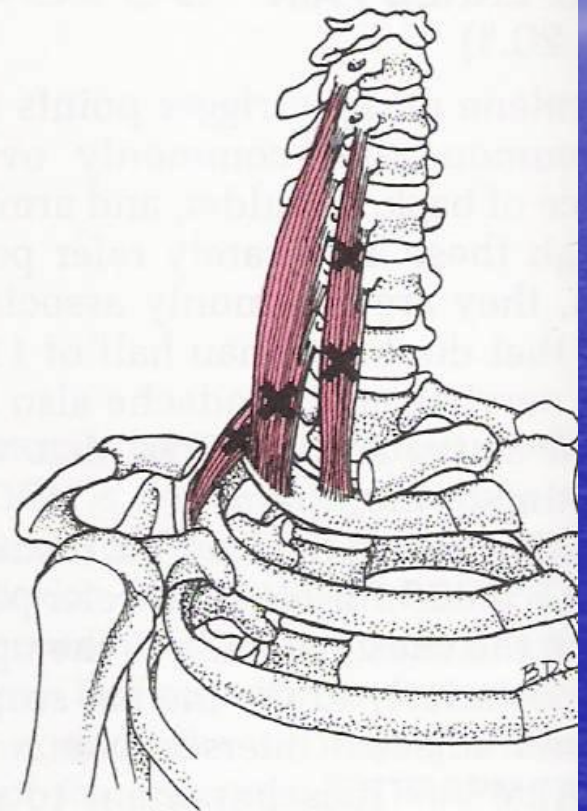
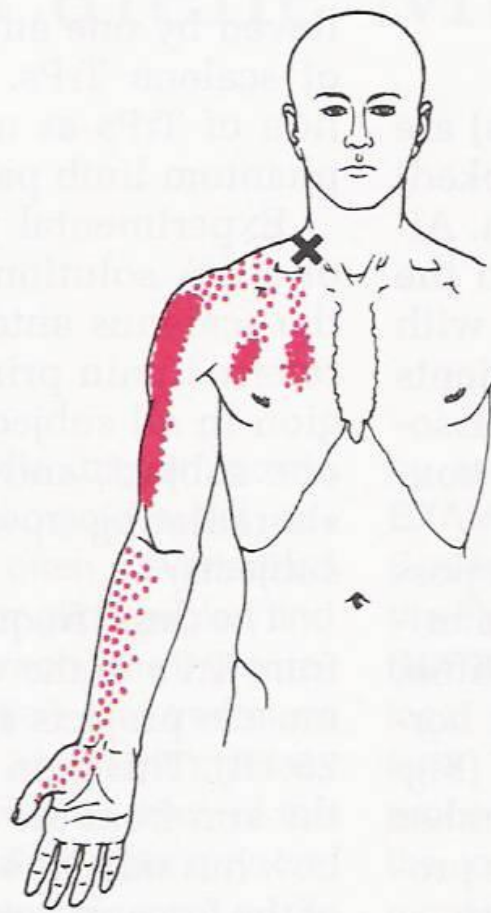
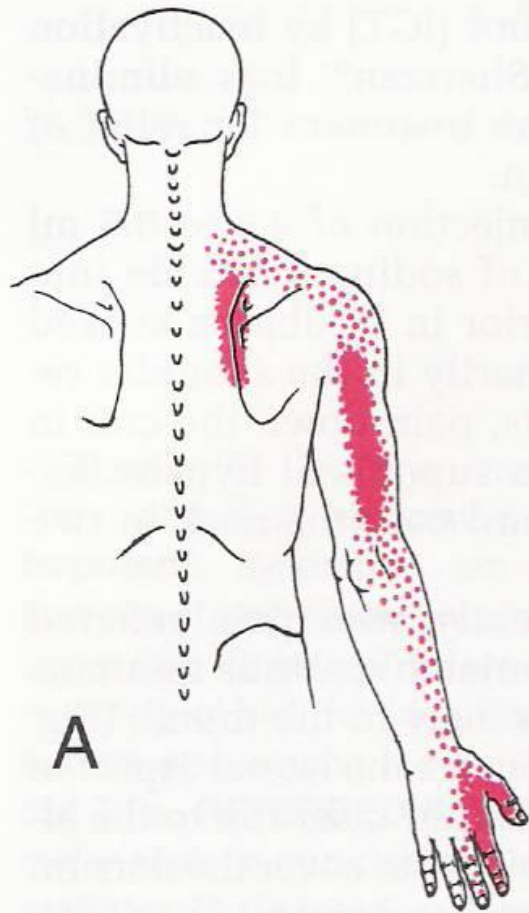


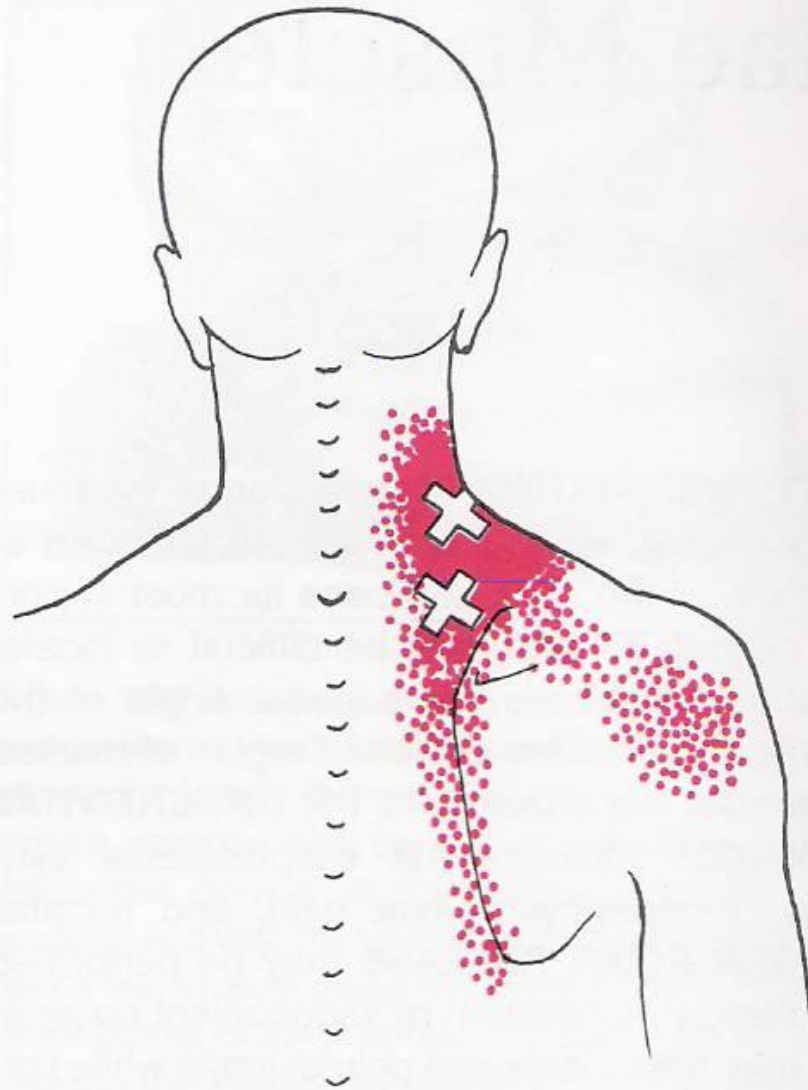
QUIZZZZZZzzzzzzzz
Continued.....

WHAT MUSCLE HAS THESE
REFERRAL PATTERNS?

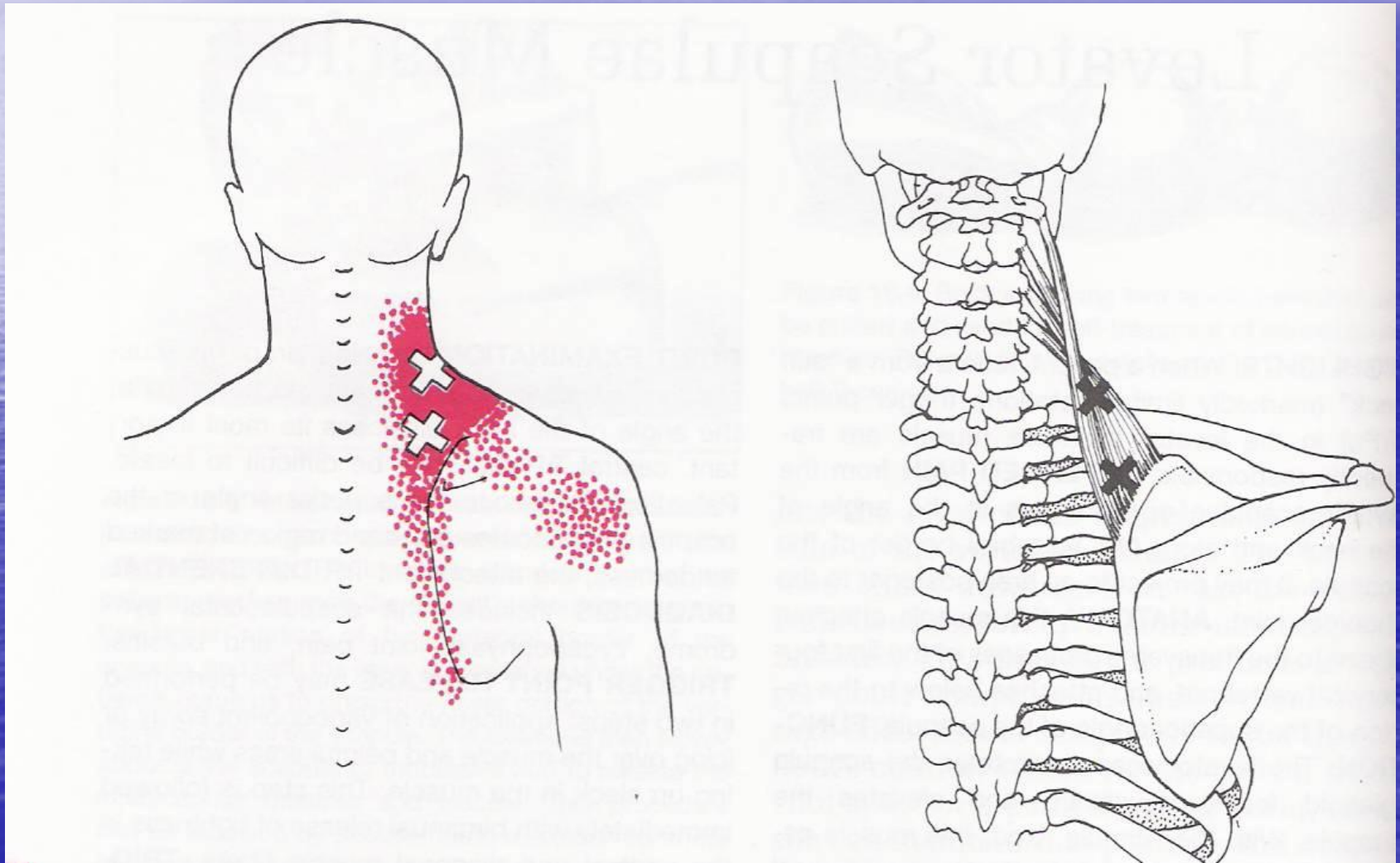


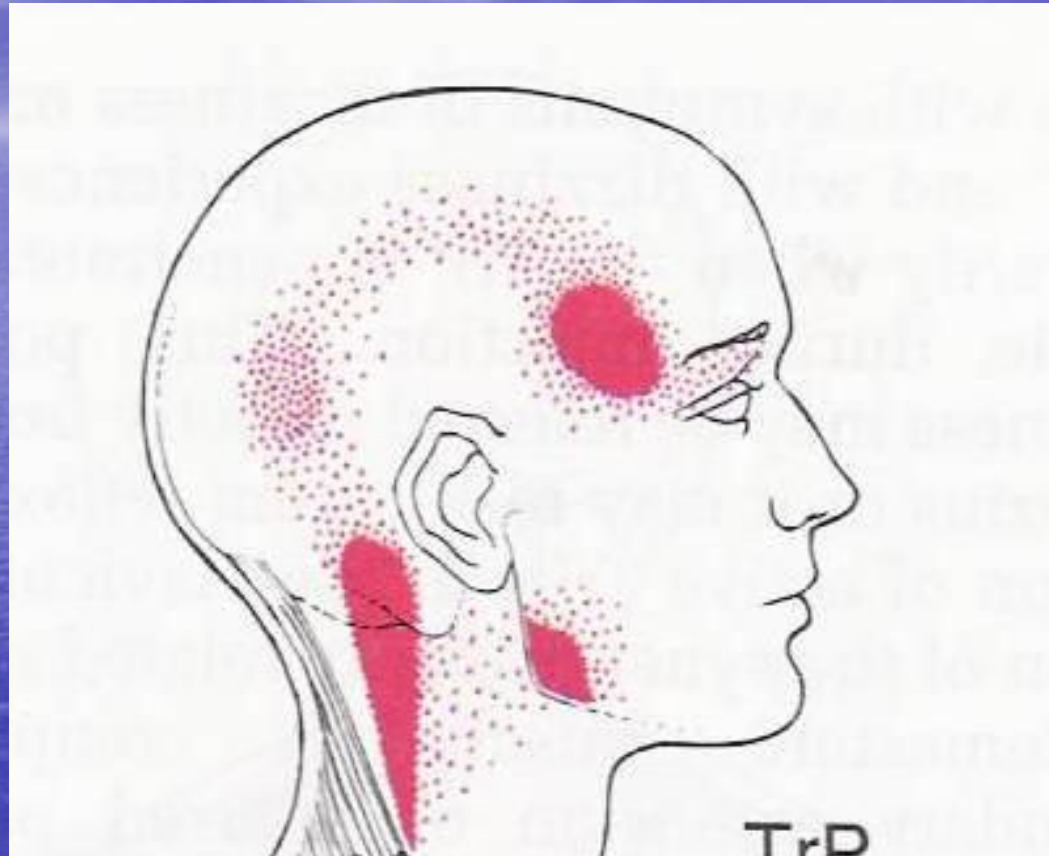
Scalenes – referral patterns



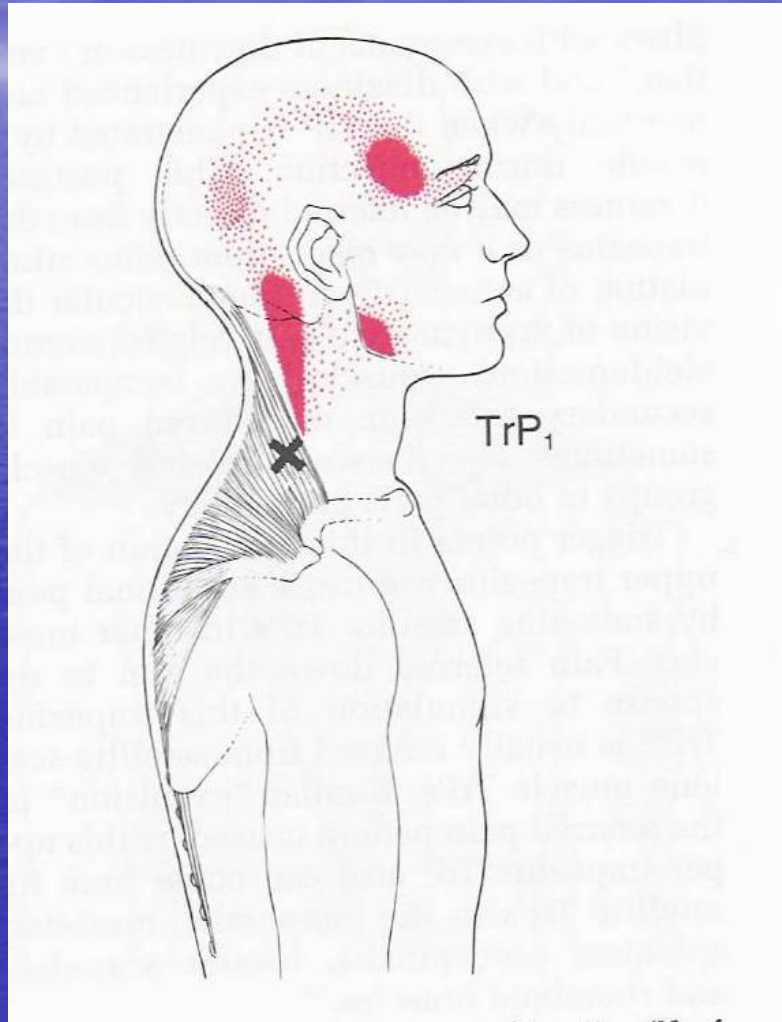


Levator Scapulae- referred pain patterns





Trapezius (upper vertical fibres) -referral pattern



Thank you – the end



Useful links

- <http://www.triggerpointtherapist.com/products/trigger-point-dvd/shoulder-pain-protocol/>
- www.pressurepointer.com/PressurePointerManual.pdf