


 NEUROMECHANICAL INNOVATIONS
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Welcome!

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Technique

**Upper Extremity
Module**


Dr. Chris Colloca
CEO and Founder
Neuromechanical Innovations


Instrument Adjusting Headquarters®

1

NEUROMECHANICAL INNOVATIONS
The Upper Extremity

Upper Extremity Joints

1. Shoulder
2. Elbow
3. Wrist
4. Hand

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The Shoulder



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Injury to an extremity may lead to two types of dysfunction:

1) mechanical instability and 2) functional instability.”

- 1) *Mechanical instability* is made up of the “hardware” components – muscles, joints, tendons, and ligaments.
- 2) *Functional instability* is made up of the “software” components – the operating system or neural programming behind muscle activation and coordinated action between muscles to produce smooth movement and provide stabilization of the joint.

Jardine, Tale of the tape, *Advance for Physical Therapy and Rehab Medicine*, Jan 18, 2010

4



The one year prevalence of shoulder pain is as high as 50% in the general population, and 50% of those afflicted consult a physician.

Wofford et al. Patient characteristics and clinical management of patients with shoulder pain in US primary care settings. BMC Musculoskeletal Disorders 2005; 6:4.

5



“Shoulder disorders affect up to 67% of the population at some point in their lifetime.”

Luime, et al, “Prevalence and incidence of shoulder pain in the general population,” Scandinavian Journal of Rheumatology,33:2004

6

PENN SHOULDER SCORE

PATIENT NAME:		DATE:
ADDRESS:		
CITY & STATE:		ZIP CODE:
HOME PHONE:	WORK PHONE:	AGE:
DOMINANT HAND:	SEX:	AFFECTED ARM:
L R Both (circle one)	M F (circle one)	L R Both (circle one)

Since beginning therapy for your shoulder, would you say that your shoulder has

_____	Gotten much worse
_____	Gotten moderately worse
_____	Gotten slightly worse
_____	Stayed the same
_____	Gotten slightly better
_____	Gotten moderately better
_____	Gotten much better

PENN SHOULDER SCORE
Part I: Pain & Satisfaction: Please circle the number closest to your level of pain or satisfaction

Pain at rest with your arm by your side: 0 1 2 3 4 5 6 7 8 9 10 No Pain Worst Pain Possible	80% CASE 20% (10 - # circled)
Pain with normal activities (eating, dressing, bathing): 0 1 2 3 4 5 6 7 8 9 10 No Pain Worst Pain Possible	(10 - # circled) (score "0" if not applicable)
Pain with strenuous activities (reaching, lifting, pushing, pulling, throwing): 0 1 2 3 4 5 6 7 8 9 10 No Pain Worst Pain Possible	(10 - # circled) (score "0" if not applicable)
PAIN SCORE: = ___/30	
How satisfied are you with the current level of function of your shoulder? 0 1 2 3 4 5 6 7 8 9 10 Not Satisfied Very Satisfied	= ___/10 (# circled)

PLEASE TURN OVER TO COMPLETE QUESTIONNAIRE

OFFICE USE ONLY
PENN SHOULDER SCORE

Visit Date	Today _ / _ / _
Pain	___/30
Satisfaction	___/10
Function	___/60
TOTAL	___/100

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PENN SHOULDER SCORE Part II: Function: Please circle the number that best describes the level of difficulty you might have performing each activity.	No difficulty	Some difficulty	Much difficulty	Can't do at all	Did not do before injury
1. Reach the small of your back to tuck in your shirt with your hand.	3	2	1	0	X
2. Wash the middle of your back/hook bra.	3	2	1	0	X
3. Perform necessary toileting activities.	3	2	1	0	X
4. Wash the back of opposite shoulder.	3	2	1	0	X
5. Comb hair.	3	2	1	0	X
6. Place hand behind head with elbow held straight out to the side.	3	2	1	0	X
7. Dress self (including put on coat and pull shirt of overhead).	3	2	1	0	X
8. Sleep on affected side.	3	2	1	0	X
9. Open a door with affected side.	3	2	1	0	X
10. Carry a bag of groceries with affected arm.	3	2	1	0	X
11. Carry a briefcase/small suitcase with affected arm.	3	2	1	0	X
12. Place a soup can (1-2 lbs.) on a shelf at shoulder level without bending elbow.	3	2	1	0	X
13. Place a one gallon container (8-10 lbs.) on a shelf at shoulder level without bending elbow.	3	2	1	0	X
14. Reach a shelf above your head without bending your elbow.	3	2	1	0	X
15. Place a soup can (1-2 lbs.) on a shelf overhead without bending your elbow.	3	2	1	0	X
16. Place a one gallon container (8-10 lbs.) on a shelf overhead without bending your elbow.	3	2	1	0	X
17. Perform usual sport/hobby.	3	2	1	0	X
18. Perform household chores (cleaning, laundry, cooking).	3	2	1	0	X
19. Throw overhand/swim/overhead racquet sports (circle all that apply to you).	3	2	1	0	X
20. Work full-time at your regular job.	3	2	1	0	X

SCORING:
Total of columns = ___ (a)
Number of "X's" x 3 = ___ (b), 60 - ___ (b) = ___ (c)
(if no "X's" are circled, function score = total of columns)
Function Score = ___ (a) + ___ (c) = ___ x 60 = ___ of 60

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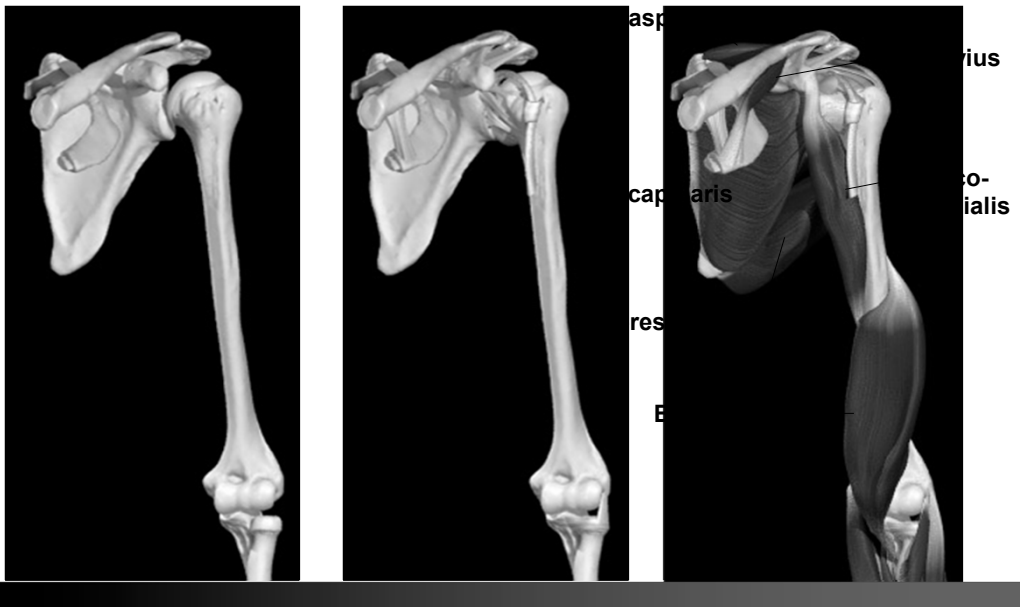
Joints of the Shoulder

All 5 of the following must be functioning correctly for full, pain-free shoulder motion:

1. Glenohumeral
2. Acromioclavicular
3. Sternoclavicular
4. Scapulothoracic
5. Upper thoracic spine

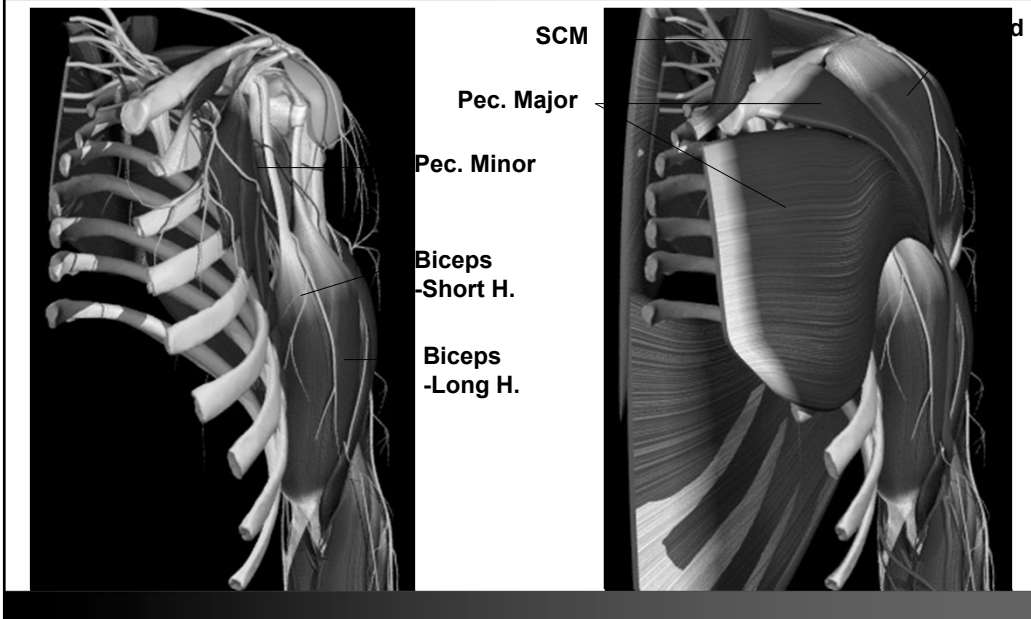


The Upper Extremity





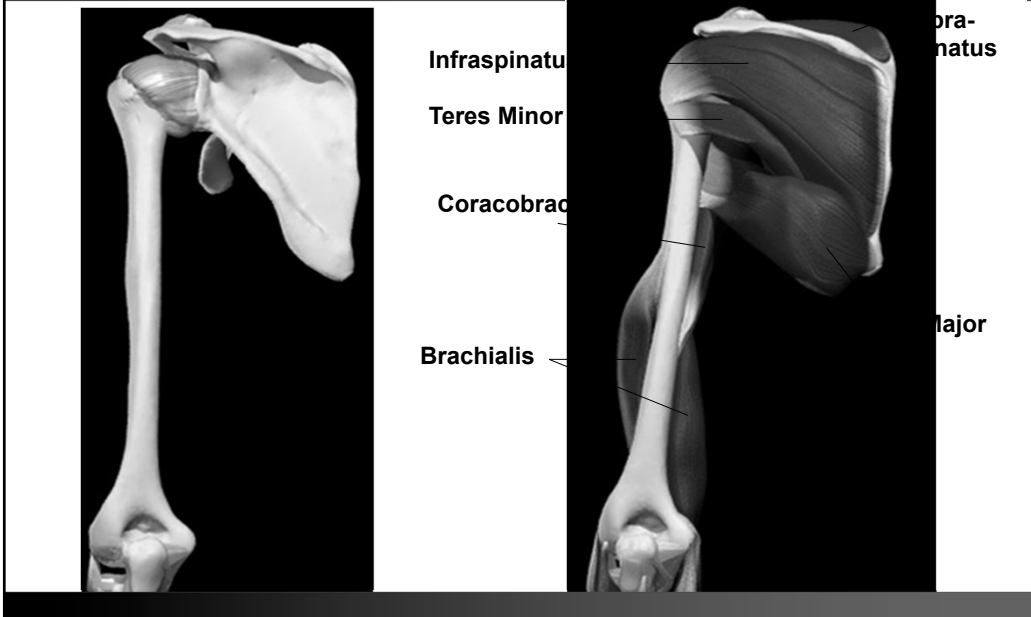
Anterior Upper Extremity Anatomy



11



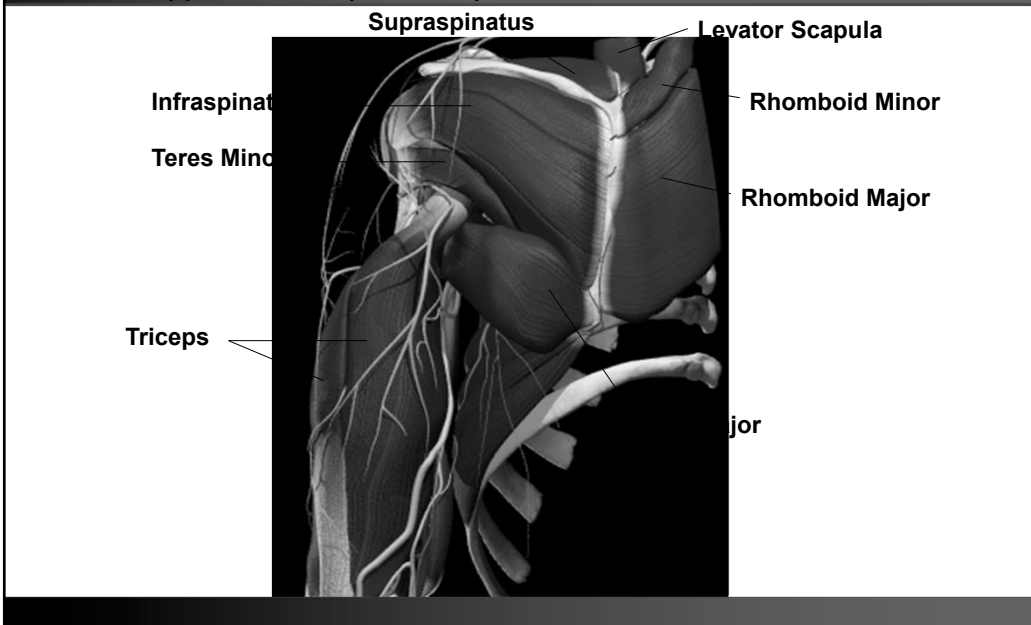
Posterior Upper Extremity Anatomy



12



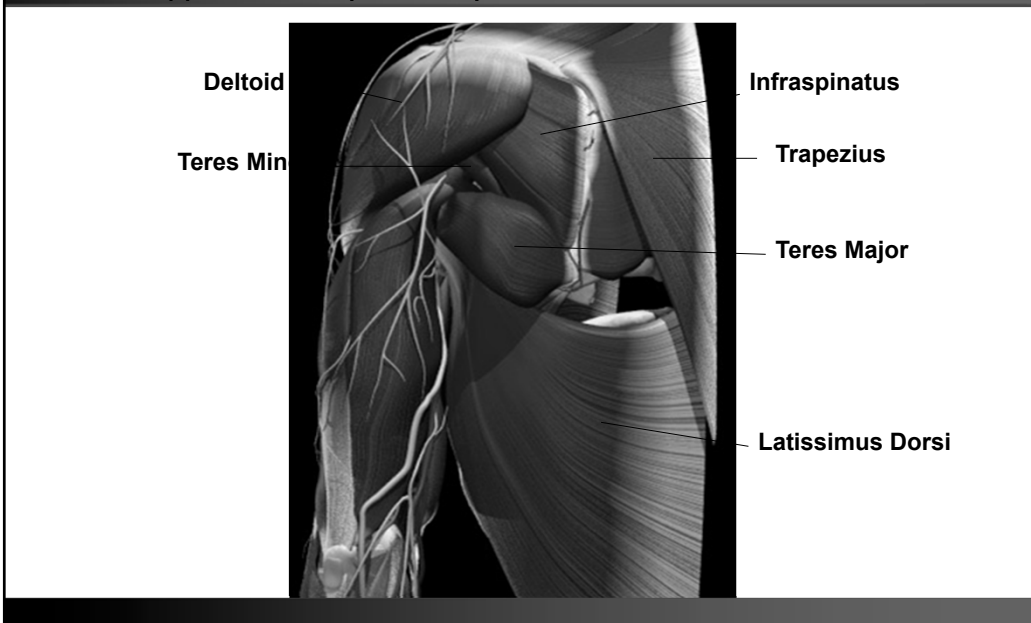
Posterior Upper Extremity Anatomy



13



Posterior Upper Extremity Anatomy



14

Shoulder Kinematics

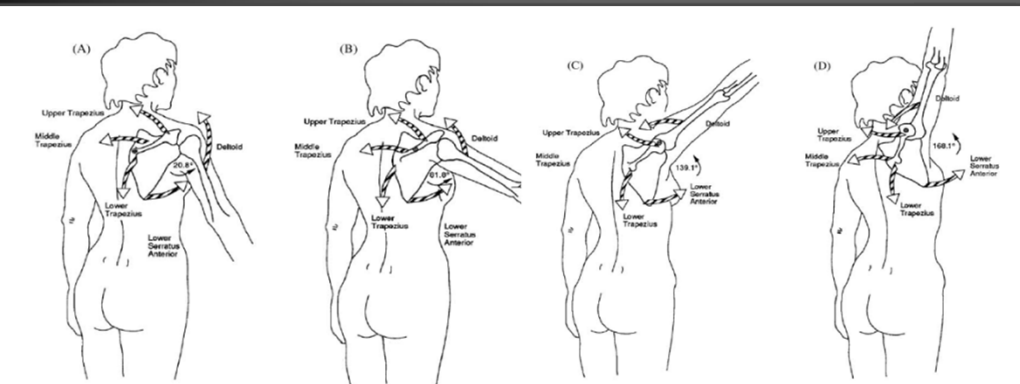


Fig. 2—Force couples around the scapula relevant in arm elevation (Adapted from Bagg and Forrest 1986; Kapandji 1982). Depicted is the most common pattern of muscle recruitment reported by Bagg and Forrest (1986). (A) In the first 60°, the axis of rotation of the scapula is situated at the root of the spine of the scapula. Primary muscles involved in upward rotation of the scapula are lower fibres of serratus anterior and upper trapezius, working via the clavicle, with lower and middle trapezius functioning eccentrically to control the movement. In this range, muscle function is highly variable. (B) In the next 60°, the axis of rotation begins to move along the spine of the scapula towards the acromioclavicular joint. This means that the emphasis of contribution of the muscles changes, with the fibres of lower trapezius now becoming more actively involved in upward rotation, along with those of lower serratus anterior and upper trapezius. (C) By the time the arm reaches 120° of elevation, the axis of rotation is at the acromioclavicular joint. Upper trapezius is no longer positioned to be able to function to upwardly rotate the scapula, whereas lower trapezius is now ideally situated to perform this function, in conjunction with lower serratus anterior. (D) In the final stages of elevation, lower trapezius and lower serratus anterior are the primary rotators of the scapula, with upper trapezius functioning to rotate the clavicle and middle trapezius working eccentrically to control the degree of upward rotation.

15

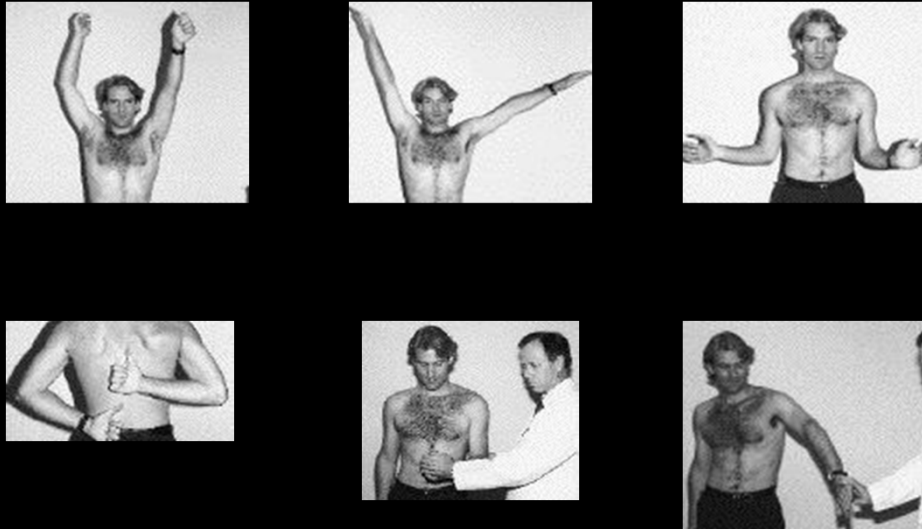
Internal vs. External Rotation of the Shoulder



16



Rotator Cuff Injury Indicators



17



External rotation lag test:

Castoldi, et al, "External rotation lag sign revisited: accuracy for diagnosis of full thickness supraspinatus tear," Journal of Shoulder and Elbow Surgery, 2009:18

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While keeping arm by the side, passively externally rotate shoulder to the end of available motion.



Inform patient that you are going to release the arm and that he/she is to hold it there, not letting it move internally. Then release.


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18



Interpretation of the external rotation lag test:

- Amount of lag for supraspinatus tear: 5-10 degrees (7.35 degrees +/- 3.12);
- Amount of lag with additional infraspinatus tear: 10-20 degrees (17.76 degrees +/- 9.55);
- Amount of lag with additional teres minor tear: >20 degrees (+/-16).
- Sensitivity .56; Specificity .98



19



External Rotation Lag Test



20



“Diagnostic accuracy of clinical tests for the different degrees of subacromial impingement syndrome,”
Park, et al, Journal of Bone and Joint Surgery, 2005:87

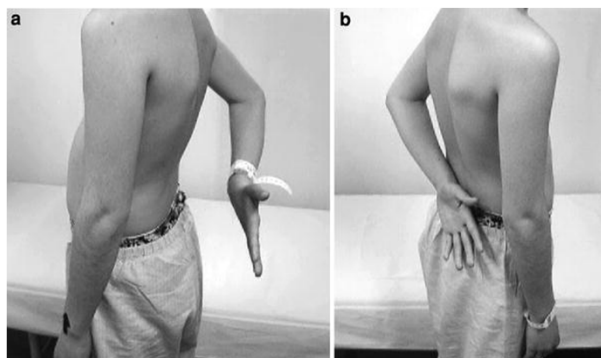
mechanical
INNOVATIONS

91% probability for full-thickness rotator cuff tear when there is a combination of a:

- Painful arc sign;
- Hornblower “Drop arm” sign; and
- Positive infraspinatus muscle test (External lag sign of approx 18 degrees or more)

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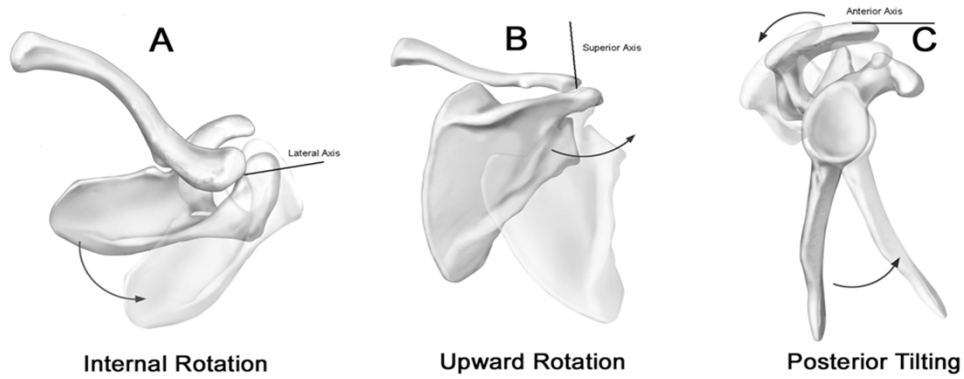
21



Lift-off test. A patient can lift off the hand from the back at the lumbar level with the intact subscapularis (**a**). If it is torn, the patient cannot lift off the hand from the back (**b**)

22

Shoulder Kinematics



Scapular rotations relative to the clavicle or thorax include internal/external rotation about a superiorly directed axis (A), upward/downward rotation about an axis perpendicular to the plane of the scapula directed anteriorly (B), and anterior/posterior tilting about a laterally directed axis (C).

Posterior Shoulder Protocol

Indications

- Rotator Cuff Syndrome
- Adhesive Capsulitis
- Frozen Shoulder
- Abduction/External or Internal Rotation Dysfunction
- Shoulder pain or weakness

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 NEUROMECHANICAL INNOVATIONS

Shoulder Kinematics

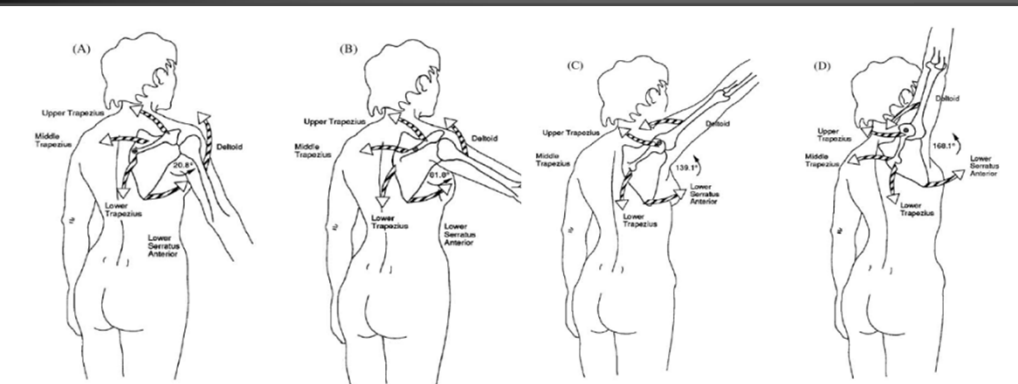


Fig. 2—Force couples around the scapula relevant in arm elevation (Adapted from Bagg and Forrest 1986; Kapandji 1982). Depicted is the most common pattern of muscle recruitment reported by Bagg and Forrest (1986). (A) In the first 60°, the axis of rotation of the scapula is situated at the root of the spine of the scapula. Primary muscles involved in upward rotation of the scapula are lower fibres of serratus anterior and upper trapezius, working via the clavicle, with lower and middle trapezius functioning eccentrically to control the movement. In this range, muscle function is highly variable. (B) In the next 60°, the axis of rotation begins to move along the spine of the scapula towards the acromioclavicular joint. This means that the emphasis of contribution of the muscles changes, with the fibres of lower trapezius now becoming more actively involved in upward rotation, along with those of lower serratus anterior and upper trapezius. (C) By the time the arm reaches 120° of elevation, the axis of rotation is at the acromioclavicular joint. Upper trapezius is no longer positioned to be able to function to upwardly rotate the scapula, whereas lower trapezius is now ideally situated to perform this function, in conjunction with lower serratus anterior. (D) In the final stages of elevation, lower trapezius and lower serratus anterior are the primary rotators of the scapula, with upper trapezius functioning to rotate the clavicle and middle trapezius working eccentrically to control the degree of upward rotation.

25

POSTERIOR SHOULDER PROTOCOL

Combination Adjustment

1. Superior Scapula
2. Superior Medial Scapula
3. Medial Scapula
4. Subscapularis
5. Posterior Humerus
6. Superior Humerus

26

POSTERIOR SHOULDER PROTOCOL

Origin:

Supraspinous fossa of scapula

Insertion:

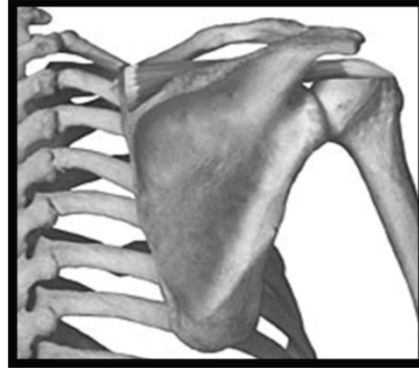
Superior facet on greater tuberosity of humerus

Action:

Initiates and assists deltoid in abduction of arm and acts with other rotator cuff muscles

Innervation:

Suprascapular nerve (C4, C5 and C6) (C4, C5, C6)



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POSTERIOR SHOULDER PROTOCOL

Superior Scapula

JOINT:

Scapulothoracic Joint

MUSCLE:

Upper Trapezius
Supraspinatus

SCP:

Superior Aspect of Spine of the Scapula

LOD:

Inferior

SETTING:

Medium (Setting 2)



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POSTERIOR SHOULDER PROTOCOL

Superior Scapula

JOINT:
Scapulothoracic Joint

MUSCLE:
Upper Trapezius
Supraspinatus

SCP:
Superior Aspect of Spine of
the Scapula

LOD:
Inferior

SETTING:
Medium (Setting 2)



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POSTERIOR SHOULDER PROTOCOL

Superior Medial Scapula

JOINT:
Scapulothoracic Joint

MUSCLES:
Upper Trapezius
Levator Scapula

SCP:
Superior Medial Aspect of
the Scapula

LOD:
Inferior and Lateral

SETTING:
Medium (Setting 2)



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Posterior Shoulder Protocol

Superior Medial Scapula



JOINT:
Scapulothoracic Joint

MUSCLES:
Upper Trapezius
Levator Scapula

SCP:
Superior Medial Aspect of the Scapula

LOD:
Inferior and Lateral

SETTING:
Medium (Setting 2)

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Posterior Shoulder Protocol

Medial Scapula



JOINT:
Scapulothoracic Joint

MUSCLE:
Rhomboid m.

SCP:
Medial Aspect of the Scapula

LOD:
Lateral

SETTING:
Medium (Setting 2)

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POSTERIOR SHOULDER PROTOCOL

Medial Scapula

JOINT:
Scapulothoracic Joint

MUSCLE:
Rhomboid m.

SCP:
Medial Aspect of the
Scapula

LOD:
Lateral

SETTING:
Medium (Setting 2)



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POSTERIOR SHOULDER PROTOCOL

Subscapularis m.

Origin:
Subscapular fossa of scapula

Insertion:
Lesser tuberosity of humerus

Action:
Medially rotates arm and adducts it; helps to hold humeral head in glenoid cavity of scapula

Innervation:
Upper and lower subscapular nerves (C5, C6 and C7) (C5, C6, C7)

Anterior View of the Shoulder



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Posterior Shoulder Protocol

Subscapularis m.


JOINT:
Scapulothoracic Joint


MUSCLE:
Subscapularis

SCP:
Anterior Lateral Aspect of the Scapula

LOD:
Posterior and Superior

SETTING:
Medium (Setting 2)



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35

Posterior Shoulder Protocol

Subscapularis m.


JOINT:
Scapulothoracic Joint

MUSCLE:
Subscapularis

SCP:
Anterior Lateral Aspect of the Scapula

LOD:
Posterior and Superior

SETTING:
Medium (Setting 2)



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36

Posterior Shoulder Protocol


Rotator Cuff Muscles

S:
Supraspinatus

I:
Infraspinatus

T:
Teres Major

S:
Subscapularis



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37

Posterior Shoulder Protocol

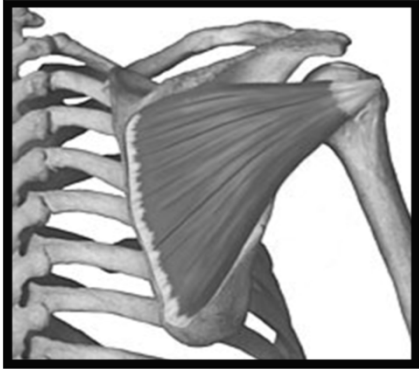
Infraspinatus m.

Origin:
Infraspinous fossa of scapula

Insertion:
Middle facet on greater tuberosity of humerus

Action:
Laterally rotate arm; helps to hold humeral head in glenoid cavity of scapula

Innervation:
Suprascapular nerve (C5 and C6)
(C5, C6)



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EXPERIENCE THE NEXT GENERATION
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38

POSTERIOR SHOULDER PROTOCOL

Teres Minor m.

Origin:

Superior part of lateral border of scapula

Insertion:

Inferior facet on greater tuberosity of humerus

Action:

Laterally rotate arm; helps to hold humeral head in glenoid cavity of scapula

Innervation:

Axillary nerve (C5 and C6) (C5, C6)



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POSTERIOR SHOULDER PROTOCOL

Posterior Humerus

JOINT:

Glenohumeral Joint

MUSCLE:

Infraspinatus m.
Teres Minor m.

SCP:

Posterior Aspect of the Humeral Head

LOD:

Anterior

SETTING:

Medium (Setting 2)



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POSTERIOR SHOULDER PROTOCOL

Posterior Humerus


JOINT:
Glenohumeral Joint


MUSCLE:
Infraspinatus m.
Teres Minor m.

SCP:
Posterior Aspect of the
Humeral Head


LOD:
Anterior

SETTING:
Medium (Setting 2)





NEUROMECHANICAL INNOVATIONS



41

POSTERIOR SHOULDER PROTOCOL

Superior Humerus

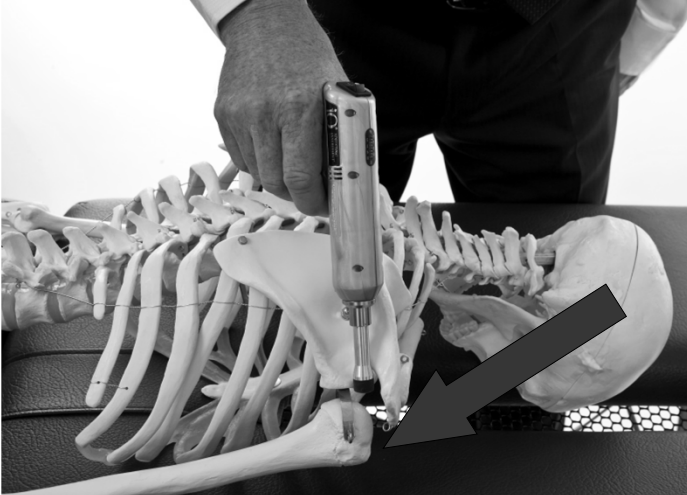
JOINT:
Glenohumeral Joint


MUSCLE:
Teres Minor m.
Supraspinatus m.

SCP:
Posterior Aspect of the
Humeral Head


LOD:
Anterior and Inferior

SETTING:
Medium (Setting 2)





NEUROMECHANICAL INNOVATIONS



42

Posterior Shoulder Protocol

Superior Humerus


JOINT:
Glenohumeral Joint


MUSCLE:
Teres Minor m.
Supraspinatus m.

SCP:
Posterior Aspect of the
Humeral Head


LOD:
Anterior and Inferior

SETTING:
Medium (Setting 2)



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43



Shoulder Rehab - The "Big 3"

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- 1. External rotation**
- 2. Prone horizontal extension**
- 3. "Full Can" abduction**

44

Shoulder external rotation with dumbbell: targets the external rotators (infraspinatus, teres)



A load of 40% maximum force produces superior selective recruitment of the infraspinatus (higher forces recruit the posterior deltoid).

Bitter et al, "Relative contributions of infraspinatus and deltoid during external rotation in healthy shoulders," *Journal of Shoulder and Elbow Surgery*, 2007:16

45

Shoulder external rotation with theraband



46

Prone horizontal abduction:

“Bent-over rows”

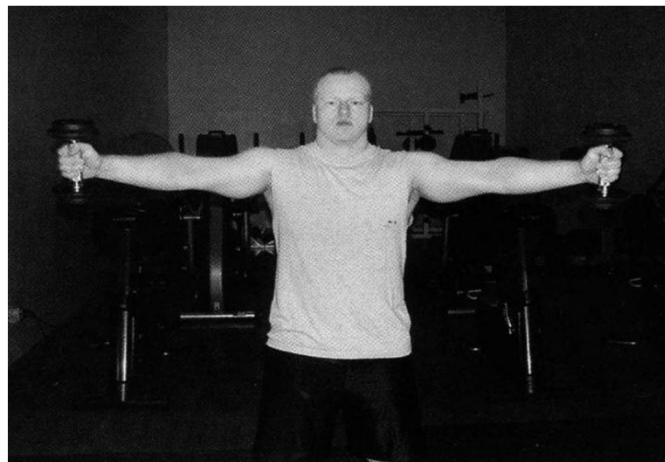
targets rhomboids, mid trap, post deltoid



47

“Full can” abduction:

targets supraspinatus, deltoid, upper trap



Note the “thumbs up” position indicating full external rotation of the shoulders

48

“EC” abduction

- Compresses the subacromial space:
- Notes “thumbs down” position:



49

“The Upright row: Implications for preventing subacromial impingement,”
Schoenfeld et al, *Strength and Conditioning Journal*, Oct, 2011

- Upright Row:
High risk for subacromial impingement

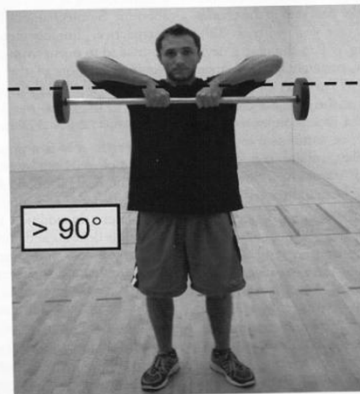


Figure 1. Illustration of traditional upright row with arms elevated above 90°. Dashed line indicates the 90° angle.

50

Anterior Shoulder Protocol

Indications

1. Anterior Shoulder pain
2. Dysfunction in shoulder flexion

Combination Adjustment

1. Anterior Humerus
2. Coracoid Process of the Scapula



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Anterior Shoulder Protocol

Anterior Humerus

JOINT:
Glenohumeral Joint

MUSCLE:
Anterior Deltoid m.
Biceps Brachii m.

SCP:
Anterior Aspect of the
Humeral Head

LOD:
Posterior and Superior

SETTING:
Medium (Setting 2)



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Anterior Shoulder Protocol

Anterior Humerus

JOINT:
Glenohumeral Joint

MUSCLE:
Anterior Deltoid m.
Biceps Brachii m.

SCP:
Anterior Aspect of the
Humeral Head

LOD:
Posterior and Superior

SETTING:
Medium (Setting 2)



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Anterior Shoulder Protocol

Coracoid Process

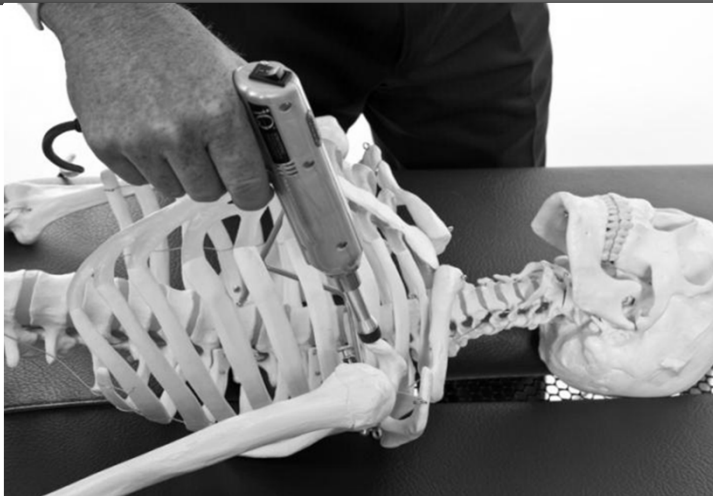
JOINT:
Glenohumeral Joint

MUSCLE:
Coracobrachialis m.
Biceps Brachii m. (short head)
Pectoralis Minor m.

SCP:
Coracoid Process of the
Scapula

LOD:
Posterior and Superior

SETTING:
Medium (Setting 2)



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Anterior Shoulder Protocol

Coracoid Process

JOINT:
Glenohumeral Joint

MUSCLE:
Coracobrachialis m.
Biceps Brachii m. (short head)
Pectoralis Minor m.

SCP:
Coracoid Process of the
Scapula

LOD:
Posterior and Superior

SETTING:
Medium (Setting 2)



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Indications

1. Superior Shoulder pain
2. Dysfunction in abduction and elevation

Combination Adjustment

1. Superior Acromion Process of the Scapula
2. Superior Distal Clavicle



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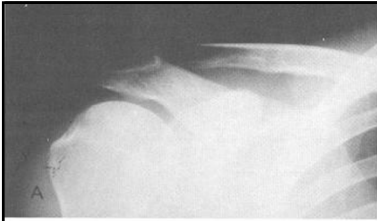
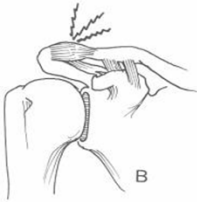
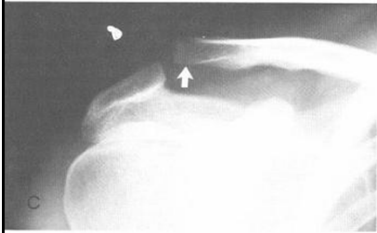
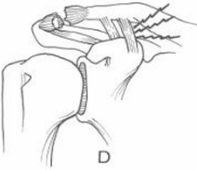
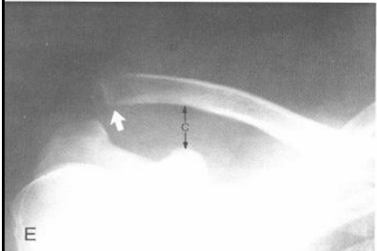
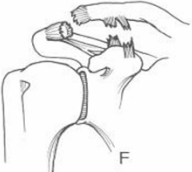


AC Separation – “Shoulder separation”

mechanical INNOVATIONS

X-ray necessary to determine degree of separation and subsequent treatment.

57

		Mild sprain – no increase in joint space. Surgery not required.
		Moderate sprain – joint space widened, elevation of clavicle. May require surgery.
		Severe sprain – Disruption of AC & CC ligaments. Widened joint space (more than 5 mm compared to opposite side) with distinctly elevated clavicle. Requires surgery.

Yochum & Rowe, *Essentials of Skeletal Radiology*

58

Acromion Process

JOINT:
Acromioclavicular Joint


MUSCLES:

SCP:
Acromion Process of the Scapula

LOD:
Inferior

SETTING:
Medium (Setting 2) or
Low (Setting 1)



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59

Acromion Process

JOINT:
Acromioclavicular Joint

MUSCLES:

SCP:
Acromion Process of the Scapula

LOD:
Inferior

SETTING:
Medium (Setting 2) or
Low (Setting 1)



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60

Distal Clavicle

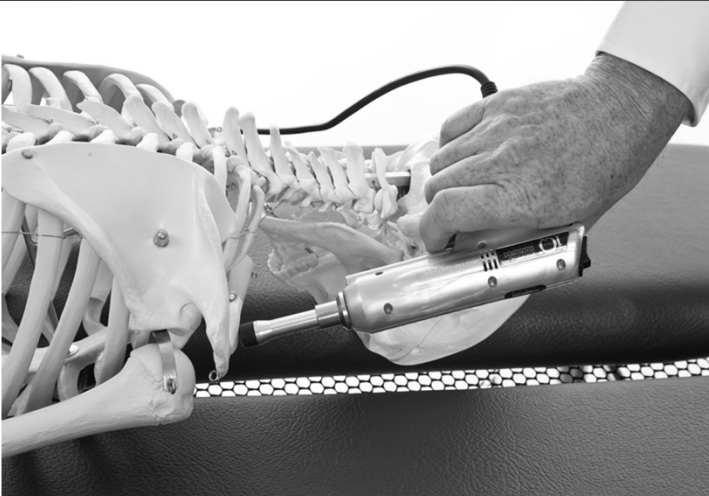
JOINT:
Acromioclavicular Joint

MUSCLES:

SCP:
Superior Distal Clavicle

LOD:
Inferior

SETTING:
Medium (Setting 2) or
Low (Setting 1)



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NEUROMECHANICAL INNOVATIONS

EXPERIENCE THE NEXT GENERATION
IN CHIROPRACTIC

61

Distal Clavicle


JOINT:
Acromioclavicular Joint

MUSCLES:

SCP:
Superior Distal Clavicle

LOD:
Inferior

SETTING:
Medium (Setting 2) or
Low (Setting 1)



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NEUROMECHANICAL INNOVATIONS

EXPERIENCE THE NEXT GENERATION
IN CHIROPRACTIC

62

Indications

1. Medial Superior Chest pain
2. Point tenderness localized pain

Combination Adjustment

1. Anterior Proximal Clavicle



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63

Proximal Clavicle

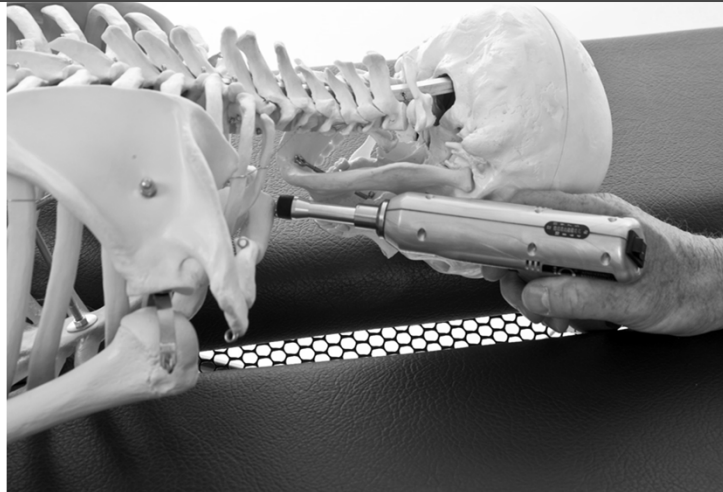
JOINT:
Sternoclavicular Joint

MUSCLES:

SCP:
Anterior Proximal Clavicle

LOD:
Inferior

SETTING:
Medium (Setting 2) or
Low (Setting 1)



NEUROMECHANICAL INNOVATIONS

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64

Proximal Clavicle

JOINT:
Sternoclavicular Joint

MUSCLES:

SCP:
Anterior Proximal Clavicle

LOD:
Inferior

SETTING:
Medium (Setting 2) or
Low (Setting 1)



NEUROMECHANICAL INNOVATIONS

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Proximal Clavicle

JOINT:
Sternoclavicular Joint

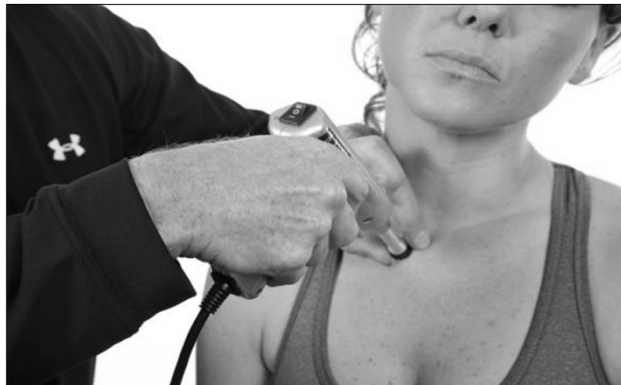
MUSCLES:

SCP:
Anterior Proximal Clavicle

LOD:
Inferior



SETTING:
Medium (Setting 2) or
Low (Setting 1)

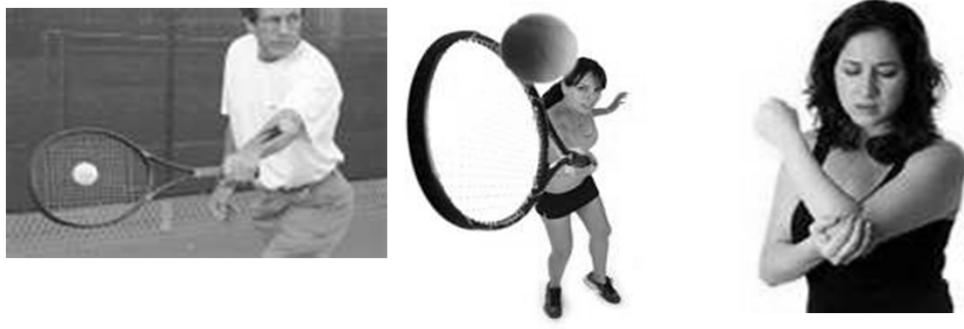
**Alternate Patient Positioning
and Adjustment**





NEUROMECHANICAL INNOVATIONS

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 **Lateral Epicondylitis: "Tennis Elbow"** 



67

 **Lateral Epicondylitis: "Tennis Elbow"** 

The muscle/tendon & tendon/bone junctions are being stressed at their weakest & most vulnerable position (wrist and fingers flexed with elbow extended).

Weakness of the extensor muscles prevents these muscles from counteracting the stress.

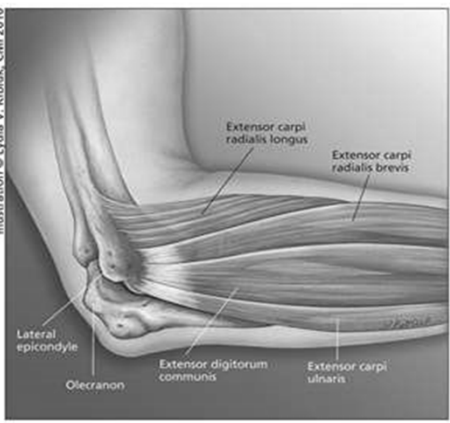



Illustration © Lydia V. Kibluk, CMT, 2010

68



Cozen's Test: Resisted wrist extension (also for lateral epicondylitis)







Figure 4. Cozen's test. (Redrawn with permission from McQuillan MA. Musculoskeletal system. In: Judge RD, Wolliscroft JO, Zelenock GB, Zuidema GD, editors. The Michigan manual of clinical diagnosis: the basis of cost-effective medical practice. Philadelphia: Lippincott-Raven; 1998:295.)



69




Mill's Test: supinator tendonitis or lateral epicondylitis



Mill's Test (3)
Procedure: With the patient seated, instruct him to pronate the arm and flex the wrist. Instruct the patient to supinate the arm against resistance (Fig. 7.12).
Rationale: The tendon of the Supinator muscle, which supinates the wrist, is attached to the lateral epicondyle. If the condyle itself or the tendon of the supinator that attaches to the condyle is inflamed, then by resisting supination of the wrist, irritation to the lateral epicondyle and its attaching tendons is reproduced. If pain is elicited at the lateral epicondyle, then lateral epicondylitis is suspect.

Photographic Manual of Regional Orthopaedic and Neurological Tests,
Cipriano



70

Indications

1. Lateral Elbow Pain and or weakness

Combination Adjustment

1. Lateral Epicondyle of the Humerus
2. Proximal Head of the Radius



NEUROMECHANICAL INNOVATIONS

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71

Lateral Epicondyle of the Humerus

JOINT:

Proximal Radioulnar Joint

MUSCLES:

Extensor Carpi Radialis Longus
Extensor Carpi Radialis Brevis
Extensor Carpi Ulnaris
Extensor Digitorum Communis

SCP:

Lateral Epicondyle of the Humerus

LOD:

Medial

SETTING:

Medium (Setting 2)



NEUROMECHANICAL INNOVATIONS

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72

Lateral Epicondyle of the Humerus

JOINT:

Proximal Radioulnar Joint

MUSCLES:

Extensor Carpi Radialis Longus
Extensor Carpi Radialis Brevis
Extensor Carpi Ulnaris
Extensor Digitorum Communis

SCP:

Lateral Epicondyle of the Humerus

LOD:

Medial

SETTING:

Medium (Setting 2)



NEUROMECHANICAL INNOVATIONS

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73

Proximal Radius Head

JOINT:

Proximal Radioulnar Joint

MUSCLES:

Extensor Carpi Radialis Longus
Extensor Carpi Radialis Brevis

SCP:

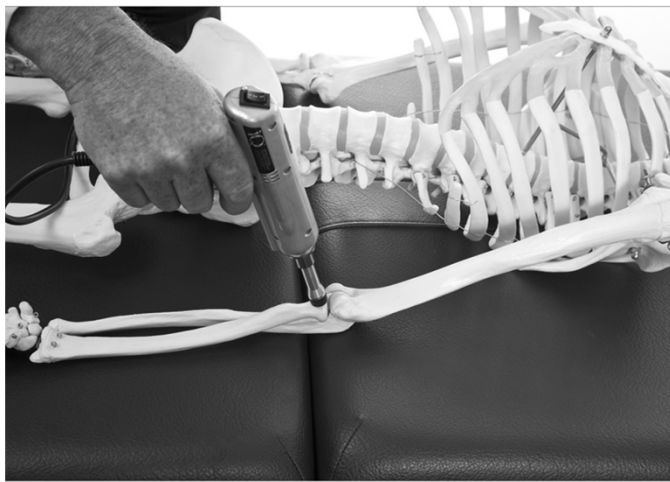
Head of the Proximal Radius

LOD:

Medial

SETTING:

Medium (Setting 2)



Book_151_US---Elbow_Radius-Proximal_RDP_DSC_3817a_1pp



NEUROMECHANICAL INNOVATIONS

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74

Proximal Radius Head


JOINT:
Proximal Radioulnar Joint


MUSCLES:
Extensor Carpi Radialis Longus
Extensor Carpi Radialis Brevis

SCP:
Head of the Proximal Radius


LOD:
Medial



SETTING:
Medium (Setting 2)




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NEUROMECHANICAL INNOVATIONS

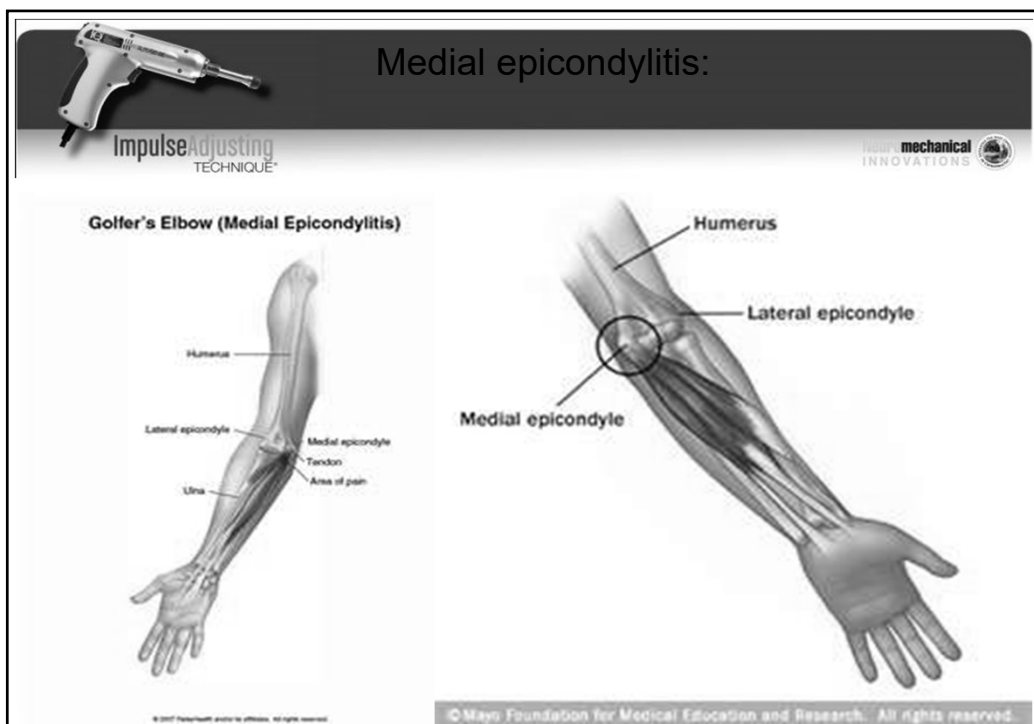
75

 **Medial epicondylitis – “Golfer’s Elbow”:**



76




77

Indications


1. Medial Elbow Pain and or weakness

Combination Adjustment

1. Medial Epicondyle of the Humerus
2. Proximal Aspect of the Ulna



NEUROMECHANICAL INNOVATIONS



78

Medial Epicondyle of the Humerus

JOINT:
Humeroulnar Joint

MUSCLES:
Flexor Carpi Ulnaris

SCP:
Medial Epicondyle of the
Humerus

LOD:
Lateral

SETTING:
Medium (Setting 2)



NEUROMECHANICAL INNOVATIONS

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79

Medial Epicondyle of the Humerus

JOINT:
Humeroulnar Joint

MUSCLES:
Flexor Carpi Ulnaris

SCP:
Medial Epicondyle of the
Humerus

LOD:
Lateral

SETTING:
Medium (Setting 2)



NEUROMECHANICAL INNOVATIONS

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80

Proximal Ulna


JOINT:
Humeroulnar Joint

MUSCLES:
Flexor Carpi Ulnaris

SCP:
Medial Proximal Ulna

LOD:
Lateral

SETTING:
Medium (Setting 2)



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NEUROMECHANICAL INNOVATIONS

EXPERIENCE THE NEXT GENERATION
IN CHIROPRACTIC

81

Proximal Ulna


JOINT:
Humeroulnar Joint

MUSCLES:
Flexor Carpi Ulnaris

SCP:
Medial Proximal Ulna

LOD:
Lateral

SETTING:
Medium (Setting 2)

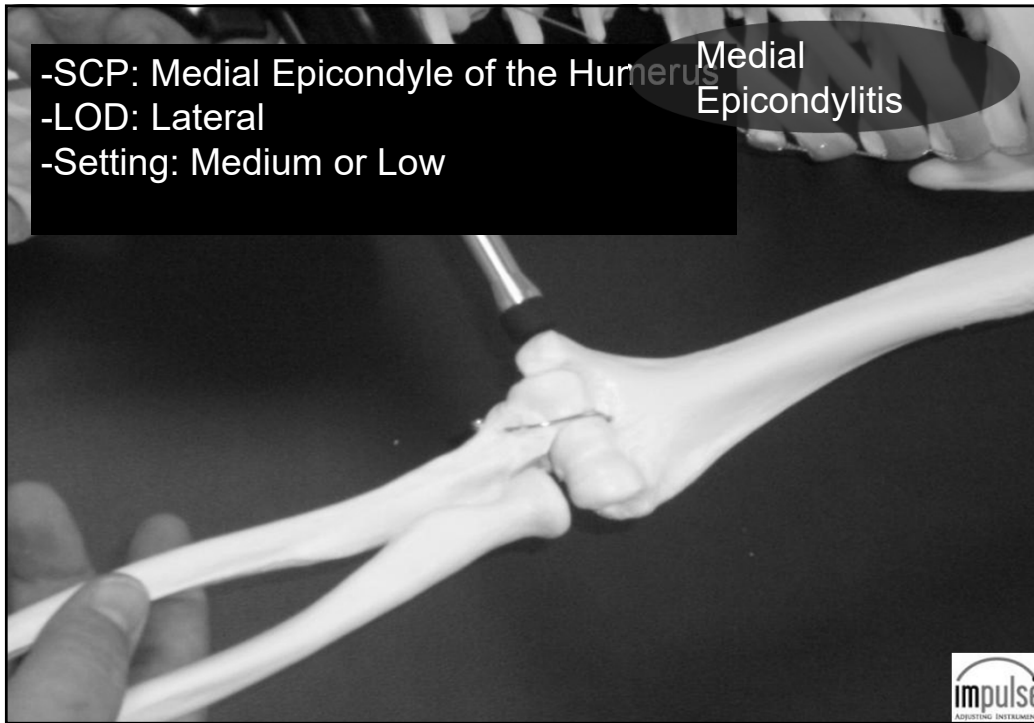


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NEUROMECHANICAL INNOVATIONS

EXPERIENCE THE NEXT GENERATION
IN CHIROPRACTIC

82



83



84

Wrist/finger extension: Concentric



85

Wrist eccentric extension: Eccentric



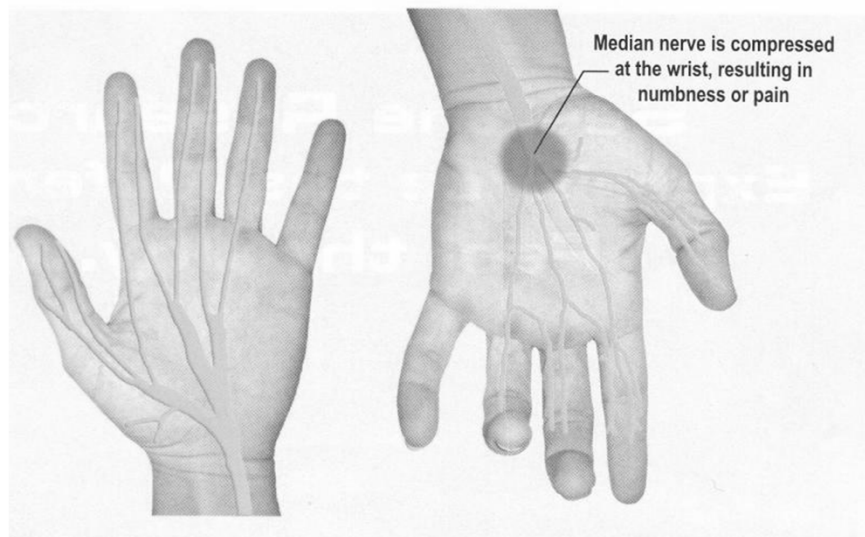
86

Carpal Tunnel Syndrome

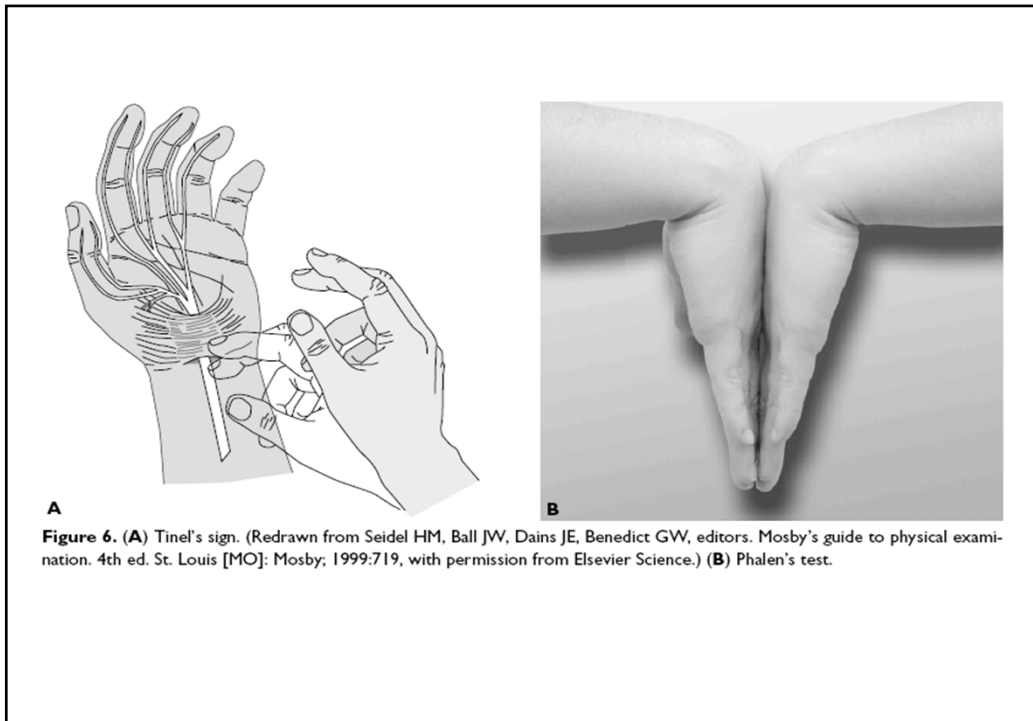
- Carpal tunnel – composed of the bones of the wrist on the back side and the transverse carpal ligament on the inside.
- Through which passes the median nerve and 9 flexor tendons.
- When fingers are used with the wrist in neutral position, the flexor tendons glide along the tunnel's walls, lubricated by fluid within their synovial sheaths.
- Repetitive use of the wrist/finger flexor muscles and tendons leads to overdevelopment and shortening (while the extensor muscles become relative weaker).
- When fingers are used with wrist in flexion or extension, their movement becomes like that of ropes dragged roughly back and forth across a pulley.
- The tendons and their sheaths become irritated and swell up within the narrow confines of the tunnel, pressing on the median nerve.
- This leads to reduction of the natural lubrication within the tendon sheaths, leading to buildup of friction, more swelling, and inflammation.
- All this leads to compression of the vascular structures that supply the median nerve leading to nerve damage.

87

Median nerve distribution:




88



89

Hand dynamometer



Grip strength is a predictor function.

"Midlife hand grip strength as a predictor of old Age and disability," *Journal of American Medical Association*, 1999;
 "Handgrip dynamometry in healthy adults," *Clinical Nutrition*, 2005;
 "Predictors of functional decline," *Journal of the American Geriatric Society*, 2000.

Death can be predicted in 5 years if the grip strength is below 31 lbs for women and 48 for men.

90

Pinch dynamometer: tests muscles supplied by median and ulnar nerves separately:



91

Rehabilitation of the Hand; Surgery & Therapy,
Hunter, 1990, Mosby

- Normal pinch strength in kgs (lbs):

	<u>Male</u>		<u>Female</u>	
	Major	Minor	Major	Minor
II	5.3 (11.5)	4.8 (10.5)	3.6 (8.0)	3.3 (7.25)
III	5.6 (12.3)	5.7 (12.5)	3.8 (8.4)	3.4 (7.5)
IV	3.8 (8.4)	3.6 (8.0)	2.5 (5.5)	2.4 (5.25)
V	2.3 (5.0)	2.2 (5.0)	1.7 (3.8)	1.6 (3.5)

92

-SCP: Medial Pisiform
-LOD: Lateral
-Setting: Medium or Low

Carpal Tunnel Syndrome



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93

-SCP: Medial Scaphoid
-LOD: Lateral
-Setting: Medium or Low

Carpal Tunnel Syndrome



impulse
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94

-SCP: Lateral Distal Ulna
-LOD: Medial
-Setting: Medium or Low

Wrist Pain



impulse
ADJUSTING INTERLIMB

95

-SCP: Lateral Distal Radius
-LOD: Medial
-Setting: Medium or Low

Wrist Pain



impulse
ADJUSTING INTERLIMB

96

“Manipulation of the wrist for the management of lateral epicondylitis,” *Struigs, Physical Therapy, 2003*

- Manipulation of the wrist appeared to be more effective than ultrasound, transverse friction massage, and stretching exercises.

97

“Balancing Muscle Groups: A Solution to Repetitive Stress Injuries”

- “Strengthening the weaker extensors of the finger and wrist extensors that are in a state of underdevelopment reduces the abnormal pressure in the carpal tunnel and on the median nerve, allowing the body’s natural healing process to function.”

Ostrem, “Balancing Muscle Groups: A Solution to Repetitive Stress Injuries”

98

Wrist/finger extension:



99

Wrist eccentric extension:



100

DeQuervain's Disease

(stenosing tenosynovitis of the tendons of the extensor pollicis brevis and abductor pollicis longus)



101

De Quervain's Tenosynovitis



102

1st metacarpal-carpal joint:



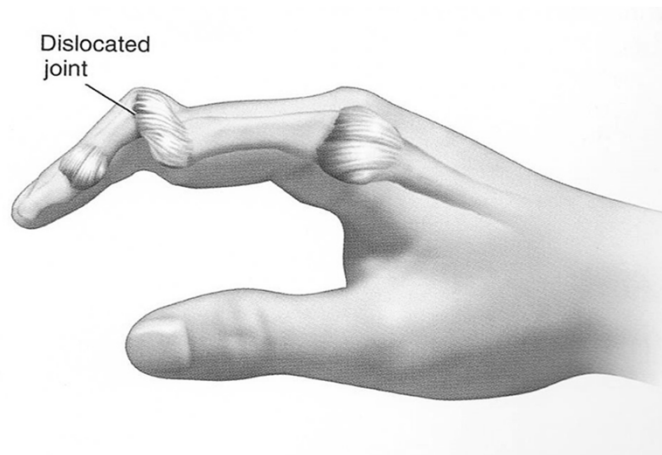
103

“Gamekeepers” or “Skier’s” thumb:



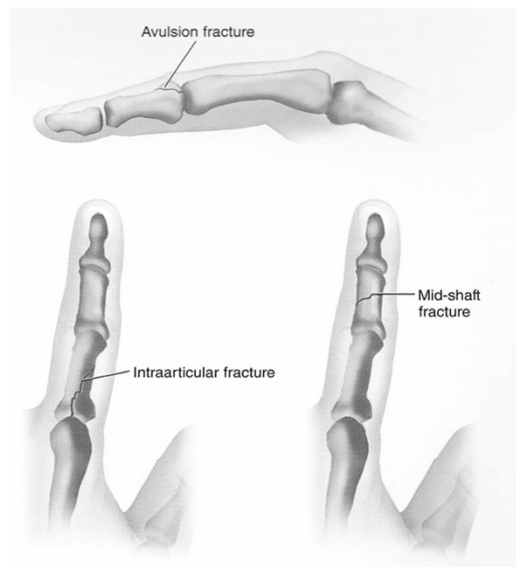
104

Finger Dislocation:



105

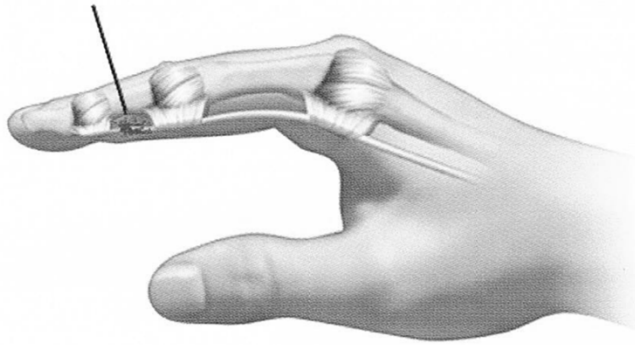
Finger Fractures:



106

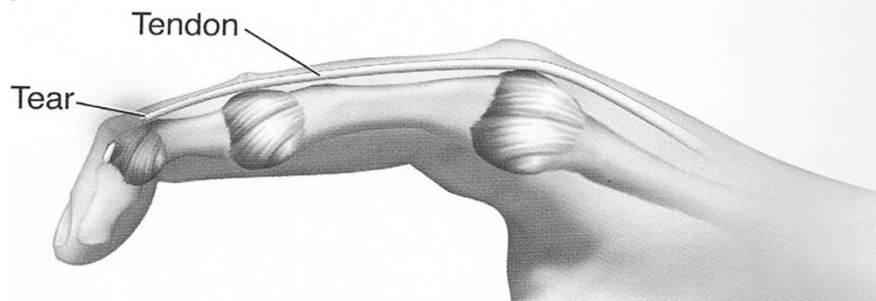
“Jersey” Flexor tendon tear:

Torn Flexor Tendon



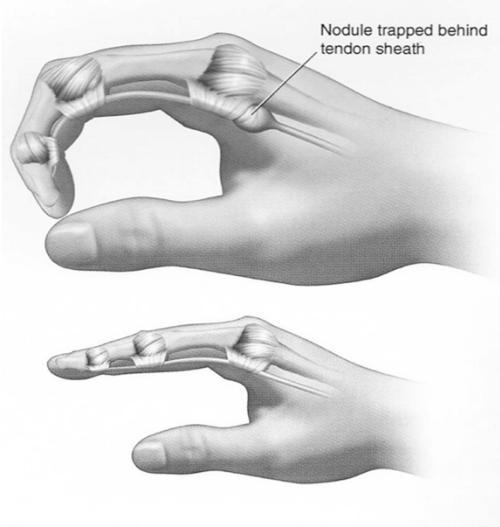
107

“Mallet” extensor tendon tear:



108

“Trigger” finger:



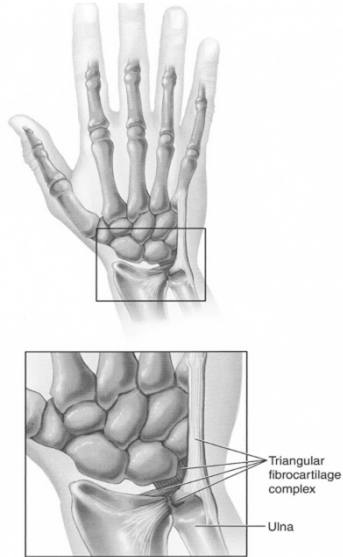
109

Scaphoid fracture:



110

Triangular fibrocartilage complex:



111

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TMJ

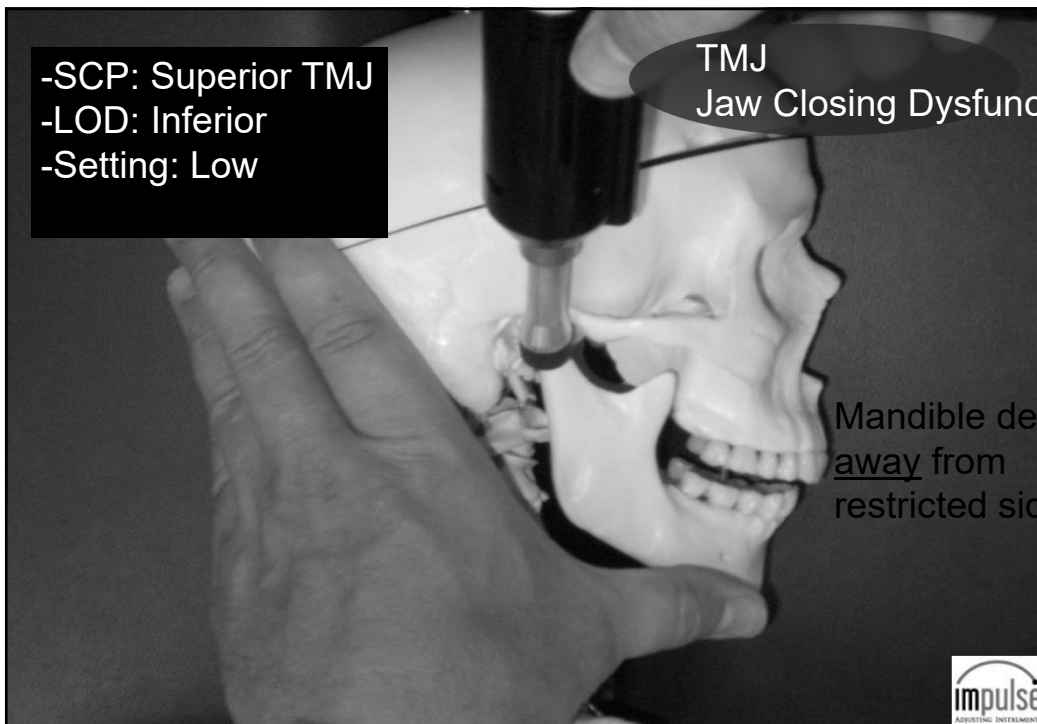
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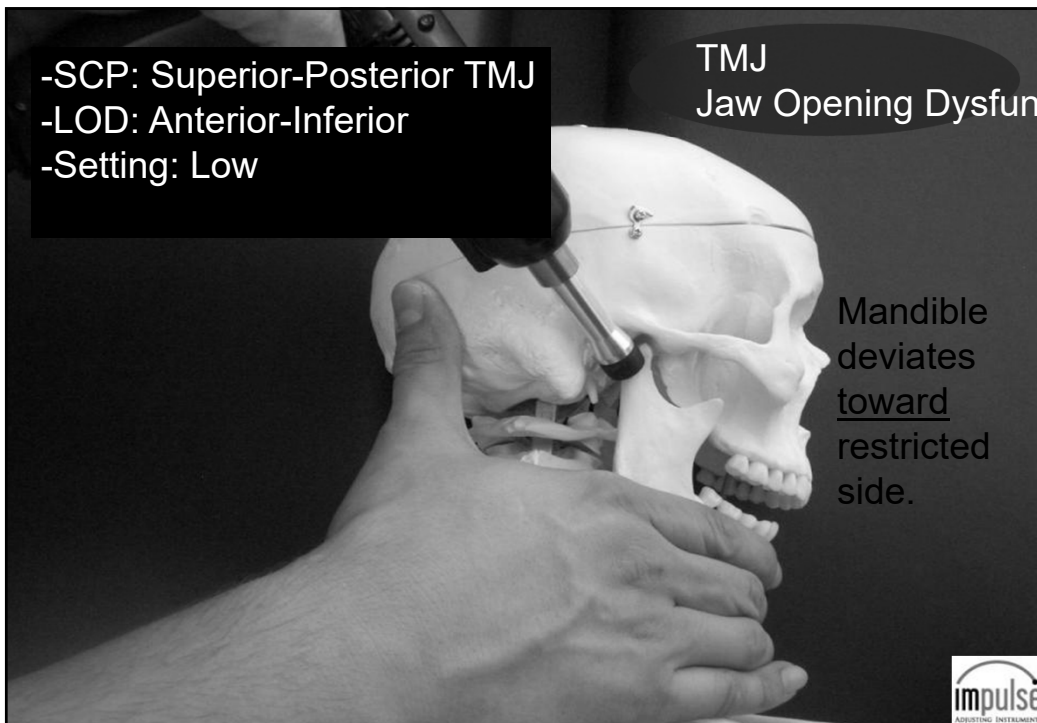
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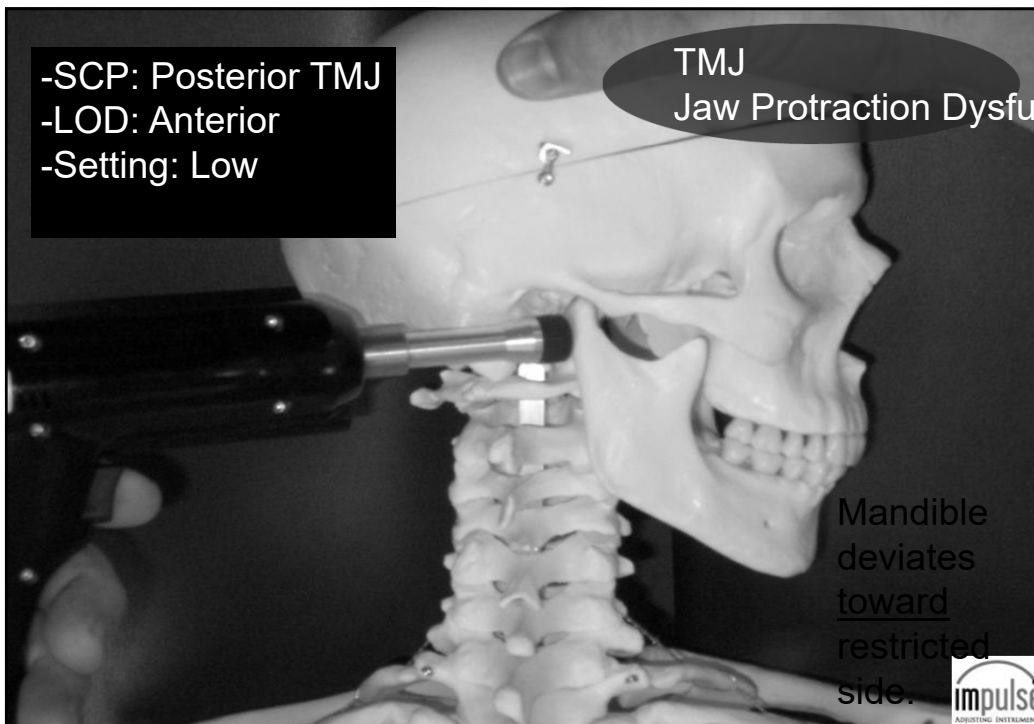
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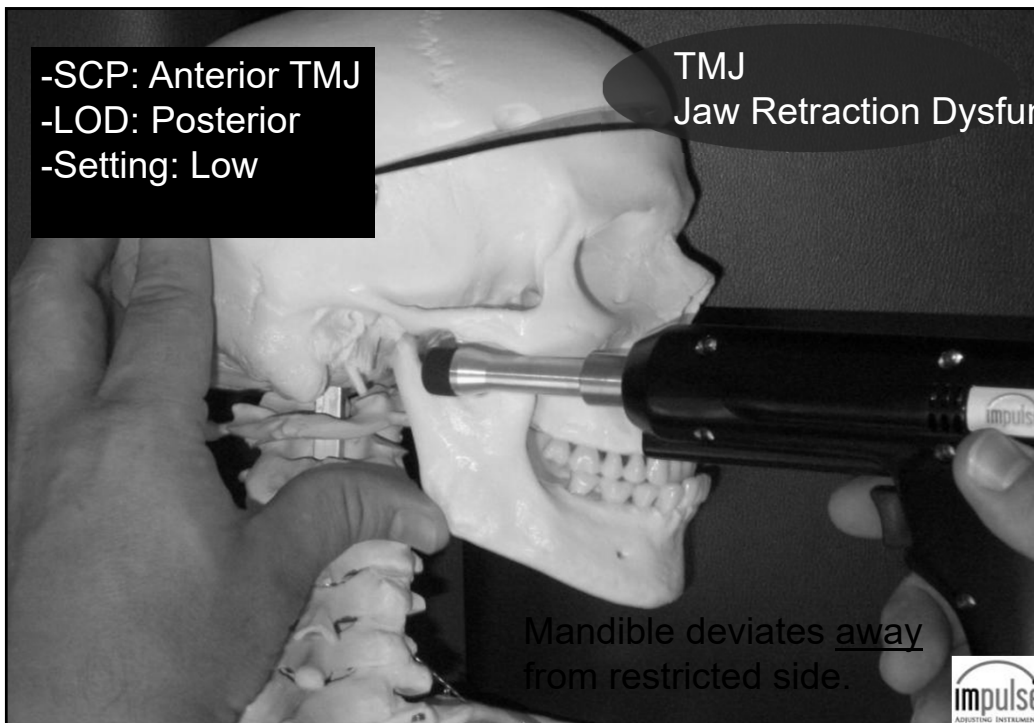
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116



117



118

