# Cervical Segmental Motion Induced by Shoulder Abduction Assessed by MRI

MULLIGAN CONCEPT

Manual Concepts
Education for Health Professionals

## Cervical Segmental Motion Induced by Shoulder Abduction Assessed by MRI

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## Spinal mobilization with arm movement

- SMWAM are a valuable clinical tool used to manage a range of clinical problems including:
  - Limited shoulder elevation
  - Tennis elbow
  - Cervical/thoracic spine dysfunction
  - Cervical neural dysfunction
    - Mulligan, 2004

## Evidence for SMWAM

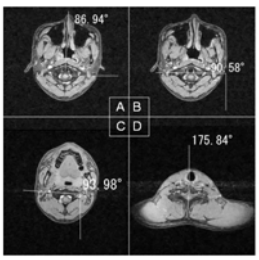
- Shoulder elevation induces complex thoracic spine movement with large inter individual variation
  - Stewart, 1995; Theodoridis, 2002
- Thoracic spine mobility is a key link in the kinematic sequence of shoulder elevation
  - Crosbie, 2008
- No studies have investigated the effect of shoulder movement on cervical segmental movement

## Purpose

- To measure the effect of shoulder elevation on cervical segmental rotation using magnetic resonance imaging
- To assess whether induced movement is influenced by active muscle contraction

## Method

- Kinematic MRI of the cervical spine was performed with a 0.2-T horizontally open unit
- 2.5mm interval between slices
- 22 asymptomatic subjects (12 male), mean age 24 without history of significant cervical/ shoulder disorders
  - MRI inspected for cx disorders – no rejections
  - Usual consent procedures




## Procedure

- Condition 1
  - Passive positioning of the right arm to the angles 0°, 30°, 60°,90°, 120°
- Condition 2
  - Isometric contraction towards shoulder abduction with the right shoulder positioned at the angles 0°, 30°, 60°, 90°, 120°
  - Isometric contraction equivalent to arm weight, applied with spring scale

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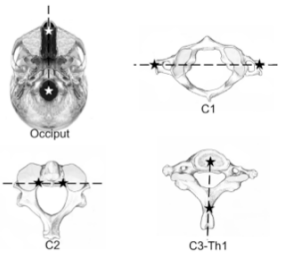
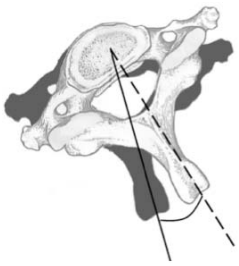
## Measurement

- MRI
  - Segmental cervical rotation assessed from the T1 axial images
  - Position of each cervical vertebra from $C_2$ to $T_1$ assessed with the right shoulder in 0, 30, 60, 90, and 120° abduction
  - Head held in neutral position at all times
  - Neutral position reference point




## Reliability of measurements

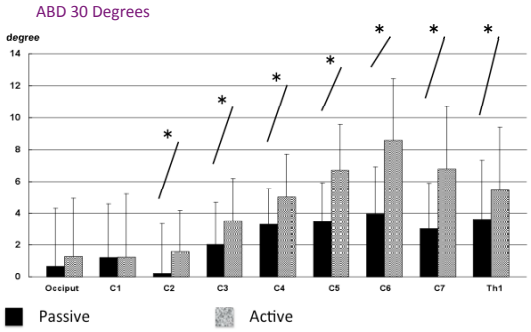
- Intra-rater reliability
  - 1 investigator measured the images twice on 2 separate occasions
  - ICC=0.96
- Inter-rater reliability
  - 2 different examiners, blind to each other's assessment, measured the same series
  - ICC=0.95

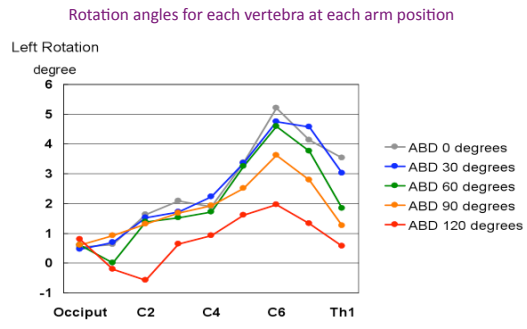


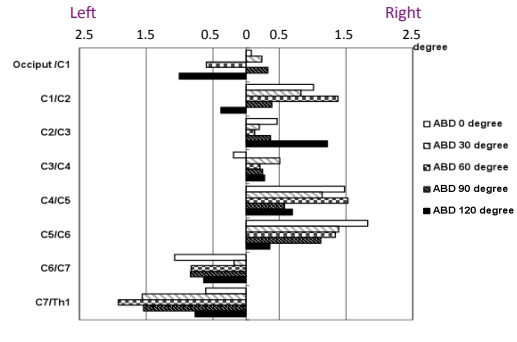
## Results

In normal subjects passively positioning the arm into abduction does not significantly induce cervical rotation

Isometric contraction induces cervical segmental rotation irrespective of arm position



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## Discussion

- Vertebral rotation
  - ? explained by axioscapular muscle activity
- Greatest cervical rotation occurred at C6, decreasing above and below
  - Maybe explained by the greater flexibility of C5/C6 compared with other levels apart from C1/C2
- These findings consistent with the Mulligan Concept and SMWAM

## Conclusion

- Passively positioning the arm into abduction does not significantly induce cervical rotation
- Shoulder abduction up to 90° generally induces right SEGMENTAL rotation in the cervical spine only in the presence of muscle contraction, with the largest movement occurring at C6
- A contrasting pattern of upper and lower cervical rotation occurs when the arm is positioned in 120° abduction

Toby Hall, 2009 www.manualconcepts.com