

Cadaveric and Chart Retrospective on Shoulder Variation: Morphology and Pain

PCOM LOGO

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Background

Osteopathic Manipulative Treatment (OMT) is a category of several types of manual techniques used by osteopathic physicians. According to the osteopathic tradition, structure and function are intimately related. This project examined the relationship between shoulder structure and function in an osteopathic framework, with a specific goal to understand how the structure of the acromion affects the development of shoulder injuries.

For the first part of this project, cadaveric dissections were performed and muscle diameters were taken of structures within the subacromial space. The second part of this project assessed the efficacy of OMT in shoulder somatic dysfunction for patients treated at Philadelphia College of Osteopathic Medicine (PCOM).

Materials and Methods

Cadaveric Study: Ten cadavers were used in this project in order to examine shoulder morphology and the incidence of rotator cuff tears. Measurements were taken of the diameter of the supraspinatus, infraspinatus, and subacromial space.

Inclusion Criteria: The cadavers used for this study were provided post-dissection by first year osteopathic students at PCOM. For inclusion in this study, the specimens must have had an intact glenohumeral joint.

Dissection Protocol:

- 1. Removal of Shoulder Girdle:** Carefully remove the clavicle from the sternum. Remove the distal attachments of the latissimus dorsi, levator scapulae, omohyoid, rhomboids, and pectoralis major and minor muscles. Remove the trapezius from its three attachment sites: the lateral 1/3 of the clavicle, the acromion, and the spine of the scapula. Remove the serratus anterior proximally at the medial border of the scapula
- 2. Special Dissection of Shoulder:** Remove the forearm and hand by using a bone saw approximately 6 inches distal to the humeral head. Remove the deltoid muscle, triceps brachii, biceps brachii, and coracobrachialis in a proximal to distal direction.
- 3. Isolating Rotator Cuff Muscles:** Carefully remove all fascia and connective tissue superior to the spine of scapula to view the supraspinatus muscle. Bluntly dissect all of the connective tissue in the subacromial space to observe the supraspinatus and infraspinatus tendons. Clean the glenohumeral joint and remove all fascia and tissues in order to obtain a view of the shoulder capsule
- 4. Measure diameter of Muscles and Subacromial Space:** Measure the diameter of the supraspinatus, infraspinatus, and subacromial space using a vernier caliper.

Retrospective Chart Review Protocol: A Retrospective Chart Review (RCR) of pre-recorded data for 70 patients seen at PCOM was conducted. Each patient was treated within the last year for generic "shoulder pain" at PCOM.

- 1. Population Selection:** Patients presenting with generic "shoulders pain" in the Osteopathic Manipulative Medicine (OMM) department at PCOM in 2015 and 2016 were included in this study.
- 2. Inclusion Criteria:** Charts must have included the patient age, sex, diagnosis, number of visits, and length of treatment. According to Knebl et al. (2002), a power analysis indicated that 25 patients are needed to achieve statistical significant. Thus, the first 25 patients with complete information were selected.
- 3. Chart Review:** Charts were reviewed and patient demographics, primary and secondary diagnosis, length of treatment, and number of visits were recorded. Changes in Range of Motion (ROM) and pain were recorded as well.
- 4. Patient Statistics:** All statistics were recorded and analyzed using Microsoft Excel

Results (Cadaver Study)

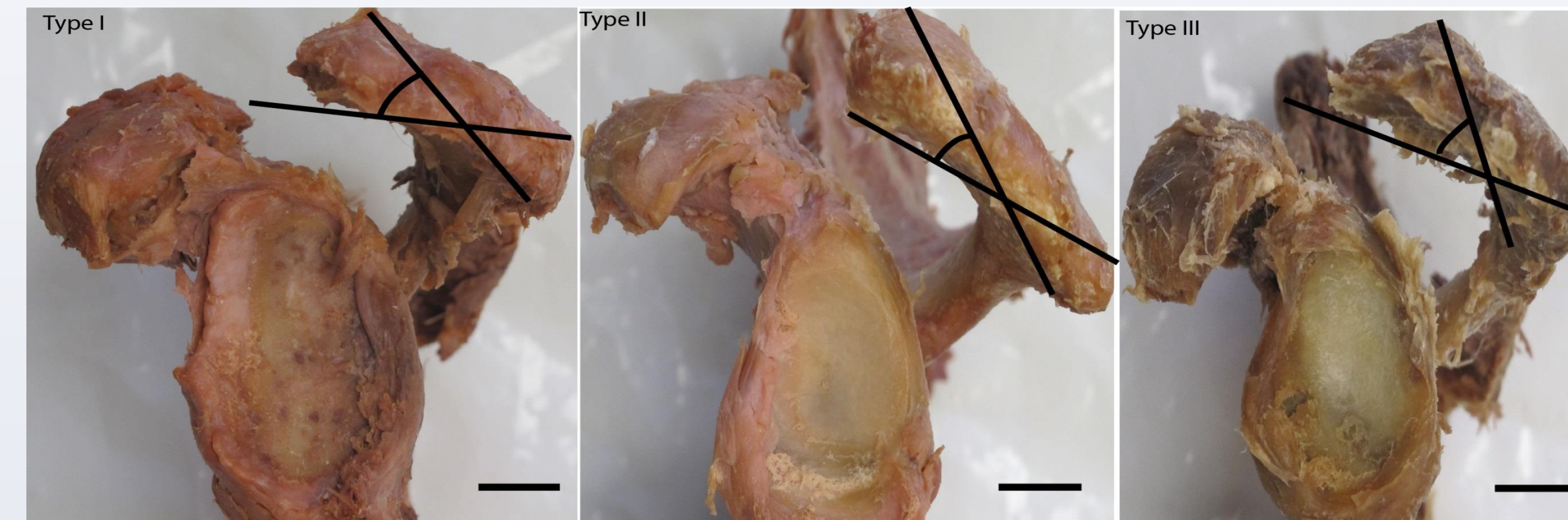


Image 1: Lateral View of the scapula with type I, type II, and type III acromion. Scale bars = 10mm.

Cadaver	Supraspinatus (mm)	Infraspinatus (mm)	Sub-Acromial Space (mm)	Acromial Type
HGR 31-2015-R	0.42	0.38	0.72	Type I
HGR 31-2015-L	0.41	0.34	0.81	Type I
HGR 13-2015-R	0.37	0.32	0.74	Type III
HGR 13-2015-L	0.35	0.40	0.82	Type III
HGR 29-2015-R	0.39	0.37	0.74	Type III
HGR 29-2015-L	0.43	0.40	0.75	Type III
HGR 14-2015-R	0.44	0.42	0.73	Type I
HGR 14-2015-L	0.43	0.35	0.80	Type I
HGR 2-2015-R	0.35	0.38	0.70	Type II
HGR 2-2015-L	0.37	0.34	0.71	Type II
HGR 23-2015-R	0.48	0.39	0.69	Type III
HGR 23-2015-L	0.45	0.36	0.73	Type III
HGR 553-2015-R	0.41	0.41	0.71	Type II
HGR 553-2015-L	0.34	0.40	0.72	Type II
HGR 34-2015-R	0.39	0.35	0.72	Type II
HGR 34-2015-L	0.41	0.46	0.69	Type II
HGR 32-2015-R	0.45	0.31	0.67	Type III
HGR 32-2015-L	0.43	0.38	0.72	Type III
HGR 30-2015-R	0.44	0.37	0.74	Type II
HGR 30-2015-L	0.39	0.39	0.70	Type II
Average	0.41	0.38	0.73	

Results (RCR)

Patient	DOB	Gender	Diagnosis 1	Number of Visits	Length of Treatment (months)
1	56	M	Shoulder Lesion, Left	13	24
2	57	F	Impingement, Right	22	24
3	68	F	Impingement, Right	4	4
4	52	M	Pain in Right Shoulder	8	18
5	87	M	Unspecified rotator cuff tear	3	3
6	68	M	Pain in Left Shoulder	4	6
7	43	F	Pain in Right Shoulder	12	16
8	83	F	Pain in Left Shoulder	5	6
9	66	F	Bursitis of unspecified shoulder	11	12
10	50	M	Pain in Left Shoulder	9	9
11	87	F	Pain in Left Shoulder	4	3
12	54	M	Pain in Right Shoulder	3	3
13	26	F	Pain in Right Shoulder	6	6
14	26	M	Pain in Left Shoulder	8	6
15	44	F	Pain in Left Shoulder	6	6
16	50	F	Pain in Left Shoulder	20	12
17	63	F	Pain in Left Shoulder	13	12
18	53	F	Pain in Left Shoulder	6	2
19	29	F	Pain in Right Shoulder	2	2
20	182	F	Disorders of Bursae and tendons in the shoulder region	4	3
21	76	F	Impingement, Right	12	10
22	62	F	Pain in Left Shoulder	15	12
23	68	M	Disorders of Bursae and tendons in the shoulder region	8	10
24	51	F	Pain in Right Shoulder	12	12
25	80	F	Bursitis of unspecified shoulder	7	5
26	58	M	Impingement, Right	9	9
Average	59.9 years old			8.7	9.0

- 68% female
- Mean age: 59
- Range: 26-88 years old
- Mean # of visits: 8.67
- Length of treatment 9.07 months

Discussion

Cadaver Study

Acromial Types

- 20% of the cadavers had type I acromion, 40% had type II, and 40% had type III acromion. These findings are consistent with the current literature (Bigliani, et al. 1986.)

The incidence of rotator cuff tears could not be reported for this study.

- Previous dissections of the rotator cuff tendons, during Structural Principles of Osteopathic Medicine, obscured our ability to determine the incidence of naturally occurring tears.

Retrospective Chart Review (RCR)

Based on the RCR, OMM efficacy could not be determined due to a lack of metrics data.

- Out of 25 patients observed, only 2 had ROM reported.
- There was no objective pain measurement scale reported.

64.2% of the patients treated in this OMM study were female.

- Of the 25 patients reviewed, 68% were female.
 - One possible explanation for this observation is that high levels of estrogen and progesterone decrease collagen proliferation, increasing joint laxity and risk for injury (Shultz et al., 2005).

The average age of patients treated in this study was 56 years old.

- Of the 25 patients reviewed, the average age was 59 years old
- Out of the 25 patients, 21 patients were over the age of 50.
- The incidence of type I acromion decreases with age, and the incidence of type III acromion increase with age greater than 50 (Wang, 1997).
- Over time, type I acromion may progress to type II, then to type III (Wang, 1997)
- The increase incidence of type III acromion would increase the likelihood of rotator cuff tears. It is possible, therefore, that these patients had type II or III by the time they were treated.

Future Directions

Examine shoulders in a larger cadaver population in order to obtain a more accurate representation of the true population.

- Special dissection of fresh cadaver shoulders in which all rotator cuff muscles are preserved to observe any original rotator cuff tears

The RCR revealed the need for a future study to objectively measure OMT's efficacy for shoulder dysfunction. We recommend the following steps be taken in a clinical study to evaluate efficacy of OMT in treating somatic dysfunction of the shoulder.

- In order to assess OMT's effect on ROM, ROM should be recorded at each visit. By having a numerical value of ROM, any change in ROM from OMT can be documented.
- Pain scale should be used in order to precisely assess the levels of pain reported at each visit. This will allow us to track the pain levels and see how OMT effects pain in individuals

References & Acknowledgments

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