

Identification and management of chronic shoulder pain in the presence of an MRA-confirmed humeral avulsion of the inferior glenohumeral ligament (HAGL) lesion

Arif Karmali, BSc(Kin), DC, RCCSS(C) Resident^{1,2}
Jennifer McLeod, BSc, BMR(PT)¹

Objective: To present the assessment and conservative management of chronic shoulder pain in the presence of a humeral avulsion of the inferior glenohumeral ligament (HAGL) lesion in an active individual.

Clinical Features: A 47 year-old female office-worker with constant, deep, right shoulder pain with occasional clicking and catching claimed to have “tore something” in her right shoulder five years ago while performing reverse bicep curls. A physical exam led to differential diagnoses of a Superior Labrum Anterior to Posterior (SLAP) lesion, Bankart lesion, and bicipital tendinopathy. A Magnetic Resonance Arthrogram revealed a HAGL lesion.

Intervention and Outcome: A conservative chiropractic treatment plan in addition to physical therapy was initiated. The patient reported 75% improvement in symptoms after 4 treatments over a four-week duration.

Objectif : Présenter l'évaluation et le traitement conservateur de la douleur chronique à l'épaule en présence d'une avulsion humérale d'une lésion du ligament glénohuméral inférieur (HAGL) chez une personne active.

Caractéristiques cliniques : Une employée de bureau de 47 ans, souffrant d'une douleur constante et profonde à l'épaule droite avec un craquement occasionnel, a affirmé avoir « déchiré quelque chose » dans son épaule droite il y a cinq ans en effectuant des flexions inversées des biceps. Un examen physique a posé des diagnostics différentiels d'une lésion du labrum supérieur antéro-postérieur (SLAP), d'une lésion de Bankart et de tendinopathie bicipitale. Une arthrographie par résonance magnétique a révélé une lésion du ligament glénohuméral inférieur (HAGL).

Intervention et résultats : Un traitement chiropratique conservateur avec une physiothérapie a été entrepris. Le patient a fait état d'une amélioration de 75 % des

¹ Elite Sport Performance, Calgary, Alberta

² Resident of the Royal College of Chiropractic Sports Sciences (Canada)

Corresponding author:

Arif Karmali

Elite Sport Performance & The Knee Clinic, 112 – 10333 Southport Road SW, Calgary, AB, T2W 3X6

Tel: 403-689-9889

Written patient consent to publish this case was obtained.

© JCCA 2016

Summary: *This case demonstrates the successful implementation of a conservative plan of management suggesting that the treatment provided to this patient should be considered and attempted prior to arthroscopic surgery.*

(JCCA. 2016;60(2):175-181)

KEY WORDS: chiropractic, glenohumeral, instability, ligament, avulsion, sports, HAGL, shoulder pain

Introduction

Chiropractors frequently see patients with upper extremity injuries that include the shoulder. Respondents to the 2015 National Board of Chiropractic Examiners¹ Practice Analysis indicated that on average 8.3% of patients present with a chief complaint involving the upper extremity. The pathology of shoulder instability frequently includes injury to both the labrum and the capsule. Labral injury can occur via separation of the labrum from the glenoid rim or direct bony injury to the anteroinferior glenoid, also known as a Bankart lesion^{2,3}, whereas capsular injury occurs as plastic deformation of the capsule or capsular stretching. In a small number of cases, capsular rupture may occur either midsubstance or directly off the humeral attachment^{4,5}. This type of capsular detachment is known as a humeral avulsion of the glenohumeral ligaments (HAGL).

The inferior glenohumeral ligament-labral complex is the primary anterior stabilizer of the shoulder when the arm is at 90 degrees of abduction and external rotation. This complex consists of anterior and posterior bands, in addition to an interposed axillary pouch that attaches to the humerus just below the articular margin of the humeral head in two distinct configurations: a collar-like attachment or V-shaped attachment⁶. If the glenoid is viewed as a face of clock (Figure 1), the attachments of the anterior band of the inferior glenohumeral ligament labral complex range from the 2 o'clock to the 4 o'clock position, whereas the attachments of the posterior band range from the 7 o'clock to the 9 o'clock position.^{6,7} In the two largest clinical series in the literature, the HAGL lesion has been reported to occur in 7.5% to 9.4% of patients under-

symptômes après un traitement de 4 séances sur quatre semaines.

Résumé : *Ce cas montre la mise en œuvre réussie d'un plan conservateur de traitement, suggérant que le traitement prescrit à ce patient doit être envisagé et tenté avant la chirurgie arthroscopique.*

(JCCA. 2016;60(2):175-181)

MOTS CLÉS : chiropratique, glénohuméral, instabilité, ligament, avulsion, sports, HAGL, douleur à l'épaule

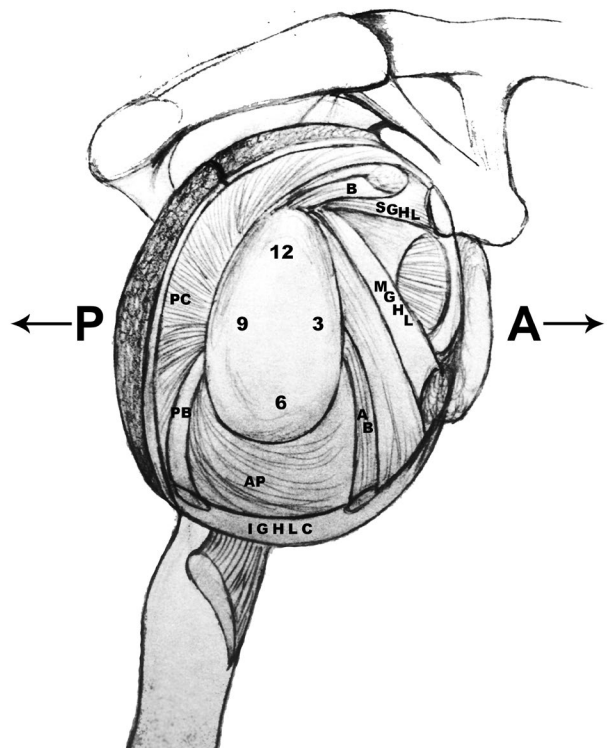


Figure 1.

Schematic drawing of the shoulder joint capsule indicating the location and extent of the inferior glenohumeral ligament labral complex. A – anterior, P – posterior, B – biceps brachii tendon, SGHL – superior glenohumeral ligament, MGHL – middle glenohumeral ligament, IGHLC – inferior glenohumeral ligament labral complex, AB – anterior band, PB – posterior band, PC – posterior capsule. Numbers are clock referents.

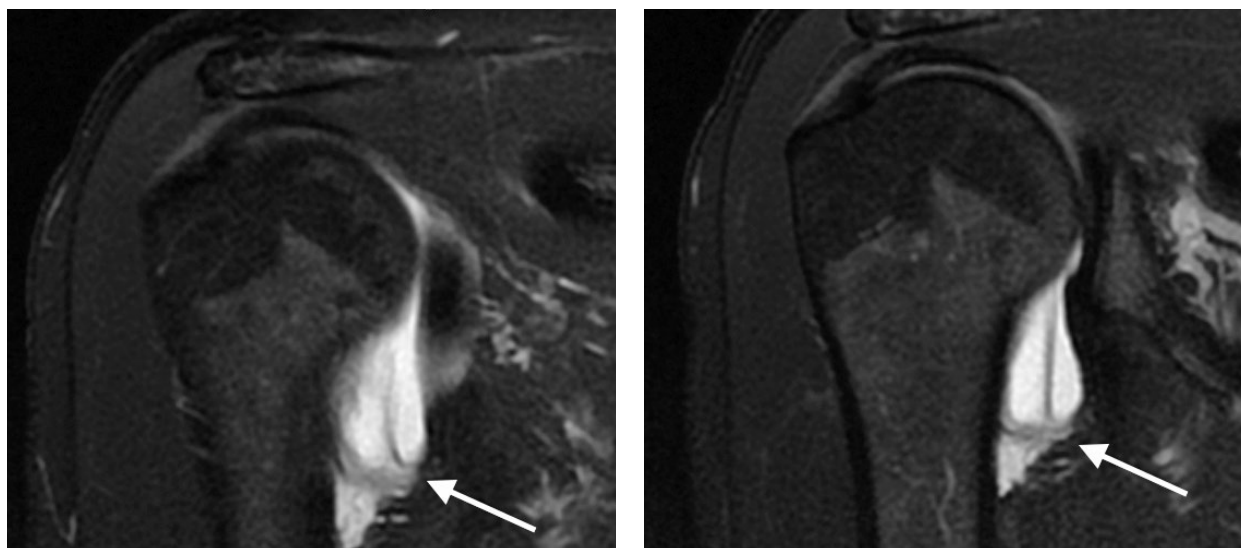


Figure 2.

MRA images showing direct visualization of discontinuity of the inferior glenohumeral ligament and extravasation of contrast material in the region of the capsular avulsion²¹ with white arrows indicating the HAGL lesion in the patient presented in this case report.

going arthroscopic surgery for anterior instability and in 1.0% to 9.0% of patients with recurrent instability.⁸

The purpose of this case presentation is to present the assessment and successful conservative management of a patient with multi-factorial chronic shoulder pain in the presence of an MRA-confirmed HAGL lesion.

Case Presentation

A 47 year-old active female presented with a chief complaint of constant, deep, right shoulder pain with no radiation, rated as a 2 to 3 out of 10 on a verbal pain-rating scale (VPRS) at rest and 5 to 6 out of 10 with certain activities, including rowing and using an elliptical. She explained that she “tore something” in her right shoulder approximately five years ago while performing reverse bicep curls with her personal trainer. The patient commented that she occasionally found this pain would interrupt her sleep and noticed a catching and clicking sensation, but she was unable to describe the specific movements that would recreate this. She had found mild relief with massage therapy and exercises prescribed by a physical therapist. Associated symptoms included mild neck stiffness and a “sore upper back”. A systems review

was unremarkable with respect to her chief complaint. A diagnostic ultrasound study ordered by her medical doctor revealed mild-to-moderate acromioclavicular osteoarthritis and no evidence of rotator cuff pathology. The patient explained that she had previously been taking medication to treat vertigo but was now in good health and had an unremarkable family history. She also revealed two previous motor vehicle accidents in 1987 and 1995 in which she was rear-ended and suffered what she described as mild whiplash.

Upon physical examination, active and passive shoulder ranges of motion were full while recreating the chief complaint at all end ranges. Resisted right shoulder flexion at 90 degrees was rated a 4/5 using the Medical Research Council Scale for Muscle Strength^{9,10}, a cervical spine screen – testing for facet, disc, and neurological incarceration in the cervical spine was normal with the exception of a positive Kemp’s test between C7-T1. Yergason’s, Speed’s and O’Brien’s tests were positive on the right as was horizontal adduction and the Crank test, insofar as reproducing the pain of chief complaint. Neer’s, Empty Can, Full Can and Hawkins-Kennedy tests were negative, however weakness of the right supraspinatus (4/5)^{9,10} was

Table 1.
Breakdown of the early, middle, and late phase rehabilitation protocol utilized in this case.

	Early Phase (Approximately 0-3 weeks)	Middle Phase (Approximately 3-8 Weeks)	Late Phase (8 + Weeks)
Goals	<ul style="list-style-type: none"> • Maintain full range of motion (ROM); • Improve resting scapular positioning and mobility; • Improve postural awareness 	<ul style="list-style-type: none"> • Progression of scapular stabilization; • Strengthen muscles of rotator cuff 	<ul style="list-style-type: none"> • Continue strengthening incorporating multi-directional movement patterns
Exercises	<ul style="list-style-type: none"> • Shoulder elevation active ROM; • Scapular Retraction/Bilateral Row with resistance band; • Prone lying isometric shoulder adduction and external rotation with scapular depression (“Robbery” position) (Figure 3); • Shoulder Circles at wall (with ball) – clockwise and counter clockwise; • Scapular Clock (Figure 4) – Resistance band shoulder protraction 	<ul style="list-style-type: none"> • Push-up plus from table level; • Lat pull down; • Resistance band shoulder flexion/abduction from 0° to 90°. Progress to full range of motion as able; • Resistance band external rotation and internal rotation. Progress exercise elevating the arm moving the elbow away from the body up to 90°. 	<ul style="list-style-type: none"> • Resistance band horizontal abduction and alternating diagonal movement patterns²² (Figure 5); • Pulley resistance ascending/descending diagonal shoulder movement patterns; • Incorporate sport/activity specific exercises
Milestones for Progression/ Outcome Measures	<ul style="list-style-type: none"> • Full active ROM without compensation patterns; • Good scapular position in resting position; • Improved postural awareness 	<ul style="list-style-type: none"> • Able to complete all exercises with proper technique without pain 	<ul style="list-style-type: none"> • Return to all functional activity and sport related activity

noted with the Empty and Full Can tests. Palpation of the cervical spine, anterior chest wall, and periscapular muscles revealed a hypertonic and tender rhomboid major, levator scapulae, trapezius, and pectoralis major on the right. The patient was diagnosed with a suspected chronic SLAP lesion. Differential diagnoses included chronic right bicipital tendinopathy with associated myofascial pain, as well as a suspected chronic Bankart lesion.

A magnetic resonance arthrogram (MRA) was requisitioned to identify the severity of damage to the glenoid labrum and to rule out any other intra-articular pathology. While waiting for the MRA, the patient underwent a course of treatment once per week for six weeks. Her plan of management included spinal manipulation and mobilization of the cervicothoracic spine, shoulder mobilizations, and myofascial release to treat the biceps tendon, infraspinatus, teres minor, rhomboid major, levator scapulae, trapezius, and pectoralis major on the right. Shoulder mobilizations included long-axis distraction and lateral gapping of the glenohumeral joint, in addition to the “shoulder shake” – inferior distraction and oscillation while moving from neutral to 90 degrees abduction in the frontal plane.¹¹ Lateral gapping is described as a medial to

lateral push along the coronal plane of the patient with an axillary contact while bracing the distal aspect of the arm against the patient’s body.¹¹ Long-axis distraction utilizes an axillary contact for stabilization while generating an inferior pull on the distal arm in the patient’s coronal plane.¹¹ An individualized, physiotherapist-guided shoulder-strengthening program was initiated (Table 1). The patient responded very well to this plan of care – a VPRS rating of two out of 10 at worst and subjectively described 75% improvement after four visits (in four weeks) during a subsequent visit. Intra-articular viscosupplementation (Monovisc®) was also prescribed and administered 5 months after initial presentation to ameliorate the pain secondary to the AC joint arthropathy. Local anaesthesia was obtained with 1% Xylocaine and 2 cc was injected into the right AC joint under fluoroscopic guidance.

The MRA was obtained after a three-month wait (Figure 2), and indicated the following: moderate hypertrophic degenerative arthropathy of the acromioclavicular joint; mild narrowing of the supraspinatus outlet; mild subacromial/subdeltoid bursitis; humeral avulsion of the inferior glenohumeral ligament; no Hill-Sachs fracture or osseous Bankart fracture. The labrum, long head of the bi-



Figure 3.

“Robbery” isometric exercise. While lying prone, bend the elbows into a “W” position. Focus on depression of the shoulder blade. Target muscle: lower trapezius.



Figure 4.

“Scapular Clock”. Protract the shoulder and in a controlled motion move to the 4 points on a clock (12, 3, 6, 9). Target muscle: serratus anterior.

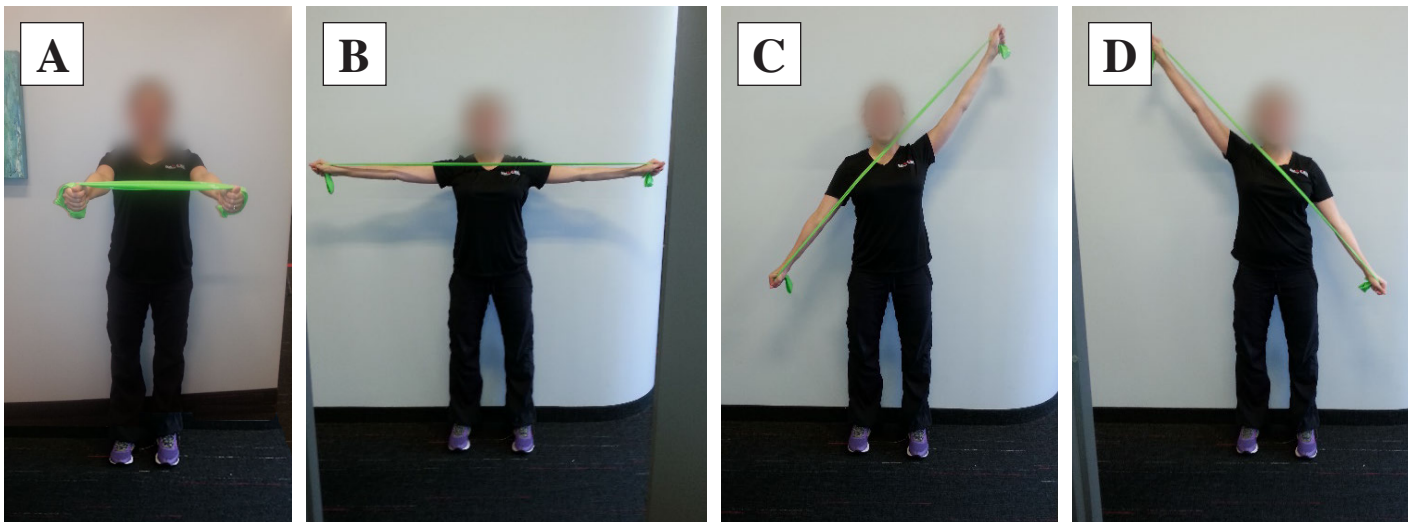


Figure 5.

From starting position (A), perform controlled movements of horizontal abduction bilaterally (B) and diagonal movement patterns (C/D). Target muscles: rhomboids, lower trapezius.

ceps tendon, supraspinatus, infraspinatus, subscapularis, and teres minor tendons were intact. The coracohumeral ligament was intact as well. Further to these findings, the radiologist noted that the patient's pain decreased only minimally with diagnostic intra-articular anaesthetic (5 cc of 1% Xylocaine) suggesting that intra-articular pathology may not be the primary pain generator, but rather the moderate AC joint arthropathy and mild subacromial bursitis as potential sources of pain.

Discussion

Although the literature has not identified a correlation between the biomechanics of a reverse bicep curl and a HAGL lesion, this particular case highlights an example of conservative management of complex chronic shoulder pain that included a fairly uncommon intra-articular lesion. Wolf¹² in a review of 64 shoulders with the diagnosis of glenohumeral instability, found a humeral avulsion of the glenohumeral ligaments lesion in 6 patients (9.4%). Bokor¹³ reviewed 547 shoulders with instability, and the cause of instability was considered to be avulsion of the lateral capsule, including the inferior glenohumeral ligament from the neck of the humerus, in 41 patients (7.5%)^{8,14}. A review conducted by Bui-Mansfield⁶ suggested that the HAGL lesion has a male predominance of 97% and occurs most often in rugby players (52%); however, this lesion is found in patients who participate in many other activities and sports including diving, football, basketball, surfing, skiing, or in those having been involved in a motor vehicle accident. Bokor¹³ found that of the patients diagnosed with a HAGL lesion, those with rotator cuff tears had a mean age of 33.8 years, while those with isolated HAGL lesions had a mean age of 25.9 years (range of 17 to 41). This case is unique as the patient is female and was 42 years of age at the time of her injury.

94% of HAGL lesions are diagnosed after violent trauma, however, they can result from repetitive microtrauma including overhand throwing.¹⁴ Nicola¹⁵ suggested from a cadaveric study that the articular capsule is torn from the humerus as a result of 105 degrees of hyper-abduction and external rotation, whereas a Bankart lesion occurs as a result of hyper-abduction and impaction. Further to this, Bigliani¹⁶ showed that three failure sites exist for the components of the inferior glenohumeral ligament complex: glenoid insertion (40%), ligament midsubstance (35%), and humeral insertion (25%). Con-

sidering the humeral involvement of this patient's injury and its decreased likelihood of occurrence, it is unclear as to why this patient suffered a HAGL lesion.

In a review, Bui-Mansfield⁶ found that 68% of patients presenting with HAGL's have associated injuries such as Hill-Sachs lesions (10%), Bankart lesions (22%), and most commonly, rotator cuff tears (27%) – particularly of the subscapularis muscle¹³. The patient in this case did not present with any of the aforementioned pathology, however, MRA findings indicated moderate hypertrophic degenerative arthropathy of the acromioclavicular joint, mild narrowing of the supraspinatus outlet, and mild subacromial/subdeltoid bursitis.

There is no specific clinical test that may differentiate a HAGL from a standard Bankart lesion¹⁴, however, in the case of anterior instability, a history of repetitive microtrauma with generalized ligamentous laxity during the physical exam is thought to be a common presentation with the hallmark abnormality believed to be inferior capsular laxity with or without associated lesions of the labrum-ligament complex¹⁷⁻¹⁹. In spite of this, the patient did not present with generalized glenohumeral joint laxity during the physical exam. In an effort to identify therapeutic techniques that were relieving during treatment visits, mobilizations such as lateral gapping and long-axis distraction were utilized. This may be the direct result of decreasing compression to the subacromial bursa that was found to be inflamed via MRA, or perhaps an analgesic response to stretching hypertonic musculature such as the right trapezius.

Plain radiographs are rarely helpful in the diagnosis of a HAGL lesion, although scalloping of the medial aspect of the humeral neck on the anteroposterior view has been reported a specific finding.¹⁴ MRA is the most reliable diagnostic imaging technique for detecting labroligamentous lesions and the presence of joint effusion or intra-articular injection of contrast fluid is necessary to detect HAGL lesions on MR images.⁸ That being said, Bui-Mansfield⁶ asserts that the diagnosis of the HAGL lesion is missed in up to 50% of cases based on imaging studies alone.

Management of a HAGL lesion depends on the presence of associated injuries. An isolated HAGL lesion may be treated with a sling immobilizer for 4 weeks followed by a shoulder-strengthening program.²⁰ To the best of our knowledge, we are the first in the English language to de-

scribe in detail the conservative management of complex chronic shoulder pain in the presence of a HAGL lesion. When necessary, arthroscopic surgery of a HAGL is safe, reproducible, and effective.¹⁴

Summary

The HAGL lesion is a potentially important cause of anterior instability of the glenohumeral joint. The HAGL lesion should be considered after any traumatic shoulder injury, including anterior shoulder dislocation, or in any patient presenting with recurrent instability. Of note, the HAGL lesion tends to present concurrently with shoulder pathology including rotator cuff tears. In athletic populations, the need for, and the recovery associated with arthroscopic surgery should be weighed against an attempt at non-surgical treatment. This case demonstrated the successful implementation of a conservative plan of management suggesting that arthroscopic surgery may not be necessary in some cases.

Acknowledgements

The authors would like to express their immense gratitude to Ms. Salima Hirji for her schematic drawing of the shoulder joint capsule.

References:

1. National Board of Chiropractic Examiners [Internet]. Greeley, CO: National Board of Chiropractic Examiners; 2015 [cited 2015 June 20]. Available from: <http://www.nbce.org/practiceanalysis/>.
2. Bankart ASB. Recurrent or habitual dislocation of the shoulder-joint. *BMJ*. 1923; 2:1132-1133.
3. Bankart ASB. Pathology and treatment of recurrent dislocation of shoulder-joint. *Br J Surg*. 1938; 26:23-29.
4. Rowe CR, Patel D, Southmayd WW. The Bankart procedure: a long-term end-result study. *J Bone Joint Surg Am*. 1978; 60(1):1-16.
5. Rowe CR, Zarins B, Ciullo JV. Recurrent anterior dislocation of the shoulder after surgical repair. Apparent causes of failure and treatment. *J Bone Joint Surg Am*. 1984; 66(2):159-168.
6. Bui-Mansfield LT, Taylor DC, Uhorchak JM, Tenuta JJ. Humeral avulsion of the glenohumeral ligament: imaging features and a review of the literature. *AJR*. 2002; 179:649-655.
7. O'Brien SJ, Neves MC, Arnoczy SP, et al. The anatomy and histology of the inferior glenohumeral ligament-complex of the shoulder. *Am J Sports Med*. 1990; 18:449-456.
8. Liavaag S, Stiris MG, Svenningsen S, Enger M, Pripp AH, Brox JI. Capsular lesions with glenohumeral ligament injuries in patients with primary shoulder dislocation: magnetic resonance imaging and magnetic resonance arthrography evaluation. *Scand J Med Sci Sports*. 2011; 21:e291-e297.
9. O'Brien M. *Aids to the Examination of the Peripheral Nervous System*. 5th ed. Philadelphia: Saunders Ltd; 2010.
10. Paternostro-Sluga T, Grim-Stieger M, Posch M, Schuhfried O, Vacariu G, Mittermaier C, et al. Reliability and validity of the medical research council (MRC) scale and a modified scale for testing muscle strength in patients with radial palsy. *J Rehabil Med*. 2008; 40:665-671.
11. Gleberzon B, Ross K. *Manual of diversified diagnostic and therapeutic procedures*. Toronto: Candian Memorial Chiropractic College; 2010.
12. Wolf EM, Cheng JC, Dickson K. Humeral avulsion of the glenohumeral ligaments as a cause of anterior shoulder instability. *Arthroscopy*. 1995; 11(5):600-607.
13. Bokor DJ, Conboy VB, Olson C. Anterior instability of the glenohumeral joint with humeral avulsion of the glenohumeral ligament. *J Bone Joint Surg Br*. 1999; 81(1):93-96.
14. Parameswaran AD, Provencher MT, Bach Jr BR, Verma N, Romeo AA. Humeral avulsion of the glenohumeral ligament: injury pattern and arthroscopic repair techniques. *Sports Med Update*. 2008; 31(8):773-779.
15. Nicola T. Anterior dislocation of the shoulder: the role of the articular capsule. *J Bone Joint Surg Am*. 1942; 25:614-616.
16. Bigliani LU, Pollock RG, Soslowsky LJ, Flatow EL, Pawluk RJ, Mow VC. Tensile properties of the inferior glenohumeral ligament. *J Orthop Res*. 1992; 10:187-197.
17. Chung CB, Sorenson S, Dwek JR, Resnick D. Humeral avulsion of the posterior band of the inferior glenohumeral ligament: MR arthrography and clinical correlation in 17 patients. *AJR*. 2004; 183:355-359.
18. Gerber C, Nyffeler RW. Classification of glenohumeral joint instability. *Clin Orthop*. 2002; 400:65-76.
19. McIntyre LF, Caspari RB, Savoie FH 3rd. The arthroscopic treatment of multidirectional shoulder instability: two-year results of a multiple suture technique. *Athroscopy*. 1997; 13:418-425.
20. Oberlander MA, Morgan BE, Visotsky JL. The BHAGL lesion: a new variant of anterior shoulder instability. *Athroscopy*. 1996; 12:627-633.
21. Coates MH, Breidahl W. Humeral avulsion of the inferior glenohumeral ligament with associated subscapularis bony avulsion in skeletally immature patients. *Skeletal Radiol*. 2001; 30:661-666.
22. Paine R, Voight M. The role of the scapula. *Int J Sports Phys Ther*. 2013; 8(5):617-629.