3 President's Message
7 Ask the Experts
14 Point/ Counterpoint

Inside AANA

ARTHROSCOPY ASSOCIATION OF NORTH AMERICA FOURTH QUARTER 2013

What's in this Issue

Check out the Calendar of Events on page 19

Visit **www.aana.org** to register.

Metcalf/AANA Winter Meeting

By Robert T. Burks, MD

The 35th annual Robert W. Metcalf, MD and Arthroscopy Association of North America (AANA) joint sponsored meeting provides attendees an unparalleled educational experience in orthopaedics. Our goal and mission is to provide the highest quality instruction in arthroscopic and reconstructive shoulder, knee and hip surgery with the emphasis on being truly relevant to the practicing orthopaedic surgeon. Courses will present cutting-edge information while keeping the focus on solving practical clinical problems.

Combining the two courses has the added advantage of providing a single venue where a world-class faculty can convene to share their knowledge in an interactive format with participants and faculty alike. Participants will have the opportunity to:

- State strategies to improve techniques for shoulder stabilization
- Define appropriate indications for SLAP repair
- Identify indications, techniques and potential complications for AC joint reconstruction
- Articulate management for patellar pain and instability
- Identify best treatment strategies for articular injuries in the knee

We are confident the Arthroscopic Surgery 2014 will be a worthwhile learning experience that will enhance practice and patient care. Meeting attendance credit for AANA members is also available. This live activity has been approved for *25 AMA PRA Category 1 Credit*.™

Robert W. Metcalf, MD / AANA Orthopedic Surgery Seminars, Inc.
www.metcalfmeeting.org

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L to R: Ed Goss, *Executive Director of AANA;* Holly Albert, *Director of Meetings and Exhibits; and* William R. Beach, *First Vice President.*

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Message from the President

Thomas Byrd, MD

Greetings to all and I wish each of you a joyous Holiday season and great New Year. We are fresh off a successful and innovative Fall Course. The 500 or so who attended gained exposure to all of the latest technical and technological advancements available in the realm of arthroscopic surgery. For those who missed it, plan early for the 2014 Fall Course in Palm Desert, November 6-8, 2014.

Next on the horizon is the Metcalf/AANA Winter Meeting in Snowbird, Utah -- January 22-25. Meeting chairman Bob Burks has assembled an all-star faculty which will present the latest in all aspects of complex shoulder management, including arthroplasty, comprehensive knee management, and hip arthroscopy. This venue is always superb, and ample time is allotted for outdoor winter activities in addition to the CME activities.

I just wanted to take a moment to express how proud AANA is of its great working relationship with our industry partners. They understand the importance of surgeon education as we all strive to improve the care we deliver to the patients that we serve. It is through these relationships that AANA has been able to provide the highest level of independent, fair, balanced, and bias-free continuing medical education. However, of equal importance is AANA's ability to serve as an advocate for patients, preserving their rights for access to healthcare, often serving for individuals who otherwise have no voice. Contributions of both time and talents by you, our members, and by our industry partners, provide essential support to these efforts.

Your membership in AANA is meaningful and makes a difference. This fuels the AANA engine, and is the source of manpower in AANA's advocacy role. This was recently illustrated through reversal of a non-coverage decision for treatment of femoroacetabular impingement (FAI) in Oregon. Of course, this is an issue dear to my heart, but signifies how AANA is leading the charge in patient advocacy, preserving access to the latest treatment advances in a country that has the greatest medical resources in the world.

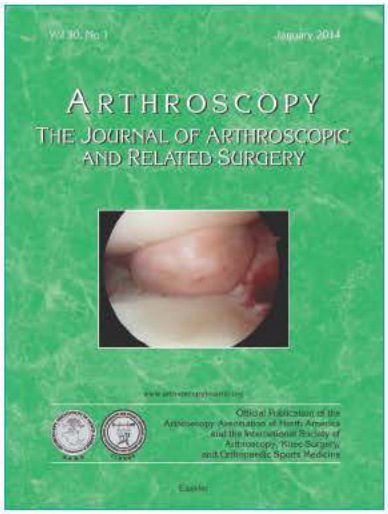
Mark your calendars for the 33th Annual Meeting of the Arthroscopy Association of North America in Hollywood, Florida, May 1-3, 2014. You will see some exciting innovative changes focusing on better surgeon education. The exhibit area is undergoing transformation. These changes will be conducive to maximizing the use of time and optimizing each surgeon's experience at the meeting. Watch for more on this in our next newsletter and start making plans to attend – May is just around the corner.

In closing, again, I wish each of you a joyous Holiday season and a great start to the New Year.

Arthroscopy: The Journal of Arthroscopic and Related Surgery

Arthroscopy Techniques

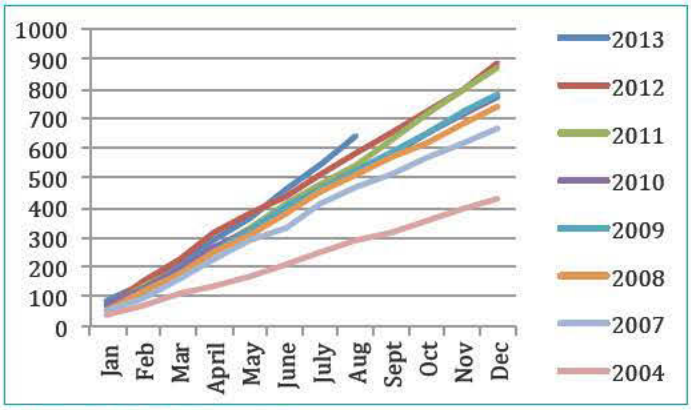
By Gary G. Poehling, M.D. Editor-in-Chief



The publishing landscape for scientific journals is changing rapidly and our two journals, *Arthroscopy* and *Arthroscopy Techniques*, are adapting as new technologies become available. We now have a strong and active presence on the social media platforms Facebook and Twitter. We have a completely redesigned Web sites for both *Arthroscopy and Arthroscopy* Techniques; they are now cleaner and less cluttered and, importantly, the videos load much more quickly and consistently. *Arthroscopy Techniques* has thrived; as of the end of 2013 we will have published 152 technical notes with videos and we are presently publishing 3 new videos every week.

We are working with our publisher Elsevier on an entirely new HTML5 Web publishing platform, scheduled to go live in 2014. This will greatly improve the interface for users and enable mobile use with no restrictions as is currently the case.

Our submissions continue to grow not only in numbers but also in quality. Our impact factor increased to 3.103 and we look for that trend to continue. We are very excited about the future and our ability to bring orthopaedic knowledge from all over the world to be shared for the benefit of our patients. We thank all of you for your support!



Submission of Arthroscopy

The 2013 *Arthroscopy* Journal Prize

Best Level I Study Published in 2013

The Editor-in-Chief, Assistant Editor-in-Chief, Deputy Editor, and Associate Editors are pleased to announce that the 2013 *Arthroscopy* Journal Prize of $5,000 for Best Level I Evidence is awarded to:

Jung Ho Noh, M.D., Ph.D., Young Hak Roh, M.D., Bo Gyu Yang, M.D., Seung Rim Yi, M.D., Ph.D., and Sung Yup Lee, M.D.

Femoral Tunnel Position on Conventional Magnetic Resonance Imaging After Anterior Cruciate Ligament Reconstruction in Young Men: Transtibial Technique Versus Anteromedial Portal Technique

Arthroscopy 2013;29:882-890.

AANA's Fundamentals of Arthroscopic Surgery Training (FAST) Program:

A New Way to Learn Basic Arthroscopy Skills

By Robert A. Pedowitz, MD, PhD

FAST
FUNDAMENTALS OF ARTHROSCOPIC SURGERY TRAINING

Medical simulation involves *anything* that offers educational value outside of the clinical domain. From this perspective, orthopaedic surgeons have been using simulation for many years, for example cadaver dissection (to learn anatomy and rehearse surgical approaches), task simulation (using bone and joint models), and development of arthroscopic knot skills (using rope or suture on knot-tying boards). A more recent alternative is high-tech virtual reality (VR) training, which involves computers, haptic devices, and advanced gaming technology. These devices allow for realistic simulation of full surgical procedures. The marketplace for virtual reality continues to grow, and it is likely that the affordability index for VR medical training will improve as the associated technologies proliferate. At the same time, we still need practical and cost effective training platforms designed for basic skills development.

Orthopaedists, especially arthroscopic surgeons, have a natural passion for "gizmos". This attraction causes us to focus upon the operation and the associated instruments, with relatively little emphasis upon the core training objectives defined by well-structured educational curriculum. AANA's collaborative efforts with the AAOS and ABOS over the last few years have been directed at simulation development and implementation using a coordinated approach for fundamental orthopaedic skills training. There has been greater emphasis upon creation of curriculum that will facilitate proficiency-based progression, which is particularly important for the efficient development of surgical motor skills.

About five years ago, AANA established a simulation task force that was charged with evaluation and implementation of simulation technology for arthroscopic surgery training. A similar workgroup was established by the AAOS to look at the broader field of orthopaedic surgery. The first AAOS Simulation Summit was convened in 2011, which brought together key stakeholder organizations in the hopes of establishing an implementation strategy. During the subsequent year, the ABOS and the orthopaedic RRC approved mandates requiring surgical simulation for motor skills training in all US orthopaedic residency training programs. These mandates established rapid implementation deadlines (starting July 1, 2013), with dedicated surgical skills training during the PGY1 year for all orthopaedic training programs. Motor skills training must include dedicated time, dedicated simulation space, and a structured educational curriculum. Surgical skills programs should be integrated across the training continuum during subsequent years of residency training.

AANA responded with the Fundamentals of Arthroscopic Surgery (FAST) Training Program. The FAST Program is designed to help programs meet these new educational requirements. The program is equally suitable for practicing surgeons and training programs worldwide who wish to develop or improve basic arthroscopy skills. The FAST Program is a collaborative initiative of AANA, AAOS, and ABOS. Financial contributions from each organization were made available to underwrite the work of the FAST workgroup, which includes Rob Pedowitz, MD, PhD (Chair), Mark Hutchinson, MD, Keith Nord, MD, Rob Hunter, MD, Chris Geary, MD, Howard Sweeney, MD, and Gregg Nicandri, MD. None of the committee members have any personal financial interest in this effort.

The FAST workgroup utilized a standardized curriculum template, which was also used by the ABOS Basic Motor Skills taskforce to create the other orthopaedic basic surgical skills modules. We de-constructed arthroscopy into its most fundamental elements, and worked back up from there. Basic curriculum modules include arthroscopic equipment tutorials, fundamental triangulation skills, use of hand instruments, arthroscopic suture passage, suture anchors, and arthroscopic knot tying skills. Ambidextrous performance is emphasized, since this is one of the more challenging components of

continued on page 6

AANA's FAST Program:

A New Way to Learn Basic Arthroscopy Skills

continued from page 5

arthroscopic proficiency. These educational modules and video tutorials are available, *without charge*, for any orthopaedic program and for any individual wishing to utilize the FAST program in whole or in part *(https://www.abos.org/abos-surgical-skills-modules-for-pgy-1-residents.aspx)*.

Once our curriculum was well-defined, the FAST project team created a modular workstation, which was designed specifically for simulation training of basic arthroscopy skills. The FAST workstation was a collaborative effort with Sawbones (Vashon, WA). The workstation directly complements each core element of the FAST program curriculum. Basic skills can be practiced under direct visual control, under direct vision working through a clear dome with multiple working portals, or with video-arthroscopic visualization with an opaque dome that has identical working portals. This approach allows for deliberate and sequential progression from simple to complex ambidextrous motor skills, which (we hope) will facilitate development and enhancement of good surgical habits.

The FAST workgroup also developed a novel and relatively inexpensive knot testing device that every arthroscopic surgeon will want to use in order to assess their personal knot tying skills. After a surgeon creates a suture loop using arthroscopic knot technique, the knot tester allows for defined load application to the suture loop. The device gives the surgeon a direct measurement of loop expansion caused by a defined load. It is a humbling experience, but in the end the knot tester should make us all better. After all, what matters most for our patients is whether our arthroscopic knots actually hold! The FAST knot tester is a new way to measure and improve technical skills in practicing arthroscopic surgeons, and it provides immediate and objective feedback that should enhance performance in clinical practice.

Our hope is that orthopaedic training programs and practicing surgeons worldwide will utilize the FAST program, and that this will become an integral part of a proficiency-based paradigm shift. There is plenty of room for curriculum improvement and for simulation product development. New technologies and creative alternatives will surely emerge, though the core concepts will remain relatively constant. Virtual reality training will grow over the coming years, and it is great to see that companies around the world are already incorporating the concepts of the FAST program into their VR training platforms. IN parallel, products like the FAST workstation are likely to satisfy a lower-cost training niche. Ultimately, our goal is to provide effective, practical, and cost-efficient solutions that improve fundamental arthroscopy education and enhance surgical patient care. It is nice to report that AANA continues to lead the way!

Ask the Experts- Acromioclavicular Joint Reconstruction

By Michael E. Pollack, MD

Acromioclavicular joint reconstruction has become increasingly popular for severe and unstable injury patterns. Reconstruction has evolved to a more anatomic technique often with graft augmentation. Controversy exists as to the best technique, as there are dozens, for this exacting procedure. The postoperative course of these high demand patients can be frustrating, fraught with radiographic failures and complications.

We have asked our expert panel to share their wisdom and hard learned lessons with us. We gratefully acknowledge the contributions of Dr.'s John Tokish, Mark Lemos, Gus Mazzocca, and Peter Millett.

1. What are your surgical indications for repairing/ reconstructing the acute acromioclavicular separation?

Tokish: Surgical indications in general would include open injuries, skin tenting, and in some associated injuries (severe displaced clavicular fractures, e.g.).

The traditional indications of conservative management of low grade (Rockwood grade I and II), and *surgical management of higher grade (IV-VI) AC separations remain a good guideline* for decision making. More difficulty arises with the Rockwood Grade III injury where there is less consensus. Part of the confusion comes from the classification itself, as differentiating between a grade III complete dislocation and a grade V "severe" complete dislocation is often inconsistently applied; Rockwood's original description (Rockwood, 1984) noted a grade III separation as having a 25-100% increase the CC ligament distance compared to the opposite side on a Zanca view, and a grade V demonstrating a 100-300% increase.

Many grade IIIs become grade Vs with hanging weight, and while little data exists to clarify its clinical significance, this may be a better approximation of how the patient will use their shoulder in real life. Similarly, Basamania popularized the cross-arm adducted X-ray view (Bontempo, BJSM, 2010), noting that in this position some AC separations overlapped, which he defined as unstable. More recently, Wellmann (Orthopade 2013) has advocated stress radiographs in the horizontal plane, noting that horizontal instability is independent of vertical dislocation, rendering a less stable joint. These findings may portend less successful non-operative management, but studies are lacking to make these findings definitive risk factors.

In the *vast majority of studies on grade III injuries, conservative management has been proven effective.* This includes multiple systematic reviews and prospective cohort comparisons with operative treatment. In the most recent of these (Beitzel Arthroscopy 2013) the authors evaluated 14 studies that compared operative vs. conservative treatment and noted a high rate of successful treatment in both groups. They noted that the *non-operative group returned to work in roughly half of the time compared to operatively managed cases.*

That being said, surgeons who manage active populations will note that there are certain subsets of patients with these injuries who do not do well with conservative treatment. *In my population of active duty military warriors, it is not uncommon to see patients fail conservative management for their AC separation.* This is likely due to the occupational requirements of these patients. Murena (KSSTA 2012) has shown that non-operative management of grade III AC injuries alters scapular motion and mechanics, and Schlegel et al (AJSM 2001) noted a 17% decrease in bench press in patients with AC joint injuries treated conservatively. Thus in a population where push-ups and pull-ups are an occupational necessity, operative intervention is often required.

I would not recommend acute surgical management of the elite thrower with an AC joint injury, however. First, many do fine with conservative management (Schlegel, NFL Team Physicians, 2000; McFarland, MLB pitchers, AJO 1997). Secondly, operative treatment will likely end the thrower's season anyway, and thus there is enough time to try conservative management.

Lemos: There is a consensus that T*ypes IV, V and VI be treated operatively* because of the significant morbidity associated with these injury patterns and can lead to a dislocated, unstable AC joint with periscapular shoulder dysfunction.

Imaging should include an AP of the "AC joint" be ordered as this requires less beam penetration than a shoulder radiograph as well as an *axillary view which will help discern Type IV injuries.* I have had a reading come back of an AP of the AC joint as an "adequate distal clavicle excision" in a patient who did not have an operative procedure and

continued on page 8

Ask the Experts- Acromioclavicular Joint Reconstruction

continued from page 7

who had a Type IV injury. Therefore, it is important to image in two planes.

Mazzocca: My indications for repairing the acute acromioclavicular separation are *severely symptomatic grade IV, V & VI injuries*. In my practice I have found that the Grade IV (dislocation into the trapezius) is really the most painful. The Grade V are generally very similar to the Grade III just obviously more damage (dislocation through the deltotrapezial facsia). I have not seen any Grade VI in my career up to this point but with that devastating high trauma injury I would fix it as quickly as possible.

My key radiographic findings are with *a bilateral Zanca view which incorporates both shoulders, the normal and the injured shoulder in the same radiographic exam so the coricoclavicular distance can be measured. Axillary radiographs* are also evaluated to determine *positions of the clavicle in relation to the acromion*. Be sure to check for any fracture of the coracoid process.

My key physical finding is pain, lack of range of motion, lack of strength but specifically would be shrug sign. Dr. Bernard Bach taught me this where you have the patient *shrug their shoulders and if they can reduce their AC joint then they have a Grade III if they cannot reduce their AC joint with a shoulder shrug (activating the trapezius muscle) then they have a Grade V*.

In general, I treat AC joint injuries quite conservatively. Even most Grade III and even some Grade V depending on the patient we will *wait 3-4 weeks to see how their pain is and see what their function is*. If they can return to their normal activities of daily living with minimal pain and will accept the cosmetic defect then we will hold on surgery. If any of these become a problem then we will proceed with reconstructive surgery.

Millett: There is a general consensus for non-operative treatment of Rockwood type 1 and type 2 lesions (Tauber et al. 2009, Beitzel et al. 2013, Tamaoki et al. 2010, Warth et al. 2013). Operative treatment is generally recommended for *Rockwood acute types 4, 6, and 6*, although I have never seen a type 6 and for acute injuries that are not passively reducible. (Warth et al. 2013, Beitzel et al. 2013). We also typically recommend *operative treatment for all chronic, symptomatic AC joint injuries, most typical of which are type 3's*. Controversy exists regarding the proper treatment of acute type 3 AC joint dislocations (Trainer, Arciero and Mazzocca 2008, Murena et al. 2013). For *acute type 3 injuries*, we discuss acute surgery on a case-by-case basis, and *usually recommend operative treatment in overhead athletes when the dominant throwing arm is affected, in manual laborers or others engaged in overhead work, and in those in whom the deformity and pain are unacceptable*.

2. What are your surgical indications for reconstructing the chronic acromioclavicular joint separation?

Tokish: My approach to the chronic AJ joint injury is similar to the acute injury. I offer surgery to those patients who *fail physical therapy for continued pain, fatigue, weakness, functional limitations, and occasionally cosmetic concerns*.

A careful physical examination with emphasis on scapular dyskinesis and deconditioning is especially critical in the work-up of these patients. Chronic cases are more likely to have decompensated dynamic stabilizers, and rehabilitation of these muscle groups is critical in both the operative and nonoperative approaches in the chronic patient.

Therefore, a trial period of physical therapy for all patients should be accomplished to ensure scapular mechanics and shoulder strength are optimized. In a military population where physical therapy is essentially unlimited, most patients have been through months of physical therapy upon initial presentation to the surgeon, and patients may not have much confidence in its further utility.

The active duty military population is also unique in that failure to remain physically fit can place one's career in jeopardy. Thus, it is important to stay engaged with these patients to determine as early as possible, which patients fail conservative treatment, so that operative intervention and postoperative recovery can be accomplished within the time allowed.

Lemos: 1) Pain at the AC joint with progressive neurologic deficits, sensory deficits or motor weakness. 2) Gross Instability of the AC joint with continued pain and weakness. It is important when discussing surgical reconstruction of the AC joint that the patients understand that their shoulder will not be perfect. Most athletes do return to their level of pre-injury play. There

is some concern of return to high level overhead sports such as professional pitching although this is an uncommon injury in this athletic population.
3) Scapulothoracic Dyskinesia, secondary to AC Joint Instability

Mazzocca: The surgical indications for reconstructing the chronic acromioclavicular joint separation would be *pain and lack of function*. If someone has persistent *pain at the AC joint or at the deltotrapezial region, pain with forward elevation greater than 120 degrees, pain with cross arm abduction, difficulty lifting weights or doing any of their sporting activities* such as hockey or football those are all indications for reconstructing the chronic AC joint.

Millett: We recommend operative treatment of chronic AC instability in those with *persistent pain, shoulder dysfunction, or unacceptable deformity*. We also recommend operative treatment for *chronic type 2 injuries that have developed symptomatic posttraumatic osteoarthritis of the AC joint*.

3. Please describe your technique for acute injuries.

Tokish: Some literature has shown (Walz 2008) that acute cases can be successfully repaired with suture button constructs. The justification is that these constructs provide anatomic reduction and allow the native ligaments to heal in this correct position. I had high hopes for the arthroscopic single tunnel GraftRope technique, but have found a near 100% failure with this device (Cook, Tokish JSES 2012).

I prefer to place *a biologic graft in every case*, and though there is no literature to confirm this reconstruction as superior to repair in the acute setting, I see no down side to using a graft-scaffold in every case. My current technique is an arthroscopic ACCR reflective of many of Gus Mazzoca's concepts, with some modifications.

First, I base my clavicle tunnels on *ratios of clavicle length* as opposed to the general 25 and 45 mm length measurements often recommended. We have found up to a 9 mm difference when using length vs. ratio methods, and *failing to lateralize the clavicular tunnels is a risk factor for failure* (Cook, Tokish, AJSM 2013). When we lateralized our conoid tunnel, for example, to no more than .25 of the length of the clavicle, we had no failures, whereas more medialized tunnels had significantly higher failure rates.

Second, *I do not cross the graft*. I have found that in many cases a crossed graft develops different tension in the limbs and I want to ensure that the graft can be equally tensioned so as not to over-tighten one limb and slacken the other.

Third, I *do not rely on intraosseous screws as sole fixation*. In our series we found a 29% radiographic loss of reduction, and in those that were revised, found slippage within the tunnel as the best explanation for early failure. I will *routinely back up the screws with suture reinforcement*.

I no longer routinely excise the end of the clavicle (Mazzocca JSES 2010), as it has been shown to supplement graft strength (Costic JOR 2003). While Kowalsky et al (AJSM 2010) noted that preservation of the AC joint adds a minimal additional protective effect to the reconstruction, I believe that *without a reinforced AC joint, the clavicle can be pulled forward by the graft, leading to laxity in the construct*.

Admittedly, I have had two cases where patients with distal clavicle preserved AC joint reconstructions have returned with isolated AC joint arthropathy. Both were confirmed with injection and temporary relief, and both had excellent pain relief after an isolated distal clavicle excision. My experience would suggest that this is an uncommon occurrence and perhaps worth the risk to optimize stability of the operation.

Lemos: The majority of AC joint reconstructions are of chronic acromioclavicular dislocations. In the acute setting, the patient is placed in a sling to fully support and elevate the arm and take tension off the injured structures. With higher grade injuries such as Type IV and Type V AC joint injuries, I will perform a sub-acute reconstruction. *I currently perform this open, and I augment it with allograft semitendinosis or tibialis*. I drill two tunnels with a 4.5 to 5.0 mm cannulated reamer (no larger than 5 mm as it increase risk of fracture). These are placed at the insertion of the conoid and trapezoid ligaments. One guide pin is placed for the *conoid ligament approximately 45 mm medial from the distal clavicle* just posterior to the midline of the clavicle in the coronal plane. A second guide pin is *placed lateral to the conoid pin by approximately 20 mm* just anterior to the midline of the clavicle. This should not be less than 15 mm from the end of the clavicle. It is also important to make sure that these bone tunnels are at least 3 mm from the edge of the clavicle to avoid cutout. In most instances, *a distal clavicle excision is performed removing less than 8 mm*. I pass my graft

continued on page 10

Ask the Experts- Acromioclavicular Joint Reconstruction

continued from page 9

and augmentation device, (synthetic tape), around the coracoid and through these tunnels to reproduce the conoid and the trapezoid ligament. If it is *a Type IV injury or I feel that there is posterior displacement of the clavicle I will also place augmentation device through one of the tunnels, usually the more medial one, and around the posterior clavicle trying to reduce the clavicle more anterior to help correct the deforming forces that have developed in the healed injury*.

Fixation of the graft is controversial. I have used interference screws, over-sewn the graft, as well as suture repair. I believe the important point of the repair and the construct is to adequately augment the reconstruction to allow the graft to heal. Unlike ACL reconstructions, there is constant tension on the repaired structure if we do not protect this.

Finally, I believe one of the most important steps in the operation is *imbricating and repairing the deltotrapezial fascia*. This is made much easier if during the initial dissection the surgeon develops *full thickness tissue flaps*.

Mazzocca: In my practice *we do not change any of the techniques for acute or chronic*. If you have an acute AC dislocation injury associated with a lateral clavicle fracture or some other problem generally speaking we will go in arthroscopically use a cortical button suture technique to reduce the clavicle to the coracoid process and then put plate over the top fixing that. In severe Grade V injuries I will also go with a anatomic coracoclavicular ligament reconstruction. We will r*econstruct anatomically both the coracoid and trapezoid ligaments as well as the posterior, superior and anterior AC joint ligaments*.

Millett: We presently use the *same technique for both acute and chronic injuries*. There are three components to the technique: (1) we fixate the *clavicle to the coracoid using suture tapes and cortical fixation buttons* placed superiorly on the clavicle and inferiorly on the coracoid; (2) we reconstruct the disrupted CC ligaments, using a *free tendon graft*; and (3) we *repair the AC ligaments primarily*. This is done in an *arthroscopically-assisted manner.*

The patient is positioned in the modified beach chair position. A standard posterior arthroscopic portal is established, the arthroscope is introduced and diagnostic arthroscopy is performed. Once concomitant intra-articular injuries are addressed, the anterior joint capsule is opened using a radiofrequency probe through the rotator interval, between the middle and superior glenohumeral ligaments. After switching to a 70° arthroscope, the coracoid process is identified and exposed. An accessory anteroinferolateral portal is established inferior to the anterolateral acromial border at the level of the coracoid. This portal is used to facilitate coracoid exposure and graft passage. The pectoralis minor and conjoined tendon attachments are preserved. A 1.5 cm incision is made within Langer's lines perpendicular to the clavicle approximately 3.5 cm medial to the AC joint. The AC joint capsule and deltotrapezial fascia are incised in-line with the clavicle. The anterior and posterior flaps that include the AC ligaments are elevated subperiosteally as a single layer and are tagged for later repair over the reconstructed clavicle. The *distal clavicle is typically preserved* as this has been shown to improve the biomechanical stability of the AC joint. When concerns about post-traumatic AC arthrosis exist, the distal clavicle is elevated from the incision and a distal clavicle excision can be performed. Reduction and reconstruction of the AC joint is supplemented with specially designed cortical fixation buttons and suture tape (Arthrex, Naples, FL). Under fluoroscopic control and with arthroscopic visualization under the coracoid, a single 2.4 mm drill hole is placed from center of the clavicle process into the posterior base of the coracoid. Two suture tape are shuttled from the anteroinferolaterial portal through the coracoid and clavicle drill holes, and cortical fixation buttons are then used to secure the construct. Under fluoroscopic control, the clavicle is reduced anatomically and fixed with the tapes and the buttons. The CC ligaments are now reconstructed with a free graft. We do not put the graft through drill holes, but *simply loop it around the coracoid and clavicle, as we found an unacceptably high complication rate with drill holes in the clavicle*. (Martetschlager et al. 2013). Soft tissue tunnels are created from posteromedial to medial on the coracoid (conoid limb) and from anterolateral to lateral on the coracoid (trapezoid limb). The allograft is then passed from posterior and medial on the clavicle around the medial aspect of the coracoid and is then shuttled superiorly along the lateral coracoid, deep to the deltoid, and anterior to the clavicle to recreate the trapezoid ligament. The allograft is secured to itself and tied over

the top of the clavicle. The graft is tensioned to remove creep and secured with figure-of-eight sutures. The free ends of the allograft may be used to augment the AC capsule, however, *we typically prefer to perform primary repair of the AC ligaments and capsule*. Following the reconstruction, fluoroscopy is typically used to ensure the joint is fully reduced and the arthroscopic portals and superior incision are closed routinely.

4. Does a chronic injury (> 6 weeks) alter this technique?

Tokish: My *technique for acute injuries is the same as it is for chronic injuries*, and it continues to evolve. Based on the pre-operative template of ratio of the clavicle, I drill a 4 mm tunnel at 17% and 25% from the lateral end of the clavicle. *I carefully ensure that I can reduce the AC joint anatomically*, and am impressed with how often this cannot be done without entering the joint to remove interposed soft tissue. Next, I perform a *shoulder arthroscopy in every case*. Both Pauly et al (JSES 2013) and Tischer et al (AJSM 2009) have shown between an 18-30% associated injury rate, which we have noted as well. Any pathology is addressed and the base of the coracoid is exposed through the rotator interval.

Next, an ACL guide or other similar aiming device is placed through the anterior portal. Removal of the cannula can aid in allowing the freedom to place this guide at the medial border of the coracoid, and the guide wire bullet is placed into the medial conoid tunnel. A blunt switching stick is placed through the bullet and advanced until it is visualized arthroscopically at the medial border of the coracoid. This can be a challenging step, and there are several tips that can help with a smooth passage of the switching stick. One can contact the coracoid and "walk" the stick medially until it just clears the medial border of the coracoid and is visualized. In cases where there is not enough freedom to accomplish this step through the clavicular tunnel, I will reposition the bullet just anterior to the clavicle and slightly divide the deltoid fascia to allow passage. Once the blunt tip is visualized at the medial border of the coracoid, the ACL guide is removed. A curette is introduced through the anterior portal and used to cup the switching stick. A metal cannulated portal introducer is then placed over the switching stick and advanced through the space to dilate a path for the graft to pass. Once the tip of the dilator is visualized, the switching stick is removed and replaced with a stiff passing suture. This is then delivered through the anterior portal.

In the same manner, the blunt switching stick is placed either through the trapezoid tunnel or just anterior to the clavicle adjacent to it, and enters the joint just lateral to the coracoid. The same dilator is used to create a path for the graft, and a ring grasper is introduced along this same path, and it is used to grasp the guide suture and to deliver it up through the lateral trapezoid tunnel. If it is necessary to go anterior to the clavicle to pass the switching stick, then an extra step is taken here with a suture lasso device to deliver each limb of the passing suture through the clavicle tunnels. The suture is not crossed, and I ensure it can be toggled to allow free passage of the graft.

Once this is accomplished, an *allograft non-irradiated semitendinosis graft* is and passed through the medial tunnel, around the coracoid, and out through the lateral tunnel. Our data showed *no difference in failure rates between allograft and autograft*, though it was underpowered (Tokish, Cook AJSM 2013), and I believe that donor site morbidity is not negligible. The *lateral (trapezoid) limb is left long enough to reach the AC joint to reinforce it later in the case*.

Next, the clavicle is reduced to its anatomic position and held in place, usually with the metal cannula introducer, placed at the lateral edge of the clavicle. With both limbs of the graft under tension, two 4.5 interference screws are placed into their respective tunnels against the graft and advanced until flush. It is critical that these *screws are long enough to be bicortical across the clavicle to maximize their strength and resistance to slippage. The medial limb is then sutured into the lateral limb with a high strength #5 suture*. The *lateral limb*, which was left long, is extended out and *sutured over the AC joint*, either with local fascia, or with a suture anchor to ensure that the posterior superior capsule is reconstructed and reinforced.

Mazzocca: We use the same technique. We drill 5 mm tunnels and based on some of our research have moved those tunnels to about 25-30 mm lateral to lateral edge of the clavicle and then 50 mm lateral to the edge of the clavicle. We will go posterior with those and ream 5 mm and then put a semitendonosis graft through that using a 5.5 interference screw. This should be very tight and difficult to penetrate. We also spend a lot of time reconstructing the AC joint. We *do not do a distal clavicle excision* we keep it. We have found with biomechanical research that this does affect the stability. We feel that fixing both an acute or chronic AC separation is due to instability and we try to maximize our stability in any way we can. If this does fail an arthroscopic distal clavicle

continued on page 12

Ask the Experts- Acromioclavicular Joint Reconstruction

continued from page 11

excision can always be performed.

Millett: We use a *tendon graft in all cases*, both in acute and chronic AC joint injuries. A few years ago I tried to only use fixation devices only without grafts but I had an unacceptably high failure rate, with failures being defined as loss of reduction. Since we have improved our arthroscopic technique we don't see any major downside to performing the technique with a tendon graft to reconstruct the CC ligaments. We typically use a *non-irradiated tibialis anterior cadaveric allograft or semitendinosus autograft*.

5. Please describe your postoperative protocol including timing of return to sports and overhead activities.

Tokish: I am very conservative in the postoperative protocol of these patients. They are instructed to remain in the *shoulder immobilizer full time for 6 weeks*. They may remove the immobilizer for showers, but I ask them to support their arm as much as possible even during this task. They are encouraged to do *hand, wrist, and elbow motion*, but only with the *arm supported*. Elbow exercises, for example, require them to come out of the sling, and so I instruct them to perform those exercises supine so they minimize the effects of gravity on their reconstruction during this early period.

At the 6-week postoperative visit the patient is instructed that they can wean themselves from the immobilizer, and formal physical therapy is initiated to work for restoration of range of motion and re-establishment of scapular rhythm.

The patient returns for a *3 month postoperative visit*, to ensure *range of motion has returned*. Patients often display some scapular abnormalities, and strengthening and resisted scapular rhythm is stressed with physical therapy.

The patient again returns at *4.5 months from surgery*. The expectation is n*ear full return of strength and the restoration of scapular rhythm*. At this point, the focus of therapy shifts to sport specific programs. Return to play decisions should always be made in conjunction with the athlete and trainer or therapist. This injury occurs most often during game situations (Dragoo AJSM 2012, Lynch AJSM 2013), and operative intervention generally ends the season. Therefore, there should be no hurry in returning the athlete to sport before the surgery has taken and the athlete is fully rehabilitated.

Lemos: Post operative management for ACCR (Anatomic Coraco-Clavicular Reconstruction) includes wearing a *brace for six to eight weeks which is a sling with a bolster*. This provides support and protects the surgical repair against the pull of gravity. At eight weeks, upright range of motion is begun. At *twelve weeks*, with pain free normal range of motion, *strengthening exercises* are begun. Most of these revolve around scapular stabilization. *Weight training* is delayed for at least *three to five months post operatively* and full contact may be allowed as early as six months. Generally, it requires *nine months to a year prior for the patient to regain full strength and return to pressing activities*.

Mazzocca: We place our patients postoperatively in a *shoulder brace (gun slinger or Lehrman) for between 6-7 weeks*. The idea of this is that we are unloading the AC joint. We do not start any motion at that time. At *6 weeks* we take them out of that and *start ROM exercises* which be obtain by 12 weeks. At *12 weeks* we start *strengthening*. At between 16-20 weeks we will start sports specific activities and generally return to high level playing at 5-6 months.

Millett: A *shoulder immobilizer is worn for 4 - 6 weeks postoperatively* to minimize strain on the CC ligament reconstruction. *Full passive motion* in the *supine position* is encouraged immediately postoperatively. *Active motion and strengthening* in the upright position begins after the 4th postoperative week and advanced per the patient's tolerance. Return *to full sport typically occurs 4 postoperatively in acute injuries and 6 months postoperatively in chronic ones*.

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Scientific Paper Review

By John D. Kelly, IV, MD

This is a review of *Tunnel Positions in Transportal Versus Transtibial Anterior Cruciate Ligament Reconstruction: A Case Control Magnetic Resonance Imaging Study.* Yau W, Fok M, Yee D. Arthroscopy, 29(6) June 2013, pp1047-1052. The purpose of this article is to examine the differences in bone tunnel position created by transtibial technique vs medial portal drilling as determined by MRI. To give you an overview of the article I have included the methods and results followed by my comments.

Methods:
42 consecutive patients underwent single bundle ACL reconstruction over an 18 month period. The first 21 patients had the femoral insertion created via transtibial technique while the second series of patients underwent creation of the femoral tunnel by means of the medial portal. 93% of patients underwent subsequent MRI studies approximately 12 months post operatively. Optimal femoral tunnel placement was defined as lateralized (less than 11 o'clock for a right knee) and posterior, as defined by residing in the posterior quadrant of femoral length on sagittal MRI (Bernard method). Tibial tunnel position was graded as optimal if it fell between 25 and 50% of the AP tibial Sagittal diameter (Amis line).

Results:
Femoral position was lower in the Medial portal drilling subset (10:18 O'Clock vs 10:54) and more posterior (74% of AP femoral diameter vs 69%). Tibial tunnels were 47% of AP tibial diameter in the medial portal group while transtibial tunnels averaged 52% (more posterior). More 'outliers' (grossly unacceptable tunnel position) were seen in the trastibial group.

Conclusions:
Medial portal drilling appeared to generate tunnels which more closely approximated contemporary 'ideal' positions for both tibial and femoral tunnel.

Comments:
Recent paradigms suggest that rotary stability of the ACL deficient knee can be better restored with more horizontally placed (lower) femoral tunnels. This more closely mimics the anatomic insertion. Similarly, the center of the anatomic tibial insertion of the ACL has been shown to be more anterior than originally conceived. In an effort to avoid notch impingement and restore "isometry" a generation of overly vertical and posterior femoral tunnels combined with a posterior tibial tunnels has produced less than optimal knee stability. This Anteromedial (Femur) Posterior Lateral (Tibia) 'mismatch' has indeed compromised the restoration of normal kinematics.

Although the 'clock' method of measuring femoral position certainly has misgivings, the femoral tunnels were indeed 'lower' in the medial portal cohort.

As one who believes in anatomic reconstruction, medial portal drilling affords more opportunity to reproduce native anatomy. Lower femoral tunnels can be achieved transtibially with some creativity; however, more reproducible results in approximating native ACL anatomy can be reliably attained with medial portal drilling.

One critique is that the study was not randomized. Furthermore, perhaps too much emphasis may have been placed on gaining a posterior position of the femoral tunnel. Also the AP diameters were made in flexion. Clearly more relevant images would be performed with the knee in flexion, where the center of the femoral insertion has been shown to approach the midline with respect to AP dimensions.

Bottom line: Medial portal drilling does not place the femoral tunnel at the mercy of the tibial tunnel. As the precise optimal tunnel locations continue to be debated, a movement toward more anatomic approximation is evident. Medial portal drilling simply affords more versatility in attaining tunnel placement where the surgeon desires.

I have been performing medial portal drilling for approximately 14 years and have been quite pleased with my results. The addition of an additional mid patella tendon viewing portal has enhanced my ability to more precisely visualize and drill an anatomic femoral tunnel.

Point/Counterpoint

Point/Counterpoint is a feature of the newsletter where doctors who have differing opinions are asked to discuss a topic. This issues topic is the treatment of AC separations.

By Joshua Port, MD

The treatment of grade three AC separations is controversial. Operative indications vary. Timing of surgery varies. Postoperative protocols vary even in very experienced hands. We are fortunate to have two esteemed shoulder surgeons: James Guerra, MD and JT Tokish, MD, to academically spar in regards to their thinking in the treatment of these injuries in the active patient population. I have asked that they represent an extreme of treatment to piqué our interests and provoke our own reflection when faced with these challenging cases and patients. We are most grateful to our authors for sage advice and clarity in defining our options. Enjoy a point – counterpoint in the treatment of grade 3 AC separations.

Acromioclavicular Joint Injuries - Point

By John M. Tokish, MD

In the vast majority of studies on grade III injuries, conservative management has proven effective. This includes multiple systematic reviews and prospective cohort comparisons with operative treatment. In the most recent of these (Beitzel Arthroscopy 2013) the authors evaluated 14 studies that compared operative vs. conservative treatment and noted a high rate of successful treatment in both groups. They noted that the non-operative group returned to work in roughly half of the time compared to operatively managed cases. While some may argue that more modern techniques will shift the standard of care toward operative intervention, no study has demonstrated them to be superior to non-operative management. Thus, based on all of the available data, it would seem most reasonable to manage the grade III AC injury conservatively in nearly all cases.

I do not believe that a Grade 3 ACJ injury heals with non-operative management. Thus the non-operative treatment program is designed to minimize pain, regain range of motion, and restore function. Patients should be counseled to understand that their cosmetic deformity will be permanent. I believe rehabilitation of this injury is an active process which is begun as soon as the patient can tolerate a progressive program. Particular emphasis is placed on scapular function, as I believe those who attain scapular control are much better able to manage their separation than those who develop scapular dyskinesis. I do not immobilize these injuries, except in the very early post-injury period for pain control, and am aware of no data that suggests that a particular form of sling or brace is superior to any other in reducing the deformity or accelerating the rehabilitation process.

There are many factors that must be considered in the evaluation and management of the acute acromioclavicular (AC) separation. Surgical indications in general would include open injuries, skin compromise, and in some associated injuries (severe displaced clavicular fractures, e.g.).

While most of these injuries do very well with non-operative management, surgeons who manage active populations will note that there are certain subsets of patients with these injuries who do not do well with conservative treatment. In my population of active duty military warriors, it is not uncommon to see patients fail conservative management for their AC separation. This is likely due to the occupational requirements of these patients. Murena (KSSTA 2012) has shown that non-operative management of grade III AC injuries alters scapular motion and mechanics, and Schlegel et al (AJSM 2001) noted a 17% decrease in bench press in patients with AC joint injuries treated conservatively. Thus in a population where push-ups and pull-ups are an occupational necessity, operative intervention is often required.

It should also be remembered that the diagnosis of these injuries is somewhat arbitrarily based on a non-gravity xray view. Under gravity or stress, many Grade 3 AC separations easily become Grade 5 injuries, and thus these radiographic approaches may be a better approximation of how the patient will use their shoulder in life. Similarly, Basamania popularized the cross-arm adducted X-ray view (Bontempo, BJSM, 2010), noting that in this position some AC separations overlapped, which he defined as unstable. More recently, Wellmann (Orthopade 2013) has advocated stress radiographs in

the horizontal plane, noting that horizontal instability is independent of vertical dislocation, rendering a less stable joint. These findings may portend less successful non-operative management, but studies are lacking to make these findings definitive risk factors.

Determining is there a failure of non-operative treatment is a bit challenging. In studies by both Weinstein (AJSM 1995), and our own work (Cook, Tokish AJSM 2013) acute approaches to these injuries fared better than chronic ones. Thus, it would be ideal to know who needed an operation, so that they could be fixed early in order to optimize their result. This data remains elusive however. Thus the vast majority of patients are managed for 12 weeks non-operatively. This should be sufficient time to allow the effects of the injury to subside, as well as to take advantage of the rehabilitation program. Patients are routinely followed and enrolled into a rehabilitation program during this time. At 12 weeks a subset of patients will still have significant shoulder pain, fatigue, and dysfunction, and if they have not responded to a rehabilitation program, they are offered surgery.

My technique for ACJ Reconstruction continues to evolve. Like many surgeons, I have tried a number of these reconstructions, and have yet found one that "cures" this problem. I had progressed from the Weaver-Dunn to open single tunnel graft reconstructions, and I had high hopes for the arthroscopic single tunnel GraftRope technique, but have found a near 100% failure with this device (Cook, Tokish JSES 2012).

My current technique for open reconstruction is similar to Mazzocca's ACCR, with some modifications (see below under pearls). My technique is identical in the acute and chronic scenario, and includes placing the patient in the beach chair position. I begin with a horizontal incision over the distal clavicle which is exposed superiorly, and of sufficient length to expose the AC joint and the conoid reference point. Based on the pre-operative template of ratio of the clavicle, I drill a 6 mm tunnel at 17% and 25% from the lateral end of the clavicle. I carefully ensure that I can reduce the AC joint anatomically, and am impressed with how often this cannot be done without entering the joint to remove interposed soft tissue. The anterior deltoid/ pectoralis is elevated off of the anterior clavicle in one robust layer for a distance of 2 cm, centered at the coracoid and long enough to include the two clavicular tunnels. The coracoid is easily accessed beneath this layer. A curved or right angled clamp is passed from medial, through the pectoralis minor at the base of the coracoid, under and against the coracoid until its tip is visualized at the lateral border of the coracoid base. This clamp is spread to allow sufficient space for the graft to pass, and a passing suture is then passed around the base of the coracoid in a retrograde fashion. Care is taken to not stray distal to the tip of the coracoid or medial, as both errors may risk the neurovascular structures.

Once this is accomplished, an allograft non-irradiated semitendinosis graft which has been prepared with locking stitches in both ends is passed around the coracoid anterior to the clavicle, and each limb of the graft is routed into its respective tunnel. I ensure that the graft can be toggled so that there is no binding which may lead to differential tension in the limbs of the graft. The lateral (trapezoid) limb is left long enough to reach the AC joint to reinforce it later in the case.

Next, the clavicle is reduced to its anatomic position and held in place, usually with a metal cannula introducer, placed at the lateral edge of the clavicle. With both limbs of the graft under tension, two 5.5 interference screws are placed into their respective tunnels against the graft and advanced until flush. It is critical that these screws are long enough to be bicortical across the clavicle to maximize their strength and resistance to slippage. The medial limb is then sutured into the lateral limb with a high strength #5 suture. The lateral limb, which was left long, is extended out and sutured over the AC joint, either with local fascia, or with a suture anchor to ensure that the posterior superior capsule is reconstructed and reinforced.

Finally the fascial layer overlying the clavicle is repaired securely, and incorporated into the underlying grafts, and the wounds are closed and dressed sterilely. A shoulder immobilizer is placed while still on the operating table. Postoperatively, xrays are taken in recovery which include an AP and modified axillary in the upright position, to confirm reduction of the AC joint. Patients are released to home once they meet postoperative criteria.

There are several modifications I have made based upon my experience with this operation to avoid common pitfalls. First, I base my clavicle tunnels on on ratios of clavicle length as opposed to the general 25 and 45mm length measurements often recommended. We have found up to a 9mm difference when using length vs. ratio methods, and failing to lateralize the clavicular tunnels is a risk factor for failure (Cook, Tokish, AJSM 2013). When we lateralized

continued on page 16

Point/Counterpoint

Acromioclavicular Joint Injuries

continued from page 15

our conoid tunnel, for example, to no more than .25 of the length of the clavicle, we had no failures, whereas more medialized tunnels had significantly higher failure rates. Templating from a pre-operative xray on a PACS system is simple and quick to do and results in a more anatomic reconstruction than with length measurements alone.

Second, I do not cross the graft. I have found that in many cases a crossed graft develops different tension in the limbs and I want to ensure that the graft can be equally tensioned so as not to over-tighten one limb and slacken the other.

Third, I do not rely on intraosseous screws as sole fixation. In our series we found a 29% radiographic loss of reduction, and in those that were revised, found slippage within the tunnel as the best explanation for early failure. I will routinely back up the screws with suture reinforcement. Further, I have evolved to taking a limb of the graft to reconstruct the AC joint itself, which may help stabilize the horizontal motion of the reconstruction.

I no longer routinely excise the end of the clavicle (Mazzocca JSES 2010), as it has been shown to supplement graft strength (Costic JOR 2003). While Kowalsky et al (AJSM 2010) noted that preservation of the AC joint adds a minimal additional protective effect to the reconstruction, I believe that without a reinforced AC joint, the clavicle can be pulled forward by the graft, leading to laxity in the construct.

Admittedly, I have had two cases where patients with distal clavicle preserved AC joint reconstructions have returned with isolated AC joint arthropathy. Both were confirmed with injection and temporary relief, and both had excellent pain relief after an isolated distal clavicle excision. My experience would suggest that this is an uncommon occurrence and perhaps worth the risk to optimize stability of the operation.

Graft choice

My current choice for graft is an allograft semitendinosis. In our series of reconstructions, we found no difference in failure rates between allograft and autograft, though it was underpowered (Tokish, Cook AJSM 2013), and I believe that donor site morbidity is not negligible. No other study to my knowledge has evaluated allograft vs. autograft in AC joint reconstructions.

Post op protocol and return to sport/work

I am very conservative in the postoperative protocol of these patients. They are instructed to remain in the shoulder immobilizer full time for 6 weeks. They may remove the immobilizer for showers, but I ask them to support their arm as much as possible even during this task. They are encouraged to do hand, wrist, and elbow motion, but only with the arm supported. Elbow exercises, for example, require them to come out of the sling, and so I instruct them to perform those exercises supine so they minimize the effects of gravity on their reconstruction during this early period. Patients are seen around 10 days postoperatively for a wound and postoperative check, and these concepts are reinforced at that time.

At the 6-week postoperative visit the patient is instructed that they can wean themselves from the immobilizer, and formal physical therapy is initiated to work for restoration of range of motion and re-establishment of scapular rhythm. Routine standing xrays to include AP, scapular-y, Zanca, and axillary views are taken. We evaluate the coracoclavicular distance, and the position of the joint in the anteroposterior plane under the effects of gravity.

The patient returns for a 3 month postoperative visit, to ensure range of motion has returned. Patients often display some scapular abnormalities, and strengthening and resisted scapular rhythm is stressed with physical therapy.

The patient again returns at 4.5 months from surgery. The expectation is near full return of strength and the restoration of scapular rhythm. At this point, the focus of therapy shifts to sport specific programs. Return to play decisions should always be made in conjunction with the athlete and trainer or therapist. The therapist often has much more contact with the player and can note subtle breakdowns in the athlete's sport specific technique that are missed on follow-up examination by the surgeon. This injury occurs most often during game situations (Dragoo AJSM 2012, Lynch AJSM 2013), and

operative intervention generally ends the season. Therefore, there should be no hurry in returning the athlete to sport before the surgery has taken and the athlete is fully rehabilitated.

Disadvantages of the arthroscopic approach

I believe this operation can be effectively done either arthroscopically or open. The one advantage of the arthroscopic approach is the potential to address additional intraarticular pathologies. Both Pauly et al (JSES 2013) and Tischer et al (AJSM 2009) have shown between an 18-30% associated injury rate, which we have noted as well. Any pathology is addressed and the base of the coracoid is exposed through the rotator interval. The primary disadvantage of the arthroscopic approach is the additional cost and time involved, though this is of minimal impact.

G3 Acromioclavicular Joint Reconstruction - Counterpoint

By James J. Guerra, MD

There is little debate with respect to the management of grade 1-2 AC injuries, which are routinely treated conservatively, nor grade 4-6 separations, which we all agree require surgery. However, there is substantial controversy with respect to treatment of grade 3 pathology. Expert opinion – including that of my esteemed colleague, Dr. Tokish—is that it is best to wait 3 months and reconstruct only those who remain symptomatic. Expert opinion is just that and is not necessarily founded on sound evidence-based medicine.

If we look to the literature, there are now at least four studies that strongly support the rationale for early intervention 2,2,5,7. In a recent well performed meta-analysis of the treatment of AC dislocations, Betzel and al. compared early to delayed surgical treatment. A favorable outcome was achieved in 91% early treatments compared with 72% delayed treatments. Weinstein et al. compared acute repairs (< 3 weeks) treated with nonabsorbable AC sutures to a Weaver-Dunn procedure in delayed reconstructions. Satisfactory results were found in 96% of the early treatment as compared to 76% in the delayed treatment group. Similarly, Rolf et al compared reconstructions immediately after trauma to a group of patients who had reconstructions after failing conservative care. They concluded that there was a statistically significant advantage to early intervention.

So if the literature clearly supports early intervention, why has initial non-operative treatment been historically generally recommended? Dr. Tokish will tell you that there is a relatively high failure rate with surgical intervention and patients do functionally well with conservative care. Yet, recent studies suggest that conservatively treated G3 pathology results in altered motion of the scapula and significant impairment to the shoulder suspensory mechanism 4. Techniques have significantly improved now that we have a greater appreciation of the anatomy and biomechanics of the AC joint complex. Biomechanical testing has revealed that the CC ligament and AC capsular ligament complex have an ultimate strength of 1200 N. Many historical procedures pale in biomechanical comparison to the native AC joint complex which has resulted in early failures. Salzmann et al. utilizing more current techniques reported satisfactory results at intermediate follow-up using an arthroscopic double tightrope anatomic reconstruction 6. Currently, I use a suspensory button-ultra high strength tape construct which on biomechanical testing has a supra-physiologic ultimate load strength of 1400 N.

In the acute setting, less than 2 weeks from injury, when surgery is warranted, I will perform an arthroscopic suspension button-ultrahigh strength tape repair alone (Figure 1). If the injury is beyond 2-3 weeks, then I feel strongly that the injury bed has lost its reparative ability. In this setting, I perform the same reconstruction but supplement it with a soft-tissue graft (Figure 2).

I manage these athletes much like I treat first time glenohumeral dislocators. I consider the timing of the injury relative to the athletic season, type of sport, throwing demands, and the athlete's tolerance to a six-month convalescence. Another very important factor is the acuteness of the injury. If the athlete is more than 3 weeks out, I generally will recommend a 3 month conservative treatment trial. However, if the injury is truly acute, I at least have the discussion with the athlete about whether they would like to consider a minimally invasive, low morbidity, arthroscopic repair utilizing the suspension button-ultra high strength tape technique.

I perform my AC reconstructions arthroscopically in both the acute and chronic situation. The obvious advantages of the arthroscopic approach are similar to all arthroscopic procedures in that they are less invasive which translates in to less morbidity, pain, postoperative stiffness, and a faster convalescence. The arthroscopic

continued on page 18

Point/Counterpoint

G3 Acromioclavicular Joint Reconstruction

continued from page 17

technique has the distinct advantage of avoiding destabilizing the AC joint further when exposing the undersurface of the clavicle which is generally required for the open technique. In addition, it allows for excellent visualization of the coracoid for precise tunnel placement and allows for the arthroscopic management of concomitant intra-articular pathology. Although arthroscopic AC reconstructions are a technically more advanced procedure, once the arthroscopist is familiar with the anatomy it can be done in an efficient and reproducible fashion.

Prior to starting the arthroscopy, I make a 2 cm transverse incision 3.5 cm proximal to the AC joint which places the construct anatomically between the conoid and trapezoid ligaments. I make a unicortical 2.4 mm drill hole in the center of the clavicle which will serve as a drill sleeve rest for the guide. This greatly facilitates future guide placement since it is very difficult to place the guide in the correct location below the coracoid and in the center of the clavicle. I then arthroscopically expose the undersurface of the coracoid through the rotator interval. Many times there already is a tear in the interval which occurs at the time of injury. Otherwise, the coracoid can be easily exposed by making a small rent in the rotator interval just superior to the subscapularis. A 70-degree scope will facilitate visualization of the proximal coracoid process as it projects off of the scapula. The guide should be placed as proximal (near the scapula) under the coracoid as possible where the coracoid is widest (2.2-2.5 cm, ref). A 2.4 mm cannulated drill is utilized to make the tunnel through the clavicle and coracoid. It is not necessary to have the AC joint anatomically reduced to create the tunnels. I use a commercially available open button suspension technique (Figure 1). I load the buttons with a 30" ultra strong tape in a double pulley mechanism (TightRope configuration) which allows for cinching the clavicle down to the coracoid. In the chronic setting, I supplement the repair with a graft which is passed arthroscopically around the coracoid. I have found that this is easiest to perform by releasing a 1 cm area of the deltoid just anterior to the clavicle and medial to the coracoid. I then place a curved guide around the coracoid from medial to lateral. The guide is arthroscopically visualized and a penetrator grasper is placed anterior to the clavicle and lateral to the coracoid down to retrieve the shuttle suture. The graft is then shuttled around the coracoid and secured on top of the clavicle with two 2-hole low profile plates (syndesmotic plates, Arthrex). I prefer placing the graft on top of the clavicle rather than through the clavicle since I try to avoid 7 mm holes in the clavicle. It has been my experience that when the graft is placed transosseously 'windshield wipering' occurs leading to significant widening of the inferior cortical holes of the clavicle. In addition, this allows for the use of a larger graft since the graft size is not limited by the diameter of the holes in the clavicle.

Figure 1: Acute Reconstruction

Figure 2: Chronic Reconstruction

Postoperatively, patients are placed in a sling for 6 weeks. They are instructed to start immediate ROM in the supine position. At 6 weeks, the sling is discontinued and formal therapy is started. I generally allow patients to return to the gym in a graduated fashion at 4 months. We start sports specific skill training at 4 months as well. Contact sports are not permitted for 6 months.

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Calendar of Events

Fulfill your CME requirements and network with the best in arthroscopy at AANA's 2014 Meetings and Courses. Make sure these meetings are on your professional development calendar!

2014 Metcalf/AANA Winter Meeting
January 22-25, 2014
Snowbird, Utah

2014 Annual Meeting
May 1-3, 2014
Hollywood, Florida
Abstract Submission is now CLOSED

2014 Fall Course
November 6-8, 2014
Palm Desert, California

First Quarter Masters Experience Courses
Rosemont, IL

302 – Shoulder Course
January 31 – February 2, 2014

303 – Patellofemoral Knee
February 28 – March 1, 2014

304 – Hip
March 28 – 30, 2014

Visit **www.aana.org** to register.

Arthroscopy Association of North America
6300 N. River Road, Suite 600
Rosemont, IL 60018
P 847.292.2262 | F 847.292.2268
www.aana.org

SAVE THE DATE

33RD Annual Meeting

The Westin Diplomat Resort & Spa | Hollywood, Florida

May 1-3, 2014

Watch for the Preliminary Program in the mail and online.
Registration for the Annual Meeting will open in January, simply go to www.aana.org

MEETING HIGHLIGHTS:

- Dynamic educational sessions
- Featured speakers
- Instructional Course Lectures
- Resident & Fellows Day
- Exhibits by leading companies
- Product Workshops
- Networking opportunities

This live activity has been approved for *AMA PRA Category 1 Credit™*.

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