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January 3, 2011

Re: Advances in Orthopaedics

Greetings friends and colleagues,

This is our first white paper addressing topics of importance in orthopaedics. Each of the articles are written by one of the Raleigh Orthopaedic Clinic physicians. The topics are selected for relevance to our referring physicians and colleagues. Articles this month are:

Carpal Tunnel Syndrome, Wallace F. Andrew, Jr., M.D.

Posterior Tibial Tendon Dysfunction, Kevin Logel, M.D.

New Date on the Natural History of Rotator Cuff Tears:
Implications for Timing of Surgical Treatment, Matthew T. Boes, M.D.

I hope you find this information to be useful and that it furthers your understanding of the subject matter. We will publish on a quarterly basis in 2011. Please contact myself or any of the authors if you would like to discuss the articles in greater detail.

Sincerely,

G. Hadley Callaway, M.D.
President, Raleigh Orthopaedic Clinic

Advances in Orthopaedics

Carpal Tunnel Syndrome

Wallace F. Andrew, Jr., M.D.

Carpal tunnel syndrome is one of the most common problems affecting the upper extremities in the United States. It affects multiple thousands of people yearly and surgery to relieve carpal tunnel syndrome is one of the very most common operations done in the United States.

What is carpal tunnel syndrome? Carpal tunnel syndrome is compression of the median nerve in the carpal tunnel. The carpal tunnel is a tight canal in the wrist surrounded by bones on 3 sides and a stout ligament which makes up the roof. The canal is small and the median nerve can be compressed within it.

Carpal tunnel syndrome affects women more than men and is associated with several risk factors. People with diabetes (high blood sugar), thyroid disease, and rheumatoid arthritis are at greater risk to develop carpal tunnel syndrome. It is sometimes associated with trauma such as a fractured wrist.

People that develop carpal tunnel syndrome are bothered by numbness and tingling as well as a burning type pain in the hand, wrist, forearm, and even into the upper arm. The numbness and pain are typically in the thumb, index, and middle fingers and the inside half of the ring finger.

People are commonly awakened at night by these symptoms. They also can be bothersome when driving for lengthy periods of time, writing, or holding a book or newspaper.

Most commonly, carpal tunnel syndrome is idiopathic. That is, there is no known cause. It is simply compression of the nerve in a tight space.

There is a common misconception that you cannot get carpal tunnel syndrome unless you work at a job entailing constant keyboarding. There is no scientific evidence to support keyboarding being a causative factor in carpal tunnel syndrome. There is actually evidence that shows that people who spend greater than 4 hours per day on a keyboard actually have lower incidents of carpal tunnel syndrome. If, however, you develop carpal tunnel syndrome, then keyboarding can certainly aggravate the symptoms.

How is the diagnosis made? A combination of the history provided by the patient and physical findings on examination

generally make the diagnosis quite readily. The patient will have numbness to light touch in the thumb, index, middle, and inside half of the ring finger. They may have weakness in the fleshy muscles in the thumb in advanced cases. Compression over the nerve in the wrist can increase symptoms. In some cases, a nerve conduction study is useful to confirm the diagnosis and determine the degree of involvement. Nerve conduction study measures the speed of conduction of the nerve. If the conduction speed slows down at the wrist, then the diagnosis can be made electronically.

What is the treatment? The first type of treatment was to wear a wrist splint at night. This holds the wrist in the neutral position to diminish extra compression that might be due to awkward positioning of the wrist.

The second form of treatment is cortisone injection into the carpal tunnel. A cortisone injection diminished swelling within the carpal canal and can relieve pressure on the nerve, resulting in diminished symptoms. This treatment, however, is generally temporary, lasting typically 3-4 months.

The definitive form of treatment is surgical release of the carpal tunnel. This entails dividing the stout transverse carpal ligament that makes up the roof of the carpal tunnel. This is done in 2 ways. The most prevalent form of treatment is open carpal tunnel release through a very small incision measuring about 1 inch in the palm of the hand. The ligament is released through this incision and the pressure on the nerve is thus relieved, resulting in improvement of symptoms.

The procedure can also be done endoscopically through a smaller incision with an endoscope and a cutting blade so that the ligament is divided from beneath. This too results as a good resolution of symptoms. The endoscopic technique, while more expensive, and possibly entailing more complicated anesthesia, can lessen the pain in the early postoperative period. Both techniques give the same result in the long run. Surgical release is generally a permanent cure. There is a very small incident of recurrence after surgery.

Carpal tunnel syndrome is a very common malady affecting the upper extremity in many patients. The history and physical examination usually lead to a readily made diagnosis. Treatment options including splinting, injection, and surgery.



Advances in Orthopaedics

Posterior Tibial Tendon Dysfunction

Kevin Logel, M.D.

The posterior tibial tendon is one of the most important tendons of the lower extremity. This structure begins as a muscle in the mid-calf and runs behind the medial side of the ankle to its attachment on the medial side of the foot. Its main function is to assist in holding up the arch and provide stability to the hind foot as you step off onto your toes when walking. Loss of this tendon's normal function can lead to significant impairment in ambulation and ultimately, the development of a flat foot.

Symptoms:

- Pain and/or swelling on the medial side of the ankle (with or without injury history)
- Weakness or inability to raise up on the toes (single heel rise test)
- Gradual development of flattened arch
- Once foot is flat, pain may move to lateral side of ankle

Risk Factors:

- Obesity
- Diabetes
- Previous surgery of foot/ankle or trauma such as ankle sprain or fracture
- Repeat steroid injections in the area of the tendon
- Inflammatory conditions such as RA, Psoriatic arthritis, seronegative arthropathies
- Repetitive overuse in the running athlete
- Female to male 3:1

Initial diagnosis of posterior tibial tendon issues is primarily based on the history and physical examination. Examination of both feet without shoes or socks on in a weight bearing position is preferred. A sign of posterior tibial tendon dysfunction may be the "too many toes" sign. The sign is present when the examiner, when viewing the patient's feet from behind, can see too many toes showing on the side where the arch has fallen and the front of the foot has begun to turn outward.

Another important test to do is the single heel rise test. This is positive if the patient is unable to raise up on his/her toes on the affected side with a single leg stance. (Have the barefooted patient stand on the affected foot alone and ask them to rise up on their toes without the assistance of the other foot. If they are unable to do this, the test is positive.)

The treatment of posterior tibial tendon dysfunction depends on

the stage at which it is recognized. Early onset posterior tibial tendon dysfunction may represent an inflammation of the tendon without the development of a flattened arch. Termed Stage I, this may be managed with simple rest, NSAIDs, and immobilization in a walking boot or cast. Stage II represents tendon dysfunction with obvious development of a flattened arch but maintenance of hind foot flexibility (i.e., no arthritis). Treatment of Stage II dysfunction begins with immobilization, support of the arch with orthotics or bracing, and occasionally physical therapy. If conservative treatment (non-operative) fails to provide adequate relief or restoration of function, surgical intervention may be indicated.

Some of the common surgical options include:

Tendon repair or tenosynovectomy- The tendon is actually cleaned or debrided of excess inflammatory tissue and any fraying or tearing is repaired

Tendon transfers- In the case of a completely dysfunctional tendon, use of an alternate tendon in the same area of the foot can help to augment or replace the damaged tendon. Often this tendon is in the same phase of the gait cycle as the posterior tibial tendon so it adapts quickly to its new role.

Osteotomies- This refers to actually cutting the bone (usually the heel bone) to realign it to a more favorable position in order to protect the damaged tendon or the newly transferred tendon. Some osteotomies involve removal of bone and some may actually add bone to aid in the realignment of the foot and recreation of the arch.

Arthrodesis- This refers to actual fusion of two or more bones together (usually through and arthritic joint) in order to realign the stiff flat foot (Stage III dysfunction) to a more favorable position and prevent further progression of the deformity.

Posterior tibial tendon dysfunction is a very common condition of the foot that is often manageable with conservative measures if recognized early. Once flattening of the arch is apparent, restoration of optimal function is difficult and surgery may be required.

Reference:

American Academy of Orthopaedic Surgeons, Posterior Tibial Tendon Dysfunction, 2002.



Advances in Orthopaedics

New Data on the Natural History of Rotator Cuff Tears: Implications for Timing of Surgical Treatment

Matthew T. Boes, M.D.

Rotator cuff disorders are the most frequent cause of shoulder pain in patients presenting for medical evaluation. The rotator cuff is the primary stabilizer of the glenohumeral joint, and as such, is critical to shoulder function. Though the overall results of surgical treatment for rotator cuff tears are good, the indications for rotator cuff repair have historically been poorly defined and often somewhat arbitrary. Traditionally, surgery was offered to younger patients who sustained acute tears and older patients who had failed a course of non-operative treatment (NSAIDs, cortisone injections, and physical therapy). Recently, several studies have helped elucidate the natural history of rotator cuff tears and the potential consequences of chronic tearing on the muscle-tendon units of the rotator cuff. These data are helping to more clearly define indications and timing of surgical treatment in order to help maximize long-term function of the shoulder.

Many of the natural history studies involved a cohort of patients treated for shoulder pain who were evaluated for evidence of rotator cuff tearing over time using ultrasound. This cohort provided a unique, longitudinal analysis of patients with rotator cuff disorders that yielded previously undocumented data on changes in the incidence of tears over time, changes in tear size over time, and changes in the quality of the muscles and tendons involved over time. What these data reveal is an age-associated increase in the incidence of rotator cuff tears. More importantly, there was no evidence showing a decrease in tear size over time, and no evidence of spontaneous healing. Simply stated, full-thickness tears of the rotator cuff will not heal if untreated. On the contrary, it was observed that these tears tended to progress or increase in size. In addition, the natural history studies support previous findings on the negative effects of chronic tearing on the quality of the muscles and tendons in the rotator cuff. These findings include progressive muscle atrophy or shrinkage, fatty infiltration of the muscle or scarring which disrupts normal muscle function, and an increase in tendon stiffness. These negative effects have been shown to be largely irreversible even if the rotator cuff is subsequently repaired meaning that the alterations in the function of the muscle-tendon units are permanent. Overall, these changes can have a significant impact on long-term shoulder function.

The goals of any treatment approach to rotator cuff disorders are to alleviate pain and maximize function. In light of this more recent data, however, a primary goal should also be to intervene at a point in the disease process prior to the development of chronic and irreversible damage to the cuff musculature. A new algorithm

treatment can now be constructed with all of these goals in mind that categorizes patients into three general groups:

- **Group I** – patients with shoulder impingement syndrome or bursitis, or those patients with “partial-thickness” or incomplete tendon tears
- **Group II** – active patients with “full-thickness”, or complete tendon tears
- **Group III** – more sedentary patients with full-thickness tears who may not be good surgical candidates for various reasons (i.e. – medical comorbidities, inability to comply with post-operative restrictions and rehabilitation, unwillingness to undergo surgery)

Patients in **Groups I and III** either are not at risk for changes in the muscle unit due to the fact that there is no full tendon detachment and retraction or they are not interested in undergoing surgery with the associated rehabilitation. These patients may be managed more traditionally with control of sub-acromial inflammation using NSAIDs and cortisone injections, avoidance of aggravating activities, and a rehab program to improve the overall function of the remaining cuff attachments. **Group II** patients are at most risk for progression in tear size and permanent rotator cuff dysfunction if left untreated. These patients are also those for who the natural history of rotator cuff tearing can be altered with appropriate treatment to maximize the chances for good long-term shoulder function. These patients should be identified early using ultrasound or MRI, counseled on the risks to the health of the rotator cuff from chronic tearing, and recommended for surgical repair in an effort to restore the normal anatomic attachments and function of the cuff muscles.

In summary, recent data shows the significant risks of permanent damage to the rotator cuff musculature that can occur following delayed treatment of full-thickness tears. Once changes to the rotator cuff muscles occur, the outcomes of treatment can be diminished even if full healing of a tendon repair is achieved at a later time. It is important to remember that despite many tremendous advances in orthopaedics, there is no good long-term solution for younger, active patients with advanced rotator cuff disease. There is no “replacement” for the rotator cuff as is analogous for the hip and knee with arthritis. All efforts to maintain the health of the native rotator cuff should be made to maximize long-term function. With timely treatment, patients with reasonably-sized rotator cuff tears can expect >85% good/excellent results following surgical treatment and restoration of a full and active lifestyle with long-term durability of shoulder function.

