PASIG PERFORMING ARTS
SPECIAL INTEREST GROUP

ORTHOPAEDIC SECTION
AMERICAN PHYSICAL THERAPY ASSOCIATION

APTA
American Physical Therapy Association
The Science of Healing. The Art of Caring.

PASIG MONTHLY CITATION BLAST: No.41 **June 2009**

Dear PASIG members:

PASIG President, Leigh Roberts, and Treasurer, Amy Humphreys, are initiating a new service to our members: information on continuing education and conferences related to Performing Arts. See below.

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Thank you to those members who participated in the PASIG Membership Survey between December 2008 and March 2009. We had 64 responses, which is a return rate of 8.9%. We appreciate learning more about our membership and your feedback is helpful. The results provide valuable information that we plan to use for developing a better website and meeting your needs. One of the things that was evident from the survey is that members want more continuing education.

The PASIG will use the citation blasts as a way to inform you about Performing Arts continuing education, courses, and related conferences that you may be interested in attending.

Orthopaedic Section Independent Study Course
Dance Medicine: Strategies for the Prevention and Care of Injuries to Dancers. This is a 6-monograph course and includes many PASIG members as authors. This home study course can be purchased at http://www.orthopt.org/independent2.php. The PASIG has plans to develop other Performing Arts Independent Study Courses, so be on the lookout for those.

Performing Arts Medicine Association (PAMA)
27th Annual Symposium on Medical Problems of Musicians and Dancers
June 22-25, 2009
Aspen, CO
Contact: http://www.artsmed.org/

National Athletic Trainers' Association (NATA) 2009 World Congress
June 15-17, 2009
San Antonio, TX
Contact: http://www.nata.org/worldcongress/

National Athletic Trainers' Association (NATA) Annual Meeting and Clinical Symposia
June 17-20, 2009
San Antonio, TX
Contact: http://www.nata.org

Musculoskeletal Examination and Interventions of the Dancer Using Regional Interdependence as a Framework
The Harkness Center for Dance Injuries
New York, NY
July 31, 2009
Contact: www.danceinjury.org

International Assocation for Dance Medicine and Science (IADMS) 19th Annual Meeting
October 29- November 1, 2009
The Hague, The Netherlands
Contact: www.iadms.org

If you know of other courses of interest to our membership, please send the information to: Amy Wightman PT, DPT, OCS, MTC
e-mail: ahumphrey@bodydynamicsinc.com

Thanks!
Leigh

Leigh A. Roberts, DPT, OCS
PASIG President
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CSM 2010 abstract submissions are now closed. If you are or know of a student who has an PA-related abstract accepted to CSM, please don't forget, the PASIG sponsors an annual student research scholarship. For more information on the research award please check our webpage (www.orthopt.org/sig_pa.php). Students with additional questions can contact PASIG Treasurer Amy Humphrey (ahumphrey@bodydynamicsinc.com).

For this June Citation BLAST, Jeff Stenback, former PASIG President and Treasurer and now on our Research Committee, has contributed a topic: *Lateral Epicondylitis*. The format is an annotated bibliography of articles on the selected topic from 1998 – 2008. If you are interested in contributing a special topic citation blast, please step up! The BLASTS and updated libraries are posted on the PASIG webpage for our members to access and download. (Information about EndNote referencing software can be found at http://www.endnote.com, including a 30-day free trial).

As always, your comments and suggestions are welcome. Please drop me an e-mail anytime.

Regards,
Shaw

Shaw Bronner PT, PhD, OCS
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Lateral Epicondylitis

Lateral epicondylitis can be quite devastating to performing artists—whether they are a musician or gymnast. Often beginning insidiously, symptoms may appear on and off for a protracted period of time before a patient seeks treatment. This delay may require a lengthy period of recuperation and therapy and, ultimately, delays optimal participation in auditions, rehearsals, and performances or gymnastic practices and competitions. As PTs, we see the larger picture and need to educate these patients to understand that gym training, computer use, and general ADL effect their symptoms even as they have curtailed the specific performing arts-related activity that was most painful. As in most performing arts literature, there is relatively little written on the subject from a specific performing artist slant (see Storm, 2006), but consideration of material on the management of "tennis elbow" suggests that a moderate, graded return to activity (see Gieck or Gill); judicious use of modalities/strengthening; controlling physical stressors to the involved area; and, occasionally in more involved cases, considering a surgical alternative are current options. Your involvement with performing artists means that you can provide these patients with specific task-related information that can engage the performing artist in better understanding their role in managing this condition.

Jeff Stenback, PT, OCS
PASIG Research Committee member and former PASIG President
Orthopedic Rehab Specialists, Miami, FL

Altan L, Kanat E (2008). Conservative treatment of lateral epicondylitis: comparison of two different orthotic devices. Clin Rheumatol **27**(8): 1015-9.

We investigated the effectiveness of braces in the treatment of lateral epicondylitis and compared the effects of two different types of most frequently used braces. A total of 50 patients (seven males and 43 females) with an age range of 34 to 60 who had the diagnosis of lateral epicondylitis were included in the study. The patients were distributed into two groups. In group I, 25 patients (21 females and four males) were given a lateral epicondyle bandage. In group II, 25 patients (22 females and three males) were given a wrist resting splint holding the wrist in slight dorsiflexion. Evaluations of the patients were done before treatment and at the second and sixth weeks of treatment. Evaluation parameters were pain during rest and movement, sensitivity, algometer score, hand grip strength, and evaluation of the response to treatment. The response to treatment was evaluated according to the following categories: excellent, good, medium, and bad. In group I, only pain during rest and movement significantly decreased at 2 weeks while significant improvement was obtained for all parameters at 6 weeks. In group II, all parameters except for algometric sensitivity showed significant improvement at 2 weeks. Significant improvement was obtained for all

parameters at 6 weeks in this group. Comparison of the two groups showed significantly better improvement in resting pain in group II at 2 weeks while there was no difference for other parameters including response to treatment at either evaluation stage. Braces might be a good strategy to help wait out the natural course of tennis elbow complaints. Although epicondyle bandage was not found to be superior to wrist splint in our study, we may suggest that it could be favored over splint since it is more practical and cosmetically acceptable.

Baker CL, Baker CL (2008). Long-term follow-up of arthroscopic treatment of lateral epicondylitis. Am J Sports Med **36**(2): 254-60.

BACKGROUND: In a previously published report of the authors' arthroscopic technique of operative management of recalcitrant lateral epicondylitis, they demonstrated short-term success with the procedure in their patients. HYPOTHESIS: Arthroscopic management of patients with lateral epicondylitis can produce clinical improvement and have successful long-term outcomes. STUDY DESIGN: Case series; Level of evidence, 4. METHODS: Forty patients (42 elbows) with lateral epicondylitis who had not responded to nonoperative management were treated with arthroscopic resection of pathologic tissue. Thirty of these patients (30 elbows) were located for extended follow-up. At a mean follow-up of 130 months (range, 106-173 months), patients were asked to use a numeric scale to rate their elbow pain from 0 (no pain) to 10 (severe pain). Patients were also asked to rate their elbows according to the functional portion of the Mayo Clinic Elbow Performance Index. RESULTS: The mean pain score at rest was 0; with activities of daily living, 1.0; and with work or sports, 1.9. The mean functional score was 11.7 out of a possible 12 points. No patient required further surgery or repeat injections after surgery. One patient continued to wear a counterforce brace with heavy activities. Twenty-three patients (77%) stated they were "much better," 6 patients (20%) stated they were "better," and 1 patient (3%) stated he was the same. Twenty-six patients (87%) were satisfied, and 28 patients (93%) stated they would have the surgery again if needed. CONCLUSION: Arthroscopic removal of pathologic tendinosis tissue is a reliable treatment for recalcitrant lateral epicondylitis. The early high rate of success in patients was maintained at long-term follow-up.

Calfee RP, Patel A, et al. (2008). Management of lateral epicondylitis: current concepts. J Am Acad Orthop Surg **16**(1): 19-29.

Lateral epicondylitis, or tennis elbow, is a common cause of elbow pain in the general population. Traditionally, lateral epicondylitis has been attributed to degeneration of the extensor carpi radialis brevis origin, although the underlying collateral ligamentous complex and joint capsule also have been implicated. Nonsurgical treatment, the mainstay of management, involves a myriad of options, including rest, nonsteroidal anti-inflammatory drugs, physical therapy, cortisone, blood and botulinum toxin injections, supportive forearm bracing, and local modalities. For patients with recalcitrant disease, the traditional open debridement technique has been modified by multiple surgeons, with others relying on arthroscopic or even percutaneous procedures. Without a standard protocol (nonsurgical or surgical), surgeons need to keep abreast of established and evolving treatment options to effectively treat patients with lateral epicondylitis.

Coombes BK, Bisset L, et al. (2009). A new integrative model of lateral epicondylalgia. Br J Sports Med **43**(4): 252-8.

Tennis elbow or lateral epicondylalgia is a diagnosis familiar to many within the general community and presents with an uncomplicated clinical picture in most cases. However, the underlying pathophysiology presents a more complex state and its management has not been conclusively determined. Research on this topic extends across anatomical,

biomechanical and clinical literature; however, integration of findings is lacking. We propose that the current understanding of the underlying pathophysiology of lateral epicondylalgia can be conceptualised as encompassing three interrelated components: (i) the local tendon pathology, (ii) changes in the pain system, and (iii) motor system impairments. This paper presents a model that integrates these components on the basis of a literature review with the express aim of assisting in the targeting of specific treatments or combinations thereof to individual patients.

Ernst E (1992). Conservative therapy for tennis elbow. Br J Clin Pract **46**(1): 55-7.
Tennis elbow is a common overuse syndrome. It is accompanied by degenerative changes in the enthesis of the extensor carpi radialis brevis muscle. It may be best diagnosed clinically by eliminating other possible causes of lateral elbow pain. Physical methods should always be selected as initial treatment. Immobilisation is the initial advice that most doctors give: ultrasound has been shown to be effective in a placebo-controlled, double-blind trial, and low energy laser has been found to reduce objective but not subjective symptoms. Other forms of physical treatment like electrotherapy, thermotherapy and massages can be tried, even though proof of their efficacy needs to be established more firmly. When physical treatments have failed, steroid injections can help. If symptoms still persist, then surgery is called for. There are still many open questions surrounding the syndrome of tennis elbow. Research into this common soft tissue disease should be intensified.

Field LD, Savoie FH (1998). Common elbow injuries in sport. Sports Med **26**(3): 193-205.
Athletes of all ages and skill levels are increasingly participating in sports involving overhead arm motions, making elbow injuries more common. Among these injuries is lateral epicondylitis, which occurs in over 50% of athletes using overhead arm motions. Lateral epicondylitis is characterised by pain in the area where the common extensor muscles meet the lateral humeral epicondyle. The onset of this pathological condition begins with the excessive use of the wrist extensor musculature. Repetitive microtraumatic injury can lead to mucinoid degeneration of the extensor origin and subsequent failure of the tendon. Lateral epicondylitis can almost always be treated nonoperatively with activity modification and specific exercises. If the athlete fails to respond to nonoperative treatment after 6 months to 1 year, they are candidates for surgical intervention. Medial epicondylitis is characterised by pain and tenderness at the flexor-pronator tendinous origin with pathology commonly being located at the interface between the pronator teres and flexor carpi radialis origin. Golfers and tennis players often develop this condition because of the repetitive valgus stress placed on the medial elbow soft tissues. Careful evaluation is important to differentiate medial epicondylitis from other causes of medial elbow pain. As with lateral epicondylitis, patients with medial epicondylitis not responding to an extensive nonoperative programme are candidates for surgical intervention. A less common cause of medial elbow pain is medial ulnar collateral ligament injury. Repetitive valgus stress placed on the joint can lead to microtraumatic injury and valgus instability. When the medial ulnar collateral ligament is disrupted, abnormal stress is placed on the articular surfaces that can lead to degenerative changes with osteophyte formation. As with other elbow injuries, a strict rehabilitation regimen is first employed; ligament reconstruction is only recommended if the injury fails to improve and only in athletes requiring a high level of performance. Excessive valgus stress can also lead to posteromedial olecranon impingement on the olecranon fossa producing pain, osteophyte and loose body formation. Arthroscopic elbow debridement can often be helpful in improving motion and in reducing pain in such patients.

Foye PM, Sullivan WJ, et al. (2007). Industrial medicine and acute musculoskeletal rehabilitation. 6. Upper- and lower-limb injections for acute musculoskeletal injuries and injured workers. Arch Phys Med Rehabil **88**(3 Suppl 1): S29-33.

This self-directed study module focuses on the use of corticosteroids and other injections in the treatment of lateral epicondylitis, de Quervain's tenosynovitis, carpal tunnel syndrome, Achilles' tendinitis, and plantar fasciitis. It is part of the study guide on industrial rehabilitation medicine and acute musculoskeletal rehabilitation in the Self-Directed Physiatric Education Program for practitioners and trainees in physical medicine and rehabilitation. OVERALL ARTICLE OBJECTIVE: To review the medical literature to help clinicians make treatment decisions regarding corticosteroid and other injections in the upper and lower limbs in injured workers.

Foye PM, Sullivan WJ, et al. (2007). Industrial medicine and acute musculoskeletal rehabilitation. 3. Work-related musculoskeletal conditions: the role for physical therapy, occupational therapy, bracing, and modalities. Arch Phys Med Rehabil **88**(3 Suppl 1): S14-7.

This chapter focuses on the use of modalities, therapeutic exercise, and orthotic devices in the treatment of lateral epicondylitis, carpal tunnel syndrome, plantar fasciitis, neck pain and low back pain. It is part of the study guide on industrial rehabilitation medicine and acute musculoskeletal rehabilitation in the Self-Directed Physiatric Education Program for practitioners and trainees in physical medicine and rehabilitation. OVERALL ARTICLE OBJECTIVE: To review the medical literature that may help clinicians make treatment decisions regarding modalities, therapeutic exercise, and orthotic devices for treating common work-related conditions in the upper and lower limbs.

Gieck JH, Saliba EN (1987). Application of modalities in overuse syndromes. Clin Sports Med **6**(2): 427-66.

Improper techniques are often the cause of overuse syndromes. Unless the technique is corrected, the patient is doomed to recurrence. The same is true of improper posture, especially in the lower extremity and trunk areas. The pitcher or tennis player should have his or her style analyzed for proper form. The runner should have his or her muscular imbalances corrected by exercise and orthotic appliances. As with all other modalities used for treating painful conditions, proper evaluation of the etiology and the rectification of the cause is important. When athletes are underway in their sports seasons, it is often difficult to convince them to accept the ideal healing conditions needed to eliminate the problem. Management of the condition with any modality while maintaining an active lifestyle often brings about ethical scrutiny. However, it is the belief of the authors that noninvasive modalities do not provide the pain relief that would enable the athlete to tolerate activity beyond a significant injurious stress level. The modalities allow the athlete to regain the criteria for return, strength, and range of motion more successfully. Short-term goal setting is imperative to proper return. Several plateaus should be successfully completed before full return to activity is allowed. Tennis elbow, for example, may be allowed an initial period of 5 minutes on alternate days, gradually increasing to full activity every other day. Patients are often so anxious to return to activity that they overdo, leading to a decrease in function with a rapid return to the results of inflammation. The goals of successful rehabilitation of the overuse syndrome are pain-free range of motion, strength, and endurance. The use of cold, heat, electrotherapy, and exercise allow the athlete to reach his or her goal of returning to activity more quickly with a reduced risk of reinjury.

Gill TJ, Micheli LJ (1996). The immature athlete. Common injuries and overuse syndromes of the elbow and wrist. Clin Sports Med **15**(2): 401-23.

Specific elbow and wrist injuries are predictable in the skeletally immature athlete based on the biomechanics of the sport and the age of the patient. The physician must be aware of the potential for overuse injuries. Modification in training regimens is essential for recovery. A greater emphasis must be placed on the prevention of these injuries. As a general rule, the young athlete should not progress more than 10% per week in the amount and frequency of training. Correction of muscle-tendon imbalances is accomplished by maintaining strength and flexibility of susceptible tissues. In throwers, a triceps-strengthening program of progressive resisted extension exercises and a forearm flexor/extensor-strengthening program using the French curl technique are helpful. Careful attention to throwing technique and proper coaching are essential. The goal for the young athlete is early recognition of the injury and thereby prevention of a long-term disability.

Grewal R, MacDermid JC, et al. (2009). Functional outcome of arthroscopic extensor carpi radialis brevis tendon release in chronic lateral epicondylitis. J Hand Surg Am **34**(5): 849-57.

PURPOSE: To evaluate outcomes of arthroscopic tennis elbow release in a population of patients with chronic, recalcitrant symptoms, a large number of workers' compensation claims, and high occupational demands using standardized outcome measures, including a detailed objective assessment of workplace demands. METHODS: We treated 36 patients with chronic lateral epicondylitis with an arthroscopic release. A standardized protocol was used to measure strength, motion, and outcomes (American Shoulder and Elbow Surgeons Elbow [ASES-e] score, Short Form-12, Patient-Rated Tennis Elbow evaluation [PRTEE], and Work Limitations Questionnaire-26). RESULTS: The mean duration of symptoms before surgery was 30 months. A total of 25 of 36 patients were employed in heavy or repetitive occupations and 23 of 36 were involved in a workers' compensation claim. The final overall results were favorable, with 30 of 36 subjects reporting improvement with surgery. The final mean Mayo Elbow Performance Index score was 78.6 +/- 16.5 (22 = good to excellent, 9 = fair, and 5 = poor). The average total PRTEE was 26.2 +/- 24.3 out of 100. The average ASES-e pain score was 16.1 +/- 15.0 and the average ASES-e function score was 27.9 +/- 8.8. Patients in heavy or repetitive occupations and those with workers' compensation claims had significantly worse outcome scores (Mayo Elbow Performance Index, ASES, and PRTEE). Based on Work Limitations Questionnaire-26 scores, patients with workers' compensation claims had significantly greater difficulties with physical (36.8 vs 3.2, $p < .001$), output (40.8 vs 3.1, $p = .002$), mental (36.0 vs 9.0, $p = .05$), and social (27.7 vs 6.3, $p = .05$) workplace demands. CONCLUSIONS: Arthroscopic tennis elbow release provides symptomatic improvement in most patients with lateral epicondylitis. Patient selection and reported occupational demands have an important role in determining outcomes. More work is required to identify factors predicting outcome in this difficult subgroup.

Henry M, Stutz C (2006). A unified approach to radial tunnel syndrome and lateral tendinosis. Tech Hand Up Extrem Surg **10**(4): 200-5.

Two of the most common diagnoses assigned to patients presenting with lateral elbow and proximal forearm pain are lateral tendinosis and radial tunnel syndrome. Traditionally, these 2 conditions have been treated as distinct and separate entities with most patients being diagnosed with either one or the other, but not both. The extensor carpi radialis brevis (ECRB) and, to a lesser the degree, a portion of the extensor digitorum communis that form the conjoined lateral extensor tendon are thought to be primarily responsible for the excessive traction that induces lateral tendinosis (a degenerative process of microtears in the tendon with impaired healing), but the supinator blends with these same fibers and shares a role in the pathology. The supinator, primarily the arcade of Frohse, has been thought to play the majority role in compressing the posterior interosseous nerve in radial tunnel syndrome, but the undersurface thick tendon of the ECRB may also cause

substantial nerve compression. Reduction of the linear tension transmitted by the ECRB is the common element in the various surgical treatments for lateral tendinosis, performed anywhere from directly at the lateral epicondyle to the distal myotendinous junction. Nerve decompression by division of fascial bands is the goal in surgery for radial tunnel syndrome. These 2 surgical approaches need not be mutually exclusive. In fact, this separation of the 2 clinical entities may play a role in the unpredictable results reported in the literature. This article presents a unified approach to treating both pathologies simultaneously including short-term clinical results.

Johnson GW, Cadwallader K, et al. (2007). Treatment of lateral epicondylitis. Am Fam Physician **76**(6): 843-8.

Lateral epicondylitis is a common overuse syndrome of the extensor tendons of the forearm. It is sometimes called tennis elbow, although it can occur with many activities. The condition affects men and women equally and is more common in persons 40 years or older. Despite the prevalence of lateral epicondylitis and the numerous treatment strategies available, relatively few high-quality clinical trials support many of these treatment options; watchful waiting is a reasonable option. Topical nonsteroidal anti-inflammatory drugs, corticosteroid injections, ultrasonography, and iontophoresis with nonsteroidal anti-inflammatory drugs appear to provide short-term benefits. Use of an inelastic, nonarticular, proximal forearm strap (tennis elbow brace) may improve function during daily activities. Progressive resistance exercises may confer modest intermediate-term results. Evidence is mixed on oral nonsteroidal antiinflammatory drugs, mobilization, and acupuncture. Patients with refractory symptoms may benefit from surgical intervention. Extracorporeal shock wave therapy, laser treatment, and electromagnetic field therapy do not appear to be effective.

Kalainov DM, Makowiec RL, et al. (2007). Arthroscopic tennis elbow release. Tech Hand Up Extrem Surg **11**(1): 2-7.

Tennis elbow is a common affliction manifested by symptoms of lateral elbow pain and diminished grip strength. Conservative treatment measures will lead to symptom resolution in most cases. Surgery is reserved for patients with recalcitrant elbow pain unresponsive to nonsurgical management. This article reviews the technique of arthroscopic tennis elbow release surgery, including indications, contraindications, complications, postoperative rehabilitation, and outcome.

Kamien M (1990). A rational management of tennis elbow. Sports Med **9**(3): 173-91.

Tennis elbow is due to a torque injury or sudden overstretching of tendons which insert into the epicondyles of the humerus. The predominant lesion is an enthesopathy--a pathological lesion at the insertion of tendon into bone. The most common site is at the lateral epicondyle and this is 3 times as frequent as at the medial epicondyle. Approximately 50% of tennis players can expect to get a tennis elbow at some time during their playing lifetime. In one-third of the players this will be severe enough to interfere with their tasks of daily living. The major unresolved question about the aetiology of tennis elbow is why it has its peak incidence between the ages of 40 and 50 years and why 90% of players then have no further recurrence. Making sense of the literature on the treatment of tennis elbow is difficult because there are few studies that have used the acceptable epidemiological techniques of the prospective randomised controlled trial or case-controlled study. Most papers are based on a collection of highly selected cases which represent the more intractable end of the tennis elbow spectrum and their reported results have been inconsistent. Tennis elbow is largely a self-limiting condition. The prime aim of treatment should be based on Hippocrates' first tenet of medicine--first do no harm. Therapy should start with the simple and conservative before progressing to the more complex and invasive therapies. It should be

acceptable to the patient, cost-effective and where invasive therapy is recommended, the potential benefits should clearly outweigh the risks. The principles of therapy for tennis elbow are to relieve pain, microbleeding and inflammation, promote healing, rehabilitate the injured arm and try to prevent recurrence. The most effective modalities of treatment are found to be cryotherapy in the acute stage then nonsteroidal anti-inflammatory drugs and heat in its various modalities including ultrasound. This is combined with rest which is best defined as the absence of painful activity. Injection of a depot preparation of cortisone is effective although patient reports are not as flattering as those of doctors. There is no advantage and in fact considerable disadvantage in using more than 2 such injections. Therapies such as acupuncture and chiropractic have not been evaluated. Nevertheless they cause no harm, may result in good and should be tried before resorting to more invasive therapy. Rehabilitation should run parallel to treatment.(ABSTRACT TRUNCATED)

Karkhanis S, Frost A, et al. (2008). Operative management of tennis elbow: a quantitative review. Br Med Bull **88**(1): 171-88.

INTRODUCTION: The results of operative management of tennis elbow are varied, and the indications for surgery are not well codified. Many operative techniques are reported, but a clear consensus on whether a given surgical procedure is more effective over another is yet to be reached. METHODS: We conducted a MEDLINE, CINAHL and EMBASE search on all available scientific articles that reported the outcomes of surgery for lateral epicondylopathy. Keywords used were 'tennis elbow', 'lateral epicondylitis', 'lateral epicondylalgia', 'tendinopathy', 'tendonitis' and 'tendon'. Subheadings used were 'surgery', 'outcomes', 'pathology', 'physiology' and 'operation'. All relevant articles were retrieved. Each article was scored using the Coleman methodology score (CMS), a highly repeatable methodology score, by two independent reviewers, followed by data analysis. RESULTS: The mean CMS for the 45 studies identified was 43 +/- 9 (of a possible 100 points), with 'number of patients', 'type of study', 'outcome criteria and assessment' and 'subject selection process' being the major low scorers. Also, there was no improvement in the CMS, and hence study design, over the years (intra-class correlation coefficient = 0.45). DISCUSSION: There is a dearth of quality evidence available to be able to advocate one operative technique over another. CONCLUSION: We stress the need for well-designed adequately powered randomized controlled trials to be able to understand which of these operative techniques is really superior to the others.

Kentta G, Hassmen P (1998). Overtraining and recovery. A conceptual model. Sports Med **26**(1): 1-16.

Fiercer competition between athletes and a wider knowledge of optimal training regimens dramatically influence current training methods. A single training bout per day was previously considered sufficient, whereas today athletes regularly train twice a day or more. Consequently, the number of athletes who are overtraining and have insufficient rest is increasing. Positive overtraining can be regarded as a natural process when the end result is adaptation and improved performance: the supercompensation principle--which includes the breakdown process (training) followed by the recovery process (rest)--is well known in sports. However, negative overtraining, causing maladaptation and other negative consequences such as staleness, can occur. Physiological, psychological, biochemical and immunological symptoms must be considered, both independently and together, to fully understand the 'staleness' syndrome. However, psychological testing may reveal early-warning signs more readily than the various physiological or immunological markers. The time frame of training and recovery is also important since the consequences of negative overtraining comprise an overtraining-response continuum from short to long term effects. An athlete failing to recover within 72 hours has presumably negatively overtrained and is in

an overreached state. For an elite athlete to refrain from training for > 72 hours is extremely undesirable, highlighting the importance of a carefully monitored recovery process. There are many methods used to measure the training process but few with which to match the recovery process against it. One such framework for this is referred to as the total quality recovery (TQR) process. By using a TQR scale, structured around the scale developed for ratings of perceived exertion (RPE), the recovery process can be monitored and matched against the breakdown (training) process (TQR versus RPE). The TQR scale emphasises both the athlete's perception of recovery and the importance of active measures to improve the recovery process. Furthermore, directing attention to psychophysiological cues serves the same purpose as in RPE, i.e. increasing self-awareness. This article reviews and conceptualises the whole overtraining process. In doing so, it (i) aims to differentiate between the types of stress affecting an athlete's performance: (ii) identifies factors influencing an athlete's ability to adapt to physical training: (iii) structures the recovery process. The TQR method to facilitate monitoring of the recovery process is then suggested and a conceptual model that incorporates all of the important parameters for performance gain (adaptation) and loss (maladaptation).

Kibler WB (1994). Clinical biomechanics of the elbow in tennis: implications for evaluation and diagnosis. Med Sci Sports Exerc **26**(10): 1203-6.

Elbow injuries constitute a sizeable percentage of tennis injuries. Biomechanical analysis of the forces, loads, and motions on the elbow in tennis, and the constraint systems operating the control the forces, can lead to an understanding of the pathophysiology of these injuries. A biomechanically based evaluation framework can be used to document all of the clinical symptoms, anatomic alterations, and biomechanical alterations that are associated with the pathological problem.

Kohia M, Brackle J, et al. (2008). Effectiveness of physical therapy treatments on lateral epicondylitis. J Sport Rehabil **17**(2): 119-36.

OBJECTIVE: To analyze research literature that has examined the effectiveness of various physical therapy interventions on lateral epicondylitis. DATA SOURCES: Evidence was compiled with data located using the PubMed, EBSCO, The Cochrane Library, and the Hooked on Evidence databases from 1994 to 2006 using the key words lateral epicondylitis, tennis elbow, modalities, intervention, management of, treatment for, radiohumeral bursitis, and experiment. STUDY SELECTION: The literature used included peer-reviewed studies that evaluated the effectiveness of physical therapy treatments on lateral epicondylitis. Future research is needed to provide a better understanding of beneficial treatment options for people living with this condition. DATA SYNTHESIS: Shockwave therapy and Cyriax therapy protocol are effective physical therapy interventions. CONCLUSIONS: There are numerous treatments for lateral epicondylitis and no single intervention has been proven to be the most efficient. Therefore, future research is needed to provide a better understanding of beneficial treatment options for people living with this condition.

Leach RE, Miller JK (1987). Lateral and medial epicondylitis of the elbow. Clin Sports Med **6**(2): 259-72.

Tennis elbow is a common condition, with the extensor carpi radialis brevis attachment being the usual site of pain. Conservative care including decreased activity, ice, nonsteroidal anti-inflammatory medications, and muscle strengthening will help most people. The small percentage of cases that require surgery usually benefit from debridement of the damaged portion of the extensor carpi radialis brevis attachment. The postoperative course must include muscle strengthening and a gradual return to activity.

Lederman RJ (2003). Neuromuscular and musculoskeletal problems in instrumental musicians. Muscle Nerve **27**(5): 549-61.

Over the past 20 years, there has been increasing interest in the medical problems of performing artists. In this review, the major playing-related disorders seen in instrumental musicians are discussed. Among the 1353 instrumentalists personally evaluated, the major diagnoses included musculoskeletal disorders in 64%, peripheral nerve problems in 20%, and focal dystonia in 8%. Of these instrumentalists, 60% were women, although men were the majority in the group with focal dystonia. The average age at the time of evaluation was 37 years for men and 30 years for women. Among musculoskeletal disorders, regional muscle pain syndromes, particularly of the upper limb, upper trunk, and neck, were most common. Specific entities such as tendinitis and ligament sprain were less common. Frequent peripheral nerve disorders included thoracic outlet syndrome, ulnar neuropathy at the elbow, and carpal tunnel syndrome. Each instrument group showed a characteristic distribution of symptoms and signs that appeared to be directly related to the static and dynamic stresses inherent in the playing of the instrument. Electrodiagnostic studies are an important part of the evaluation of these disorders, particularly nerve entrapment syndromes. With carefully designed treatment, the majority of instrumental musicians can return to full and pain-free playing. Nerve entrapment syndromes have the highest treatment success rate, followed by musculoskeletal pain syndromes. Despite some recent innovative approaches, focal dystonia remains largely resistant to therapy.

Lew HL, Chen CP, et al. (2007). Introduction to musculoskeletal diagnostic ultrasound: examination of the upper limb. Am J Phys Med Rehabil **86**(4): 310-21.

With recent advances in computer technology and equipment miniaturization, the clinical application of diagnostic ultrasonography (U/S) has spread across various medical specialties. Diagnostic U/S is attractive in terms of its noninvasiveness, lack of radiation, readiness of use, cost-effectiveness, and its ability to make dynamic examinations possible. Dynamic imaging deserves special emphasis because it is useful in differentiating full-thickness from partial-thickness tendon tears, muscle tears, and tendon and nerve subluxations or dislocations. It is also a quick and easy avenue for side-to-side comparisons. When appropriately used, diagnostic U/S can be considered as an extension of one's physical examination. However, there are limitations of U/S, which will be discussed in this review article. This is part 1 of two articles; this first part will focus on the ultrasound examination of the upper extremity, using selected examples relevant to musculoskeletal medicine. Part 2 will cover common pathologies of the lower extremity.

Nirschl RP, Ashman ES (2003). Elbow tendinopathy: tennis elbow. Clin Sports Med **22**(4): 813-36.

The pathoanatomy of overuse tendinopathy is noninflammatory angiofibroblastic tendinosis. The areas of elbow abnormality are specific, including the ECRB-EDC complex laterally, the pronator teres, flexor carpi radialis medially, and triceps posteriorly. The goals of nonoperative treatment are to revitalize the unhealthy pain-producing tendinosis tissue. The key to nonoperative treatment is rehabilitative resistance exercise with progression of the exercise program. If rehabilitation fails, the surgical interventions as described are highly successful.

Noteboom T, Cruver R, et al. (1994). Tennis elbow: a review. J Orthop Sports Phys Ther **19**(6): 357-66.

Tennis elbow is a common yet sometimes complex musculoskeletal condition affecting many patients treated by physical therapists. The purpose of this article is to review the anatomy, clinical examination, differential diagnosis, conservative care, and surgical

treatment for tennis elbow or lateral epicondylitis. Particular attention is given to determining the precise pathological cause of lateral epicondylitis, with consideration of intrinsic and extrinsic factors associated with this condition. This information should assist health care practitioners who treat patients with this disorder.

Oskarsson E, Gustafsson BE, et al. (2007). Decreased intramuscular blood flow in patients with lateral epicondylitis. Scand J Med Sci Sports **17**(3): 211-5.

The purpose of this pilot study was to investigate intramuscular microcirculation in extensor carpi radialis brevis (ECRB) in patients with lateral epicondylitis. Ten patients with unilateral epicondylitis, mean duration of symptoms of 39 (12-96) months participated. The diagnosis was based on clinical examination and none was under treatment for the last 6 months. Isometric handgrip strength, 2-pinch grip strength and muscle strength during radial deviation and dorsal extension were determined. Functional perceived pain was evaluated by a modified behaviour rating scale and perceived pain during contraction by visual analogue scale. Intramuscular and skin blood flow was recorded by a laser-Doppler flowmetry system technique (LDF) during stable temperature condition. Intramuscular blood flow was significantly lower in the affected side, 22.7+/-9.8 perfusion units (PU), as compared with 35.2+/-11.9 PU in the control side (P=0.01). There was no difference in skin blood flow or temperature between the affected and the control side. A positive correlation was found between the duration of symptoms and the difference in intramuscular blood flow between the affected and the control arm (r=0.65, P=0.06). The present data indicate that decreased microcirculation and anaerobic metabolism in ECRB may contribute to the lateral epicondylitis symptoms.

Staples MP, Forbes A, et al. (2008). A randomized controlled trial of extracorporeal shock wave therapy for lateral epicondylitis (tennis elbow). J Rheumatol **35**(10): 2038-46.

OBJECTIVE: The aims of this double-blind, randomized, placebo-controlled trial were to determine whether ultrasound-guided extracorporeal shock wave therapy (ESWT) reduced pain and improved function in patients with lateral epicondylitis (tennis elbow) in the short term and intermediate term. METHODS: Sixty-eight patients from community-based referring doctors were randomized to receive 3 ESWT treatments or 3 treatments at a subtherapeutic dose given at weekly intervals. Seven outcome measures relating to pain and function were collected at followup evaluations at 6 weeks, 3 months, and 6 months after completion of the treatment. The mean changes in outcome variables from baseline to 6 weeks, 3 months, and 6 months were compared for the 2 groups. RESULTS: The groups did not differ on demographic or clinical characteristics at baseline and there were significant improvements in almost all outcome measures for both groups over the 6-month followup period, but there were no differences between the groups even after adjusting for duration of symptoms. CONCLUSION: Our study found little evidence to support the use of ESWT for the treatment of lateral epicondylitis and is in keeping with recent systematic reviews of ESWT for lateral epicondylitis that have drawn similar conclusions.

Stephens MB, Beutler AI, et al. (2008). Musculoskeletal injections: a review of the evidence. Am Fam Physician **78**(8): 971-6.

Injections are valuable procedures for managing musculoskeletal conditions commonly encountered by family physicians. Corticosteroid injections into articular, periarticular, or soft tissue structures relieve pain, reduce inflammation, and improve mobility. Injections can provide diagnostic information and are commonly used for postoperative pain control. Local anesthetics may be injected with corticosteroids to provide additional, rapid pain relief. Steroid injection is the preferred and definitive treatment for de Quervain tenosynovitis and trochanteric bursitis. Steroid injections can also be helpful in controlling pain during physical

rehabilitation from rotator cuff syndrome and lateral epicondylitis. Intra-articular steroid injection provides pain relief in rheumatoid arthritis and osteoarthritis. There is little systematic evidence to guide medication selection for therapeutic injections. The medication used and the frequency of injection should be guided by the goal of the injection (i.e., diagnostic or therapeutic), the underlying musculoskeletal diagnosis, and clinical experience. Complications from steroid injections are rare, but physicians should understand the potential risks and counsel patients appropriately. Patients with diabetes who receive periarticular or soft tissue steroid injections should closely monitor their blood glucose for two weeks following injection.

Storm SA (2006). Assessing the instrumentalist interface: modifications, ergonomics and maintenance of play. Phys Med Rehabil Clin N Am **17**(4): 893-903.

Awareness of the tasks required to play a particular instrument requires observation of technique and understanding of the dynamic and static loads placed on the musculoskeletal system to play a particular instrument. Anatomic differences, variation in hand size, gender, instrument choice, and maintenance of the instrument all may play a role in the development of playing-related complaints. Simply observing particular instruments, we can see a variety of positions that are required to play the instrument. Important to the discussion of overuse syndromes, we must evaluate the duration of practice sessions and warm-up and cool down periods, which may help minimize playing-related problems. Avoid absolute rest and opt for relative rest for playing-related problems. Immobilization for more than 3 to 4 weeks may lead to greater risk of injury when playing is resumed. Return to play schedules should start with simple, soft music, doubling minutes of playing every few days, dropping back if pain develops. Practical advice may include building up practice times gradually with 5- to 10-minute intervals in 60- to 90-minutes sessions. This recommendation is supported by the findings of Lutz and colleagues who showed decreased blood flow to the forearm after repetitive hand and wrist activities for 90 minutes. This decrease in blood flow normalized after 5 to 10 minutes of stretching exercises. Players with hypermobility should consider limiting practice sessions to 45 minutes allowing for rest breaks of 10 to 15 minutes. Fry suggested a shift in thinking of ergonomics as a reactive strategy to one in which we anticipate and prevent problems before they become insidious or severe enough to limit the ability of the instrumentalist to play. Joint protection is important in all musicians, and although youth can be forgiving for many, we must remind our patients about joint protection as it applies to activities of daily living. Instrumentalists rely on their hands and finger joints to allow them to perform. Basic principles that apply to patients with all types of arthritis also apply to our patients when activities that worsen symptoms or place unnecessary stress on joints are identified. Using adaptive equipment to open jars is an obvious example. Overall, engaging the patient to observe routine behaviors may lead to the identification of modifiable activities, which might be aggravating or manifesting as a playing-related discomfort. Although some injury patterns can be associated with particular instruments, remember that your guitar-playing patient may be taking drum lessons on the side, which could result in lateral epicondylitis that bothers him when he plays the guitar.