PASIG MONTHLY CITATION BLAST: No.9 **April 2006**

Dear PASIG members:

This month's Citation BLAST initiates our special topic series. To mix it up, the format is an annotated bibliography of articles on the selected topic from 1996 – 2006. Special topics will be targeted periodically throughout the year. If you'd like to suggest a topic or create one, please let me know.

As a reminder, each month's citations will be added to specific EndNote libraries:

1) Ice Skating,
2) Gymnastics,
3) Music,
4) Dance.

These updated libraries will, in turn, be posted on the PASIG webpage for our members to access and download. (Please note: information about EndNote referencing software can be found at http://www.endnote.com, including a 30-day free trial). This month's topic on the hallux sesamoids will be added to the Dance library.

I'd like to share with our members an update on the Dance/USA Medical Task Force meetings on preventing injury and illness in professional dancers. In February, Dance/USA company managers and the dancer's union AGMA endorsed a pilot trial of the *Annual Post-Hire Health Screen for Professional Dancers* by a group of representative member companies. The finalized 30-minute assessment and guidelines are near completion. A formal letter inviting companies interested in participating in the pilot has gone out. It is anticipated that each organization will screen their dancers at the beginning of their new fiscal year, which is usually during the summer. This is an exciting next step in providing a new standard of health care to dancers.

This fall, the PASIG is pleased to announce a course offering Red Cross Certification as an Emergency First Responder with a focus on the performing artist. The course will be taught at University of Delaware on September 15-17, 2006. For more information, please contact PASIG Vice President Tara Jo Manal at: Tarajo@udel.edu.

Don't forget, the PASIG sponsors an annual student research scholarship. This award is to recognize students, who have had an abstract accepted to CSM, for their contribution to performing arts medicine and research. We encourage you to mentor your students in PA-related research and have them apply! If the PASIG Research Committee can assist students, please contact us. For more information on the research award please check our webpage (www.orthopt.org/sig_pa.php). The deadline for 2007 CSM abstracts submission is July 14th, 2006. They can be submitted via link at the APTA's website or at http://apta-csm2007.abstractcentral.com

As always, your comments and entry contributions to these Citation BLASTs are always welcome. Please drop me an e-mail anytime.

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SPECIAL TOPIC: PATHOLOGY OF THE HALLUX SESAMOIDS

Rolling through the foot to attain relevé makes painful sesamoids particularly problematic for the dancer. The following question was asked: What is the optimal treatment of hallux sesamoid non-union or avascular necrosis? Bone stimulation, ultrasound, or surgical excision? Considerations regarding excision include the potential loss of flexor strength of the first toe and postoperative weightbearing discomfort (padding is not an option for the modern dancer when dancing barefoot). This provoked the following literature search.

Anderson, R. B. and A. M. McBryde, Jr. (1997). "Autogenous bone grafting of hallux sesamoid nonunions." Foot Ankle Int **18**(5): 293-6.

We first performed autogenous bone grafting for lesions of the hallux sesamoid in 1984. During the next 9 years, 21 patients (11 men and 10 women with an average age of 34 and 32 years, respectively) underwent this surgical procedure for symptomatic tibial hallux sesamoid non-unions. Successful bony union was achieved in all but two patients. The majority of patients obtained concomitant relief of preoperative symptomatology and returned to their preinjury level of activity. We believe that this procedure serves as an alternative to hallux sesamoid excision in selected cases.

Biedert, R. and B. Hintermann (2003). "Stress fractures of the medial great toe sesamoids in athletes." Foot Ankle Int **24**(2): 137-41.

The purpose of this study was to determine whether specific symptoms and findings are present in patients with symptomatic stress fractures of the sesamoids of the great toe and, if so, whether partial sesamoidectomy is sufficient for successful treatment. Five consecutive athletes (five females; mean age 16.8 years [range, 13 to 22 years]) with six feet that were treated for symptomatic stress fractures of the sesamoids of the great toe were included in this study. Four athletes (five feet) performed rhythmic sports gymnastics; the fifth athlete was a long jumper. Some swelling to the forefoot and activity-related pain that increased in forced dorsiflexion, but disappeared at rest was found in all patients. While plain X-rays evidenced fragmentation of the medial sesamoid, MRI (n=2) and frontal plane CT scan (n=3) did not always confirm the

diagnosis, but bone scan (n=3) and axial as well as sagittal CT scan were useful to detect the pathology. After failure of conservative treatment measures, surgical excision of the proximal fragment was successful in all patients, and there were no complications. All patients were pain free and regained full sports activity within six months (range, 2.5 to six months). At final follow-up which averaged 50.6 months (range, 20 to 110 months), the overall clinical results were graded as good/excellent in all patients, and there was only one patient with of restriction sports activities. The obtained AOFAS-Hallux-Score was 95.3 (75 to 100) points. Apparently, stress fractures occur more often at the medial sesamoid, and females are mainly involved. When a stress fracture is suspected, bone scan and CT scan are suggested as more reliable in confirming the diagnosis than other imaging methods. When conservative treatment has failed, surgical excision of the proximal fragment is recommended.

Blundell, C. M., P. Nicholson, et al. (2002). "Percutaneous screw fixation for fractures of the sesamoid bones of the hallux." J Bone Joint Surg Br **84**(8): 1138-41.

Over a period of one year we treated nine fractures ofhe sesamoid bones of the hallux, five of which were in the medial sesamoid. All patients had symptoms on exercise, but only one had a recent history of injury. The mean age of the patients was 27 years (17 to 45) and there were six men. The mean duration of symptoms was nine months (1.5 to 48). The diagnosis was based on clinical and radiological investigations. We describe a new surgical technique for percutaneous screw fixation for these fractures using a Barouk screw. All the patients were assessed before and after surgery using the American Orthopaedic Foot and Ankle Society Hallux Score (AOFAS). There was a statistically significant improvement in the mean score from 46.9 to 80.7 ($p = 0.0003$) after fixation of the fracture with a rapid resolution of symptoms. All patients returned to their previous level of activity by three months. We believe that this relatively simple technique is an excellent method of treatment in appropriately selected patients.

Cortes, Z. E. and J. F. Baumhauer (2004). "Traumatic lateral dislocation of the great toe fibular sesamoid: case report." Foot Ankle Int **25**(3): 164-7.

Traumatic dislocation of the hallucal sesamoids is uncommon. This case involves a 17-year-old female driver involved in a head-on collision who sustained traumatic lateral dislocation of the fibular sesamoid associated with intersesamoidal ligament disruption, partial plantar plate avulsion, and impaction fracture of the metatarsal head. The diagnosis was delayed due to incorrect interpretation of initial radiographs. In addition, the severity of the soft-tissue injury was not appreciated, possibly further delaying the diagnosis. The patient was treated with open reduction of the fibular sesamoid and reconstruction of the intersesamoidal ligament. Eight months after surgery, she had mild persistent symptoms, decreased range of motion, and near full resumption of prior activities.

Fleischli, J. and E. Cheleuitte (1995). "Avascular necrosis of the hallucial sesamoids." J Foot Ankle Surg **34**(4): 358-65.

The authors present a literature review and systematic approach to the diagnosis and treatment of avascular necrosis of the sesamoids of the flexor hallucis brevis tendon. Renander, in 1924, was one of the earliest authors to call attention to this condition. Since that time, many other authors have written about this entity, some even questioning its existence. Many different treatment regimes have been postulated, encompassing both the conservative and surgical modalities. Most literature advocates attempted conservative treatment followed by surgical excision, only if conservative methods fail.

Julsrud, M. E. (1997). "Osteonecrosis of the tibial and fibular sesamoids in an aerobics instructor." J Foot Ankle Surg **36**(1): 31-5.

Osteonecrosis of the sesamoids is a fairly uncommon clinical entity. The development of this condition involving both sesamoids has never been presented in the American literature. After extirpation of the sesamoids and interdigital fusion, the patient returned to her regular activities, including dance.

Kanatli, U., A. M. Ozturk, et al. (2006). "Absence of the medial sesamoid bone associated with metatarsophalangeal pain." Clin Anat.

Pain at the first metatarsophalangeal (MTP) joint can result from inflammation, chondromalacia, flexor hallucis brevis tendinitis, osteochondritis dessecans, fracture of a sesamoid bone, avascular necrosis of sesamoids, inflamed bursae, intractable keratoses, infection, sesamoiditis, gout arthropathy, and rheumatoid arthritis. Congenital absence of a sesamoid bone is extremely rare. We present a 17-year-old male patient with pain at the plantar aspect of the right MTP joint associated with congenital absence of the medial sesamoid. There was tenderness and the range of motion was minimally restricted. He described the pain as necessitating changes in his social life. On radiographs, the medial hallucial sesamoid was absent on the right side. The MTP joint was also evaluated using magnetic resonance imaging (MRI). A metatarsal pad was prescribed and the patient was satisfied with the treatment at the 2 months follow-up period. MRI revealed no pathological tissue at the medial sesamoid site. Hallucial sesamoids absorb pressure, reduce friction, protect the tendons, act like a fulcrum to increase the mechanical force of the tendons, and provide a dynamic function to the great toe by elevating first metatarsal head. Congenital absence of these bones is very rare but we must consider it in a patient with MTP joint pain. Clin. Anat. 19, 2006. (c) 2006 Wiley-Liss, Inc.

Lee, S., W. C. James, et al. (2005). "Evaluation of hallux alignment and functional outcome after isolated tibial sesamoidectomy." Foot Ankle Int **26**(10): 803-9.

BACKGROUND: Functional loss and clinical evidence of hallux malalignment have been reported to follow isolated tibial sesamoidectomy. METHODS: Thirty-two patients with isolated tibial sesamoidectomies were identified. Patients with a diagnosis of peripheral neuropathy, diabetes mellitus, inflammatory arthropathy or previous foot surgery were excluded as were patients who had concomitant joint realignment procedures. Twenty patients were available for followup with the Short Form-36 (SF-36), Foot Function Index (FFI) disability scale, visual analog scale (VAS), and questionnaire at an average of 62 (range 10 to 157) months after surgery. Fourteen patients returned for physical examination, radiographs, and pedographic and isokinetic examination. RESULTS: Physical examination of the 14 patients did not reveal any significant change in clinical alignment, range of motion or tenderness. Preoperative and postoperative comparison radiographs did not reveal significant differences in the intermetatarsal (IM) angle, hallux valgus (HV) angle distal metatarsal articular angle (DMAA), or sesamoid alignment (sesamoid station). Postoperative outcome measurements (VAS, SF36, and FFI) for 20 patients found significant relief of pain and improved functional outcome. Computerized dynamic pedographic measurements (Performance Orthotic) for 12 patients did not reveal any altered plantar pressures in the region of the hallux metatarsophalangeal joint. Isokinetic measurements of ankle plantar flexion push-off strength in eight patients did not reveal significant differences in side-to-side measurements. Eighteen of 20 (90%) patients indicated that they were able to resume all preoperative activities; six (30%) had extreme difficulty or an inability to stand on tip toe, but this did not impact their activities of daily living or their athletic endeavors. Two patients (14.3%) developed transfer metatarsalgia, but only one was symptomatic. CONCLUSION: Isolated tibial sesamoidectomy is a safe and effective treatment for recalcitrant tibial sesamoiditis. Hallux malalignment and deformity resulting in functional loss and change in hallux

alignment can be avoided by meticulous surgical technique with repair of the soft tissues.

Oloff, L. M. and S. D. Schulhofer (1996). "Sesamoid complex disorders." Clin Podiatr Med Surg **13**(3): 497-513.

Disorders of the hallux sesamoids and associated soft-tissue structures are commonly seen. With a differential diagnosis consisting of no fewer than 30 conditions, establishing an accurate diagnosis can be challenging but is important to appropriate treatment implementation. An understanding of first metatarsophalangeal joint anatomy, function, and current diagnostic technology aids the practitioner in the diagnosis and successful treatment of these often overlooked and anecdotally managed disorders.

Ozkoc, G., S. Akpinar, et al. (2005). "Hallucal sesamoid osteonecrosis: an overlooked cause of forefoot pain." J Am Podiatr Med Assoc **95**(3): 277-80.

Four cases of osteonecrosis of hallucal sesamoids are reported here. Surgical excision of necrotic sesamoid tissue yielded satisfactory results, with the patients reporting no residual pain. Although it has not been frequently addressed in the literature, avascular necrosis of the sesamoid bones should be considered in the differential diagnosis of persistent forefoot pain.

Perez Carro, L., J. I. Echevarria Llata, et al. (1999). "Arthroscopic medial bipartite sesamoidectomy of the great toe." Arthroscopy **15**(3): 321-3.

This is the first report of a successful first metatarsophalangeal joint medial bipartite sesamoidectomy using great toe arthroscopy. The surgical trauma associated with open operative sesamoidectomy can be minimized using minimally invasive techniques under arthroscopic control. The authors describe the surgical principles and discuss the advantages compared with traditional surgery.

Richardson, E. G. (1999). "Hallucal sesamoid pain: causes and surgical treatment." J Am Acad Orthop Surg **7**(4): 270-8.

The hallucal sesamoids, although small and seemingly insignificant, play an important role in the function of the great toe by absorbing weight-bearing pressure, reducing friction, and protecting tendons. However, the functional complexity and anatomic location of these small bones make them vulnerable to injury from shear and loading forces. Injury to the hallucal sesamoids can cause incapacitating pain, which can be devastating to an athlete. Although traumatic injuries usually can be diagnosed easily, other pathologic conditions may be overlooked. Careful physical and radiologic examinations are necessary to determine the cause of pain and allow a recommendation of the optimal treatment. Surgical treatment may include partial or complete resection of the sesamoid, shaving of a prominent tibial sesamoid, or autogenous bone grafting for nonunion. Excision of both sesamoids should be avoided if possible.

Riley, J. and M. Selner (2001). "Internal fixation of a displaced tibial sesamoid fracture." J Am Podiatr Med Assoc **91**(10): 536-9.

The authors present a surgical technique for the preservation and repair of an acutely fractured sesamoid using internal fixation of the sesamoid. A case report demonstrating the technique for the open reduction and internal fixation of a fractured tibial sesamoid is presented. The authors recommend this procedure as a viable alternative to surgical excision of the tibial sesamoid. The use of the procedure as an adjunct for the surgical treatment of recalcitrant traumatic sesamoiditis is also discussed.

Saxena, A. and T. Krisdakumtorn (2003). "Return to activity after sesamoidectomy in athletically active individuals." Foot Ankle Int **24**(5): 415-9.

Sesamoidectomy of the first metatarsophalangeal joint in athletically active patients may be indicated in cases of chronic sesamoiditis resistant to nonsurgical care or symptomatic displaced fractures or nonunion. Painful scar, hallux deviation, and delayed return to activity are all potential complications. These need to be considered especially when performing surgery in the athletically active individual. Twenty-six sesamoidectomies in 24 patients (21 females and 3 males) were reviewed for type of sesamoidectomy, incision location, time to return to activity, and complications. Mean age was 35.4 years (range, 16-68 years) with mean follow-up 86.4 months. Eleven athletes (defined as professional or varsity level sports) operated on had a mean return to activity of 7.5 weeks (range, 4-10 weeks), while 13 "active" patients had a mean return to activity of 12.0 weeks. This difference was statistically significant using the t-test, ($p < .02$). There were 10 fibular and 16 tibial sesamoids excised. Complications included one hallux varus and two cases of postoperative scarring with neuroma-like symptoms, all associated with fibular sesamoidectomy; there was one case of hallux valgus deformity with tibial sesamoidectomy. Despite the functional importance of tibial and fibular sesamoids, athletically active individuals can return to sports after a sesamoidectomy as early as 7.5 weeks.

Talbot, K. D. and C. L. Saltzman (1998). "Assessing sesamoid subluxation: how good is the AP radiograph?" Foot Ankle Int **19**(8): 547-54.

Subluxation of the metatarsosesamoid joints frequently occurs with the development of hallux valgus deformity, and the restoration of a normal metatarsosesamoid articulation has been proposed as essential for achieving a biomechanically sound operative result. The position of the sesamoid bones on the AP radiograph is used often to assess the pre- and postoperative relationship between the hallucal sesamoids and the metatarsal sulci. We evaluated the validity of this approach. Thirty subjects with hallux valgus and 30 control subjects participated in this study by undergoing both AP and tangential weightbearing radiographs. The sesamoid station on the AP radiographs was compared with the position of the sesamoids on tangential radiographs, using a new continuous measure to estimate subluxation. In approximately half of the cases, we found a difference between the apparent sesamoid station on the AP radiograph and the true position on the tangential one. Increased metatarsal rotation was associated with misclassification of the sesamoid station on the AP radiograph. We conclude that the standard method for measuring the sesamoid station on the AP radiograph is not valid. Surgeons wishing to evaluate the metatarsosesamoid joint should obtain weightbearing tangential radiographs.

Toussirot, E., L. Jeunet, et al. (2003). "Avascular necrosis of the hallucal sesamoids update with reference to two case-reports." Joint Bone Spine **70**(4): 307-9.

We report two cases of nontraumatic metatarsal pain with sclerosis and fragmentation of the lateral sesamoid bone on roentgenographs and computed tomography images. One patient underwent magnetic resonance imaging (MRI), which showed low signal from the sesamoid bone. These imaging findings suggested osteonecrosis. Histology of the sesamoidectomy specimen confirmed this diagnosis in one patient. Avascular necrosis of the metatarsal sesamoid is an uncommon disorder. The suggestive roentgenographic and MRI findings rule out the other painful conditions of the sesamoid bone. The features are reviewed and the treatment options discussed.