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.53 **September 2010**

Dear PASIG members:

As fall activities get underway, so do plans for attending conferences, continuing education, and participation in professional activities, which brings me to these Citation BLASTS. If these BLASTS are interesting and useful, we need your contributions to continue them! Please contact me with your ideas and assistance!

At CSM 2010, a number of our members volunteered to work on new PA-terminology resources. Areas include ice skating, gymnastics, hip hop dance, cheerleading, baton and flag twirling, instrumentalists, vocalists, ballroom dance, an update of ballet, and modern dance (Graham, Horton, etc.). Our intent is to include definitions and photographs, to publish them as Blasts, and then post them on our website. Volunteers, please send me your completed work within the next month! To get these resources ready for CSM, I'll need them no later than October 15th.

Finally, don't forget to start planning your trip to the next Combined Sections Meeting, which will be held in New Orleans, February 9 –12, 2011. PASIG programming and new PA research is always an exciting part of this conference. By this time, CSM abstract acceptance notices have gone out. If one of your students has had an abstract accepted, don't forget, the PASIG sponsors an annual student research scholarship. For more information on the research award please check our webpage (http://www.orthopt.org/sig_pa.php). Students with additional questions can contact Amy Humphrey (ahumphrey@bodydynamicsinc.com). DEADLINE for application: November 15th.

Performing Arts continuing education, courses, and related conferences:

****NEW Performing Arts Independent Study NOW AVAILABLE****
20.3 Physical Therapy for the Performing Artist.
Monographs are available for:
- Figure Skating (J. Flug, J. Schneider, E. Greenberg),
- Artistic Gymnastics (A. Hunter-Giordano, Pongetti-Angeletti, S. Voelker, TJ Manal), and
- Instrumentalist Musicians (J. Dommerholt, B. Collier).

Contact: Orthopaedic Section at: http://www.orthopt.org

Also available:
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.

- Epidemiology of Dance Injuries: Biopsychosocial Considerations in the Management of Dancer Health (MJ Liederbach),
- Nutrition, Hydration, Metabolism, and Thinness (B Glace),
- The Dancer's Hip: Anatomic, Biomechanical, and Rehabilitation Considerations (G. Grossman),
- Common Knee Injuries in Dance (MJ Liederbach),
- Foot and Ankle Injuries in the Dancer: Examination and Treatment Strategies (M. Molnar, R. Bernstein, M. Hartog, L. Henry, M. Rodriguez, J. Smith, A. Zujko),
- Developing Expert Physical Therapy Practice in Dance Medicine – (J. Gamboa, S. Bronner, TJ Manal).

Contact: Orthopaedic Section at: http://www.orthopt.org

International Association for Dance Medicine and Science (IADMS) 20th Annual Meeting
October 28 – 31, 2010
October 31: Biomechanics and Dance Workshop
Birmingham, UK
Contact: http://www.iadms.org

Combined Sections Meeting
February 9 –12, 2011
New Orleans, LA
PASIG Programming: *Movement Impairment Issues in Performing Artists: Considerations for Evaluation and Treatment of Upper and Lower Quarter Injuries*.
The keynote speaker is Lynette Khoo-Summers from Washington University with cases being presented on vocal musicians, instrumental musicians, dancers, and figure skaters.

If you know of other courses of interest to our membership, please send the information to: Amy Humphrey PT, DPT, OCS, MTC; ahumphrey@Bodydynamicsinc.com

For this September Citation BLAST, I've selected the topic *Peroneal and Tibial Nerve Entrapments.* The format is an annotated bibliography of articles from 2000 – 2010. The PASIG Research Committee initiated this monthly Citation BLAST on performing arts-related topics in June 2005 in the hopes of encouraging our members to stay current in the literature and, perhaps, consider conducting research themselves. Each month we send a new list of performing arts (PA) citations to members of the PASIG to further the pursuit of PA-related scholarship. 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, suggestions, and entry contributions to these Citation BLASTs are welcome. Please drop me an e-mail anytime.

Regards,
Shaw

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Peroneal and Tibial Nerve Entrapments

At our dance injury clinic we have recently seen four lower extremity cases involving neural entrapment. A recent pubmed search of the key words peroneal nerve OR tibial nerve, AND entrapment OR compression, AND dance OR gymnast came up empty. In our first case, a dancer fell asleep while icing his posterior knee with his leg on top of the ice. When he woke up, he exhibited a foot drop with peroneal and anterior tibialis muscle weakness. In our second case, a dancer complained of chronic calf tightness and achilles tendon pain. On palpation, a hardened mass was palpated at her proximal medial gastrocnemius. Referral to her orthopaedist found a large osteochondroma embedded in the muscle. In a third case, a student complained of pain down her lateral leg, exacerbated by pointwork. Only palpation at posterior fibula head reproduced her symptoms. Her orthopaedist found an osteochondroma at the fibula neck compressing her common peronal nerve. In a fourth case, a student dancer in our intensive summer program complained of anterior lower leg and dorsal foot pain, parasthesias and muscle cramping, exacerbated by vigorous dancing, especially with jumping. Due to lack of insurance, she refused our recommendation to see our dance orthopadist, and requested assistance in monitoring and minimizing her symptoms until her return home. With modification of her activities, massage, and anti-inflammatory treatment, she finished the remaining 2 weeks of the program and was referred to her physician at home with a working diagnosis of compartment syndrome.

Each of these cases involved a relatively rare diagnosis that might easily have been mistaken for strains or tendinitis. Muscle cramping, aching, tightening, and burning may be related to lower leg exertional compartment syndrome and/or concurrent neural symptoms. While symptoms may be neurogenic symptoms or ischaemic, all were neurogenic in these cases.

Common peroneal nerve compression may be caused by habitual leg crossing, compression of the nerve against a hard surface, against fascial layers of well-developed muscles of the legs in athletes, spending long hours in a squatting position, or prolonged immobility, and less frequently by compression from neurilemomas, intraneural or extraneural ganglia, schwannomas, angiomas, neuromas, exostosis, chondromatosis, Baker cysts, and vascular abnormalities. Proximal tibial nerve entrapment in the popliteal fossa, even rarer, may occur with compression by the proximal soleus muscle insertion, Baker cyst, or other masses or anomalies in this region. Osteochondromas are also relatively rare, presenting in 1-2% of the population.

Shaw Bronner PT, PhD, OCS

Al-Kashmiri A, Delaney JS (2007). Case report: Fatigue fracture of the proximal fibula with secondary common peroneal nerve injury. Clin Orthop Relat Res **463**: 225-228.

Stress fractures of the proximal fibula are uncommon and usually result from axial loading, which is mostly described in runners. We report an unusual mechanism of such a fracture in a circus performer resulting from repetitive direct horizontal loading from a trapeze bar. In addition, the bony injury resulted in a secondary injury to the common peroneal nerve with corresponding weakness. Both injuries responded well to nonoperative treatment and the athlete had an excellent recovery with no residual symptoms. He was able to resume his training with the use of protective padding applied to the proximal legs. Fracture of the proximal fibula caused by direct repetitive stress to the bone with a secondary compression injury to the common peroneal nerve is a previously undescribed injury. We report a patient who presented with this injury, the possible mechanisms of such injury, its management, and outcome.

Cardelia JM, Dormans JP, et al. (1995). Proximal fibular osteochondroma with associated peroneal nerve palsy: a review of six cases. J Pediatr Orthop **15**(5): 574-577.

Osteochondroma of the proximal fibula is relatively common, but reports of this lesion in conjunction with peroneal nerve palsy have been scarce. Six patients with peroneal nerve palsy and fibular exostosis are presented with the results of electrical studies, radiographic evaluation, physical examination, and operative treatment. A wide variation in presentation and outcome was observed. Preoperative and postoperative electromyography and nerve-conduction studies are useful in evaluation. A heightened awareness of this entity is required to avoid permanent damage in an otherwise treatable condition.

Daghino W, Pasquali M, et al. (1997). Superficial peroneal nerve entrapment in a young athlete: the diagnostic contribution of magnetic resonance imaging. J Foot Ankle Surg **36**(3): 170-172.

Fascial entrapment of the superficial peroneal nerve produced severe pain in the ankle and foot of a 16-year-old female athlete after several sprains of the same ankle. The pain coexisted with erythema and sensory alteration of the area involved. Magnetic resonance imaging confirmed the diagnosis of this unusual neuropathy. Limited fasciectomy, at the point where the nerve becomes subcutaneous, relieved all symptoms.

Dallari D, Pellacani A, et al. (2004). Deep peroneal nerve paresis in a runner caused by ganglion at capitulum peronei. Case report and review of the literature. J Sports Med Phys Fitness **44**(4): 436-440.

Although lateral popliteal sciatic nerve damage is not one of the commonest diseases in the general population, it is quite frequent among athletes. Several physiopathologic mechanisms have been thought to bring about this damage in athletes. Soft tissue ganglions with neurological involvement of the lateral popliteal sciatic nerve or its terminal rami are in differential diagnosis with several lesions of this area, as direct or indirect trauma, subcutaneous rupture of anterior tibialis muscle and long peroneal muscle, disc hernia, intraspinal tumor, anterior tarsal tunnel syndrome, cysts, neurofibroma, baker's cyst, vascular claudication, stenosing or inflammatory pathology of 2(nd) motoneuron, antimicrobial agents for urinary tract infection (nitrofurnantoin). The authors report the case of a 34-year-old amateur athlete with a recent paralysis of the hallux extensor, paresis of the toe extensor and hyposthenia of the tibialis anterior. The patient had been suffering from episodes of lumbalgia for a long time. He was sent to us because neurological damage due to disc herniation was suspected. Electromyography, sonography, and CT showed peripheral compression of the deep peroneal nerve caused by a mucous cyst at the capitulum peronei, a "rare" condition. The patient underwent surgery to excise the cyst, which led to the rapid resolution of the nerve deficit shown by clinical and electromyographical tests. A meticulous anamnesis and accurate objective examination, followed by specific tests (radiographs, sonography, and possibly CT scan) generally enable a correct diagnosis to be made. If diagnosis and therapy are carried out correctly, and without delay, symptoms quickly resolve and the nerve deficit progressively regresses.

Dash S, Bheemreddy SR, et al. (1998). Posterior tibial neuropathy from ruptured Baker's cyst. Semin Arthritis Rheum **27**(5): 272-276.

OBJECTIVES: To increase awareness of entrapment neuropathy caused by rupture of Baker's cyst. METHODS: A patient with psoriatic arthritis, ruptured Baker's cyst, and entrapment neuropathy is reported and the literature on this complication is reviewed. RESULTS: Nerve entrapment caused by rupture of Baker's cyst is rare. Neurological examination and demonstration of Baker's cyst by Color Doppler Duplex Ultrasound (CDDU) help in making the diagnosis. Nerve Conduction Study (NCS) may confirm the diagnosis of posterior tibial nerve entrapment. CONCLUSIONS: Peripheral nerve entrapment should be considered in patients with Baker's cysts and loss of sensation along the plantar aspect of the foot or other neurological symptoms or findings.

de Ruiter GC, Torchia ME, et al. (2005). Neurovascular compression following isolated popliteus muscle rupture: a case report. J Surg Orthop Adv **14**(3): 129-132.

This case report concerns an unusual complication of neurovascular compression following an isolated popliteus muscle rupture. A 59-year-old man, after a fall from a horse, gradually developed symptoms of a swollen leg, dysesthesias in the sole of his foot, and muscle weakness of his toe flexors. At presentation, he was found to have a complete tibial nerve injury at the level of the popliteal fossa and significant neuropathic pain. MRI demonstrated a rupture in the muscular portion of the popliteus muscle with extensive edema and hemorrhage compressing the tibial nerve in the popliteal fossa. The edema extended up to the distal part of sciatic nerve where there was evidence of intraneural hemorrhage. In the course of recovery, the patient additionally developed deep venous thrombosis in the ipsilateral popliteal vein. Spontaneous recovery was documented on serial clinical and electrodiagnostic examinations. The patient's neuropathic pain improved significantly within 6 months and his neurologic function recovered nearly fully by 2 years.

Edwards Jr PH, Wright ML, et al. (2005). A practical approach for the differential diagnosis of chronic leg pain in the athlete. Am J Sports Med **33**(8): 1241-1249.

Chronic lower leg pain results from various conditions, most commonly, medial tibial stress syndrome, stress fracture, chronic exertional compartment syndrome, nerve entrapment, and popliteal artery entrapment syndrome. Symptoms associated with these conditions often overlap, making a definitive diagnosis difficult. As a result, an algorithmic approach was created to aid in the evaluation of patients with complaints of lower leg pain and to assist in defining a diagnosis by providing recommended diagnostic studies for each condition. A comprehensive physical examination is imperative to confirm a diagnosis and should begin with an inquiry regarding the location and onset of the patient's pain and tenderness. Confirmation of the diagnosis requires performing the appropriate diagnostic studies, including radiographs, bone scans, magnetic resonance imaging, magnetic resonance angiography, compartmental pressure measurements, and arteriograms. Although most conditions causing lower leg pain are treated successfully with nonsurgical management, some syndromes, such as popliteal artery entrapment syndrome, may require surgical intervention. Regardless of the form of treatment, return to activity must be gradual and individualized for each patient to prevent future athletic injury.

Flores LP, Koerbel A, et al. (2005). Peroneal nerve compression resulting from fibular head osteophyte-like lesions. Surg Neurol **64**(3): 249-252; discussion 252.

BACKGROUND: The anatomical relationship of the fibular head with the fibular nerve is a critical point in regard to injuries of peripheral nerves in the lower extremities. In this location, the peroneal nerve may be injured due to several mechanisms, and osteophyte-like lesions can be considered as a differential diagnosis. METHODS: The suitable literature concerning this association is reviewed and a case is presented. A 15-year-old adolescent boy presented with right peroneal nerve palsy on admission. The radiological examinations (computed tomography and magnetic resonance imaging) demonstrated an osteophytic lesion in the head of the right fibula. The patient underwent surgical decompression of the nerve and resection of the lesion. Postoperatively, there was a complete recovery of the deficits. CONCLUSIONS: The association of osteophyte-like bone changes and peroneal nerve palsy is rare. The differential diagnoses of these lesions include cartilaginous exostoses and osteochondromas, which may be related to hereditary multiple exostoses syndrome. The timing of the treatment plays an important role in the neurological recovery.

Gray KV, Robinson J, et al. (2004). Splitting of the common peroneal nerve by an osteochondroma: two case reports. J Pediatr Orthop B **13**(4): 281-283.

Multiple exostoses is an autosomal dominant disease in which bony protuberances arise from the metaphyseal periphery. Most are asymptomatic but occasionally the tumors become troublesome, causing irritation to the surrounding tissues. While nerve compression by an adjacent osteochondroma has been reported, to our knowledge there are no reports of the tumor growing through the mid-substance of a nerve. This article reports two occurrences of an osteochondroma of the proximal fibula that was noted at surgery to grow through the common peroneal nerve, splitting it into two limbs. By reporting these cases, it is our hope to alert surgeons that this problem may occur, and care should be taken to identify the entire nerve prior to removal of the osteochondroma.

Hutchinson MR, Bederka B, et al. (2003). Anatomic structures at risk during minimal-incision endoscopically assisted fascial compartment releases in the leg. Am J Sports Med **31**(5): 764-769.

BACKGROUND: Although minimal-incision surgical techniques are recommended for treatment of chronic exertional compartment syndrome of the leg, which is an increasing problem among endurance athletes, there is little information about anatomic correlation with structures at risk. HYPOTHESIS: Fascial releases performed with endoscopic assistance are safer than the percutaneous method. STUDY DESIGN: Controlled laboratory study. METHODS: Ten endoscopically assisted and six percutaneous fascial releases were performed on 16 human cadaveric lower limbs. Formal dissection documented length of release and proximity of structures at risk. RESULTS: Endoscopically assisted fascial release led to reduced risk of superficial peroneal nerve injury compared with a blind percutaneous release through a 2- to 3-cm incision. Both techniques had unacceptable rates of saphenous vein injury (30% to 100%), and releases performed percutaneously had greater length. CONCLUSIONS: Risk of superficial peroneal nerve injury was less with single-incision endoscopically assisted fascial release. Risk of injury to the saphenous vein from either technique appeared to be unacceptable. Clinical Relevance: Single-incision endoscopically assisted fascial release of the anterior and lateral compartments may be a useful technique with low risk of peroneal nerve injury. Clinical studies will confirm whether this technique proves safer or more effective than those currently used for chronic exertional compartment syndrome of the leg.

Ji JH, Shafi M, et al. (2007). Compressive neuropathy of the tibial nerve and peroneal nerve by a Baker's cyst: case report. Knee **14**(3): 249-252.

We report a case of Baker's cyst that induced compression of both the tibial and common peroneal nerves. The patient presented with calf atrophy and foot drop over a 6-month period. These signs and symptoms could have been mistaken for those of spinal origin.

Based on an electrodiagnostic study and magnetic resonance imaging, compression of nerves by an asymptomatic Baker's cyst measuring 6x4 cm was confirmed. This cyst communicated with the articular joint which was also associated with a medial meniscal lesion. We treated the patient arthroscopically by performing partial medial meniscectomy, and through the posterolateral and the posteromedial portal, decompression of the Baker's cyst was performed. Approximately 6 weeks after the arthroscopic decompression, the cyst recurred. Therefore open resection was performed. At 1-year follow-up, the patient had considerable improvement in motor as well as sensory function and showed no evidence of recurrence. Although the electrodiagnostic studies showed an improvement in symptoms, the patient continued to complain of lower leg weakness owing to delayed diagnosis and cyst decompression. We believe that Baker's cysts should also be considered in the differential diagnoses of patients who present with neuromuscular dysfunction in the calf and leg.

Kaplan KM, Patel A, et al. (2008). Peroneal nerve compression secondary to an anomalous biceps femoris muscle in an adolescent athlete. Am J Orthop (Belle Mead NJ) **37**(5): 268-271.
Common peroneal nerve compression is a well-recognized entity that can cause severe debilitating clinical manifestations. The current literature describes numerous locations and mechanisms of compression, including both structural and systemic causes. Anatomical variants should be considered part of the differential diagnosis in peroneal nerve impingement. We present the case of a 14-year-old basketball player with footdrop secondary to compression of the common peroneal nerve from an accessory biceps femoris muscle, which was treated by neurolysis. In addition, we review the systematic workup of patients with nerve compression.

Kollrack YM, Mollenhoff G (2009). [Exertional compartment syndrome of the lower leg and common peroneal nerve palsy as combined injury after weight lifting]. Sportverletz Sportschaden **23**(3): 165-168.
While the compartment syndrome after traumatic injury is a well-known entity and well recognised, an exercise-induced acute compartment syndrome is seldom and often missed. Delayed diagnosis and treatment can result in a poor outcome such as loss of function or limb. Early recognition and prompt fasciotomy are necessary. We would like to present the case of an exertional compartment syndrome of the tibialis anterior space after weight-lifting which was complicated by an acute pressure-induced palsy of the common peroneal nerve due to a self applied knee-support-bandage. A thorough case history provided the clue to understand the resulting pathology. This case shows again the necessity of good medical assistance for athletes in leisure-time sport activities.

Leach RE, Purnell MB, et al. (1989). Peroneal nerve entrapment in runners. Am J Sports Med **17**(2): 287-291.
In a practice involving large groups of athletes, seven runners and one soccer player with peroneal nerve compression neuropathy secondary to exercise have been found. Running incited pain, numbness and tingling to varying degrees in all patients, and examination after running revealed muscle weakness and a positive percussion test as the nerve winds around the fibular neck. Nerve conduction velocity studies confirmed the diagnosis in the five patients on whom the test was performed; other studies served primarily to exclude other causes of pain. All patients were treated surgically by neurolysis of the peroneal nerve as it travels under the sharp fibrous edge of the peroneus longus origin. Seven of eight had excellent results and returned to their previous level of physical exertion without further symptoms. We think entrapment of the peroneal nerve at the fibular neck is a more common entity than previously recognized, and it should be considered in the differential diagnosis of exertional lateral leg pain.

Lee JH, Jun JB, et al. (2000). Posterior tibial neuropathy by a Baker's cyst: case report. Korean J Intern Med **15**(1): 96-98.

Baker's cysts are rare cause of peripheral nerve entrapment and only a few cases of tibial nerve entrapment resulting from the popliteal cyst in the calf muscle have been reported in the literature. We present a case of rheumatoid arthritis complicated by a Baker's cyst with a tibial nerve entrapment. It is important to diagnose a Baker's cyst early and to differentiate it from thrombophlebitis, a popliteal aneurysm, tumor or muscle tear to effect optimal therapy and to obviate a potential neuropathy. Prompt recognition of these cases may save the patients unnecessary procedures and delay in treatment.

Mastaglia FL (2000). Tibial nerve entrapment in the popliteal fossa. Muscle Nerve **23**(12): 1883-1886.

Details are presented of nine cases of tibial nerve entrapment by the tendinous arch of origin of the soleus muscle. The diagnosis was confirmed by surgical exploration of the popliteal fossa in six patients, who recovered fully after division of the soleus arch, whereas the other three improved spontaneously. This condition can be distinguished clinically from tibial nerve compression at the ankle, and from S1 radiculopathy, by the presence of severe pain and tenderness and a positive Tinel sign in the popliteal fossa, and by electrodiagnostic studies.

McAuliffe TB, Fiddian NJ, et al. (1985). Entrapment neuropathy of the superficial peroneal nerve. A bilateral case. J Bone Joint Surg Br **67**(1): 62-63.

A 21-year-old female athlete presented with bilateral lumps in her calves which became painful on exercise. Exploration revealed entrapment of the superficial peroneal nerves. Her symptoms were relieved by fasciectomy.

McCrory P, Bell S, et al. (2002). Nerve entrapments of the lower leg, ankle and foot in sport. Sports Med **32**(6): 371-391.

Exercise-related leg pain is a common and yet difficult management problem in sports medicine. There are many common causes of such symptoms including stress fractures and muscle compartment syndromes. There are also a number of less common but important conditions including popliteal artery entrapment and nerve entrapment syndromes. Even for an astute clinician, distinction between the different medical causes may be difficult given that many of their presenting features overlap. This review highlights the common clinical presentations and raises a regional approach to the diagnosis of the neurogenic symptoms. In part, this overlapping presentation of different pathological conditions may be due to a common aetiological basis of many of these conditions namely, fascial dysfunction. The same fascial restriction that predisposes to muscle compartment syndromes may also envelop the neurovascular structures within the leg resulting in either ischaemic or neurogenic symptoms. For many athletes with chronic exercise-related leg pain, combinations of such problems often coexist suggesting a more widespread fascial pathology. In our clinical experience, we often label such patients as 'fasciopaths'; however, the precise pathophysiological basis of this fascial problem remains to be elucidated. This review discusses the various nerve entrapment syndromes in the lower limb that may result in exercise-related leg pain in the sporting context. The anatomy, clinical presentation, investigation, medical management and surgical treatment are discussed at length for each of the syndromes. It is clear from clinical experience that the outcome of surgical management of such syndromes fares much better where a clear dermatomal pain distribution is present or where focal weakness and/or sensory symptoms appropriate for the nerve are present. In many situations, however, nonspecific leg pain or vague nonlocalising sensory symptoms are present and in such situations, alternative diagnoses must be considered and investigated appropriately. As mentioned above, many different pathologies

may coexist in the lower limb and may be a source of confusion for the clinician or alternatively may be the reason for poor treatment outcomes.

Mitra A, Stern JD, et al. (1995). Peroneal nerve entrapment in athletes. Ann Plast Surg **35**(4): 366-368.

Peroneal nerve entrapment is one of the less common causes of exercise-induced leg pain in competitive athletes. This type of lower extremity peripheral nerve dysfunction is usually associated with activities that subject the nerve to constant compression or repetitive trauma. Herein, we present our experience with 12 competitive athletes treated for peroneal nerve entrapment. Diagnostic electromyography results, intraoperative findings, and the results of cadaveric dissections are discussed.

Mnif H, Koubaa M, et al. (2009). Peroneal nerve palsy resulting from fibular head osteochondroma. Orthopedics **32**(7): 528.

This article describes a case of a 11-year-old boy with an osteochondroma of the peroneal head causing peroneal nerve palsy. Physical examination disclosed large exostoses palpated at the right fibular head. Neurological examination revealed paresis of the tibialis anterior, lateral peroneal, and extensor digitorum muscles with a muscle strength grade of 2. Electrophysiological studies confirmed denervation of the muscles supplied by the right peroneal nerve. Radiological examination showed an osteochondroma in the head of the right fibula. The patient underwent surgical decompression of the right peroneal nerve after resection of the bone tumor. At 36-month follow-up, there was a complete recovery of the deficits. Peroneal mononeuropathy in children is uncommon. Osteochondroma is a benign tumor consisting of projecting bone capped by cartilage. These tumors may be solitary or multiple and occur in hereditary multiple exostoses syndrome. The conjunction of this lesion with peroneal nerve palsy has been exceptionally reported for children, usually linked to hereditary multiple exostoses syndrome. Most peroneal nerve trauma occurs at the fibular head, where the common nerve has not yet divided into its deep and superficial peroneal nerve and where most peroneal nerve lesions, therefore, involve both branches, although motor deficits are more frequently involved than sensory ones. Surgical treatment should not be delayed because neurological improvement may be achieved if surgery is performed before severe neurological deficits become irreversible.

Montella BJ, O'Farrell DA, et al. (1995). Fibular osteochondroma presenting as chronic ankle sprain. Foot Ankle Int **16**(4): 207-209.

A 19-year-old baseball player was referred for assessment of recurrent sprains of the right ankle. This was found to be secondary to a palsy of the common peroneal nerve that was compressed by an osteochondroma of the fibular neck. The lesion was resected from the fibula and the patient made a complete recovery. We present this case as an example of a rare underlying problem in a patient who was initially diagnosed as having a sports-related ankle injury.

Pagnoux C, Lhotellier L, et al. (2002). Synovial cysts of the proximal tibiofibular joint: three case reports. Joint Bone Spine **69**(3): 331-333.

Synovial cysts are fluid-filled masses lined with synovium and located within or about joints. The main symptoms are pain and/or neurological deficits. They can be intraneural or extraneural or develop between or within muscles. Synovial cysts that arise at a distance from a joint raise diagnostic challenges. We report three cases of synovial cysts of the proximal tibiofibular joint, including an intramuscular cyst responsible for paralysis of the anterolateral leg muscles. Tibiofibular synovial cysts are less common than popliteal cysts, and their pathophysiology is poorly understood. Pressure on the common peroneal nerve is the main complication and requires careful surgical excision of the cyst. Injection of a

glucocorticoid into the cyst can be used as the first-line treatment in patients without common peroneal nerve symptoms.

Raikin SM, Rapuri VR, et al. (2005). Bilateral simultaneous fasciotomy for chronic exertional compartment syndrome. Foot Ankle Int **26**(12): 1007-1011.

BACKGROUND: Chronic exertional compartment syndrome (CECS) occurs bilaterally in approximately 60% of patients. Fasciotomy is the primary corrective treatment. We hypothesized that bilateral fasciotomy can be done during the same operative procedure with early return to sports and low complication rates METHOD: Sixteen patients had simultaneous bilateral lower extremity fasciotomies for CECS confirmed by compartment pressure testing before and after exercise. Ten patients had concomitant superficial peroneal neurolysis for associated numbness. All patients who were athletes (six runners; nine ball sports) (average age 25 years) had sports related pain limiting participation. RESULTS: Patients were followed for an average of 16.4 (range 6 to 48) months. Full return to sports participation occurred at an average of 10.7 weeks. Three patients continued to have mild, but much improved, pain with active sports participation, while 13 were pain free. All 11 patients with exertional related numbness had resolution after operative release. All patients were satisfied and all patients stated that they would have simultaneous fasciotomies again if required. As a nonmatched comparison, three patients who had staged fasciotomies for bilateral CECS were also evaluated, but because of the small number no statistical comparison was made. All three also returned to their previous levels of sports participation, however, at an average of 22.7 months as compared to 10.7 weeks in patients with simultaneous bilateral releases. CONCLUSION: Bilateral simultaneous fasciotomies for CECS can be done safely and effectively with early return to sports participation and low complication rates.

Rosenthal R, Buitrago-Tellez CH, et al. (2001). Athletes with lower limb ischaemia. Eur J Vasc Endovasc Surg **22**(6): 566-567.

The case of a young healthy sportsman and acute exacerbation of chronic infragenicular pain is presented. Further investigation revealed an obstruction of the tibiofibular trunk due to an osteochondroma, arising from the fibula, which was immediately resected. Osteochondroma is observed in 1-2% of the population and may present with vascular complications. In young patients and athletes, leg pain may be of vascular origin due to an entrapment or compression and should always be considered.

Sansone V, Sosio C, et al. (2002). Two cases of tibial nerve compression caused by uncommon popliteal cysts. Arthroscopy **18**(2): E8.

We report 2 cases of a popliteal mass of very unusual origin that induced compression neuropathy. The signs and symptoms could have been mistaken for those of a common Baker's cyst. Several recent studies have shown that the cause of Baker's cyst formation should be sought within the joint because of a communication between the gastrocnemio-semimembranosus bursa and the joint cavity. These 2 cysts had no communication with the articular joint, thus suggesting that the surgeon perform an open exploration of the popliteal fossa in the search for other cystic formations with origins and features different from Baker's cysts.

Schepsis AA, Fitzgerald M, et al. (2005). Revision surgery for exertional anterior compartment syndrome of the lower leg: technique, findings, and results. Am J Sports Med **33**(7): 1040-1047.

BACKGROUND: Recurrent symptoms or failure after fasciotomy for exertional anterior compartment syndrome is not uncommon. HYPOTHESIS: Symptoms from high compartment pressures can be secondary to involvement of the entire compartment or to localized constrictions from postsurgical fibrosis, as well as to entrapment of the superficial peroneal nerve. STUDY DESIGN: Case series; Level of evidence, 4. METHODS: Eighteen

patients who underwent revision surgery for exertional anterior compartment syndrome were available for follow-up. All were athletes who had either a failure or a recurrence of symptoms at a mean of 23.5 months (range, 8-54 months) after the index fasciotomy. Pressure measurements using a slit catheter at rest, at 1 minute postexercise, and at 5 minutes postexercise were performed in 2 places within the compartment: in the area of the previous incision and in the proximal muscle belly of the tibialis anterior. Surgical technique consisted of a 2-incision approach with partial fasciectomy, exploration and decompression of the superficial peroneal nerve, and excision of all fibrotic tissue. An objective examination and a comprehensive subjective questionnaire previously described were performed at a mean follow-up of 42 months (range, 22-67 months). RESULTS: Sixty percent of patients had abnormal pressures only in a localized area, whereas 40% had high pressures throughout the compartment. Eight of 18 (44%) patients had symptoms, signs, and surgical findings of entrapment of the superficial peroneal nerve. At follow-up, 72% of patients had a satisfactory outcome (5 excellent, 8 good), and 28% had an unsatisfactory outcome for intense running sports (4 fair, 1 poor), although 3 patients with the fair results reported improvement with low-level activity. All 8 patients with documented peroneal nerve entrapment had a satisfactory outcome. CONCLUSION: Symptoms from high pressures can be secondary to involvement of the entire compartment or localized to a certain area from postsurgical fibrosis. Pressure measurements should be performed in at least 2 separate areas.

Sferopoulos NK (2010). Compression peroneal neuropathy following a bicycle injury in a child. Med Sci Monit **16**(4): CS45-49.

BACKGROUND: The spectrum of bicycle riding injuries is extremely wide. However, compression peroneal neuropathy complicating a bicycle injury has not been previously reported. CASE REPORT: An 11-year-old girl with common peroneal neuropathy is presented. Her knee was caught in between the chain stay and the crank arm on the left side of her bicycle and was jammed. Clinical examination indicated a motor paralysis producing foot drop and a sensory deficit over the lateral calf and the dorsum of the foot. Magnetic resonance imaging (MRI), although not diagnostic, provided useful information regarding soft tissue injury in relation to the common peroneal nerve's course in the popliteal fossa. An electrodiagnostic (EDX) study was indicative of a common peroneal neuropathy. Complete recovery of the peroneal nerve was noted 7 months post-injury. CONCLUSIONS: Compression peroneal neuropathy may be included in traumatic bicycle-related injuries, while the space between the chain stay and the crank arm on the left side of the bicycle may be recognized as potentially hazardous to entrap the rider's leg.

Spinner RJ, Hebert-Blouin MN, et al. (2010). Extreme intraneural ganglion cysts. J Neurosurg.

Object The mechanism responsible for exceptional examples of intraneural ganglia with extensive longitudinal involvement has not been understood. Such cases of intraneural cysts, seemingly remote from a joint, have been thought not to have articular connections. Decompression and attempted resection of the cyst has led to intraneural recurrence and poor neurological recovery. The purpose of this report is not only to clarify the pathogenesis of these cysts, but also to discuss their treatment based on modern concepts of intraneural ganglia. Methods Two examples of extreme longitudinal propagation of intraneural ganglia are presented. Results A patient with a moderate tibial neuropathy was found to have a tibial intraneural ganglion. Prospective interpretation of the MR imaging study demonstrated the cyst's origin from the posterior portion of the superior tibiofibular joint (STFJ), with proximal extension within the sciatic nerve to the lower buttock region. Communication between the STFJ and the cyst was confirmed with direct knee MR arthrography. The tibial intraneural cyst was treated successfully by a relatively limited exposure in the distal popliteal fossa: the cyst was decompressed, the articular branch disconnected, and the STFJ resected. Postoperatively, the patient improved neurologically and there was no evidence of recurrent

cyst on postoperative MR imaging. A second patient, previously reported by another group, was reexamined 22 years after surgery. This patient had an extensive peroneal intraneural ganglion that extended into the sciatic nerve from the knee to the buttock; no joint connection or recurrent cyst had initially been described. In this patient, the authors hypothesized and established with MR imaging the presence of both: a joint connection to the anterior portion of the STFJ from the peroneal articular branch as well as recurrent cyst within the peroneal and tibial nerves. Conclusions This paper demonstrates that extreme intraneural cysts are not clinical outliers but represent extreme examples of other more typical intraneural cysts. They logically obey the same principles, previously described in the unified articular (synovial) theory. The degree of longitudinal extension is probably due to high intraarticular pressures within the degenerative joint of origin. The generalizability of the mechanistic principles is highlighted by the fact that these 2 cases, involving the tibial and the peroneal nerve respectively, both extended well distant (that is, to the buttock) from the STFJ via their respective articular branch of origin. These extensive intraneural cysts can be treated successfully by disconnecting the affected articular branch and by resection of the joint of origin, rather than by a more aggressive operation resecting the cyst and cyst wall.

Styf J (1989). Entrapment of the superficial peroneal nerve. Diagnosis and results of decompression. J Bone Joint Surg Br **71**(1): 131-135.

Entrapment of the superficial peroneal nerve was treated in 24 legs of 21 patients by fasciotomy and neurolysis; 19 of the patients were reviewed after a mean period of 37 months. Nine were satisfied with the result, another six were improved but not satisfied because of residual limitation of athletic activity, three were unchanged and one was worse. Conduction velocity in the superficial peroneal nerve had increased after operation, but the change was not significant. In five patients the nerve had an anomalous course and in 11 there were fascial defects over the lateral compartment. Chronic lateral compartment syndrome is an unusual cause of nerve entrapment. Operative decompression produces cure or improvement in three-quarters of the cases, but is less effective in athletes.

Tseng KF, Hsu HC, et al. (2006). Nerve sheath ganglion of the tibial nerve presenting as a Baker's cyst: a case report. Knee Surg Sports Traumatol Arthrosc **14**(9): 880-884.

Nerve sheath ganglion is a relatively rare clinical entity commonly found in the peroneal nerve in the lower limb or the ulnar nerve in the upper extremity. It is rarely found in the tibial nerve. The occurrence of a nerve sheath ganglion in a patient's tibial nerve has been identified. The initial presentation of the tumor mass has been very similar to that of a Baker's cyst, namely a soft undulating popliteal mass. Yet, the case also presented symptoms and signs of tibial nerve compressive neuropathy. We present here a rare case of nerve sheath ganglion of the tibial nerve. Clinical courses of the patient were reviewed, and relevant issues were discussed with a thorough literature review.

Vastamaki M (1986). Decompression for peroneal nerve entrapment. Acta Orthop Scand **57**(6): 551-554.

I reviewed 24 patients after decompression for peroneal entrapment neuropathy; in 3 cases the lesion was bilateral. There were 15 males and 9 females; mean age 44 (12-72) years. The etiology was an operation around the knee in 12, a tibial fracture in 2, a slight compression in 1, an ankle sprain in 2, excessive climbing in 2, sitting in a cross-legged position in 4, and in 4 cases no reason was found. There was foot drop in 15 and ankle instability in 12 cases. The nerve was decompressed after an average period of 17 months (4 days-8 years). Immediate relief of symptoms was achieved in 14 cases, slower relief in 10, and in 3 cases there was no recovery. In peroneal neuropathy, decompression should be considered after 2 months without recovery and after 4 months when recovery is slow.

Williams EH, Williams CG, et al. (2009). Combined peroneal and proximal tibial nerve palsies. Microsurgery **29**(4): 259-264.

Combined compression of both the common peroneal nerve and the proximal tibial nerve at the level of the popliteal fossa is rare. Recently, an anatomic site of compression of the proximal tibial nerve at the soleal sling (originating arch for the soleus muscle) has been described in cadavers. The present report includes three patients who had a combined compression of the common peroneal nerve at the fibular neck (fibular tunnel syndrome) and compression of the proximal tibial nerve at the soleal sling (soleal sling syndrome). In each case, blunt trauma was the precipitating event. Neurolysis of both nerves resulted in restoration of motor and sensory function in each of these three patients. This is the first clinical report illustrating combined neurolysis of the common peroneal at the knee and the proximal tibial nerve in the soleal sling.

Yoo JH, Min KD, et al. (2010). A case of extension loss of great toe due to peroneal nerve compression by an osteochondroma of the proximal fibula. Arch Orthop Trauma Surg **130**(9): 1071-1075.

The authors present a case of extension loss of great toe caused by entrapment neuropathy of a peroneal nerve due to an osteochondroma of the proximal fibula. Plain radiographs revealed no bony abnormality around the foot or ankle, but a sessile exophytic bony growth at the proximal fibula. A positive Tinel sign in this area led us to a suspicion of compressive neuropathy of the peroneal nerve, and a subsequent electrophysiologic study confirmed the entrapment neuropathy. The peroneal nerve was decompressed by excisional biopsy. At 3 months postoperatively, normal full extension of the great toe was completely restored. The current case deserves attention in that the only clinical manifestation of peroneal nerve entrapment neuropathy by the osteochondroma at the fibular neck was extension loss of great toe.