Spring 2016

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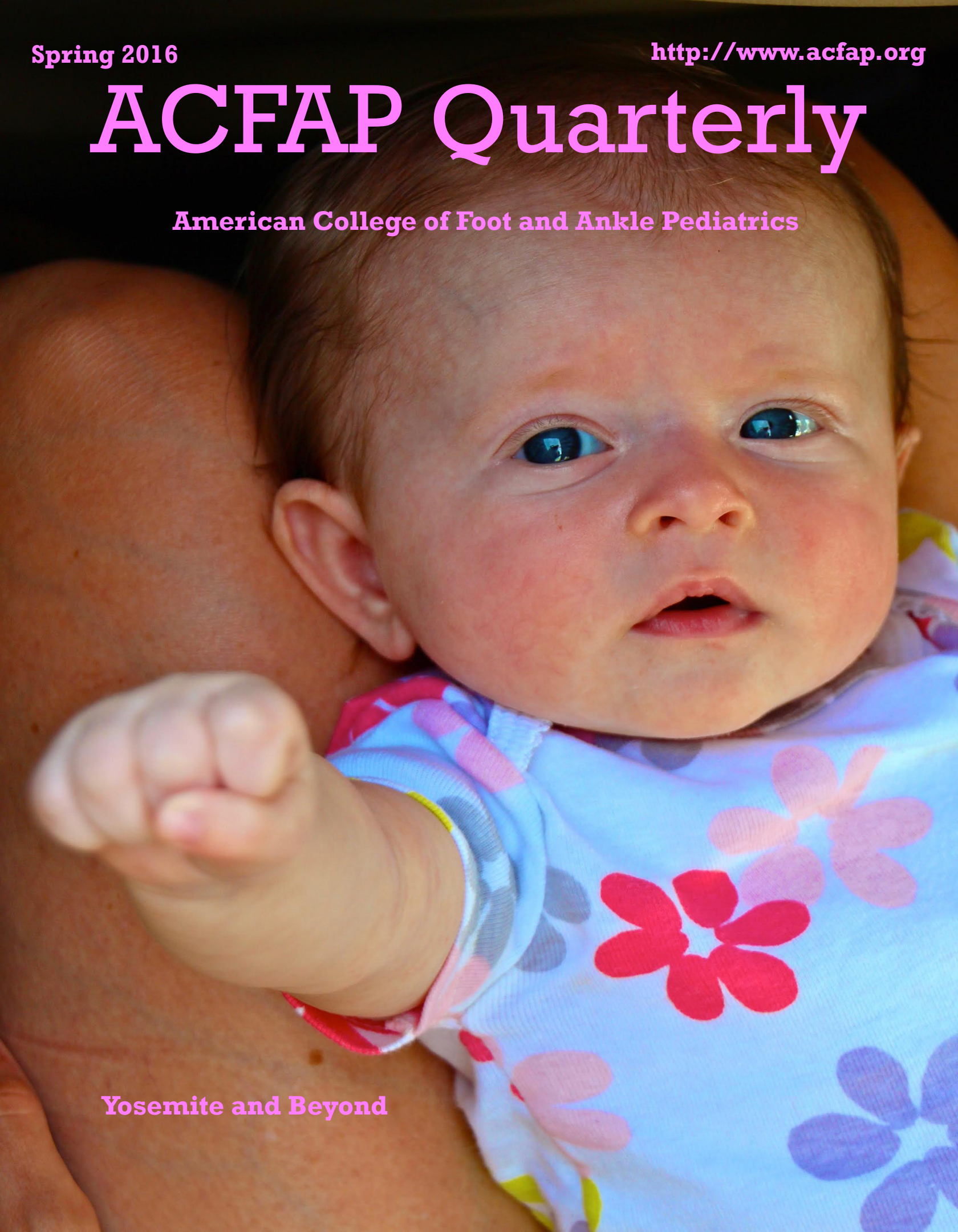
ACFAP Quarterly

American College of Foot and Ankle Pediatrics



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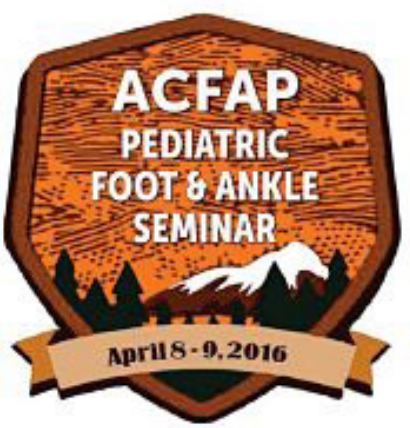

ACFAP
American College of Foot and Ankle Pediatrics

is proud to present the

2nd Annual ACFAP PEDIATRIC FOOT & ANKLE SEMINAR

to be held at

TENAYA LODGE
AT YOSEMITE NATIONAL PARK
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ACFAP
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The American College of Foot & Ankle Pediatrics is excited and proud to announce its 2nd Annual ACFAP Pediatric Foot & Ankle Seminar. The Seminar will take place at Tenaya Lodge, Yosemite National Park on Saturday April 9, 2016.

This CME event will feature leading authorities on pediatric foot & ankle conditions. It will cover topics ranging from pediatric H&P, flatfoot, equinus, sports medicine, surgery, and rotational conditions. The meeting will be preceded on Friday April 8 by a one day national park excursion.

Featured at this meeting will be spectacular Yosemite National Park.

At the Conclusion of this meeting, the attendee shall be able to:

- Develop an effective History & Physical procedure for treating the pediatric patient.
- Effectively evaluate surgical vs. non-surgical options for many common Pediatric foot & ankle pathologies.
- Improve patient outcomes in the pediatric patient for common conditions such as flatfeet, juvenile HAV, and Equinus.

For Conference details or to register online: please go to acfap.org/events.html

Approved for 8 CE Contact Hours

No commercial interest provided financial support for this continuing education activity

Lecture Schedule

7:00-7:40am	**Registration, Breakfast & Visit Exhibitors**
7:40-7:50am	**Louis J. DeCaro, DPM, FACFAP** Welcome Address
7:50-8:30am	**Louis J. DeCaro, DPM, FACFAP** The Pediatric H&P
8:30-9:10am	**Doug Murdoch, DPM, FACFAS** Tarsal Coalitions
9:10-9:50am	**Stephen Silvani, DPM** Pediatric Flatfoot Surgery
9:50-10:20am	**Visit Exhibitors**
10:20-11:00am	**Jeff Siegel, DPM, FACFAS** Met. Adductus & Clubfoot: Practical approaches & tx. protocols
11:00-11:40am	**Ron Valmassy, DPM, FACFOAM** Eval. & Tx. of Pediatric Hip Dysplasia
11:40-12:20pm	**Patrick Deheer, DPM, FACFAS, FACFAP** The role of Equinus in the Pediatric Flatfoot
12:20-1:15pm	**Lunch & Visit Exhibitors**
1:15-1:55pm	**Onyx Reyes-Martinez, MD** The Role of EOTTS in the Treatment of RTTJD
1:55-2:35pm	**Russell Volpe, DPM, DABPM** Torsion: Why it matters and how to manage it

Lecture Schedule (cont.)

2:35-3:15pm	**Patrick Agnew, DPM, FACFAS** Juvenile HAV & Collagen Diseases
3:15-4:00pm	**Break & Visit Exhibitors**
4:00-4:40pm	**Larry Huppin, DPM** Practical Approaches & Troubleshooting of Orthotic Therapy
4:40-5:20pm	**Paul Scherer, DPM, MS** Childhood Obesity and Hyper Mobile Flatfoot; a pathological relationship
5:20-6:00pm	**Nick Pagano, DPM, FACFAS, FACFAP** Pediatric Sports Medicine

This conference is intended for podiatric physicians and other medical specialties dealing with the pediatric lower extremity. No prerequisite levels of skill, knowledge, or experience required of learners.

This activity has been planned and implemented in accordance with the standards and requirements for approval of providers of continuing education in podiatric medicine through a joint provider agreement between the William L. Goldfarb Foundation as a provider of continuing education in podiatric medicine. The William L. Goldfarb Foundation has approved this activity for a maximum of 8 continuing education contact hours

In the event of cancellation ACFAP is unable to assume risk or responsability for the exhibitor's and/or registrants time or expenses should an act of God, government action, disaster, weather or other force beyond ACFAP's control make it inadvisable or impossible to conduct this event. The exhibitor and/or registrant may wish to consider purchasing personal travel insurance to insure their expenses.

27th Kaplan-Clarke-Foster Practice Management Seminar

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Amount to Charge: **$300**: Registration Fee **$150**: Non-DPM Registration Fee **$125**: Tournament Facilities Fee

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❑ Check this box if you prefer to pay your registration and tournament facilities fee in monthly installments.

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Contact Ben Wallner at 301-581-9231 or e-mail ***bjwallner@apma.org***.

Hotel reservations deadline is August 31, 2016. After this date, rooms are assigned on an "as available" basis.

www.apma.org/KCF

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Presidents Message

As I sit down to "pen" this installment of the "Presidents Message" I am just minutes from conducting a nation-wide webinar for the National Down Syndrome Society. The timing of such inherently forces me to reflect not only on the tremendous work everyone at ACFAP has done over the past year and a half, but also the utter importance of the our educational impact thus far. Helping better the lives of children both medically and educationally around the world is the true essence of what it's all about. This is the impetus for my own motivation within this society.

2016 has already been a banner year for ACFAP. We continue our membership & corporate sponsorship explosion. We now have paying members from over 41 states and a growing international contingent. Some even said it was crazy to run a seminar "out west" in a remote location like Yosemite, but in fact that has driven our California membership up to 38 members (we only had 3 CA members last year)! Additionally, our conference is looking to replicate the outstanding attendance we had in Miami in 2015.

This issue will coincide with the Yosemite seminar. A seminar that has such a tremendous lineup of speakers and contributing vendors I'm not sure why anyone would dare miss it! You know who you are, and next year I'll let you redeem yourselves by attending!

2016 is launching bigger, better, and more exciting initiatives for ACFAP. A new website, increased national lectures, new resources, and new meeting content are just a few of our initiatives. We have to continually raise the bar for lower extremity pediatric excellence, and we will!

So let's look ahead!

Planning for the ACFAP 2017 Annual Scientific Meeting is already underway. I promise you that once again it will be the "Can't Miss" meeting of 2017. It will be held once again at some absolutely spectacular and breathtaking national park that you will not want to miss! In addition to another guaranteed stellar lecture lineup and outing Parks tour, we will be adding hands on workshops featuring ponsetti casting, kinesio taping, surgical techniques, torsional and limb length evaluation protocols, and more!

Our meetings are designed with two main missions in mind. The first is to educate in a positive environment that is both professional and fun at the same time. The second mission is to forge camaraderie between pediatric foot and ankle specialists and the companies that offer our patients the best and innovative solutions to manage their conditions…and maybe even foster ideas for new procedures, technology and products by putting the best minds together and learning from each other.

ACFAP is continuing its exposure at national conference such as SAM, AAPPM, Midwest, and APMA national to name a few. We are also continuing to work with and help grow the ACFAP college student chapters! I personally assure you that your membership dollars are hard at work and being used to grow pediatric foot and ankle education!

Thank you to each and every one of you for making this all possible.

Louis J. DeCaro, DPM
President, ACFAP
www.acfap.org

Using Your Website To Attract More Pediatric Patients

Andrew Espenschied
Nick Turner

As a member of ACFAP, you have already proven to be one of the foremost experts on podo-pediatric foot care today. The question is, how do you let prospective patients know that? Thankfully, your website is an affordable way to promote your expertise and treatment options to existing and prospective parents and guardians. While the World Wide Web can be intimidating, this article will outline three easy ways that you can begin to attract and target more pediatric patients to your practice:

1) Advertise On Your Home Page

Many people don't know much about children's foot problems or who to see, so make it obvious that you are there for them! Your homepage slider is a great place to start. Remember your website's promotional pieces are not only for prospective patients but are equally important for educating existing patients about your services.

2) Don't Just Talk About It, Blog About It

Your blog is a natural place for you to communicate with future patients about the pediatric services and expertise that your practice has to offer so make sure to use it! Whenever you give talks or attend conferences, take some photos, write 400 words on your favorite topic discussed and post it! You'd be surprised how many potential patients look to your blog before scheduling an appointment.

3) Target "Mommy Bloggers"

Although not a traditional media outlet, mommy bloggers have a huge influence on the communities which they are a part of. People tend to trust mommy bloggers and the recommendations or information they share more so than some of the biggest media outlets. Not shocking, but these bloggers are most popular with parents or expecting parents and are, in most communities, a huge WOM (word of mouth) network. Not sure what to say? Try reaching out to local mommy bloggers and offer a free children's foot screening day at your office as a promotion through their blog.

Depending on what the pitch is, they usually ask for compensation for posts, or at least some type of reward, like a pair of free orthotics for their child in exchange for promotion of your services or the event you want them to promote. Mommy Bloggers are usually great at not only sharing the information on their blog, but also on their social pages, which sometimes have even more of a following than their blogs. Dad bloggers are not to be ignored either, but are often harder to find in smaller cities. Having trouble finding a mommy blogger to reach out to? Simply Google "Mom Blogs In [Insert Your City Here]" and you will find a slew of potential influencers that could be driving pediatric patients your way.

While marketing your practice can seem time consuming and stressful, there are plenty of service providers out there that can help connect you with more pediatric patients. Remember, the World Wide Web is often times the first place people look to for health advice, so make sure your website reflects the high level of children's services that you offer!

Clean Sweep® Another Innovation from Tetra

George A. Cioe

The inspiration for The Tetra Corporation's product Clean Sweep® came from doctors of podiatric medicine, especially during conversations at professional meetings and conferences. The challenge they were facing was the need for an odor-suppressing shoe spray that was not poisonous and was safe for children's shoes. In the fall of 2010, the amount of requests were significant enough to justify product research and development. We had a clear objective and our antimicrobial shoe spray research started that December. Bacteria is, by far, the hardest microbe to kill. They were the first organisms to crawl on the earth and most scientists believe they will be the last! Fungus, and even viruses outside the host, are relatively easy to eradicate. Ultimately, our research led us to nano science, and in April of 2013, we launched Clean Sweep® - The Tetra Corporation's Antimicrobial Shoe Shield®.

Clean Sweep® is a clear, flexible, micro-coating fortified with pure nano silver formulated to kill 99.9 % of the microorganisms which cause odor in footwear, clothing, orthotics, walker braces & boots, cam walkers, air casts, and other therapeutic/treatment items that need disinfecting.

About 90% of clothing and footwear odor is caused by bacteria. The remaining odor is cause by smelly fatty acids, urea, ammonia, and steroids contained in our sweat. Clean Sweep® is enhanced with "odor capture" technology. Clean Sweep® employs spherical encapsulation at a molecular level. These microspheres surround the molecules of these substances and seal off their odor.

Because it eliminates all the causes of odor, Clean Sweep® is formulated without any added fragrance. A fragrance would mask odor and compromise the patient's ability to detect "absolutely no odor". This is one of the fundamental differences between Clean Sweep® and other sprays. If you can smell even a slight odor, it's a sign that the item needs to be treated again to ensure that 100% of the "sweat contact surface area" of the item has been treated.

When other sprays achieve the high degree of effectiveness of Clean Sweep®, they use ingredients that are either toxic, caustic, carcinogenic, flammable, volatile organic compounds (VOCs), chlorofluorocarbons (CFCs), ozone depleting materials or known allergens. Not Clean Sweep®. Clean Sweep® is hypoallergenic, non-toxic, and environmentally friendly and is designed to treat washable and non-washable items. You can treat a toddlers' shoes with Clean Sweep® – it's completely safe!

Apply Clean Sweep® until the item has absolutely no odor. Just like wet paint, allow it to dry before wearing. For example, if you wear shoes before they are dry, the socks will wick the treatment from the shoes. You can treat an item when it's wet or dry. What's important is to let the treated item dry **BEFORE** wearing it. Otherwise, you may remove some of the treatment by contact. When it is first applied, the odor will go away immediately. Sometimes, a second application is required for items that have been well-worn.

The key to Clean Sweep's effectiveness is its particle size and concentration. The silver particle size is so small that you can line up 1,000 particles across the diameter of a single human hair! These nanoparticles attach to the individual fibers of the fabric, or surface of the leather, that lines the item. Cotton Incorporated subjected treated fabric to 30 machine washings and then tested the material. After 30 machine cycles, the fabric had enough residual nanosilver to provide full antimicrobial protection.

The real genius of Clean Sweep® is that every time a treated item is worn and the plume of sweat reaches Clean Sweep®'s nanosilver – it reactivates the silver – and it produces silver ions that wipe out all the microbes on the item. The FDA recently approved silver as a wound dressing coating. Dressings treated with silver prevent the microbes from colonizing the dressing. When your patient treats personal items with Clean Sweep®, they are preventing pathogens from colonizing their belongings. Once an item is properly treated with Clean Sweep®, its effectiveness should last for weeks – even months. Simply retreat the item when the odor returns.

To receive the clinical trials supporting the antimicrobial science of nano technology, and specifically nano silver, please send an email request to gcioe@TheTetraCorp.com . Also, if you have the need for the development of any other topical product please mention that too!

George A. Cioe is President and CEO of The Tetra Corporation

Revisiting Ponseti: A new option for hands on applications

Nicholas Pagano, DPM

Ponseti's technique revolutionized the treatment of clubfoot. Up until the 1990's, clubfoot was primarily treated surgically with mixed results and the added risks of surgery. By the mid 1990's, Ponseti's 30 years of work finally paid off as a dependable correction of clubfoot with early intervention. [1]

In the medical school, we learn principles but rarely have exposure to this treatment hands on. As an interest and focus on pediatric patients continues to rise, I had the opportunity to teach a clubfoot casting workshop with the students of Temple University School of Podiatric Medicine with the use of MDorthopedics staged clubfoot legs.[2] This enabled the students to get that hands-on exposure to correct clubfoot in stages based on the degree of deformity of the child/models. It allows you to focus on the following principles when performing your clubfoot correction and reinforce what we've learned.

Clubfoot is characterized by Forefoot Adduction, Rearfoot Varus and Ankle equinus. Ponseti technique involves manipulation and casting to first address the forefoot adduction and heel varus, then the equinus with incorporation of a percutaneous achilles tendon lengthening.[3]

The technique is best performed with an assistant to maintain your correction after the manipulation. By palpating the malleoli, with your thumb and index finger of your primary hand, your secondary hand holds the forefoot and toes. Advancing your primary hand from the malleoli to the talus medially and the anterior calcaneus palpable under the talus, your secondary hand moves the forefoot laterally in supination. It is important to avoid pronating the foot. By keeping the foot in supination and utilizing the talus as your fulcurm point, the navicular will relocate in front of the talus and the calcaneus moves laterally under the talus. Supinating the forefoot also corrects the cavus deformity.

This manipulation will take 10-15 minutes, once you've reached the correction desired, apply your cast. When applying your cast avoid pressure areas by moving your hand to constantly, smoothing the cast. Capture the arch in supination while molding to avoid a rocker bottom foot. Make sure your cast is well padded and add extra padding of webril around the upper thigh for diaper changes so that the parent can remove if there is any debris on the padding.

Treatments are performed twice weekly for the first three months or until acceptable correction is achieved. If the equinus is not fully corrected (Ankle Dorsiflexion <10 degrees), a percutaneous achilles lengthening is performed in the operating room. After the tenotomy, braces with the foot in corrected position should be worn for the next three months, followed by nightly brace wearing for the next four years. [4]

Ponseti created a dynamic, reproducible treatment method for clubfoot. It is a treatment we should all be well versed and able to apply when required. The students loved the opportunity to get their hands on approach with the models and will continue to utilize the models for continuing to develop their techniques.

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4. Clubfoot: Ponseti Management. Global-Helpp. 2009

Management of the Adolescent Athlete by Foot Type

Roberta Nole, MA, PT, C.Ped

One of the most commonly injured parts of the body in adolescents is the foot and ankle, particularly those involved in sports. Consider demographics: More than 2.6 million children are treated in the emergency department each year for sports and recreational-related injuries; over 30 Million kids are involved in at least one interscholastic sports program; 21.5 Million kids are playing on one or more organized sports teams! Therefore it is prudent to understand how functional foot types may predispose athletes to particular conditions and risk of injury. This article will review 6 functional foot types, in relation to structure and functional gait, common injuries to each, sport risk concerns, and physical management including orthotic recommendations.

Toddlers begin walking around 12-14 months. At the age of 2-3yo it is quite common for the child's foot to be pronated, but by the age of 6-8yo the heel should be assuming a vertical alignment in standing. By 9-13yo the foot will be attaining its adult form and ideally assume an inverted heel alignment of about 4-5 degrees. It is important for the Podiatrist to understand that children are not merely "mini-adults", and consideration needs to be given to the physeal plates and growth.

The long bones in the legs and arms grow from an area at either end called the physis, or growth plate. When a child's bones have completed growing, the growth plates ossify and cause the epiphysis to fuse together with the metaphysis, forming one complete bone. Skeletal maturity is typically reached in girls around the ages of 13-15, while boys' growth plates close around the ages of 15-17. Around the ages of 13-15 the child's foot will begin to evolve into its adult form, most often mirroring the foot type of Mom or Dad. Particular attention needs to be paid to young athletes complaining of pain, since the growth plates are susceptible to fracture.

Functional Foot Groups: There are 6 functional foot groups (called "Quads") that present themselves as a child's foot matures into adult form. Foot type is identified by simply observing how arch height couples with forefoot "toe-sign". Each Quad produces a distinctive gait pattern. The characteristics each Quad is summarized below along with a list of potential injuries relative to gait style and sports.

A QUAD:

Foot Morphology: The "A-Quad" has an uncompensated (supinated) rearfoot combined with a forefoot valgus, resulting in a combined foot condition referred to as "torque foot". This is a Pes Cavus foot with and inverted heel and an adducted forefoot.

Gait: STJ pronation is restricted during contact phase resulting in a rigid midfoot with high impact and shock. Upon foot flat, the 1st ray loads prematurely driving the foot and ankle into increased supination throughout propulsion. The resultant gait is a rectilinear pattern with a narrow base of support and a propensity towards over supination.

Common Injuries: Excessive supination often leads to lateral ankle instability and sprains, Jone's fractures, sesamoiditis, and peroneal longus tendinitis.

Sport Risk Concerns: Risk factors are those activities, such as basketball and jumping sports, in which an athlete can come down on and turn the ankle or step on an opponent's foot.

Management of the A Quad: Ankle strapping or bracing, and orthotic intervention are warranted for

"A-Quad" Athletes, especially those with prior injury. Orthotic recommendations include a deep heel cup with lateral heel clip, a lateral flare at the base of the 5th metatarsal, lateral forefoot posting with a 1st met cutout, and heel elevation for associated forefoot equinus, which is commonly associated with this foot type.

B QUAD:

Foot Morphology: The "B-Quad" is a mildly pronated rearfoot combined with a flexible forefoot valgus. It has a lower arch, and vertical or slightly inverted heel and adducted forefoot.

Gait: This foot pronates during contact phase but can resupinate during midstance due to the presence of a flexible forefoot valgus (or plantarflexed 1st ray), which decelerates rearfoot pronation. In propulsion, the hypermobile 1st ray dorsiflexes, transferring weight to the 2nd met. The gait is "in-toed" or "pigeon-toed".

Common Injuries: The in-toed gait draws the lower limb into internal rotation at the hips leading to muscle imbalances and weakness at the pelvis, hips and core. Common injuries include sacro-iliac pain and 1st ray hypermobility and pathology. Torsional deformities of the limbs, such as femoral anteversion, internal tibial torsion, or metatarsal adductus may cause or exaggerate the in-toeing.

Sport Risk Concerns: "B-Quad" Athletes involved in ballistic sports requiring jumping, cutting and pivoting are at increased risk of injury. Low back pain should be examined carefully to rule out sacral stress fractures (more common in young female adolescents) caused by repetitive stress from sports such as gymnastics, football or other impact sports, or long distance running.

Management of the B Quad: Core and hip strengthening are essential for this foot type to restore proximal stability. Orthotic recommendations include mild medial rearfoot posting and a mild medial skive, and a reverse Morton's extension. Do not to "over-post" the rearfoot if internal tibial torsion or femoral anteversion are present, since these conditions may necessitate some degree of pronation for compensation.

C QUAD:

Foot Morphology: This foot is an under-pronator. At times it may appear "Normal", and at times "Subtle Pes Cavus". This foot-type exists when an uncompensated rearfoot varus is coupled with a relatively neutral forefoot. A key distinguishing feature of this foot-type is an obvious toe-out gait pattern with a "normal" or slightly cavus arch height, and a "false" toe sign.

Gait: This gait is "toe-out" (like a duck) because the subtalar joint lacks pronation, making loading the inner aspect of the feet extremely difficult. As a result the body must acquire the necessary motion to load the medial foot by externally rotating the hips, causing tightness of the lateral hip rotators and ITB.

Common Injuries: Hip and ITB tightness often leads to hip bursitis, ITB Syndrome, low back pain, and frequent muscle strains (hamstring, TFL, Sartorius, and rectus femoris), and occasionally femoral stress fractures (more common in females). The inverted heel alters vector forces on the Achilles leading to lateral insertional tendinitis, or cancaneal apophysitis.

Sport Risk Concerns: Ten percent to 24% of athletic injuries in children are hip related. Ballet dancers are most likely to have a hip-related injury, and runners, hockey players, and soccer players are also prone to hip injuries.

Management of the C Quad: C-Quads tend to be very tight, particularly at the hips and back, so stretching is essential. Orthotic recommendations include a moderate heel cup depth with a heel balancing post to "bring the ground up to the rearfoot". DO NOT add a medial skive to this orthosis as it will not be tolerated well.

D QUAD:

Foot Morphology: This is a congenitally splayed flat foot. A child demonstrating excessive pronation beyond the age of 6yo has "Developmental Flat Foot". Although early intervention is warranted, treatment is often neglected in the belief that the child will "outgrow it". Left untreated DFF matures into the adult D-Quad, a moderately over-pronated foot-type. This foot-type occurs when a compensated rearfoot varus couples with a neutral forefoot alignment. The foot looks like a "Fred-Flintstone" foot with a vertical heel and a neutral toe sign.

Gait: This foot immediately pronates at the subtalar joint at heel strike, and continues to pronate throughout midstance. The midtarsal joint unlocks and the midfoot collapses, causing lateral column instability and subluxation of the calcaneal cuboid. This disrupts the peroneal (longus) pulley system and the 1st ray becomes unstable. During propulsion, the 1st and 5th rays dorsiflex causing reversal of the transverse metatarsal arch.

Common Injuries: The planus foot of the adolescent athlete presents with symptoms commonly associated with flat feet, such as: plantar fasciitis, metatarsalgia and neuroma due to reversal of the transverse metatarsal arch, and functional hallux limitus. Freiberg's Infarction is avascular necrosis of the 2nd metatarsal epiphysis, most common in girls around 13yo. Patellofemoral pain syndrome is another common condition associated with flat feet that involves drifting of the patella out of the trochlear groove.

Sport Risk Concerns: "D-Quad" athletes notoriously have tight heel cords. Adolescent athletes with this foot type could potentially have more muscle cramping and endurance related issues due the inefficiency of gait. This athlete is at risk of a multitude of injuries due to associated muscle weakness of the lower extremities and core, particularly in endurance sports such as running.

Management of the D Quad: Educate the athlete in gastrocsoleus stretching to assure proper performance and results. Avoid stretches where the heel drops off the edge of a step due to midfoot instability. Use night splints in severe cases. Core and hip strengthening are essential for this foot type to restore proximal stability. Orthotic recommendations include a deep heel cup, medial rearfoot posting and medial skive, and in some cases a metatarsal pad with soft topcovers to offload the 2nd met.

E QUAD:

Foot Morphology: The E-Quad Foot is one of the most unique looking feet, with a reverse-lasted foot shape created by an uncompensated rearfoot varus, combined with a structural forefoot varus. The arch is moderately pronated and there is a positive "creasing" toe-sign characterized by a sharp lateral foot angulation at the 5th metabase.

Gait: This foot-type is a rigid foot that is unable to provide the pronatory motion necessary to load the medial aspect of the foot during stance phase of gait. It is for this reason that, when an individual with this foot-type is standing still, they will tend to stand on the outer borders of their feet with the inner side of the foot elevated from the ground. Compensation occurs in propulsion with a rapid abductory twist (medial heel whip) that allows the medial forefoot to eventually load. At times this causes the person to kick themselves!

Common Injuries: Recurrent torque and strain on the foot and the muscles of the lower leg causes maladies like periostitis (shin splints), plantar fasciitis, tailor's bunionettes, and knee pain. The adolescent athlete may be at risk of Osgood Schlatter's disease, Jumper's Knee, and calcaneal apophysitis.

Sport Risk Concerns: Risk of injury to the E-Quad athlete can occur in all sports but especially those that involve distance running, or rapid directional changes

such as soccor.

Management of the E Quad: These athletes have imbalances between agonist and antagonist muscle groups and should be screened for flexibility and strength. Orthotic recommendations include a moderate heel cup depth with medial rearfoot posting, and extrinsic medial forefoot posting with a 5th MTH cutout.

F QUAD:

Foot Morphology: The "F-Quad" is commonly referred to a Pes Planovalgus foot. The condition occurs when a severely compensated (pronated) rearfoot couples with an acquired forefoot supinatus, resulting in an extreme flat foot with a valgus heel and an abducted forefoot. This is an acquired foot type usually caused by a D-Quad foot that was not managed properly at a young age. This foot is typically called "Adult Acquired Flat Foot", although it often occurs as early as 12-13yo.

Gait: All the gait characteristics of the D-Quad are exaggerated in the F-Quad foot and pronation continues throughout propulsion, with excessive abduction of the forefoot (positive splaying toe sign).

Common Injuries: The F-Quad is subject to all the same symptoms as the D-quad but to even a greater degree of pathology. Posterior tibial tendinitis can lead progress to dysfunction and potential rupture or tarsal tunnel syndrome. The abducted forefoot coupled with 1st ray insufficiency leads to HAV deformity with bunions.

Sport Risk Concerns: "F-Quad" athletes will often be plagued by repetitive overuse injuries not limited to the foot and ankle. Shin pain, hip and knee pain, and low back pain are all common. Adolescent bunions occur most commonly in girls between the ages of 10-15. Hallux Valgus affects 22-36% adolescents and is very common in young dancers.

Management of the F Quad: Core and hip strengthening are also essential for this foot type to restore proximal stability. Orthotic recommendations include aggressive medial rearfoot posting and medial skive. Medial forefoot posting may be useful depending on the severity and acquired stiffness of the supinatus; if used, a 1st ray cutout is recommended and on occasion a Cluffy Wedge.

Conclusion: The best way to treat sports injuries in the adolescent athletic is through prevention. Understanding foot types and their propensity for injury allows the podiatrist the opportunity to treat the athlete before the injury happens, while eliminating the chance for repetitive, chronic injuries that could potentially have long term implications into adulthood.

For more information on webinars and classes on functional foot typing and pediatrics, email: RobertaN@thequadrastepsystem.com

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SUDDEN ONSET OF PAIN AND LIMP IN CHILDREN AND ADOLESCENTS: A DIAGNOSTIC DILEMMA

Edwin J. Harris, DPM

Identifying the etiology of sudden onset pain in children and adolescents can be difficult. The details of the events leading up to the onset of pain may be vague or non-existent in toddlers and younger children because they may not be able to communicate the particulars. Older children may or may not relate a history of trauma. Older children may withhold critical details if they were engaged in forbidden activities. Minimal physical findings plus numerous differential diagnoses make interpretation of the disorder difficult. The examiner must be well versed in the frequently encountered lower extremity pathologies common to the age, and must be alert when symptoms differ from the usual presentations. With these things in mind, consider the following case scenarios:

Case One: a 40 month old cognitively impaired nonverbal male suddenly began to cry and refused to bear weight on the right foot. He had previously been well, was physically active and had been playing unsupervised in his home. When he began crying, his mother examined him and found no obvious cause for his pain. There was no edema, erythema, ecchymosis or any other physical finding. Since it was late in the day, and he seemed otherwise well, his mother put him to bed for the evening. In the morning, he was no longer complaining of pain but refused to bear weight on the affected leg and foot. Over the next 24 hours, he began to walk. However, he had developed a definite limp characterized by external rotation of the right foot, knee hyperextension in mid-stance and a shortened stance phase of gait. He developed some local edema around the medial aspect of his right foot. His mother consulted his pediatrician. On examination, he had a rectal temperature of 100.8. Three days before, he had mild pharyngitis. His pediatrician was concerned about the possibility of joint sepsis and osteomyelitis and ordered a CBC and differential, erythrocyte sedimentation rate and a C-reactive protein. These were all normal.

Because the diagnosis was still obscure, and since it was felt that the issue was probably in the right foot, his mother consulted a podiatrist. A radiograph of the right foot was interpreted as normal. (Figure 1A) Because of the history, the podiatrist placed him in a short leg weight-bearing cast for protection.
Your diagnosis?

Figure 1A. A 40 month old cognitively impaired male with no history of trauma. The AP radiograph was interpreted as normal with no evidence of fracture or dislocation.

After 10 days, the cast was removed. There were no objective findings. A new radiograph showed a lateral first metatarsal metaphyseal cortical fracture with healing cancellous bone. The physis was not involved. (Figure 1B)

Commentary: Arriving at the correct diagnosis early in the course of this child's illness was difficult. The first problem is the lack information leading up to the onset of symptoms. The first indication that something was wrong was the crying and the refusal to

Figure 1B. Ten days following the radiograph in 1A, there is cancellous bone repair in the metaphysis (small arrow) and a torus-like bulge of the lateral metaphyseal cortex (large arrow). The physis appears uninvolved.

bear weight. Because of his age and non-verbal state, he couldn't contribute any information to assist in the work-up. No trauma was witnessed. This resulted in an extensive differential diagnosis that includes bone and joint infections, juvenile chronic arthritis, trauma, foreign body and so many more that they are too numerous to mention. His rectal temperature was just at the threshold for considering it a fever. Infection is the most important condition to address, and the laboratory testing ordered was appropriate.

The second problem was the return of some semblance of weight-bearing. This is comforting, since it points to a problem that is probably improving over a short period of time. Unfortunately, it can lull the examiner into a false sense of security.

The third problem occurred when the consultant worked the patient up further. The decision to place the child in a cast was appropriate once joint sepsis and osteomyelitis had been placed very low on the differential diagnostic list. Unfortunately, the first radiographs were misinterpreted because the consultant was not well versed in interpreting pediatric radiographs. A more experienced clinician would have noted the irregularity of the lateral metaphyseal cortex and made the diagnosis immediately. A lateral oblique radiograph should also have been ordered. In defense, cancellous fractures are notoriously difficult to diagnose. Many of them will have normal appearing radiographs immediately following the injury since, by definition, the cortex remains intact. Ten to fourteen days later, the fracture can be diagnosed based on the repair of the damaged cancellous bone.[1] Four weeks after the injury, this finding has resolved. This leaves only a small window of time to make the diagnosis.

Case two: a previously healthy three year old female suddenly began to complain of pain in the right foot. There was no history of trauma and the child had previously been well. Past medical history was noncontributory.

On physical examination, she complained of pain over the dorsum of the second and third metatarsals. There was no edema. Initial radiographs taken at a local hospital were read as normal. (Figure 2A)

Three days later, her mother consulted a podiatrist. The original radiographs were reviewed, and the podiatrist

Figure 2A. AP of a three year old female with sudden onset of pain. No trauma was reported. The hospital radiographs were interpreted as normal.

felt that they were negative for fracture or dislocation. The only objective finding was tenderness over the second and third metatarsal shafts distally. She was clinically well, afebrile and showed no other objective findings.

Your diagnosis?

Although no trauma was witnessed, fracture was suspected. She was placed in a short leg weight-bearing cast for protection. The cast was changed at two weeks. At that time, a firm fixed mass was felt on the dorsum of the foot in the area of the second metatarsal. A new radiograph at the two week examination showed a healing fracture of the second metatarsal. (Figure 2B)

Commentary: The absence of findings on the initial radiograph and the fact that there is no witnessed

Figure 2B. A follow-up radiograph two weeks after the onset of pain showed a healing fracture in the distal second metatarsal (arrow).

trauma does not rule out fracture. The fracture pattern in this case is unusual. It is a diaphyseal fracture that resembles a stress fracture such as might be seen in an adolescent or an adult.[2] As long as there is no evidence of infection, empirical immobilization for protection is appropriate. The case demands repeat radiographs at intervals even though the initial films are negative.

Case three: a 27 month old male was jumping from the couch to the floor, landed in slight plantarflexion with the left foot coming down first. He began to cry immediately and refused to bear weight. The dorsolateral aspect of the left foot was diffusely tender but there were no objective findings. He was seen in the Urgent Care center that afternoon. Radiographs of the foot and ankle were interpreted as negative and he was treated for a lateral ankle sprain with an Ace wrap.(Figure 3A) Over the ensuing 24 hours, he refused to bear weight. His mother consulted a podiatrist to evaluate the radiographs and the child. He supported a diagnosis of lateral ankle sprain and recommended rest and elevation. Over the next 24 hours, he began to bear weight but continued to limp.

Your diagnosis?

The mother then consulted another podiatrist who evaluated him and placed him in a short leg weight-bearing cast for protection. The second podiatrist was quite convinced that this was not an ankle sprain because of the initial location of the pain and the descrip-

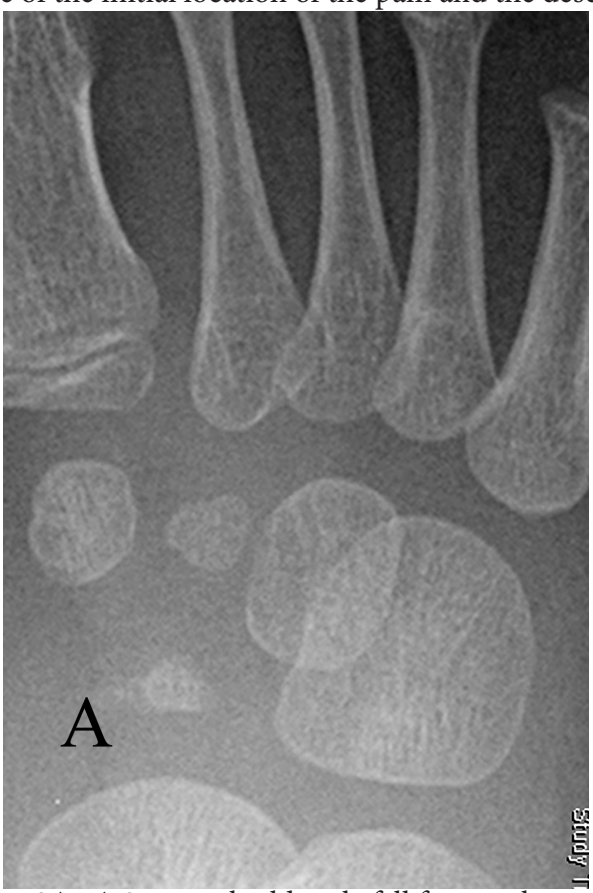

Figure 3A. A 27 month old male fell from a short height landing in fixed equinus. Radiograph of the tarsal area was interpreted as normal.

tion of the mechanism of the injury. At the end of 10 days the cast was removed and new radiographs were taken showing a healing cancellous fracture in the proximal cuboid. (Figure 3B)

Commentary: Neither the mechanism of the injury nor the initial tenderness over the dorsolateral foot is consistent with a lateral ankle sprain. The description of the injury favors a longitudinal overload of the me-

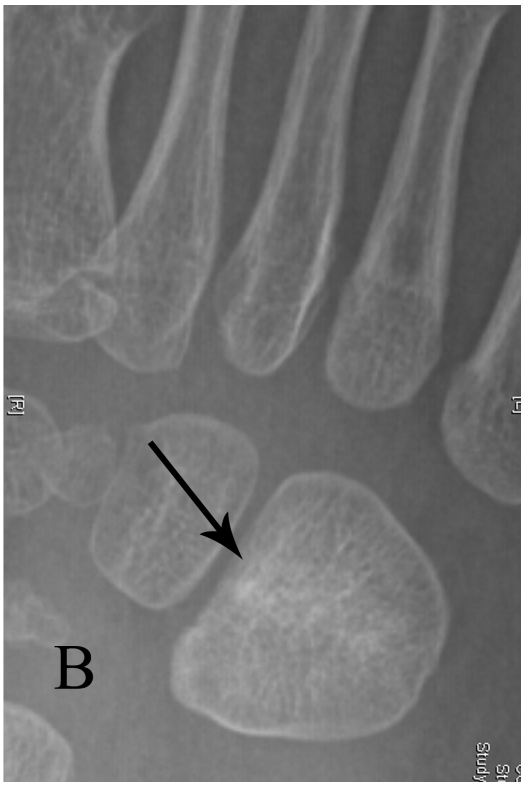

Figure 3B. Approximately 10 days after the radiograph seen in Figure 3A, a new radiograph shows repair on injured trabeculae in the cuboid (arrow).

dial or the lateral column as the full weight of the child is transmitted to the ground through the foot fixed in equinus. The developing cuboid has no protective cortex at this age and is vulnerable to compression. The cancellous elements are crushed very much like a Styrofoam holiday ornament. The follow-up radiograph shows new bone laid down on damaged trabeculae and is a sign of repair. Unfortunately for diagnosis, radiographs taken early in the healing process will be interpreted as negative.[3] The repair process is seen at 10-14 days after the injury. By 21 days, the repair is complete and the radiographic findings may no longer be seen. Thus, there is only a small time window to make the diagnosis radiographically. In a witnessed injury of this type, a fracture can be presumed and immobilization is justified to provide relief of pain and prevent further injury. There is a high probability that this injury pattern is frequently missed, and it would seem that there are no long-term problems from these injuries. However, if the injury is not witnessed, the examiner is left speculating on the nature of the problem. This leaves the child open to a long list of possible diagnoses that must be systematically ruled out.

Case four: a seven-year-old female was standing on the seat of a picnic table when she fell to the ground. She inverted her right ankle, had immediate pain and refused to bear weight. Since the injury was witnessed, she was taken immediately to the emergency room. The emergency room physician examined the patient, evaluated radiographs and made a diagnosis of a lateral ankle sprain based on the clinical findings of edema surrounding the distal fibula and tenderness in the area. (Figure 4A) He placed her in a posterior splint and fitted her for crutches. He instructed the family to seek an orthopedic consultation. Your diagnosis? Twenty-four hours later, she was seen by a podiatrist who evaluated her clinically and evaluated the radiographs. On clinical examination, there was pain over the distal fibula, but minimal discomfort on palpat-

Figure 4 A. A seven year old female inverted her right ankle in a fall. Initial radiographs were interpreted as normal.

ing the lateral collateral ligaments. She was placed in a short leg weight-bearing cast for three weeks. She made an uneventful recovery. As a precaution, the patient was instructed to return for follow-up radiographs in three months.
Your diagnosis, now?

Commentary: The anterior talofibular, calcaneofibular and posterior talofibular ligaments originate from the fibula distal to the physis. Only the lower portion of the anterior tibiofibular ligament offers any protection to the physis. In the event of a lateral inversion injury in a child of this age, it becomes an issue of tensile strength of the collateral ligaments versus the tensile strength of the physis. The collateral ligaments are not likely to yield, so the distal fibular physis is fractured in a Salter-Harris I or II pattern. Since the periosteum is not completely ruptured, displacement or misalignment is unlikely. Radiographs of the ankle will be interpreted as normal, although the experienced clinician may notice that the physis appears slightly wider than expected. (Figure 4B) The courses of the collateral ligaments are well known, and they are easily palpated. The presence of minimal or no tenderness rules out major injury to the ligaments. Tenderness on palpating the physis of the distal fibula is presumptive evidence of physeal injury and justifies cast protection. Since it is a clinical diagnosis, stress inversion radiographs are not indicated and may even carry a risk for additional physeal insult. On very rare occasions, lateral ankle instability may be demonstrated. (Figure 4C) Fortunately, physeal closure is uncommon, but can happen. (Figure 4D) The rule: children in this age group don't tend to sprain the ankle. They fracture the fibular physis.

Figure 4 B. The radiograph shows an abnormally wide gap at the epiphyseal plate (large arrow). Note the soft tissue edema (small arrow).

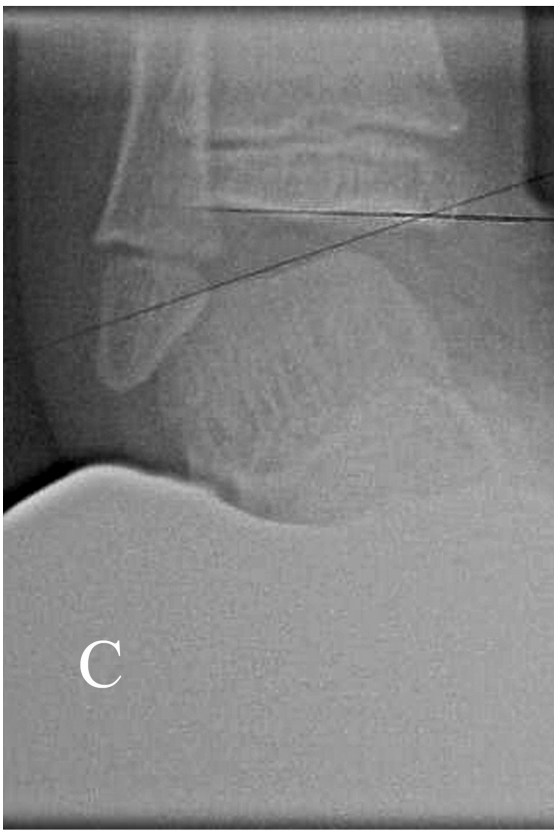

Figure 4 C. Lateral ankle sprains do occasionally occur and can demonstrate significant lateral ankle instability.

Some recent studies utilizing MRI have questioned the incidence of Salter-Harris I and II injuries in this scenario. Ankle sprains are real possibilities. [4] Another study based on MRI failed to identify any Salter-Harris I or II of the distal fibula.[5]

Case number five: a 14-year-old male was engaged in soccer and basketball activities. Over a period of four days, he began developing pain in the right heel. He had difficulty bearing full weight, and walked in equinus. On examination, there was mild edema and ery-

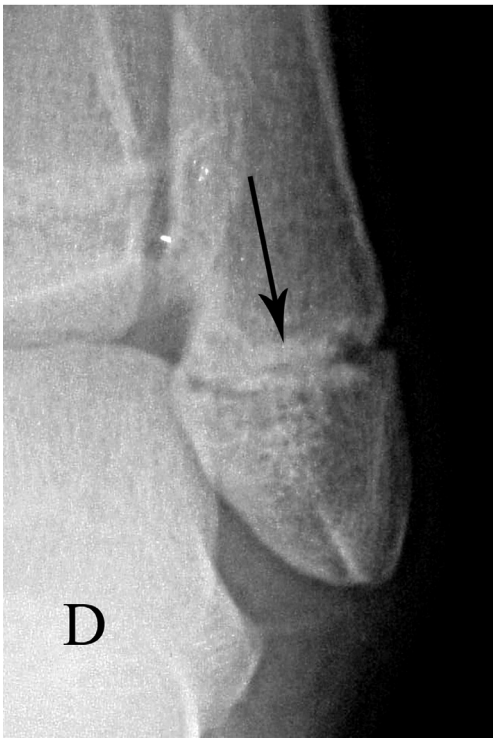

Figure 4D. Post-traumatic premature closure of the distal fibular physis (arrow).

thema of the posterior aspect of the right heel. There was considerable discomfort on side to side compression. Pain was continuous, and rest and elevation offer no relief. He was seen in the emergency room, and a diagnosis of calcaneal apophysitis was made based on the clinical findings. Radiographs were not taken.6 The emergency room physician recommended that he get a gel cushions for his shoes and also recommended physical therapy to maintain his ankle range of motion. Pain continued, and he was seen by his podiatrist who evaluated radiographs and felt that they were normal. (Figure 5A) No mention was made about the observation that the apophysis was for all intents and purposes closed.

Your diagnosis?

Because of the pain, he was placed in a short leg nonweight-bearing cast in gravity equinus and placed on crutches. Differential diagnosis included calcaneal apophysitis, contusion and the possibility of rheumatological disease. Ten days later, the cast was removed and new radiographs were evaluated. (Figure 5B)

Your diagnosis, now?

Commentary: Sever's disease was first described in 1912.[7] It was traditionally considered to be a form of avascular necrosis because of its resemblance to Perthes' disease, but it is now considered to be overuse of the posterior calcaneus. Increased density of the

Figure 5A. A 12 year old male had a four day history of pain following extensive soccer and basketball practice. There was mild edema and erythema. Lateral radiograph taken 6 days after the onset of pain was interpreted as negative for fracture.

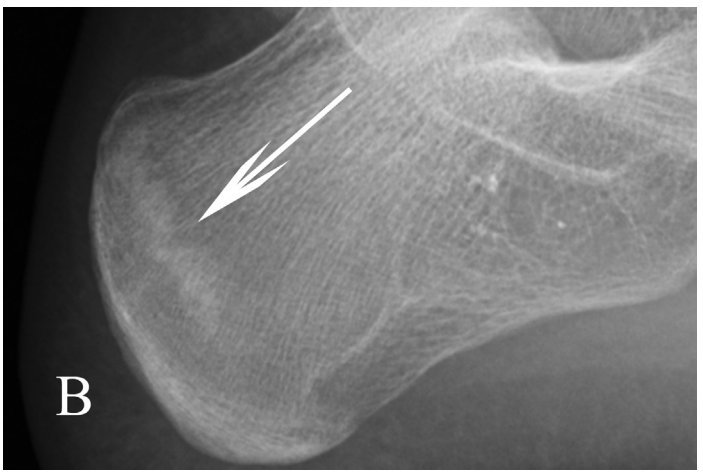

Figure 5B. Ten days after the radiograph shown in 5A, a new radiograph shows a healing cancellous fracture in the proximal calcaneus (arrow).

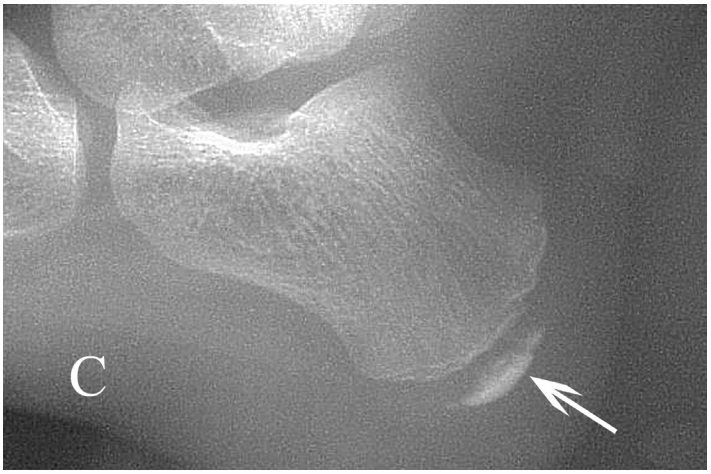

Figure 5C. Increased density of the apophysis (arrow).

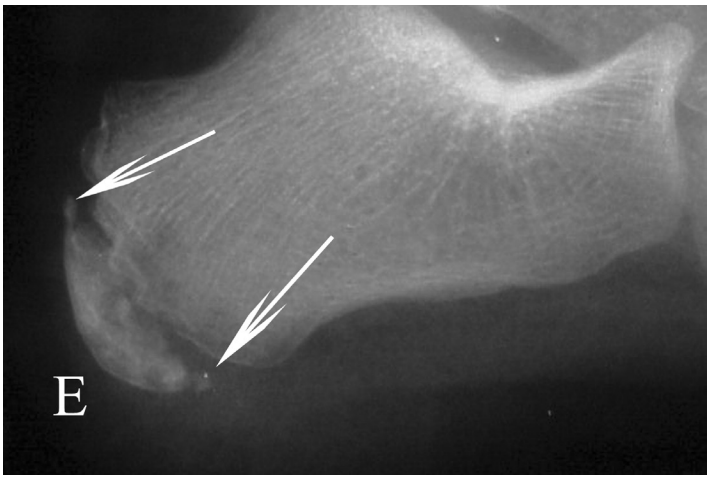

Figure 5E. "Fragmentation" of the apophysis (arrows).

apophysis, (Figure 5C) saw-toothed appearance of the calcaneal metaphysis, (Figure 5D) and a fragmented appearance (Figure 5E) are all normal radiographic findings and are not indicative of avascular necrosis.6 The absence of pathognomonic imaging findings makes calcaneal apophysitis a clinical diagnosis based on the history and the physical findings.

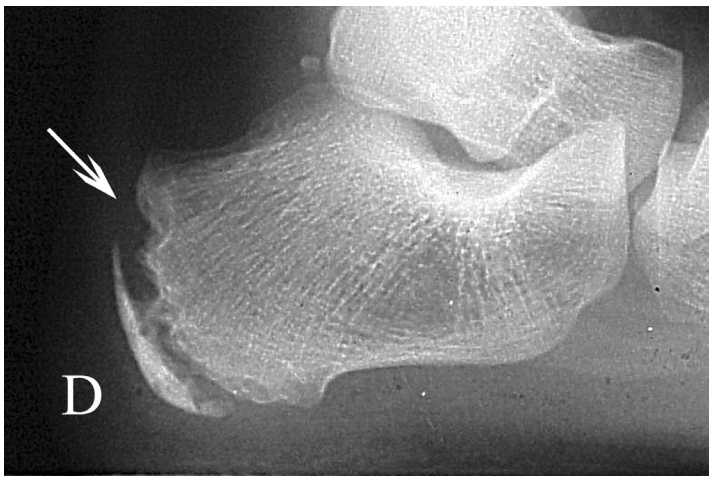

Figure 5D "Saw tooth" metaphyseal pattern (arrow).

Most cases are associated with sports and other high impact activities. The pain usually follows activity and is relieved by rest after these events, Very often there is no pain with normal walking. Pain on side-to-side compression of the calcaneus is a constant feature. Persistent unremitting pain associated with local edema, erythema and increase in temperature point away from this diagnosis. Since the posterior calcaneus and the apophysis are actually a growth plate complex, any metaphyseal pathology can occur there. Included are tumors, osteomyelitis and any pathology favoring the metaphysis.

Onset averages around ten to twelve years of age, immature apophyses are favored and males predominate.8 The apophysis first appears around 5-7 years in females and 7-8 years in males. The apophysis may remain open as late as 13 years in females and 15 years in males.8 It is important to remember that these are skeletal ages, and there may not be a close correlation between skeletal or developmental age and calendar age.

In this case, the age at onset of the pain could still be appropriate, but the appearances of the objective findings on examination of the heel are not. Other differential diagnoses should be considered before calcaneus apophysitis. The advanced maturity of this child (facial and axillary hair, deepening voice, etc.) should have been recognized and predicted advanced skeletal age should have been taken into consideration. Obviously, if the apophysis is closed, this pain cannot be the result of apophysitis.

The role of radiographs and other imaging modalities in diagnosis of calcaneal apophysitis must be considered carefully.[8,9] In the absence of local findings, radiographs are highly likely to be normal and therefore will not assist in the diagnosis. The likelihood of finding unsuspected pathology is very small and cannot be used as justification for the routine use of radiographs. MRI and bone scans show only the pathophysiology and do not confirm or refute the diagnosis.(Figures 5F,

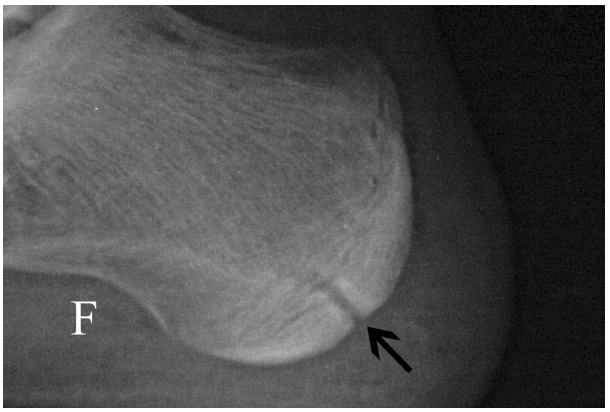

Figure 5F. Cleft in the apophysis (arrow).

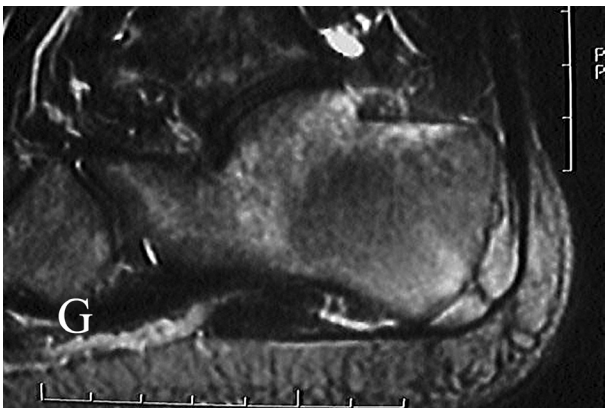

Figure 5G. Abnormal MRI at the site of the cleft.

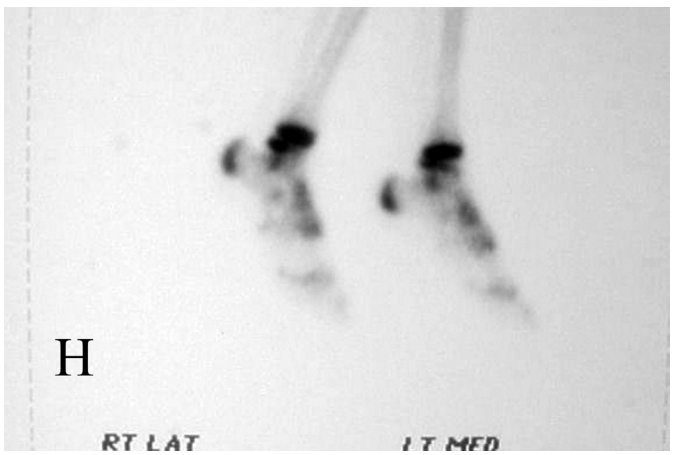

Figure 5H. Equivocal bone scan.

G and H) The risk from unnecessary radiation exposure from radiographs as well as the overutilization of medical resources must be balanced by risk of missing pathology. Had the emergency room physician appreciated the significance of the general and local physical examination findings plus the continuous pain, a radiograph would have been justified, even though it would have been normal.

The follow up radiograph clearly demonstrates a healing cancellous fracture. (Figure 5B)

Summary: Pain in the pediatric patient can be difficult to work up clinically. Great attention must be paid to the history of the complaint. Witnessed trauma suggests fracture. No specific information on the onset opens the door to a host of differential diagnoses that must be excluded. Many of them are serious medical illnesses and must not be missed.

The pediatric knowledge base and experience of the examiner are extremely important. Physicians who see children only occasionally are likely to miss the diagnosis because they lack the ability to recognize the diseases as well as interpret laboratory test results and radiographs. Additionally, inappropriate imaging modalities are likely to be ordered. This makes a strong argument for developing a foot and ankle pediatric specialty. Ideally, these specialists should limit their practices to infants, children and adolescents. Adult specialists should not hesitate to refer.

Fractures in infants and young children are very common, and are often missed. It takes surprisingly little trauma to produce these fractures. Physeal fractures are unique to the pediatric age group, and the long term sequel of these fractures must be considered. Because of the strengths of soft tissues, sprains are much less common than fractures. It is always appropriate to immobilize in the face of these complaints once more serious and urgent pathologies have been systematically excluded.

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