

The Myth of Growing Pains

Single-case studies elucidate the cause of growing pains with a connection to restless leg syndrome.

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Abstract

Eleven children, ages 5-15 with histories of growing pains, were fitted with orthotics to control abnormal subtalar joint pronation, which forces this joint into subluxation. All eleven children responded within two days with complete resolution of painful symptoms. Six adults, ages 30-65 with histories of restless leg syndrome (RLS), were also treated with orthotics with an 83% success rate. All six adults had growing pains as children and, therefore, may represent a subset of all patients with RLS.

Introduction

In spite of being intensively investigated, few medical conditions have been as misunderstood than growing pains in children. While the pain is real, the causative fac-

tor(s) are not well understood. Few topics in medicine have garnered as much attention, without realizing the benefits of continuous research as this misunderstood malady. Indeed, a Google Scholar search on "growing pains in children" results in 217,000 hits.

The idea of growing pains was first described in 1823 by M. Duchamp,¹ The theory that the pains are generated as a result of the long bones, particularly in the lower extremities, growing faster than the soft tissues can keep pace with, is not new, but was debated for well over one hundred years.

It wasn't until over 100 years after the Duchamp article was written that the subject was again vigorously explored by a number of researchers from both the United King-

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New Concepts and Studies

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dom and the United States. Hawksley in 1931² attributed growing pains to rheumatic fever, a connection he continued over the next eight years. Sheldon (1936) dismissed this correlation.³ Psychological maladjustment was implicated as a contributing factor to growing pains, by the forensic psychologist Neustatter, in 1937,⁴ as was hair and eye color,⁵ and race.³

A connection between orthopedic anomalies and growing pains was referred to as early as 1939 by Hawksley, when he wrote: “A classification of the cases into various types for the purpose of observing whether coexisting abnormalities were in any way connected with the limb pain had the following result: a frequent cause of the pain is a postural or orthopaedic defect such as flat-foot, knock-knee, scoliosis, or bad stance; treatment of the cause in these cases nearly always gives relief. The success of the treatment has been most satisfying, and the majority have rapidly ceased to complain of pain.”⁶

The actual treatment for these orthopedic and postural defects, especially by Drs. Kellgren and Wesson, was not discussed in Hawksley’s article, nor can any reference be found in the archives. However, Hawksley did offer an anatomical theory suggesting that pes planoval-

cussed in her published article that growing pains were a result of pes planus deformity¹⁰ based on the evaluation of eight pediatric patients. Her findings, however, were dismissed in her follow-up expanded study in 2008 when she wrote, “Growing pains is not associated with flat feet.”¹¹

Growing Pains and Restless Leg Syndrome—What’s the Connection?

Beginning in the mid-1940s,

ties in his article written in 1960.¹⁵

One can now begin to appreciate the volume of information that has been proffered by a multitude of specialists in describing this condition, and the confusion that can result from such a vast array of articles written over the course of almost 200 years.

It is the purpose of this article to describe the process by which children experience this type of pain, and discuss the biomechanical reasons why they exist. As has been

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a disorder was described by K. A. Ekblom MD as “restless leg syndrome”, or RLS or even Ekblom Syndrome, named after the author who first coined the term¹². Ekblom and his associate R. Brenning initially believed there was a connection between growing pains in children and restless leg syndrome in adults. But Ekblom dismissed this connection based upon an interview with one

suggested by many, growing pains must be a diagnosis of exclusion, after other, more serious causes have been ruled out first. Certainly, juvenile rheumatoid arthritis (JRA) is a real concern, but has a different clinical presentation and can be easily determined with serologic studies. Osgood-Schlatter’s disease, or tibial tubercle apophysitis, is also part of the differential diagnosis, but also is fairly easily distinguished by the patient’s age, and by taking a careful history and clinical examination. The condition known as sinus tarsi syndrome has been discussed in many medical journals, but generally refers to pain in adult feet that is secondary to injury with demonstrable ligamentous injury between the talus and calcaneus.¹⁶

Many other investigators have also written about the potential link between Ekblom Syndrome, or RLS, and growing pains in children.

gus, genu varum and valgum, and femoral anteversion contributed to growing pains.

In 1950, an article submitted by Drs. Naish and Apley at the University of Bristol further dismissed the idea that growing pains were attributed to infectious agents but also assumed that limb pains were non-arthritis.⁷ Since that time, many authors have concluded that growing pains in children are non-articular.^{8,9}

In 2003, M. Angela Evans dis-

family.¹³

More recently, many other investigators have also written about the potential link between Ekblom Syndrome, or RLS, and growing pains in children. Arthur S. Walters, et al.¹⁴ have repeatedly made the suggestion that growing pains are a “younger” version of Ekblom Syndrome, citing previous articles from Dr. Ekblom and his colleague Brenning. Brenning thought there was a more solid relationship between the two medical en-

Discussion

So What Is It?

Simply stated, the majority of growing pains that present into physicians’ offices are the result of chronic subluxation of the subtalar joint (STJ), creating transient synovitis with referred pain symptoms into the lower leg, typically with cessation

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of activity. If one takes the time to read through much of the studies that have already been conducted on this syndrome, the above definition explains many of the findings. The association of hypermobility, pes planus, increased activity and body weight, all can contribute to this phenomenon. But just because a patient presents with a pes planus, or flatfoot deformity, doesn't mean that the subtalar joint is functioning at its end of range-of-motion at forefoot loading or static stance. Conversely, a foot that presents with a very high arch, or pes cavus, does not exclude the possibility that the subtalar joint is functioning at its everted end of range of motion during the gait cycle.

Let's explore what referred pain represents. "Referred pain (also reflective pain) is pain perceived at a location other than the site of the painful stimulus."¹⁷ While there is no widespread agreement on the causes or mechanism behind referred pain, it is a widely held and accepted term in medicine. Physicians understand that lower back pain can radiate distally, through a host of causative factors including, but not limited to,

cardial infarction can often radiate into the left jaw, neck, or left arm. A less well understood phenomenon is referred pain from the ankle joint more proximally into the leg or even the knee. Therefore, the concept of

cantly inverted at heel strike, that is to say, the STJ neutral position places the calcaneus at a fairly extreme inverted position? What happens when the STJ range of motion does not compensate for the rearfoot varus

If the motion of the oblique and longitudinal axes of the midtarsal joint are not sufficient to compensate for the varus deformity, the STJ then needs to pronate sufficiently in order for the first ray to contact the ground.

referred pain from an origin more distal than the area of perceived pain is not new or unique.

It is the belief of the authors of this program that growing pains are a result of referred pain from the subtalar joint (STJ), more proximally into the lower leg.

So what foot deformities exist that will sublux the subtalar joint? There are two main causes associated with this particular syndrome. First, a forefoot varus deformity, compensated or not, and second, a rear foot

position? This condition is termed an uncompensated rear foot varus deformity. The result of this situation is that the STJ maximally pronates to its end of ROM with the body's weight further delivering a force to this joint in a subluxing manner.

Forefoot varus is a structural deformity, where the forefoot is inverted to the rear foot, i.e., the forefoot is inverted to a bisection of the posterior aspect of the calcaneus. Further, what happens when the structural deformity of a forefoot varus cannot be compensated at the level of either the MTJ and/or the STJ? After heel strike, the foot comes into more contact with the supporting surface, as the lateral column (fourth and primarily fifth metatarsal bones) contacts the ground in mid-stance. Ground reactive force applies an upwards vector rotating the longitudinal and oblique axis of the midtarsal joint until the forefoot comes into complete contact with this surface.

If the motion of the oblique and longitudinal axes of the midtarsal joint are not sufficient to compensate for the varus deformity, the STJ then needs to pronate sufficiently in order for the first ray to contact the ground. The hallux, or great toe, has to be able to gain full contact with the supporting surface in order to propel the body in the propulsive phase of gait, as well as offer the individual the ability to balance. If the combination of midtarsal and STJ pronation is not sufficient to compensate for

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It is an accepted fact of clinical diagnoses that more proximal origins of pain need to be part of the differential diagnoses in any patient.

nerve impingement, muscle tightness, and hip arthritis. It is also well understood that a child complaining of knee pain might actually be suffering from a problem more proximal, i.e., at the hip.

It is an accepted fact of clinical diagnoses that more proximal origins of pain need to be part of the differential diagnoses in any patient. But this type of pain does not always travel distally, i.e., from a source closer to the central nervous system distally. Referred pain also can be from areas of the body other than the extremities, such as gall bladder pain being referred to the shoulder blades or right shoulder. Pain from a myo-

varus deformity can cause the subtalar joint to evert to the end of its range of motion and, as the definition of subluxation suggests, beyond.

Rearfoot varus (otherwise known as calcaneovarum in allopathic and osteopathic nomenclature), is defined as a positional deformity where the rear foot is excessively inverted to the leg and supporting surface during the swing phase of gait and, therefore, at heel strike. There are several factors that can influence and/or create a rear foot varus deformity, including a structural deformity of the calcaneus and subtalar joint, or a tibial varum condition. So what happens when the calcaneus is signifi-

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the forefoot varus, then it is termed an uncompensated forefoot varus deformity, and the patient's STJ will be functioning at its end of range-of-motion, and potentially beyond. In other words, the STJ will be subluxing at the midstance phase of gait.

The authors feel that it is important to forward a notion that is not unique in podiatry, and that is the role of the forefoot in determining the forces on the rear foot. Measuring the forefoot to the rear foot in supine and prone positions is important. However, we feel the forefoot to the ground and/or the long axis of the leg is also important in successfully treating these patients. With the patient in a sitting position, the STJ held in neutral position, and the forefoot dorsiflexed with the lateral column loaded to resistance, an imaginary plane can be visualized by the practitioner which would represent the ground and, thus, the ground reactive force that influences the forefoot in order that the great

ferred pain is chronic or acute subluxation of this joint created by maximal eversion, resulting in transient synovitis. So, how is perceived pain referred to the lower leg? By what nerve routes does this occur? The subtalar joint receives sensory innervation from three nerves that pass from the leg, into the foot. The posterior tibi-

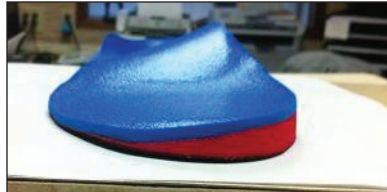


Figure 1: The authors believe that the forefoot correction should be extended beyond the metatarsal heads to the end of the top cover in order that the hallux is supported.



Figure 2: If the orthotic does not support the forefoot past the metatarsal heads, the patient will continue to pronate, by whatever means, in order to gain hallux purchase, or will subconsciously fire the intrinsic muscle flexors in order to do so.

alis, sural, and deep peroneal nerves send sensory branches to the synovium that lines the subtalar joint.

So what does this all mean? How can or should this information affect the way we not only view this medical dilemma, but treat it? The presentation of a patient into the office with these types of complaints should alert the practitioner to focus on determining the cause of this joint

thotic that will not allow the STJ to function maximally everted and at or beyond the end of its ROM (Figures 1 and 2). The results are dramatic.

It is not only the objective of this article to identify and address the root cause of growing pains in children but to also expand the inquiry to include the anecdotal evidence

that some restless leg syndrome may very well be the adult version of this same phenomenon. Are the authors implying that all RLS is referred pain from the foot? Certainly not, but the connection between the two maladies cannot be totally dismissed. There is, at least, clinical overlap between the two medical conditions that has been previously discussed as described by Ekblom, Brenning, and Walters, as well as others.

Any foot condition that forces the subtalar joint to its end of range-of-motion in pronation (and therefore at risk of subluxation) can create paroxysmal nocturnal pain in children and, perhaps, restless leg syndrome in adults. Previous investigators, with only a few exceptions, have been focused on one malady but not the other. The authors of this presentation believe the two are closely linked. The clues to identify and treat this problem that are found in the literature, first from Dr. Hawksley's article written in 1939, and more recently from Dr. Angela Evans in her article published in 2003, have seemingly been ignored or their findings minimized. Whether the foot "appears" to be flat, or conversely high-arched, does not indicate where the STJ is positioned during static stance or through the weight-bearing portion of the gait cycle.

To further elucidate the source of this pain, the examiner can press

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It is no longer acceptable for the practitioner to simply tell the patient and family that the child will grow out of this pain when immediate and satisfactory relief of this syndrome is so readily available and so simply achieved.

toe comes into contact with the supporting surface. It is our belief that this may explain why static measurements don't always coincide with the more extreme position the foot maintains during gait analysis.

Now that we've briefly reviewed abnormal foot position and function, let's review again what our working definition is for "growing pains" or paroxysmal nocturnal pain. Growing pains are referred pain from the subtalar joint into the lower leg, typically at night, once the day's activities have subsided. The cause of the re-

functioning at the end of its range of motion. It is no longer acceptable for the practitioner to simply tell the patient and family that the child will grow out of this pain when immediate and satisfactory relief of this syndrome is so readily available and so simply achieved. Evaluating the patient's lower extremities, i.e., the amount of tibial varum, rear foot range-of-motion (ROM), and position at resting calcaneal stance, and the forefoot to rear foot relationship, is the start to successfully prescribing either a pre-fabricated or custom or-

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on the skin overlying the sinus tarsi and the medial and lateral posterior facet of the subtalar joint of the patient. By pressing on the sinus tarsi, a dell in the foot structure found just anterior to the lateral malleoli, intra-capsular pressure of the STJ is increased. If the patient responds symptomatically, one can be fairly confident that this is the source of the referred pain at night. The same response should be elicited with direct palpation to the joint capsule overlying the posterior facet of the STJ, located posterior to the medial and lateral malleoli. Our observations have been that when this examination is performed on patients who are experiencing almost nightly pain, they will be very symptomatic and will demonstrate guarding responses.

So What Are the Numbers?

For this pilot program, the practitioners did not advertise in local media for treatment of growing pain or RLS patients. While a few pediatricians were contacted about this pilot study, most of the patients were sent by “word-of-mouth” from fellow patients and family members. Eleven children with growing pains, aged 5-15, were treated with orthotics, all successfully. The results were almost immediate and dramatic. By the second day

It is not the growing pains that are inherited, but the foot type that leads to growing pains that is.

of orthotic control, all symptoms were relieved. In two of the cases, the orthotic either broke, needing to be replaced, or the patient simply outgrew the existing devices. In both of those cases, the symptoms returned until new orthotics replaced the broken or outgrown devices. We believe this is a key finding. With few exceptions, each patient’s parent indicated that the symptoms began at around age six, which is consistent with prior studies and the medical record.

Six patients with the symptoms of RLS, ages 30-65, were treated with orthotics resulting in an 83% total success rate. One patient had such a high degree of calcaneal inclination angle, adequate and accepting footgear was near to impossible to find. In her case, only partial resolution of her symptoms was achieved and medication to treat neuropathic-type pain was administered. All of the RLS patients distinctly remember having growing pains as children and all related a history of family members experiencing similar problems, even several generations earlier. Four of these patients had been given medication for the painful symptoms by various medical practitioners and after treatment with orthotics, are no longer taking any medication. Foot types are an inherited trait. It is not the growing pains

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that are inherited, but the foot type that leads to growing pains that is.

Where Is the Proof?

The authors realize that this

rior facet of the STJ from medially and laterally. There is consistent and reproducible pain elicited by the patient in each of these syndromes prior to treatment that completely resolves after utilization of orthotic control.

the overlap between the two maladies, but those in allopathic medicine have described growing pains in children as the adolescent form of RLS. We have not read any articles that describe RLS as the adult version of growing pains. Therefore, the authors of this program are submitting the hypothesis that these two syndromes are a continuum of the same problem. Note that the entire small sample of RLS patients treated in this pilot study remembers having growing pains as children; therefore they may represent a subset as described by Arthur S. Walters.

Centers for further research could be established to test this hypothesis, and with careful history taking, a better correlation could perhaps be obtained. The authors are not suggesting that all RLS is referred pain from the foot, but the anecdotal evidence presented here is simply too compelling to dismiss. Considering that like growing pains, RLS seems to occur in family lineages,

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Early diagnosis and intervention are very important in treating either of these two enigmas.

program is based upon a small set of patients. However, the personal testimony of the patients indicates consistency, not only within this group, but with the vast historical record. Another piece of evidence that is being forwarded in demonstrating the source of this pain is the clinical examination of pressing on the sinus tarsi and/or the poste-

Conclusion

So Where Do We Go from Here?

While the authors feel fairly comfortable with the information given here with respect to not only what causes but successfully treats growing pains, much more research needs to be undertaken to solve the mystery of RLS. Prior researchers have discussed

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the connection between the two medical dilemmas appears to have a stronger basis in fact. Early diagnosis and intervention are very important in treating either of these two enigmas. The authors hope that this article will be useful in expediting the type of research that can bring relief to the millions of patients who currently suffer from them. **PM**

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