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Original Articles

Risk Factors for Plantar Fascitis

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Plantar fascitis is a common cause of heel pain and gait disability in adults. The patient will usually describe “a sharp heel pain that radiates along the bottom of the inside of the foot. The pain is often worse when getting out of bed in the morning.” (1) Surgery and injections for this condition are only rarely necessary, as conservative care has been found to be effective in the great majority of cases. (2) Several studies have identified various risk factors that increase the likelihood for developing plantar fascitis. Identification of these factors will help direct effective conservative care, and also provide guidance for preventive and self-care recommendations.

The Plantar Aponeurosis

The plantar fascia is the major structure that supports and maintains the arched alignment of the foot. (3) This aponeurosis is made of strong yet flexible connective tissue that functions as a “bowstring” to hold up the medial longitudinal arch. Plantar fascitis develops when repetitive weightbearing stress irritates the tough connective tissues along the bottom of the foot, resulting in collagen degeneration. When the biomechanical strain continues, the body’s repair capacity is overwhelmed, and the ligaments begin to fail. It is this tear/repair process that causes the chronic, variable symptoms that can eventually become unbearable in some patients.

Risk Factors

Abnormal biomechanics. Excessive pronation has been identified as the most common biomechanical finding associated with plantar fascitis, although a weight-bearing evaluation sometimes finds rigid supination. (4) The flatter, hyperpronating foot overstretches the bowstring function of the plantar fascia, while the high-arched, rigid foot places excessive tension on the plantar aponeurosis. In either case, the combination of improper foot biomechanics and excessive strain causes the connective tissue to undergo collagen degeneration, which can be identified by areas of fibrotic thickening during palpation.

Foot subluxations. Using careful radiographic assessment, Kell has reported the presence of a posterior calcaneus subluxation in some cases of plantar fascitis. Posterior to anterior (P-A) thrusts on the posterior calcaneus (using a table with a pelvic drop piece) produced symptom resolution and reduced the measured discrepancy. (5) Brantingham found various areas of joint dysfunction in the tarsal and metatarsal joints in patients with plantar fascitis. (6) The navicular and first metatarsophalangeal joints are often involved, and an anterior talus is frequently identified.

Limited dorsiflexion. In a matched case-control study that eliminated the effects of pronation and controlled for several other variables, Riddle et al. found that the risk of plantar fascitis increases significantly as the range of ankle dorsiflexion decreases. (7) These results support the theory that a short and tight Achilles tendon will limit ankle dorsiflexion and force the foot to compensate by pronating excessively. Calf stretching has been recommended for many years, both as a treatment and a preventive procedure for plantar strain. This course of action now has significant scientific and clinical support. (2,4,8)

Weight-bearing stress. The case-control study mentioned above identified two additional risk factors that really are part of the same phenomenon. Subjects who reported that they spent the majority of their workday on their feet, and those who were obese, were more likely to develop plantar fascitis. Both of these conditions increase the chronic tensile loading of the aponeurosis in comparison to sedentary workers and those with a normal body weight.

Orthotic Support

Many types of external support for the plantar fascia have been investigated, with mixed results. One group of frustrated researchers concluded that, "It may be that the varying success of the different inserts, both prefabricated and custom orthoses, is directly related to their shock absorption characteristics." (8) In a study that carefully measured the differences in the strain on the plantar aponeurosis using various orthotics, another

group found that, “to support the longitudinal arches of the foot effectively, the medial surface of the orthoses must stabilize the apex of the foot’s arch.” (9) These studies highlight the characteristics of the best orthotic for treating and preventing plantar fascitis: it will provide direct support for the medial longitudinal arch, and it will be made of a soft, viscoelastic material to cushion the weight-bearing stress on the aponeurosis. One additional factor that I have found very useful for actively painful plantar fascia is to special-order a “heel spur correction,” whether there is radiographic evidence of a spur or not. This modification is a “divot” in the surface of the material under the heel to spread pressure away from the irritated fascial insertion.

Conclusion

Plantar fascitis usually responds well to properly focused, conservative treatment. Several risk factors have been identified that must be taken into consideration in both the treatment and prevention phases of care. Custom-made orthotics help reduce these risk factors by limiting pronation, providing support for the medial longitudinal arch, and decreasing the amount of weight-bearing stress that occurs during standing and walking. Normalizing joint mechanics through adjustments, increasing the flexibility of the Achilles tendon with frequent stretching, and maintaining a normal body mass are also very important aspects of successful conservative treatment of plantar fascitis.

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About the Author

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Reprints & Abstracts

By Michael Smithers

Applying Ergonomics to Nurse Computer Workstations

Karen Nielsen, RN, MS, Alison Trinkoff, ScD, RN, FAAN

Abstract and Introduction

Nursing is associated with high rates of musculoskeletal disorders from patient handling, and nurses are at high risk for developing cumulative trauma disorders, which can result from computer usage. Although there are many benefits to using computers in the workplace, nurses need to incorporate ergonomic factors into work settings to promote safe workplace environments. This article reviews recent literature about computer workstation ergonomics, discusses related policies, and makes recommendations about computer workstation design and related research in nursing workplace settings.

Introduction

Nurses are more at risk than construction laborers to sustain work-related musculoskeletal disorders (MSDs). The increased use of computers at home and at work has also resulted in a higher incidence of related cumulative trauma disorders (CTDs). In 1999, RNs in the United States suffered from over 13,000 nonfatal occupational MSDs requiring days away from work, 23% involving the upper extremity. Many research studies have investigated CTDs because these are the most frequently occurring injuries related to computer use (also called repetitive trauma disorders, repetitive strain injuries (RSIs), or overuse syndrome). These injuries result from repetitive exertion of the body, such as typewriting. They involve recurrent and persistent pain, may involve disability in any body part, and may happen progressively over periods of weeks, months, or years. These conditions are one of the fastest growing problems in the workplace and may prevent workers from performing their jobs or even simple household tasks.

Ergonomics is defined as a multidisciplinary science, which studies the mental, physiological, emotional and behavioral costs incurred by humans in their interaction with their work environment. The Occupational Safety and Health Administration (OSHA) defined ergonomics as the practice of designing equipment and work tasks to conform to the capability of the worker. In 1993, The National Council on Nursing Research identified the application of patient care ergonomics to the patient-nurse-machine interaction as a priority for nursing

informatics research. Since then, a limited amount of research has been done investigating the relationship between ergonomics and
nurse computer workstations.

Scope of the Problem

Research finds into computer related CTDs found the need to have adjustable workstation equipment, although exact specifications vary from study to study. Recommended viewing distances for monitors range from 16 to 48 inches. One study recommended a flat keyboard, whereas other studies recommended 0 to 15 degrees keyboard slopes. Some studies suggest a relationship between perceptions of occupational stress and psychosomatic symptoms. Literature about chair design emphasizes the need for lumbar support, 90 leg angles, and the need for the computer user's legs to reach the floor. The number of injuries related to mouse use has risen, as
computer users have become more dependent on mouse computer input devices. Some sources advise that the mouse and trackball be placed on the left side of the user (regardless of handedness) to reduce neck and shoulder stress (especially when frequently using the number keys on the right side of the keyboard). Computer keying forces of less than 48 g are also suggested.

These specifications may be applicable to nurse computer workstations because the computer equipment used in the office worker studies is comparable to equipment used by nurses. Data on postural factors, ergonomic training, length of time spent working at a computer, type of equipment design and placement, employee workstation and environment perceptions, and presence of MSD and upper extremity user symptoms are also included. Consideration of the entire surrounding environment can also promote
healthier nurse-computer interactions. This includes such factors as lighting, aesthetics, design of furniture, and computer positioning. Screen glare is also addressed on how it affects nurse action. OSHA lists simple measures to reduce screen glare, such as putting up curtains, providing light diffusers or adjustable desk lights. Such small modifications can make computing more comfortable for the nurse and increase work efficiency.

Involvement of computer users in the selection and assessment of their workstation equipment is an important component of workspace design, can improve user satisfaction, and reduce fatigue and stress. A study of home health nurses' experiences with a wireless system prompted the modification of computing equipment by their employers. When nurses relayed their concerns about how heavy their wireless computers were, and they received computers that were one-third the weight for their home visits. We do not know how this approach affected nurse injury; however, studies have suggested a relationship between administrative and engineering controls (such as reducing heavy loads) and worker injuries. For example, the institution of an office ergonomics program resulted in a 21% decrease in time lost because of occupational injuries over a 3-year period. Office worker injury costs were diminished by half, as well. This program included researching the problems, training in ergonomic principles, encouraging managerial and staff support, involving appropriate health and safety professionals, and developing a task force responsible for equipment specification, scheduling, and defining roles and responsibilities. Assessors were chosen to evaluate compliance with ergonomic standards, measure employees and equipment, educate staff, and provide adjustable office equipment. Unfortunately, there are many limitations of the research in this area.

Very few articles are available about clinical workstations. Most of the literature is about seated workstations and their equipment components. Literature about ergonomic design of Personal Digital Assistants (PDAs) is not yet available. General laptop guidelines have been introduced, but do not focus on the clinical environment. Articles have been written for occupational health nurses to assist with performing ergonomic analyses of work settings, but they do not address the ergonomic needs of nurses themselves. Most research studies have taken place in small laboratory settings, with small samples of office workers at their worksites, and may not be

generalizable to a clinical population. Only one study was found that investigated nurse upper extremity CTD In this study, nurses and other hospital workers using the computer fewer than 4 hours daily had a 32% prevalence of upper extremity CTD, 60% of which was considered to be carpal tunnel syndrome related to excessive repetitive movements, and workstation design requiring awkward postures. Because this study was cross-sectional in design and had only a 40% response rate, conclusions should be interpreted with caution.

Policy Issues

In November 2000, OSHA proposed ergonomic standards to protect over 102 million workers from repetitive motion injuries in the workplace. These standards went into effect in January 2001, but were repealed by President Bush in March 2001 (Senate Joint Resolution 6). The OSHA standards encouraged MSD reporting for injuries sustained from heavy lifting or repetitive tasks such as typing on keyboards, and ensured that injured employees be seen by a healthcare professional and receive proper treatment.
Ergonomic programs, risk assessment, training, and outcome evaluation were to be implemented and would likely have had a beneficial effect upon nurse injury.

The new 2002 OSHA ergonomics guidelines that have been promulgated are strictly voluntary, and therefore have been criticized by the American Nurses Association as being ineffective in protecting nurses from injury. Although ergonomic programs that combine workstation assessments, appropriate equipment, furniture, and managerial support have been shown to reduce injury, it is unlikely that most organizations will provide such programs voluntarily. OSHA recently accepted public comments on new ergonomics guidelines directed toward nursing homes. These guidelines focus on management practices, performing worksite analyses, and providing control methods to prevent healthcare worker injury, but do not cover ergonomic risk factors associated with clinical computer workstations. Employee work breaks of adequate length and frequency have been found to be beneficial.

There are currently no federal laws that mandate break length and frequency. Although individual state laws and regulations vary in regard to employee break provisions, some states require 15-minute breaks or alternative work every 2 hours for video display terminal users. Breaks of different lengths and frequencies are recommended in the literature for computer work, which makes it difficult to apply to clinical work practices. One article suggests 10-minute breaks at work for each hour spent on the computer while another recommends breaks of 15 seconds to 3 minutes in length, taken every 30 to 60 minutes. The National Institute of Occupational Safety and Health (NIOSH) suggests 10-minute breaks every 2 hours for operators who have moderate visual demands, and 15 minutes per hour for workers with repetitive work or high visual demands. Breaks can be effective in reducing CTDs and other MSDs because they allow the muscles to rest or recover, although current guidelines do not specify break recommendations for computing nurses in particular.

Recommendations

For Employers: Ergonomic programs that include administrative and engineering controls can help to ensure safe nurse-computer interactions in the clinical setting. The following information can be used when instituting an ergonomic program.

NIOSH provides administrative and engineering controls that can reduce worker injury. These include: gathering evidence of worker injuries from OSHA logs, symptom data from staff, and turnover and absenteeism rates; assessing workflow so that awkward movements, forceful exertion, and repetitive motion are eliminated; designing the job and surroundings to fit the workers' capabilities; training staff how to properly use and adjust equipment; and taking frequent small breaks while computing, in addition to regular breaks. Workstation and worker assessments should be done before purchasing computer workstation equipment. Periodically, all components of the office workstation should be reassessed including video display terminals (VDT), chairs, and

peripheral equipment, such as the keyboard, computer mouse, trackball, etc., in order to improve worker productivity and safety. Any new equipment should also meet computer users' ergonomic needs. A participatory approach among staff nurses and other healthcare personnel can help to determine staff nurses' ergonomic needs and make necessary modifications. Information is available on how to perform worker/workstation assessments, including a 'Workstation Checklist,' available on the OSHA Web site. This Web site can help to quickly analyze ergonomic workstation design by assessing how the computer monitor, keyboard/input device, chair, and other workstation components fit the specific worker. Specifications cover similar workstation components as the OSHA checklist and can also be used when evaluating clinical workstations.

The effectiveness of any ergonomic interventions can be evaluated by comparing staff injury rates and job turnover and absenteeism rates to those before the program was instituted. Qualitative analysis may also reveal valuable information about the program effectiveness and any barriers to success.

Case History

Clinical Pearl

Review of the Literature

2000 American Academy of Pediatrics Annual Meeting

Update on Short Stature and Growth Hormone

Jose F. Cara, MD

Introduction

Despite many advances in our understanding of the pathophysiology and treatment of growth disorders, the short child continues to present a diagnostic and therapeutic challenge. Faced with a short child, the physician must decide whether the child has a normal variation or an abnormality of growth.

The diagnosis and treatment of growth hormone deficiency in children have been especially challenging. The lack of consensus regarding how to best diagnose the condition and the lack of guidelines regarding who is likely to most benefit from growth hormone therapy.

Dr. David B. Allen, Professor of Pediatrics and Director of Endocrinology and Residency Training at University of Wisconsin Children's Hospital reported that children go through 3 phases of growth, each of which is under different control mechanisms. In the intrauterine and immediate postnatal period, growth is regulated primarily by metabolic and nutritional factors, including insulin. During childhood, growth is mainly under the control of growth hormone, and throughout adolescence, growth is regulated primarily by the combination of growth hormone and sex steroids. Alterations in these different control mechanisms can lead to variations in the expected pattern of growth that must be recognized and adequately evaluated by primary care providers.

Evaluating the Child for Growth Hormone Deficiency

Linear growth in children follows a predictable pattern that is defined, in large part, by genetic, environmental, and psychological factors, including the child's age, sex, ethnic background, and parental height. Because growth is a dynamic process, it is important to focus on the child's rate of growth rather than on his or her

stature. In general, a normal rate of growth is a sensitive indicator of a child's well-being and excludes significant pathology, such as growth hormone deficiency.

There are 2 circumstances in which an abnormally slow rate of growth may represent a normal variation. The birth length of normal full-term infants has very little variation despite the very large variation in the height of parents. During the first 3 years of life, the child's rate of growth may speed up or slow down until he finds his own predestined growth "channel." Children with constitutional delay of adolescent growth and development (ie, "late bloomers") may have an accentuation of the decline in growth velocity that normally occurs just before puberty.

Adult Growth Hormone Deficiency

Long-standing growth hormone deficiency in adults is associated with a clinical syndrome characterized by a variety of signs and symptoms, the most common ones being reduced lean body mass, increased abdominal adiposity, decreased strength, reduced exercise capacity, impaired psychological well-being with reduced vitality, and depressed mood and social isolation. Adults with hypopituitarism have reduced life expectancy, with a greater than 2-fold increase in mortality from cardiovascular disease and may predispose to the development of premature atherosclerosis.

Growth hormone therapy reverses many of the clinical signs and symptoms of growth hormone deficiency. Long-term treatment with growth hormone has been shown to increase lean body mass an average of 2.0-5.5 kg while reducing fat mass 4-6 kg. Bone mineral content, muscle strength, and exercise capacity have also been observed to increase with long-term growth hormone therapy. Total cholesterol and low-density lipoprotein (LDL) cholesterol have been seen to diminish, whereas high-density lipoprotein (HDL) cholesterol has been observed to rise. Subjective well-being and quality of life appear to be enhanced with growth hormone treatment, with most subjects reporting increased energy, improved exercise tolerance, and improved mood.

The side effects of growth hormone treatment are determined primarily by the dose of drug). The most frequently encountered side effects include fluid retention, arthralgia, and muscle pains.

Growth Hormone Treatment in Prader-Willi Syndrome

Prader-Willi syndrome results from uniparental disomy and is caused by a functional abnormality of chromosome 15. It is characterized by short stature, obesity, hypotonia, varying degrees of mental impairment, and hypothalamic dysfunction causing hypogonadism. Children with Prader-Willi syndrome have significantly increased body fat with very little lean body mass. Obesity is often so severe that coordination and physical activity are severely impaired.

The use of growth hormone in children with Prader-Willi syndrome is based on the observations that growth hormone treatment improves lean body mass, decreases fat mass, increases strength and ability, and improves the quality of life of children with this condition.

Current Events

From the President

Announcing two Interorganizational Coalition Orthopedic Diplomate examinations administered by the Academy of Chiropractic Orthopedists.

1. Northwestern Health Sciences University Bloomington, Minnesota

November 19, 2005

2. Western States Chiropractic College Portland, Oregon
March 25, 2006

Current Events:

The new brochure for Fellows to use in patient education, industry education or other areas is now available through the Academy office. Fellows have used this brochure to put in the patient education packet about the clinic and doctor. This brochure is given to the patient on the first visit. This greatly improves the chances the patient will read about your educational achievements and dedication to excellence.

Two new sponsors have been added to our website (www.dcorthoacademy.com). We would like to welcome J. R. Richard Consulting. This company has voice dictation products available and I would urge you to visit the website and click on this link. Lloyd Table Company is the second sponsor this month. They have quality tables and have supported chiropractic orthopedics for some time. Please visit their site.

Examination review classes for the upcoming Academy Diplomate certification examination is scheduled at Northwestern Health Sciences University on August 26-28, 2005. This program is acceptable for 24 hours of voluntary re-credentialing for the Academy. The Academy continues to improve the process to be candidate friendly, these 24 hours may be used towards the 360 hours that are needed for the Diplomate examination.

Attribution

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