

Review

Useful effect of a clinical shoe insole, Mubal[®], as orthotics

Chan-Lee Park¹, Ji-Hyun Go², Na-Ra Han¹, Hong-Hee Moon³, Min-Jun Seo^{4,*}

¹Department of Pharmacology, College of Korean Medicine, Kyung Hee University, 26, Kyunghedae-ro, Dongdaemun-gu, Seoul, 130-701, Republic of Korea; ²Shinwol-Kyunghee oriental medical clinic, 931-1, Shinwol7-dong, Yangcheon-Gu, Seoul, Republic of Korea; ³Korea Creative Mubal, 40 gil 3, Neungdong-ro, Gwangjin-gu, Seoul, 161-43, Republic of Korea; ⁴Department of Oriental Medicine Resources, Gyeongju University, 188 Taejong-ro, Gyeongju, Gyeongbuk, 780-712, Republic of Korea

ABSTRACT

Arthritis is a major cause of joint pain, stiffness, and subsequent disability which adversely affects quality of life. Seriously, it can lead to long term social and psychological effects including loss of independence, depression, and anxiety. Arthritis is usually treated with joint replacement surgery or medications. However, the artificial joint is temporary and pharmacological measures have side effects, such as addiction or hypersensitivity. Thus, orthotics has been developed to improve arthritis as a nonpharmacological measure. The increased regional load across compartments of articular cartilage is an important factor in the cause of the arthritis. Mubal[®], a clinical shoe insole, has a sliding function to help people to walk straight and realign the body balance. The slide of Mubal[®] reduces the knee joint loading in patients with arthritis. In addition, pumping function of Mubal[®] can mitigate arthritis by stretching the squashed nerves from lumbar to cervical vertebral and actively circulating blood of pelvic limb. In addition, Mubal[®] could help to stimulate the growth plate. Therefore, Mubal[®] can be used for the child with short stature as well as patients with arthritis.

Keywords arthritis, orthotics, Mubal[®], growth

INTRODUCTION

The knee joint is an integral part of our body. It plays an essential role in our body's movements. It is necessary to be strong enough to take our weight and must steady position so we can stand straight. (Arthritis Research UK, 2013). Arthritis is a prevalent condition affecting millions of people around the world. It is a major cause of joint pain and stiffness and subsequent disability which adversely affects quality of life and can lead to long term social and psychological effects including loss of independence, depression and anxiety (Santy-Tomlinson, 2015). Arthritis has been as a degenerative disease which mainly affects people in later life. Arthritis is induced from a collapse in the cartilage that covers the joints. The tissue of the cartilage is injured by age and repeated motion. This increases the friction because the bones of the joint stroke against each other. It can also cause injury to the bone. Cartilage is a stout but rubbery substance covering the end of bones. It protects joints and moves the bones smoothly against each other. Arthritis of the knee joint has been shown to express in about 10% of adults over 55 years of age, and about 90% of cases are seen in the medial tibiofemoral compartment (Fu et al., 2015). The medial compartment is more commonly affected than the lateral compartment in arthritis. Throughout the whole stance phase of walking, an external adduction moment works around the knee joint, which tends to rotate the tibia medially with regard to the femur in the frontal plane. This external knee

adduction moment is mostly caused by a medially acting ground reaction force, which is existent during level walking and other locomotor paradigms. A high knee adduction moment reflects increased compressive forces playing on the medial aspect of the knee and is widely considered a surrogate measure of medial knee compression. Varus knee alignment has been reported as one of the best predictors of a high knee adduction moment. In line with this association, patients with moderate to severe arthritis show an increased varus knee alignment of between 2° and 6° compared with patients with mild to moderate symptoms. In patients with a high preoperative knee adduction moment the reemergence of a varus deformity 5 years after proximal tibial osteotomy to achieve a valgus correction underlines the central role of high knee adduction moments in both the development and progression of knee arthritis. Indeed, a high knee adduction moment is a very strong predictor of arthritis progression. The evidence unequivocally suggests that high knee adduction moments are intimately linked with the severity of medial knee arthritis, although a causal relationship might be difficult to establish (Neil et al., 2012).

The less cartilage may alter the shape of the joint (National Institute of Health, 2015). Joint pain and developing stiffness without obvious swelling, chills, or an increased temperature during normal activities perhaps suggest the gradual beginning of symptoms of arthritis. The existence of osteophytes is ordinarily seen, and muscle debilitation can also occur (Arthritis Research UK, 2013).

Factors that can predispose people to arthritis of the knee are age, weight, body mass index, genetics, occupational activities, history of trauma, and physical work activities, especially kneeling, squatting, lifting, and climbing. In particular, secondary arthritis can also be developed due to an earlier cause substance or incident such as trauma. The cause of knee arthritis has not been corroborated but it is thought that

*Correspondence: Min-Jun Seo

E-mail: mjseo@gu.ac.kr

Received May 21, 2015; Accepted May 29, 2015; Published May 31, 2015

doi: <http://dx.doi.org/10.5667/tang.2015.0012>

© 2015 by Association of Humanitas Medicine

This is an open access article under the CC BY-NC license.

(<http://creativecommons.org/licenses/by-nc/3.0/>)

mechanical factors act a major role in occurrence of the disease and corpulence is a risk factor along with a varus knee alignment (Zahra, 2015).

Treatments of arthritis

Treatment programs commonly involve non-pharmacological and pharmacological measures. If pain becomes debilitating, joint replacement surgery is to be used to ameliorate the quality of life (Zahra, 2015). Paregorics help with pain and stiffness but they do not influence the arthritis itself and will not fix the injury to joint. Stronger paregorics, for example opioids, may be substituted if patients have extreme pain and other medicines don't work well enough. But, stronger paregorics are more likely to have side effects, particularly nausea, dizziness and confusion. Non-steroidal anti-inflammatory drugs, such as ibuprofen, naproxen, or indomethacin may be suggested if inflammation is aggravating to pain and stiffness. But they carry risk of a heart attack or stroke and block the synthesis of human cartilage matrix, this is likely to increase the rate of degeneration of articular cartilage in arthritis (Arthritis Research UK, 2013; Zahra, 2015).

Limitation of the treatments

This has led many researchers to attempt to find a remedy or modalities with negligible side effects and significant improvement in the symptoms. Orthotic treatment can alter loading to the knee in the hope of reducing symptoms and disease progression. Recent conventional accesses to treat medial compartment knee arthritis involve the use of laterally wedged insoles and especially designed knee braces (Zahra, 2015). If pain interlopes with normal life in spite of other medications, joint replacement surgery may be helpful. An artificial joint, however, is not permanent (Glyn-jones, 2015). Treatment includes exercise, efforts to lessen joint stress, assist groups, and pain medications. Efforts to lessen joint stress involve resting, the use of a cane, braces and weight loss.

Orthotics for arthritis treatment

Arthritis patients have trouble in walking due to pain in their knee. Due to this, muscle strength and knee joint become weak or stiff. Thus, it is necessary to increase the muscle strength and gradually to expand the range of motion of joints for patients. The portable rehabilitation exercise device for knee joint enables arthritis patients to increase the muscle strength and to expand the range of motion of joints (Han, 2014).

One method of treating an arthritic knee is to fit the wearer with a knee brace whereby the assist is supplied to allow practical ambulatory activity without risk of damage. In addition to providing ambulatory assist, adjustable knee brace is laterally internally and externally movable to undertake straightening of the joint to conquest leg curvature with regarding a lower brace portion below the knee joint (Edward, 2005).

Clinical shoe insole as orthotics

Low back pain (LBP) affects to 80% of adults and has important related with socioeconomic and healthcare cost. Foot function has been proposed to be an etiological mechanism for the occurrence of LBP. Extreme foot pronation is suggested to

generate continued internal rotation of the lower limb and obstruct sagittal plane forward movement of the body during walk. This causes respectable transformation at the sacroiliac and lumbosacral joints supplying to the occurrence of LBP. In the presence of extreme or continued foot pronation, orthoses have traditionally been specified to lessen the scale and pace of foot movement, correcting lower limb function and proximal posture. In a rigid high arched foot type, shock receiving insoles are suggested to lessen the more proximal propagation of shock, subsequently reducing LBP (Chuter, 2014).

Foot ulceration can be depressing for people with diabetes and has been found to about 84% of lower extremity amputations. Inhibiting diabetic foot ulceration is therefore important to reduce the occurrence of amputation. The prescription of insoles and therapeutic footwear are significant factors of the prevention approach within these varied foot clinics. High plantar pressures related with the neuropathic foot raise the risk of foot ulcer occurrence. Insoles designed to diminish raised plantar pressure are presently specified to help prevent ulceration (Paton et al., 2011).

Mubal®

Mubal® has a sliding function to help landing line, starting from the outside of the heel to end at finish toe, to move to the center of the heel and center of index and middle toe, to help people to walk straight. Based on ergonomic design, the center-line of slide serves as a lever to move the balance of the body to left and right. Thus, Mubal® can mitigate arthritis by stretching the squashed nerves from lumbar to cervical vertebral and actively circulating blood of pelvic limb. Decrease in pain was involved an increase in knee joint loading during walking in that the change in pain was reciprocally related with the change in adduction moment. The knee adduction moment is a decisive factor of the load assignment between the medial and lateral plateaus. Slide of Mubal® reduces the knee adduction moment in patients with arthritis. Its pumping function actively circulates blood of pelvic limb to mitigate diseases such as leg edema caused by circulatory disturbances such as plantar fasciitis and varicose veins, and thus it significantly reduces fatigue of the entire body. Also, the materials of Mubal® are comprised of tourmaline which emits far infrared rays and anions and helps antibacterial effects and deodorization recognizes as an anticancer drug, and amethyst which has life friendly wavelength.

Effect of orthotics on stimulating growth plate

In general, the feet are called as the second heart. And many blood apertures of the soles of the feet are closely related to each organ in oriental medicine. Volar pressure energizes the body's diversity organs and circulates the blood. The great toe has a foot Reflex Zone linked with the pituitary gland in site, the pituitary can obtain an excellent help to induce growth when the region where that plays a major role in the control of hormone secretion. The conventional growth assistances are in motion, for example the foot Reflex Zone user to play in the priming state which mounting projections are formed on the pad or sock in the shoe, because a number of many protrusions are formed such that spreading on the upper surface of the pad or sock as a result stimulating (Lee, 2013).

The growth plates of adolescent white rabbits were stimulated with capacitively coupled electrical fields. Capacitor plates attached to plastic jigs placed over the proximal tibiae

and supplied sine wave signals of 60 kHz frequency and various voltages. This study shows that the rabbit growth plate was significantly stimulated to important accelerated growth. A dose effect was notable with 5 V peak showing maximum growth acceleration. Thus the application of the proper capacitively coupled electrical field widely stimulated the rabbit growth plate at voltage and present levels that are safe for human use (Brighton, 1983).

Effect of Mubal® on stimulating growth plate

Growth of people is induced by activation and proliferation of cells in the whole body. In particular, people grow up through activating the secretion of growth hormone or stimulating the growth plate. One of the powerful stimulation is exercising. Exercising promotes the release of growth hormone. Mubal® has a sliding function to help landing line, so it helps children have a balanced figure, so they can be a balanced movement and over seven grow faster (Lee, 2013). Thus, we suggest that exercising with Mubal® increases the secretion of growth hormone and promotes the growth.

CONCLUSION

Mubal® would have clinical effects on arthritis and growth. Therefore, Mubal® can be used for the child with short stature as well as patients with arthritis.

ACKNOWLEDGEMENTS

None.

CONFLICT OF INTEREST

The authors do not have any conflict of interest in the present study.

REFERENCES

Arthritis Research UK. Osteoarthritis of the knee. 2013. Available at: <http://www.arthritisresearchuk.org/arthritis-information/conditions/osteoarthritis-of-the-knee/how-is-the-kneestructured.aspx> (accessed on 20th May 2015).

Brighton CT, Pfeffe GB, Pollack SR. In vivo growth plate stimulation in various capacitively coupled electrical fields. *J Orthop Res.* 1983;1:42-49.

Chuter V, Spink M, Searle A, Ho A. The effectiveness of shoe insoles for the prevention and treatment of low back pain: a systematic review and meta-analysis of randomized controlled trials. *BMC Musculoskelet Disord.* 2014;15:140.

Fu HCh, Lie CW, Ng TP, Chen KW, Tse CY, Wong WH. Prospective study on the effects of orthotic treatment for medial knee osteoarthritis in Chinese patients: clinical outcome and gait analysis. *Hong Kong Med J.* 2015;21:98-106.

Glyn-Jones S, Palmer AJ, Agricola R, Price AJ, Vincent TL, Weinans H, Carr AJ. Osteoarthritis. *Lancet.* 2015. [Epub ahead of print].

Edward L, Castillo. Osteo-arthritis knee brace. 2005. Available at: <https://www.google.co.kr/patents/US6875187?dq=knee+brace+arthritis&hl=ko&sa=X&ei=G3NdVbKbHMKi8AXyvoHICQ&ved=0CBwQ6AEwAA> (accessed on: 20th May 2015).

Han JS. Portable rehabilitation exercise device for knee joint. Available at: https://www.google.co.kr/patents/WO2014065609A1?cl=en&hl=ko&dq=Portable+rehabilitation+exercise+device+for+knee+joint&ei=_kJcVafmIYz88QWAwYC4Ag (accessed on 20th May 2015).

Lee JH. Growth assistance device worn on big toe. 2013. Available at: <http://www.google.com/patents/WO2013115450A1?cl=en&hl=ko> (accessed on 20th May 2015).

National Institute of Health. Handout on Health: Osteoarthritis. 2015. Available at: http://www.niams.nih.gov/health_info/Osteoarthritis/default.asp (accessed on 20th May 2015).

Paton J, Bruce G, Jones R, Stenhouse E. Effectiveness of insoles used for the prevention of ulceration in the neuropathic diabetic foot: a systematic review. *J Diabetes Complications.* 2011;25:52-62.

Santy-Tomlinson J. Osteoarthritis in perspective. *Int J Orthop Trauma Nurs.* 2015;19:59-60.

Zahra Naderi, Hassan Mozaffari-Khosravi, Ali Dehghan, Azadeh Nadjarzadeh, Hassan Fallah Huseini. Effect of ginger powder supplementation on nitric oxide and C-reactive protein in elderly knee osteoarthritis patients: A 12-week double-blind randomized placebo-controlled clinical trial. *J Tradit Complement Med.* 2015;1-5.