REVIEW ARTICLE

The Usefulness of Therapeutic Diabetic Footwear and Insoles in Diabetic Foot Treatment- A Narrative Review

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Abstract

Orthosis and prosthesis is an expert knowledge in medical field including the design, fabrication and utilizing of orthosis and prosthesis. An orthosis is a device made of different types of material (plastic, aluminum, foam, leather, etc.) used externally on body segments to modify the structural or functional characteristics of musculoskeletal system to objectives such as: reducing pain, restriction or movements and redistribution of abnormal weight bearing pattern. Poor shoes fitting or abnormal friction may not be considered due to loss of senses in neuropathic diabetic patient. Untreating micro injuries may lead to ulceration and possibly even partial foot amputation. Deformities such as bunions, hammer toes, Charcot joint and also muscle weakness reported as secondary complications of neuropathy. It is suggested that in sub-acute stages of neuropathy with complication such as: Charcot joint, insensitive feet or muscles, orthotic prescription can be useful. The aim of this review was to assess the usefulness of therapeutic diabetic footwear (shoes) and insoles in treating diabetic foot.

Keywords: Diabetic foot, Orthosis, Prosthesis

Introduction

Orthosis and prosthesis is an expert knowledge in medical field including the design, fabrication and utilizing of orthosis and prosthesis. (1-3) An orthosis is a device made of different types of material (plastic, aluminum, foam, leather, etc.) used externally on body segments to modify the structural or functional characteristics of musculoskeletal system to objectives such as: reducing pain, restriction or movements and redistribution of abnormal weight bearing pattern. (1-3) Poor shoes fitting or abnormal friction may not be considered due to loss of senses in neuropathic diabetic patient. (1,4)

Untreating micro injuries may lead to ulceration and possibly even partial foot amputation. Deformities such as bunions, hammer toes, Charcot joint and also muscle weakness reported as secondary complications of neuropathy. (5-7)

It is suggested that In subacute stages of neuropathy with complication such as: Charcot joint, insensitive feet or muscles, orthotic prescription can be useful. (1,3) The aim of

this review was to assess the usefulness of therapeutic diabetic footwear (shoes) and insoles in treating diabetic foot.

Therapeutic diabetic footwear

The prevention of ulceration in diabetic foot care is a key process. (8,9) Education and proper footwear are main factors need to be considered in this process. (1) Therapeutic footwear prescribed in these cases can help in ulcer prevention by reduction of peak plantar pressure. (5,6,10,11) It is suggested that by decreasing the plantar pressure on high risk ulcer region, the rate of neuropathic diabetic ulcers will be diminished. (6,10-14)

The role of therapeutic diabetic footwear

Two types of recommended diabetic foot wears are (pre-fabricated) and (custom-made) (15). Pre-fabricated shoes are made in different sizes and widths suggested to diabetic patient with normal foot. Custom-made foot wears are fabricated from casting model of patients foot. (6,13) When diabetic patient is involved to neuropathy, ulcer, Charcot joint or partial foot amputation, custom-made shoes can be offered. (16-18)

An investigation showed that using rocker bottom shoes (a kind of shoe modification can help more comfortable walking with less pressure on metatarsal heads) (19) are the effective way to reduce forefoot plantar pressure of neuropathic patients(13). It is emphasized that the role of insole is chiefly dependent on proper shoes. The exact role of therapeutic footwear to predicting foot ulcer should be more examined. (13,19,20) Several studies do not confirm the effectiveness of therapeutic footwear to heal and treat the neuropathic ulceration, while they recommend total contact casting in healing process. (20,21)

However, in a systematic review, they found that the non-removable offloading intervention is effective to treat plantar neuropathic forefoot ulcers and therapeutic footwear which relieves pressure and used by the patient prevents recurrence of plantar foot ulcers. However controlled studies and more investigation is recommended. (22)

Although in A multicenter randomized controlled trial were published in 2013, have mentioned custom-made footwear with modification does not remarkably decrease the recurrence of plantar foot ulceration in compared with footwear with no shoe modification. (13)

Diabetic insoles

Diabetic insole is a type of soft (foam etc,) foot orthosis designed to redistribution of plantar pressure to prevent neuropathic diabetic ulceration and are nowadays recommended in prescription. (21) Insole which insert in pre-fabricated or custom-made extra depth shoes, is a good shock absorber and can relive shear force and excessive plantar pressure and provide a good support for foot, and accommodate and stabilize deformity complication of foot.

However, the evaluation of insoles in clinical treatment of neuropathic diabetic foot in case of ulcer prevention needs to be proved. Several studies have confirmed it. (21) Custom-made insoles were effective in off-loading and reduction of plantar pressure in patient with diabetes or a history of previous ulceration. Although this reduction were reported mostly in heel region. (6,17)

Also, in a paper evaluated foot pressure with and without insole by foot scan in patients who had partial foot amputation due to neuropathic diabetes. This study approved insoles reduce the peak plantar pressure in comparison with using no insole. But investigations have worked on the influence of stability of diabetic patient with peripheral neuropathy as an independent risk factor of falling.

They could achieve the results that insoles are effective in providing static balance (not walking) in patients but not in stepping time. Static balance was not affected by material softness or resilient. According to this paper, standard diabetic insoles with longitudinal arch pad which use to aims of creating more

contact area and reducing peak pressure, can make patients unstable. (22) There is no adequate investigation about best type of insole in diabetic cases, however there is a study compared custom-made insole with prefabricated one. According to a participant-blinded randomized controlled trial, the foot pressure was measured with foot scan, the results did not verified much more effectiveness of using custom-made insole in comparison with prefabricated one. They both had influenced on peak foot pressure. Although custom-made insoles were slightly more effective, but they are more expensive. (23)

Conclusions

According to a lot of studies Diabetic insoles and shoes can be effective in reduction of plantar pressure and prevention of ulceration rate consequently, but these evidences are not sufficient to definitely determine about orthotic device prescription.

Although some physicians prefer to prescribe therapeutic diabetic insole for above reasons, and some patients state the positive effects, RCTs are needed to prove these observation.

Future research should be in these subjects:

-comparison between pre-fabricated and custom-mode insoles and footwear

-period time of using the devices

-patient perception about using devices

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