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**Beyond Pressure...The Possible Role of Muscle Dysfunction in Diabetic Foot Ulceration**

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Up to 85% of diabetes related amputations are preceded by foot ulcers (FU) [1]. Therefore, any positive amputation prevention strategies must involve reducing their incidence. The study of biomechanical changes in diabetic gait has gained some recognition in the literature especially as most FU occur during walking. However, majority of this research has focused on elevated foot pressure (FP). While FP has demonstrated an important role in the development of mainly neuropathic ulcers, FU still pose a major global healthcare burden. Much work needs to be done to fully understand the biomechanical contributions to FU development. To date, there has been limited research exploring muscle activity during gait in diabetic patients. A preliminary study by Abboud et al. in 2000 demonstrated some dysfunction in the firing of the Tibialis Anterior (TA) muscle in diabetic patients [3]. It was hypothesised that such muscle dysfunction when combined with nerve impairment in neuropathic diabetic patients would amount to forefoot slap and hence higher forefoot pressures followed by ulceration. Availability of state-of-the-art technology makes this an exciting time for biomechanical studies of the foot in diabetes. The study presented has conceived the IMAR system. This is a novel method of assessing diabetic gait which has integrated for the first time the measurement of: three dimensional kinematics and ground reaction forces (VIcon® 612 and Kistler® force plates); Electromyography (EMG) and in-shoe FP (Novel PedAR®). Data has been collected and processed from 25 non-diabetic control subjects and 50 diabetic subjects under standardised, repeatable conditions. Initial data analysis has established a delay in muscle activity in the TA muscle (~ 60 milliseconds) accompanied by high forefoot pressures under metatarsal heads 2, 3, 4 and 5 in diabetic patients. These results confirm a disturbed modulating role in lowering the foot to the ground after heel strike. Additionally, all diabetic subjects demonstrated a greater total contact time under all foot regions. Further in-depth results from ongoing data analysis is hoped to be presented. We strongly believe that the art of dealing with diabetic foot problems requires a rigorous scientific approach, which is facilitated by this technology. We are optimistic that consolidated data obtained from measurements using the IMAR system will further provide a better biomechanical understanding of the diabetic foot with an aim to explore suitable ways of preventing FU development.

KEYWORDS: Diabetic Foot; Electromyography; Foot Ulcer (FU); Foot Pressure (FP); Gait Analysis.

[1] Pecoraro RE et al. Diabetes Care 1990; 13 (5):513-21. [2] Katoulis EC et al. Diabetes Care 1997; 20(12): 1904-07. [3] Abboud RJ et al. Clinical Biomechanics 2000; 15 37-45.