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Short Commentary

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Approach to Diabetic Foot

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Abstract

Diabetes Mellitus is a worldwide emerging chronic disease with a trend of increasing incidence. Among many complications, 'diabetic foot' is a severe complication of diabetes with significant morbidity and mortality. Death rate correlated with the emergence of diabetic foot ulcer (DFU) is estimated to be 2.5-5% in a year. The classical therapeutic approaches to diabetic foot ulcers are; medical cleaning, apparelling moist wound environment and secretion control, wound off-loading, vascular assessment, infection and glycaemic control, which are coordinated by multidisciplinary diabetic foot wound clinics. Despite these inclusive approaches, DFU development with a quiet scope and consequences of the complication are still important problems to focus on. Various treatment modalities have to be examined and implemented to minimize DFU emergement backgrounds and cut off rates. In order to define a preventive and therapeutic approach to DFU, the researchers analyzed the proof and principles for the contemporary commanding systems and considered the strength of adjuvant methods. The adjuvant treatment modalities searched about diabetic foot problems are: nonsurgical debridement tools, apparelling and local agents, oxygen therapeutics, topical negative pressure wound treatment, acellular bio products, human growth factor, modern energy therapies, and systemic therapies. Although a large proportion of the data about these modalities are small in amount and randomized controlled trials have high risks of bias, many of these agents have been shown to be beneficial in improving wound healing rates.

Keyword: Diabetic foot; Diabetic foot diagnosis; Diabetic foot management

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Diabetes Mellitus (DM) is one of the most prevalent chronic diseases affecting 463 million adults all around the world by 2019, unfortunately, this number is expected to rise to 700 million by 2045. Besides this undesirable increase, 79% of adult diabetics live in low or middle-income countries and DM undiagnosed rate is predicted to be very high according to the reports [1]. In similarity to the other parts of the world, the number of DM patients is rapidly increasing in the United States of America. According to the American Diabetes Association, there are a million diabetics in the USA which accounts for 10.5% of the population in 2018 [2]. Also, 10% of the whole health expenditure has been reported to be on DM and complications treatment [1].

DM causes a wide range of complications affecting the whole organism [3]. Among these complications, 15-34% of the patients suffer from the diabetic foot which causes a cost of 20-40 % of all DM expenditure [4-9]. Diabetic foot is considered as deep soft tissue infection, ulceration, and/or destruction of lower limbs in association with DM. Diabetic foot problems, by causing high amputation ratios (an amputation for every 20 seconds) is an important complication affecting life quality, and the main point is; 80% of the amputations are thought to be preventable [4].

Diabetic foot ulceration (DFU) is a full-thickness ulcer, skin necrosis or gangrene [10]. Besides neuropathy, excessive plantar pressure and trauma are important causative agents of DFU [8]. Insufficient glycaemic control, peripheral neuropathy (lack of protective sensation), peripheral vascular disease (reduced wound healing and vascular disorders), immunosuppression and outcomes of diabetes (eg, improved infection risk and improper pressure delivery across the foot) are the main risk factors both in development and treatment of DFU [6,8]. Besides DFU, DM patients are also prone to other diabetic foot complications as Charcot arthropathy and osteomyelitis [11,12]. Charcot arthropathy is characterised by fragmentation and destruction of joints which leads collapsement of the foot or ankle and ulceration [13,14]. Osteomiyelitis may both present acute and chronic, however treatment in both cases is difficult and often lead to surgical interventions [14].

The main reason for these complications is poor glycaemic control in the DM process. Uncontrolled hyperglycemia mainly causes advanced glycation end products and cytokine formation, inducing oxidative stress which gives rise to neuropathy, DFU, and other diabetic foot complications [6].

By this point of view, the main prevention method of DFU is appropriate glycaemic control, nevertheless after the complication process; patient education, general foot estimation, suitable footwear and initial referral for pre- ulcerative lesions gain importance [6,9]. The DM patient shall be aware of prevention and complications of peripheral neuropathy, peripheral arterial diseases (injuries or ulceration), and DFU protection [15]. The DM patients shall be warned to consult a specific diabetic foot center quickly when they suffer from foot ulceration and symptoms of infection, sepsis, or ischemia [15].

Besides standard treatments as antimicrobial therapy with debridement, off-loading for pressure relief and a moist wound bed maintenance, in recent years researches on advanced evidence-based alternative or modern therapeutic modalities as; different kinds of dressings, antidiabetic drug usage specific for wound healing, exogenous growth factors (PDGF, VEGF, EGF, FGF, and TGFβ1) usage, stem cell therapy, acellular bio products, LeucoPatch system and topical oxygen delivery have gained interest [16-20]. However, despite all these promising researches the main method to decrease the diabetic foot complication rates is prevention and early diagnosis.

In order to prevent from diabetic foot and complications, the DM patients, care givers and professional health personnel have to work in cooperation.

Diagnosis

Regular foot inspection, peripheral neuropathy and vascular disease risk determination, screening and follow-up are important in detecting diabetic foot problems [21]. Although study protocols may differ, diabetic foot prevention and surveillance programmes generally include yearly (more frequent according to the risk of patient): neurological foot testing (vibration fork, pinprick sensation, ankle reflexes and vibration perception threshold), foot shape examination (metatarsal heads, bony prominence, claw toes, hallux valgus, muscle wasting, Charcot deformity and/or joint mobility), dermatological examination (callus, erythema and sweating), vascular examination (peripheral foot pulses, ankle-brachial index, toe-brachial pressure index and Doppler wave forms) and diabetic foot history assessment [6,9,11]. In case of diabetic foot, the clinician shall; always keep high infection risk in mind, evaluate the patient according to infection symptoms (appearing ill, abnormal behaviour, fever, toxicity and sepsis), classify the infection degree, consider inflammatory markers as C-reactive protein, erythrocyte sedimentation rate, white cell count and procalcitonin (if necessary), refer advanced imaging techniques as magnetic resonance imaging or radiolabeled scintigraphy, make essential microbiological and histological analysis [6,19,21]. Besides, at each follow-up appointment, the diabetic feet shall be; inspected for newly formed deformities and complications as ulceration or gangrene, evaluated about paleness (ischemia) or redness and inflammation (Charcot arthropathy, cellulitis) [11].

All DM patients shall be educated about the importance of treatment compliance in prevention of complications. Education about diabetic foot shall include; yearly diabetic foot consideration by a specialist, everyday feet inspection and regular feet care (warm wash, complete dry, frequent toenail cut) by the patient, shoe and sock usage (adequate fit shoes), avoidance of excess heat exposure (heat pads, warm bottles) and avoidance of smoking [9-11,22,23].

Conclusion

Despite all different classical or alternative treatment modalities the main target in diabetic foot is prevention. Priority shall be given to the education and awareness of health professionals and DM patients about diabetic foot. In case of the complication emergence appropriate follow-up programmes shall be organised in order to avoid increased morbidity and mortality risk.

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