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Team Approach for Diabetic Foot Problems — The Hong Kong Experience

by Joseph Wing-Cheung Wong and Hon-Bong Leung

Abstract

A multi-disciplinary, hospital-based diabetic foot clinic has been established at Kwong Wah Hospital since July 1995. The team was initiated by an orthopaedic surgeon and a podiatrist. It is mainly composed of orthopaedic surgeons, orthopaedic nurses, podiatrists and prosthetists/orthotists. Subsequently, a vascular surgeon and physician were also recruited. The clinic has successfully led to a 50% reduction of major lower extremity amputation.

Keywords: Team Approach; Diabetic Foot Problems; Hong Kong Experience.

1. Introduction

Diabetes mellitus is a global problem.¹ Hong Kong is not an exception. The local prevalence of diabetes was around 10%.² Complications arising from the diabetic foot will result in extensive hospitalisation, disfiguring surgery, lifetime disability and diminished quality of life.³ Approximately 40% to 60% of all non-traumatic amputations on the lower limb are now performed for diabetic foot problems. Its occurrence, to whatever degree, is not unpredictable; 85% of these amputees had precedent foot ulcer. There are also well-defined pre-disposing factors of diabetic foot ulcers,

such as peripheral neuropathy, peripheral vascular insufficiency, infection, foot deformities and minor foot trauma.^{4,5}

However, until in the mid-nineties, the health professionals' understanding of the impact and the risk factors of diabetic foot was insufficient. Without a proper concept of systematic diabetes foot care, patients were receiving treatment as general foot problems. Swift intervention was not offered to avoid amputation. Preventive strategies were seldom implemented or even mentioned.

2. Multidisciplinary Diabetic Foot Clinic

2.1 Past — Before the Establishment of Diabetic Foot Clinic

Kwong Wah Hospital (KWH) was founded by a charitable organisation, the Tung Wah Group of Hospitals, in 1911. It has come under the management of the Hospital Authority (HA) since 1991. As a regional public hospital, it operates a 24-hour Accident and Emergency service, and provides a full range of acute care services, mainly to the population (around 600,000) of West Kowloon. KWH maintains 1284 beds, and a staff force of more than 2800.⁶

Prior to the mid-nineties, like other hospitals in Hong Kong, Kwong Wah Hospital had no standardised foot care programme. The orthopaedic surgeon, vascular surgeon, physician and general practitioner managed the diabetic patients with foot problems in their own clinics. Interdisciplinary consultation was carried out by means of routine referrals. As a result, considerable delay was common. This practice was widespread in many regional hospitals in Hong Kong throughout the last decade.

Commencing from July 1995, Kwong Wah Hospital pioneered a formal and systematic diabetic foot care service in Hong Kong. Following the overseas training in Canada, the author set up a Foot Clinic in 1994 in the Orthopaedics Department. After practising for one year, he found that half of the patients were suffering from either chronic unhealed diabetic foot ulcer or recurrent ulcer. Majority of the diabetic foot ulcers developed or recurred because patients put their insensate foot into ill-fitting shoes,

reflecting sub-optimal foot care education. The authors decided to improve the diabetic foot care through mobilising other personnel.

To originate the project, the orthopaedic surgeon approached the newly-employed podiatrist who was fully trained in the United States with a professional title of Doctor of Podiatry Medicine. Within months of service, he soon recognised the insufficient knowledge of diabetic foot care in Hong Kong. After a thorough discussion, the author and the podiatrist both agreed that the establishment of a hospital-based multidisciplinary diabetic foot clinic was an urgent necessity. At the first stage, they organised a comprehensive training course including didactic lectures and hands-on workshops for the orthopaedic nurses. An “informal” Diabetic Foot Clinic then began.

The early start was not too easy due to various factors. They had to share the premises with the ongoing Foot Clinic. Stationed in a consultation room without extra funding, the “informal” diabetic foot service ran with an experienced and trained orthopaedic nurse rotating from the ward to the clinic every alternate Thursday afternoon. The trained nurse initially assessed the patients before they were seen sequentially by the podiatrist, the prosthetist/orthotist (if present), and finally the orthopaedic surgeon. Despite all the constraints, procedures were carried out in order.

2.2 Present — Multidisciplinary Diabetic Foot Clinic

From July 1995 onward, the informal diabetic foot clinic gradually evolved with its protocol better defined and standardised. Participation of different disciplines becomes more consistent. Orthopaedic surgeon, podiatrist, trained orthopaedic nurse, prosthetist/orthotist are all present in the Diabetic Foot Clinic currently. Intake of patients is more aggressive. All diabetic patients discharged from the orthopaedics ward, either with healed ulcer or foot amputation done, are scheduled to be followed up in the Diabetic Foot Clinic. High-risk outpatients identified by the podiatrist are referred to the team as well.

The podiatrist plays a pivotal role in the multidisciplinary diabetic foot team. As a key person, he screens out the high-risk group among the attendees and treats minor ailments such as callosities and ingrown toenails.

He is also responsible for teaching the nurse proper examination techniques, like monofilament test and use of vascular Doppler.

The trained orthopaedic nurses are the principal coordinators of the entire service. They provide initial and subsequent foot assessment as well as intensive foot care education to patients and their families. A self-developed assessment form is utilised to standardise the record of the patients' demographic characteristics, history of diabetes, mode of treatment, associated complications, concomitant disease, vascular intervention, the number and level of amputations, etc. Great emphasis is put on the assessment of neurological and vascular status, skin condition and foot deformity. Neurological evaluation includes vibration sense, proprioception and monofilament mapping. Screening for the peripheral vascular disease includes history for claudication, examining the pedal pulse and the ankle brachial index. The skin is assessed for integrity, especially between the toes and under the metatarsal heads. Bony deformities and joint stiffness are also documented. Patient education is delivered during the consultation. Examination skill is demonstrated to patients and frequent self-examination of the feet is encouraged. Prevailing signs of tissue damage such as inflammation, blisters, callosities especially with haemorrhage, and ulceration, are shown to assist patient understanding.

The orthotist/prosthetist applies the PressureStat — a simple, inexpensive semi-quantitative footprint mat, to measure the patient's plantar pressures. The image of the higher pressure zones gives a vivid picture to help patients understand which areas of their feet are under high pressure, and hence higher chance of tissue breakdown.⁷ The finding also assists selection of footwear. Most of our patients can be successfully managed with either "over-the-counter" sports shoes (trainers) or extra-depth shoes equipped with customised insoles. Only patients with severe foot deformity or Charcot's foot require custom-made shoes.

Final decision of the group consultation rests on the orthopaedic surgeon, the leader of the team. While most patients with deformed foot or bony deformities such as bunions or claw toes are settled with footwear modification, prophylactic surgery to correct foot deformities is occasionally proposed. All patients with deep infection will be hospitalised for aggressive surgical debridement and intravenous antibiotics. Patients with poor blood sugar control will be referred to physicians. As more and more

evidence suggested angioplasty or vascular bypass can save the ischaemic limb or minimise the magnitude of amputation,^{8,9} we refer patients with suspected vascular insufficiency to the vascular surgeon with low threshold. By developing a good partnership, their growing experience on arterial reconstruction for lower limb ischaemia results in promising outcome.^{10,11}

There are also members of allied health disciplines who will attend the clinic on an *ad hoc* basis. The physiotherapists aid to teach patients on limb stretching exercise to alleviate joint stiffness and hence improve the walking gait and endurance. They also perform magnetopulse therapy on patients with ischaemic ulcer who are not fit for vascular reconstruction. The short term result is optimistic. Community nurses are involved to continue foot assessment and foot care for those homebound patients. Medical social workers serve to provide psychosocial assessment and help patients to apply for financial assistance, home adaptation, and appropriate social services if necessary.

During the first few years we classified and treated the diabetic foot ulcer according to the Brodsky classification and treatment protocol.¹² Basically the classification categorised ulcers by two parameters, ulcer depth and presence of ischaemia. The ulcer depth was subdivided into superficial ulcer and ulcer deep to tendon/joint or bone, with or without infection. The ischaemic group was subdivided into presence or absence of gangrenous change. We noticed limitations of this classification system. At present our management of diabetic foot in all aspects follows the Practical Guidelines recommended by the International Working Group on the Diabetic Foot.¹³

In 2006, the Diabetic Clinic was relocated to a bigger premise. The more spacious area not only allows more diabetic patients to be treated concurrently but also provides more comprehensive services by incorporating input from endocrinologists. The Integrated Diabetic Foot Clinic has finally inaugurated.

2.2.1 *Clinical Outcome of the Multidisciplinary Diabetic Foot Clinic*

From July 1995 to June 2005, a total of 851 patients, 421 (49.5%) males and 430 (50.5%) females, were recruited in a retrospective cohort study. The mean age of patients was 72.16 +/- 12.42 years, ranged from 32 to 100.

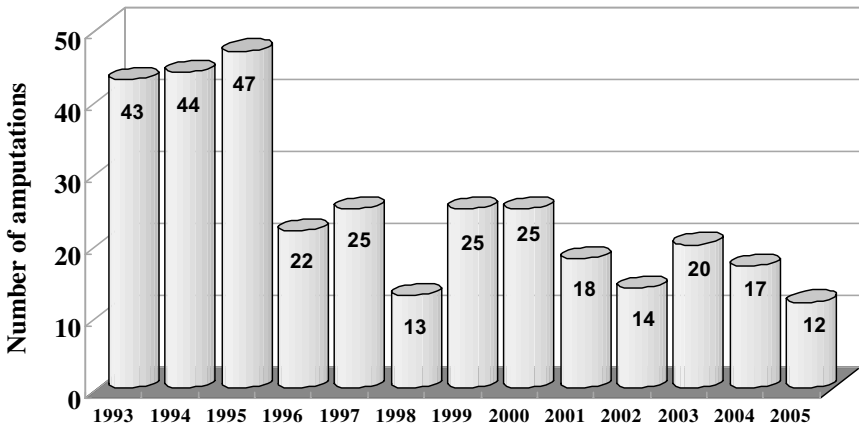


Fig. 1. Major lower limb amputations (trans-femoral and trans-tibial) of diabetic foot problems (1993–2005).

The average length of stay decreased from 26.8 days in 1995 to 13.5 days in 2005. The incidence of major lower limb amputations was reduced by 50% (Fig. 1) and then leveled out after the establishment of the diabetic foot clinic.^{14,15} One important finding might be accountable for the lack of further reduction of major limb amputations upon inauguration of the clinic. Nearly 95% of the amputees did not receive any proper foot care beforehand. In contrast, only less than 5% of those patients regularly reviewed in the Diabetic Foot Clinic required major amputation. It might reflect that the primary health care was inadequate and yet not improved through the period.

Most studies reported the peri-operative mortality to be in excess of 10% with a cumulative mortality of approximately 50% in the third year after operation.^{16–20} Mortality reported in the cohort was comparable with the results of these studies (Fig. 2). Concerning the functional outcome, only 13 out of 85 (15.3%) surviving amputees could walk independently (Fig. 3); 59% of surviving patients were rendered bed- or chair-bound after the operation.²¹ Similar results were reported by a study in Singapore in 2000.²²

The finding illustrated the impressive efficacy of the Diabetic Clinic in preventing major amputation. However, it also demonstrated its

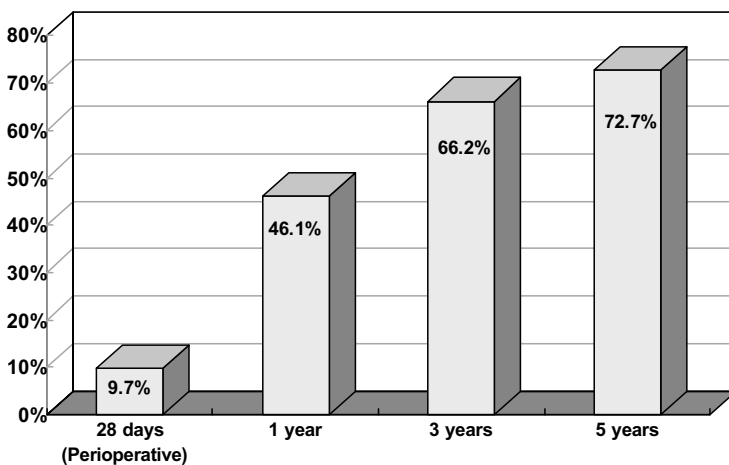


Fig. 2. Cumulative mortality rates following major lower limb amputations.

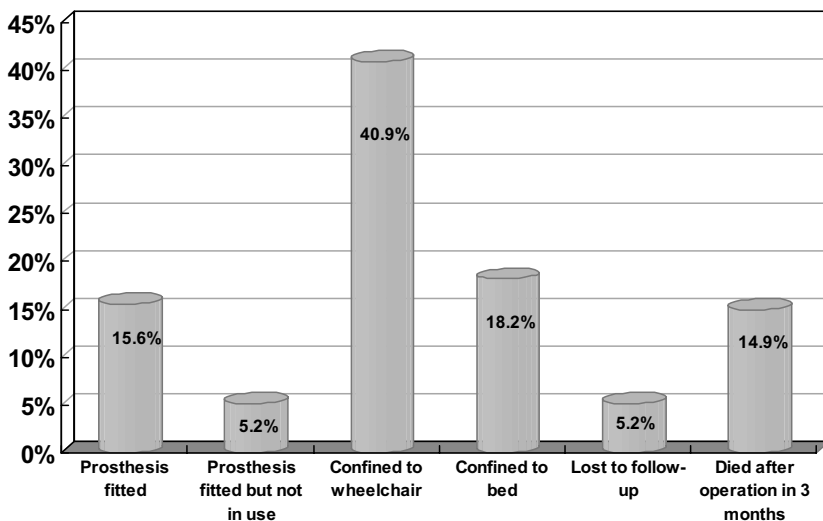


Fig. 3. Ambulatory capacity following major lower limb amputations.

limitation in providing primary prevention and improving amputee outcome. A different strategy needs to be adopted to tackle these issues, for example, emphasising more on primary and secondary prevention measures.

2.3 *The Future*

Diabetes is the global epidemic of the 21st century and is now the fourth leading cause of death in most developed countries. In 2003, the prevalence of diabetes in China was estimated at 20.8 million and predicted to double in 2030 as a consequence of changing lifestyles and dietary patterns.¹

Over the last ten years, the level of diabetic foot care in our clinic has progressed remarkably. Since 1999, we have adopted the Practical Guidelines published by the International Working Group of the Diabetic Foot¹³ and will continue to modify our service according to the advances in latest research and practice. We notice that implementation of the practice guidelines is not easy, as encountered in other regions.²³ We are still pursuing factors that are decisive in achieving a behavioural change in our patients.

With the emergence of regional foot organisations, more research is being conducted and this trend will continue to develop.²⁴ In this regard, the Diabetic Foot Clinic not only generates data for audit and review but also creates a platform for clinical trials. For example, a clinical study was performed to investigate the efficacy of the integrated traditional Chinese medicine and Western medicine in managing severe diabetic foot infection and gangrene. The preliminary result was encouraging.²⁵

The successful experience of the Integrated Diabetic Foot Clinic of Kwong Wah Hospital benefits more than its serving patient. It creates a domino effect by arousing interest of doctors working in the territory. Clinics of similar nature have been set up in different hospitals in past years.

Managing the diabetic foot and its complications is presented as the most costly part of managing diabetes.²⁶ To ensure that scarce resources achieve maximal health gain, a change in health care strategy is noted globally. The main responsibility of prevention and treatment of chronic disease has shifted from secondary to primary care.²⁷ On the other hand, the financial support from the Hong Kong Government for primary health care is, however, still far from demanding. We believe that with the growth in professional and academic interest, it will arouse the community interest sooner or later. To make expenditure cost-effective, it is of utmost importance to put priority on primary rather than secondary hospital care. Appropriate health care policy will define the future for many people living with risk of diabetes foot complications.

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