

Peripheral arterial disease and diabetes foot care

Sum C F, Lim S C, Tavintharan S

A cross-sectional study among the Medicare population in the United States suggested that people with diabetes mellitus were ten times more likely to have a major lower limb amputation when compared to people without diabetes mellitus.⁽¹⁾ It has been estimated that among people with diabetes mellitus, the vast majority of major lower limb amputations follow lower extremity ulceration.⁽²⁾ Some of the pathophysiological factors which are thought to contribute to ulceration include peripheral neuropathy, peripheral vascular disease, structural lower extremity deformities and trauma (often minor, repetitive and related to footwear).

Atherosclerotic macroangiopathy involving the arteries of the lower limbs in people with diabetes mellitus is well recognised, and is similar to that in people without diabetes mellitus, except perhaps for the extent and location. However, microangiopathy involving the arterioles and capillaries has remained more controversial. The concept of occlusive microangiopathy being a significant contributor to ischaemia of the lower extremities is felt by some to be a barrier to facilitating lower limb salvage revascularisation procedures in people with diabetes mellitus. However, “non-occlusive” microangiopathic changes in the lower limb vasculature of people with diabetes mellitus do exist.⁽³⁾

In this issue of the Singapore Medical Journal, Yusof et al reported on a cross-sectional morphometric study of skin microvasculature biopsied from the lower extremity of patients with diabetes mellitus who were admitted for surgical procedures following diabetic foot problems.⁽⁴⁾ The study reported that there was a higher blood vessel count, higher endothelial cell count per vessel and higher mean endothelial cell thickness in the skin microvasculature of patients with diabetes mellitus, as compared to the skin of non-diabetic controls. Although the study is not without limitations and should be considered preliminary, these observations are interesting and merit further study. Indeed there appears to be some parallels between these observations and the microangiopathy reported in other diabetic microvascular complications.

Elsewhere in this issue of the journal, Ong reviewed the local experience of hyperbaric oxygen therapy in the management of lower limb ulcers in patients with diabetes mellitus.⁽⁵⁾ In such patients, major amputation is a constant threat even as the ulcers require protracted and painstaking

care, often requiring the attention of a multidisciplinary team and consideration of many different options to improve healing. This article serves as a timely reminder that together with revascularisation, hyperbaric oxygen therapy should be considered as a possible option where appropriate. Indeed, a Cochrane review has also suggested that there is some limited evidence that hyperbaric oxygen therapy reduces the need for major lower limb amputation in people with diabetes mellitus who have chronic foot ulcers.⁽⁶⁾

In a complication such as foot ulceration and major lower limb amputation, where there are such profound effects on the patient and family, and where the cost to society is so high, preventive measures cannot be adequately emphasised. Khammash et al reported on the utility of screening patients with diabetes mellitus, who were admitted to hospital for unrelated elective surgery, for peripheral vascular diseases using the ankle brachial index (ABI).⁽⁷⁾ Although the interpretation of the ABI requires consideration of several factors, including possible artifactual elevation from medial calcification of the foot vessels in patients with diabetes mellitus, it does provide objective quantitative summary data on lower limb blood flow.⁽⁸⁾

Whereas managing complicated foot ulcers and limb salvage often require the multidisciplinary expertise of hospital specialists, screening and prevention should be a consideration of doctors, nurses, podiatrists and other allied health professionals, particularly those involved in primary care. Although Khammash et al reported on the measurement of ABI in the hospital setting, the use of a handheld Doppler device is required, and this may not be available in some solo primary care practices. Some primary care practices may find acquisition of the Doppler device worthwhile. However as a minimum requirement, the patient with diabetes mellitus should have a clinical assessment of foot pulses to evaluate lower limb blood flow as part of foot examination. The clinical finding of absent or diminished foot pulses have previously been found to have a high positive likelihood ratio for the presence of peripheral artery disease as measured by ABI.⁽⁹⁾

A recent media report suggests that the number of lower limb amputations among people with diabetes mellitus in Singapore has decreased over the years.⁽¹⁰⁾ Over

Department of
Medicine,
Alexandra Hospital,
378 Alexandra
Road,
Singapore 159964

Sum CF, FRCPE,
FAMS
Senior Consultant
and Director
Diabetes Centre

Lim SC, FRCPE,
FAMS
Senior Consultant
and Director Clinical
Research

Tavintharan S,
FRCPE, FAMS
Senior Consultant

Correspondence to:
Dr Sum Chee Fang
Tel: (65) 6379 3240
Fax: (65) 6379 3936
Email: chee_fang_
sum@alexhosp.
com.sg

the same period of time, several facets of foot care delivery have improved. Among others, these improvements include increased foot screening at primary care and at hospitals, increased provision of podiatry services, improved limb salvage revascularisation procedures, utilisation of hyperbaric oxygen therapy, and foot care education for patients with diabetes mellitus. A direct causal relationship between these improvements and the decrease in number of lower limb amputations will be difficult to prove. However, the perceived logic for making further similar improvements and the potential benefit of further reduction of the suffering caused by major lower limb amputations should be sufficient to spur us on to further improvements and a more targeted approach.

REFERENCES

1. Wrobel JS, Mayfield JA, Reiber GE. Geographic variation of lower-extremity major amputation in individuals with and without diabetes in the Medicare population. *Diabetes Care* 2001; 24:860-4.
2. Singh N, Armstrong DG, Lipsky BA. Preventing foot ulcers in patients with diabetes. *JAMA* 2005; 293:217-28.
3. Akbari CM, LoGerfo FW. Vascular disease of the lower extremities in diabetes: etiology and management. In: Kahn CR, Weir GC, King GL, et al. *Joslin's Diabetes Mellitus*. 14th ed. Boston: Lipponcott Williams & Wilkins, 2005: 1123-32.
4. Yusof MI, Al-Astani AD, Jaafar H, Rashid FA. Morphometric analysis of skin microvasculature in the diabetic foot. *Singapore Med J* 2008; 49: 100-4.
5. Ong M. Hyperbaric oxygen therapy in the management of diabetic lower limb wounds. *Singapore Med J* 2008; 49: 105-9.
6. Kranke P, Bennett M, Roeckl-Wiedmann I, Debus S. Hyperbaric oxygen therapy for chronic wounds. *Cochrane Database of Systematic Reviews* 2004; issue 1.
7. Khammash MR, Obeidat KA, El-Qarqas EA. Screening of hospitalised diabetic patients for lower limb ischaemia: is it necessary? *Singapore Med J* 2008; 49: 110-3.
8. Khan NA, Rahim SA, Anand SS, Simal DL, Panju A. Does the clinical examination predict lower extremity arterial disease? *JAMA* 2006; 295:536-46.
9. Boyko EJ, Ahroni JH, Davignon D, et al. Diagnostic utility of the history and physical examination for peripheral vascular disease among patients with diabetes mellitus. *J Clin Epidemiol* 1997; 50:659-68.
10. Lee HC. Better foot care, diabetes control help reduce amputations. *The Straits Times* 2008 Jan 28; H5.





National Healthcare Group
Adding years of healthy life

EARLY REGISTRATION FEES
Deadline **31 March 2008**

REGISTRATION & INFORMATION
Visit www.dmconf.com.sg

ENQUIRIES
Tel **+65 6496 6850**
Fax **+65 6496 6853**
Email conferenceinfo@nhg.com.sg

The Singapore Disease Management Conference 2008

with the **1st International Conference on Healthcare Transformation: Primary Care Focus**

8 -10 May 2008 | Suntec Singapore International Convention & Exhibition Centre