

Significance of Absent Dorsalis Pedis Pulse in Diabetic Foot Disease in Malaysia

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ABSTRACT

This study prospectively examines the clinical and doppler data of 36 consecutive diabetic foot ulcer patients. Clinically abnormal dorsalis pedis and posterior tibialis pulses were associated with skin ulcers in diabetic foot disease. However, this was only statistically significant in abnormal dorsalis pedis pulses in the affected limbs. This data suggests that an abnormal dorsalis pedis is a clinical indicator of the onset of ulceration in diabetic foot disease, and can be reliably used as a screening procedure.

INTRODUCTION

Diabetes is a common disease in Malaysia. The prevalence of diabetes has increased from 6.3% in 1986¹ to 14.6%² in Malaysia. Diabetic foot complications were responsible for 12% of all diabetic admissions at Hospital Kuala Lumpur or 17.9% of all admissions at the same hospital³. 5.6% of diabetics attending outpatient clinics at Hospital Sultanah Aminah, Kelang had foot lesions⁴.

With the increase in the prevalence of diabetes in the community and a high rate of diabetic foot complications, it has become a challenge to recognize the very early stages of diabetic foot disease as early treatment and patient education is likely to decrease the occurrence of complications⁵. Routine clinical examination of pedal pulses are usually recorded for diabetic patients at primary care, general practitioner and family physician practice clinics in Malaysia. This study examines the significance of absent pedal pulses and abnormal pedal doppler signals in diabetic foot patients in an attempt to identify a screening test that can be used at primary care level to aid in deciding for specialist vascular referral.

METHOD

Thirty-six consecutive patients who were admitted to Hospital Kuala Lumpur Orthopaedic wards for treatment of diabetic foot ulcers were studied prospectively. Peripheral pulses were examined clinically and with a portable hand held ultrasonic doppler transducer with 8 mHz probe.

The vascular data for the affected limb (with lesion) was compared and contrasted with the opposite limb of the same patient which acted as control. Six patients who had a previous amputation were excluded as they did not have an opposite leg for control data. Data that was specifically collected were (1) clinical palpation of the peripheral pulse recorded as *present or absent*; (2) doppler examination of the pulse recorded as *normal* (triphasic) or *abnormal* (monophasic or absent); and (3) Ankle-Brachial Index (ABI), which was calculated as the ratio of the ankle systolic blood pressure to the brachial systolic blood pressure (the average of the systolic pressures of the right and left arm).

Statistical analysis was performed using the chi-squared test on SPSS v 7.5 with $p < 0.05$ considered as significant.

RESULTS

Thirty-six patients with vascular data for the affected limb were analysed. Seven eventually required major amputation (either BKA or AKA) during the same admission. Three of them had the other leg already amputated for the same disease.

Affected leg

Thirty-six legs were examined. Clinical examination of dorsalis pedis was present in 16 and absent in 20 patients. Doppler dorsalis pedis signals were normal in 11 and abnormal in 25 patients. Posterior tibial pulse was clinically present in 28 and absent in 8 patients. Posterior doppler signals were normal in 29 and abnormal in 7 patients. The peroneal pulse is not palpable clinically. Doppler peroneal signals were normal in 5 and abnormal in 31 patients (Figs 1 and 2).

Unaffected leg

Thirty limbs were available, 6 having being amputated on previous admissions for the same disease. Clinical examination of dorsalis pedis pulse was present in 25 and absent in 5 patients. Doppler dorsalis pedis signals were normal in 25 and abnormal in 5 patients. Posterior tibial

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pulse was present in 28 and absent in 2 patients. Posterior doppler signals were normal in 28 and abnormal in 2. Doppler peroneal signals were normal in 12 and abnormal in 18 (Figs 1 and 2).

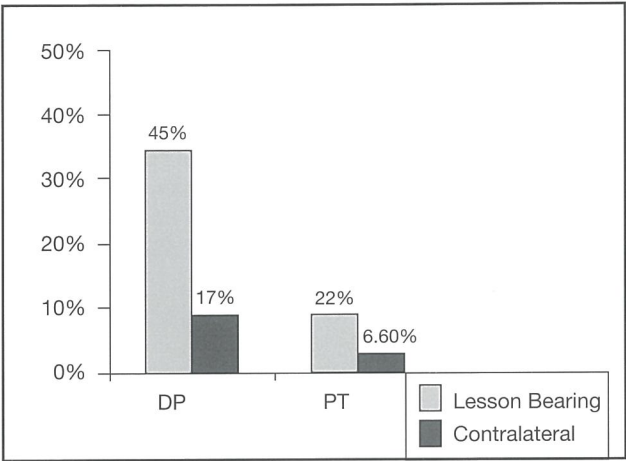
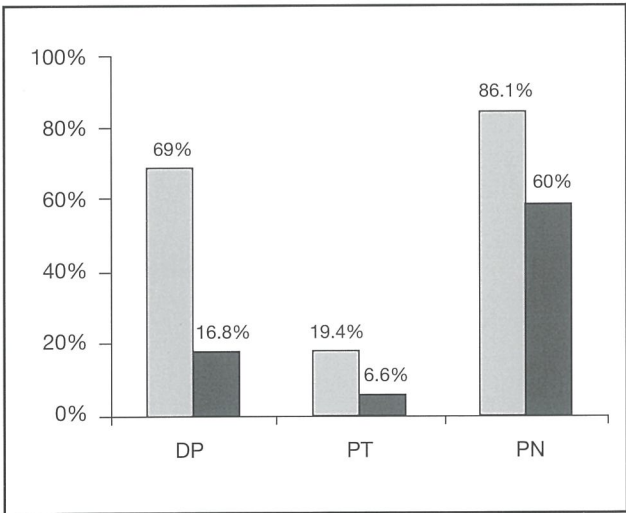


Fig. 1. Proportion of abnormal pulses.



DP – dorsalis pedis artery, PT – posterior tibial artery, PN – peroneal artery

Fig. 2. Proportion of abnormal doppler signals.

Ankle-brachial index

For the ulcerated leg the ankle pressures ranged from 86 mmHg to 168 mmHg (mean = 144.9, sd = 19.2). The ABI ranged from 0.66 to 1.56 (mean = 1.15, sd = 0.16). The non-ulcerated leg had ankle pressures from 90 mmHg to 164 mmHg (mean = 142.9, sd = 17.7). The ABI ranged from 0.69 to 1.63 (mean 1.15, sd = 0.17).

The difference in clinically palpable pulses and doppler signals between the affected foot and contralateral foot was statistically significant with the dorsalis pedis artery (Tables 1 and 2). The posterior tibial and peroneal arteries did show a higher proportion of abnormal pulses and doppler signals in the affected leg, but this was not statistically significant. Mean ankle systolic pressures and ABI between both groups were not statistically significant either.

DISCUSSION

Diabetic foot disease involves a significant vasculopathy. This is a generalized process which affects large vessels and end organs⁵. Macrovascular and microvascular disease with a subsequent diminished oxygen delivery to tissues, can delay healing in an unrecognized trauma precipitating a diabetic foot lesion. This is further compounded by the attendant immune complications in diabetes which lead to infections and finally ulceration⁶. While early intervention can change the natural history of diabetic foot disease⁵, it remains a challenge to decide when patients should be referred for further vascular assessments and possible revascularization. This may be made easier if there was a simple screening procedure.

In this study the limbs which were affected were found to have a higher proportion of absent pulses and doppler signals compared to the unaffected limb. However, this was only statistically significant in the dorsalis pedis. This diminution of the pulses clinically and abnormal doppler signals is part of the evolution of the full blown diabetic foot syndrome. There was no difference in the ABI of both groups.

The temporal relationship of the occurrence of abnormal pulses in diabetic foot disease has not been studied before. Although we were not able to study the duration of the disease in relation to pulses, our data suggested that the peroneal pulse is the first to be affected, followed by the dorsalis pedis and finally posterior tibialis. However, as the peroneal pulse cannot be felt clinically, the dorsalis pedis remains the pulse which can be easily palpated. Absence of the dorsalis pedis pulse, in a diabetic patient is an indication for referral for vascular assessment as it is an early indicator of diabetic foot disease and is significantly associated with ulcer formation.

CONCLUSION

This study suggests that the loss of the dorsalis pedis pulse is earlier than the posterior tibialis pulse and can be used as a screening test for referral of diabetic foot disease for specialist vascular assessment.

Table 1. Comparison of pulses palpable clinically between feet

	Affected limb (**6 have been excluded)			Contralateral limb			P value
	Normal	Abnormal	Total	Normal	Abnormal	Total	
Dorsalis	12	18	30	25	5	30	0.007*
Pedis	(40%)	(60.0%)	(100%)	(83.3%)	(16.7%)	(100%)	
Posterior	23	7	30	28	2	30	0.96%
Tibialis	(76.7%)	(23.3%)	(100%)	(93.3%)	(6.7%)	(100%)	

P values determined by chi-squared test on SPSS v 7.5

*significant at $p < 0.05$

Table 2. Comparison of doppler signals between feet

	Affected limb (**6 have been excluded)			Contralateral limb			P value
	Normal	Abnormal	Total	Normal	Abnormal	Total	
Dorsalis	7	23	30	25	5	30	0.007*
Pedis	(23.3%)	(76.6%)	(100%)	(83.3%)	(16.7%)	(100%)	
Posterior	24	6	30	28	2	30	0.157
Tibialis	(80%)	(20%)	(100%)	(93.3%)	(6.7%)	(100%)	
Peroneal	4	27	30	12	18	30	0.150
Artery	(10%)	(90%)	(100%)	(40%)	(60%)	(100%)	

P values determined by chi-squared test on SPSS v 7.5

*significant at $p < 0.05$

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