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TITLE

An isotope washout technique to study skin perfusion pressure and vascular resistance in diabetes, hypertension and peripheral vascular disease

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by

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## SUMMARY

The rational management of ischaemic ulcers and gangrene of the lower limb is dependent upon the accurate assessment of skin blood flow. In this thesis an isotope washout technique was developed which allowed estimation of the skin perfusion pressure (SPP) and skin vascular resistance (SVR). To measure the SVR it was necessary to paralyse the vascular bed under study to eliminate non-structural factors influencing vascular diameter. An animal experiment indicated that histamine and nitroprusside were the most potent vasodilators. In individuals free of diabetes, hypertension and peripheral vascular disease (PVD) the SPP in the leg was equivalent to the systemic mean arterial pressure. In patients with PVD the SPP was reduced in proportion to the severity of the vascular disease. It is proposed that the SPP is an objective measure of PVD and is not limited by the same restraints as ankle pressures, this is, false results due to arterial rigidity.

The SVR was measured in hypertensive and diabetic patients and was found to be elevated in these groups. It is proposed that the SVR is a quantitative measure of



microvascular disease which is known to occur in these diseases.

By studying the SPP and SVR in a group of patients with ischaemic ulceration and gangrene of the lower limb it was possible to categorise the patients into three groups depending on the etiology of the ischaemia. In the first group, which are most suitable to reconstructive surgery, the ischaemia was due to atherosclerotic disease of the main arteries. This group had reduced SPP but normal SVR. In the second group, which will have little benefit from arterial surgery, the ischaemia is due to microvascular disease, as indicated by high SVR and normal SPP. The third group had a combination of large and microvessel disease.

The SPP and SVR were also useful indicators of healing of ulcers and local amputations. If the SPP  $< 40$ mmHg, or between 40-50mmHg and SVR  $> 1000$  units, then healing was unlikely to occur and early arteriography and arterial surgery was indicated. If the SPP  $> 50$ mmHg then conservative management is indicated although if the SVR is high this may not be successful.

By determining the SPP and SVR it was possible to determine the aetiology of lower limb ischaemia and to predict the likelihood of healing thus rationalising the management of these patients.