area is one of the determinants of the thermal threshold. We have been concerned to reduce the variability of threshold measurement rather than compare the relative threshold values for thermodes of different areas. The thermode size, as stated clearly in the paper is one of six independent factors which will influence the variability. We have no evidence that thermode size is any more or less important than the other factors, and therefore a comparison of techniques such as Dr Fowler suggests purely on the basis of thermode size is an over simplification. We were slightly puzzled by the remark that "By using a relatively large thermode, Jamal *et al* may have lost the discrimination necessary to demonstrate the variation in regional sensitivity". If Dr Fowler means that our larger thermode cannot detect the variation in threshold that occurs in different parts of the body, this is manifestly incorrect, as our published results show distinct and significant differences between ankle and wrist. If however, she means the direct measurement of thermal sensitivity, then we cannot comment as our technique is designed to measure thermal threshold and not sensitivity. We cannot comment on the higher values for threshold measurements obtained by Dr Fowler as we have seen no published information on her results or technique.

Lastly, we accept Dr Fowler's observation on the statistics of the comparison of intra-individual variability between our study and that of Fagius and Wahren.² We can only compare our range of mean threshold values (-5% to 0%) on repeated testing with the quoted range of -24% to $+15\%$ of Fagius and Wahren which does however, contain mixed data on temperature, touch and vibration thresholds.

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Digital subtraction angiography in patients with cerebral ischaemic attacks and normal continuous wave doppler studies

Sir: We welcome attempts such as that by Guidotti *et al*¹ comparing non-invasive

Receiver Operating Characteristic (ROC) curve for determining the Doppler cut-point which minimizes errors when compared to angiographic results. The point on the curve corresponding to a cut-point of 30% lies closest to *I*_{max}.

tests of the extracranial carotid vasculature. Ideally, they should both be compared to the "gold standard" of cerebral angiography, but the logistics and ethics of such a study are difficult to overcome.

The authors conclude from their study that digital subtraction angiography is superior to carotid doppler, but we feel their data show just the opposite. None of the "lesions" visualised by digital subtraction angiography and missed by doppler were relevant to management. Dilatations and kinks of the carotid arteries are irrelevant to symptoms, and the stenoses ranged from 10-50%, which are generally considered below the levels indicating carotid endarterectomy. Therefore, the addition of digital subtraction angiography added to the risk (though small) but not to useful information.

Digital subtraction angiography is better at visualising arterial ulceration than the standard continuous wave doppler, used by the authors, but the addition of B-mode scanning (Duplex) overcomes this problem and, unlike digital subtraction angiography, is totally non-invasive.

The often-quoted figure, noted by the authors, for the lower limit of accuracy for detecting stenosis by carotid doppler of 50% is based on simplistic calculation. The method of Receiver Operating Characteristic curve² is a more accurate way of

determining the lower limits of accuracy. This is created by plotting the true positive rate (TP = sensitivity), against the false positive rate (FP = complement of specificity). *I*_{max} is the point on the curve closest to the plot for a perfect test (TP = 1, FP = 0) (fig). In our laboratory the cut-point for the lower limit was 30%, in 246 carotid arteries when carotid doppler was compared to the results of carotid angiography. Further, the finer calibration afforded by doppler shift, ranging from 3-20 kHz, gives higher (and more objective) accuracy than that obtained by "eyeballing" digital subtraction angiography films, at least with stenosis > 75%.

We believe that the future of intravenous digital subtraction angiography is limited, and that the gold standard will probably be interarterial digital subtraction angiography. At the moment, neither intravenous digital subtraction angiography nor doppler can be as consistently relied upon for surgical decisions as standard angiography.

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Guidotti and Landi reply:

We thank Norris and Bornstein for their interest and comment to our paper.

Digital subtraction angiography in fact showed a better morphological visualisation of some vascular lesions in our patients; particularly, it demonstrated eight stenoses and 10 irregularities not revealed by CW-doppler, but we agree that it did not add useful information for the patients' management, as we clearly stated in our paper. However, it must be noted that the