Location of thrombus	No false positive	Specificity (%)	No false negative	Sensitivity (%)
Axial and calf veins	0	100	6	79
Axial vein	0	100	2	87
Calf vein	0	100	4	69
Diagnostic criteria:				
Intraluminal filling defect		96		50
Occlusion		86		85
Compressibility		96		66
Augmentation of flow		96		60
Echogenicity		95		50

axial vein thromboses, but this technique still fails to identify 30% of calf vein thromboses.²

Thromboses in the calf veins are usually the earliest and most frequent manifestation of deep vein thrombosis. Although axial vein involvement may result from propagation of such thromboses, isolated calf vein thromboses remain an important cause of pulmonary embolism and the post-thrombotic limb syndrome.³ To date phlebography remains the only reliable and accurate investigation for the diagnosis of such thromboses.

Colour coded duplex sonography can accurately diagnose axial vein thrombosis. It may therefore have a role as a first line investigation in patients suspected of having a deep vein thrombosis. A negative result, however, must be followed up by phlebography to assess the calf vein system fully. It is possible that with all of these diagnostic criteria serial duplex scanning may improve the diagnostic yield, particularly of calf vein thromboses.

Currently reported experience with duplex sonography and deep vein thrombosis supports its continued use as a preliminary investigation, but until the diagnosis of calf vein thrombosis improves we continue to advocate combined sonography and phlebography in any patient clinically suspected of having a deep vein thrombosis.

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- 1 Schindler JM, Kaiser M, Gerber A, Vuillienmet A, Popovic A, Bertel O. Colour coded duplex sonography in suspected deep vein thrombosis of the leg. *BMJ* 1990;301:1369-70. (15 December.)
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SIR,—We performed a comparative study of over 200 patients with conventional duplex ultrasonography and phlebography in this department and agree with Dr J M Schindler and colleagues¹ that the best diagnostic criterion is incompressibility, as emphasised in this and many other papers.^{2,3} In the presence of iliofemoral thrombosis the diagnosis may be virtually instantaneous.⁴ Other criteria are complementary to this finding, as is the use of either duplex or colour Doppler ultrasound equipment. Considerable experience is necessary for a confident diagnosis with this technique, and our experience to date has been that the patient with a negative diagnosis on ultrasonography will still require phlebography.

Our experience of duplex Doppler ultrasonography indicates that it is valuable in assessing the presence or absence of pelvic thrombus and in distinguishing communicating from non-communicating thrombus. The upper margin of a free floating thrombus can often be shown by direct imaging alone.

The routine demonstration of isolated calf thrombus by ultrasonography is difficult, time consuming, and often unreliable, although other significant pathology such as a calf haematoma

may be readily identified. Treatment with anticoagulant drugs has been the subject of considerable previous debate,⁵ but most clinicians will want a definite answer at the time of presentation. The accuracy of colour Doppler ultrasonography in identifying calf thrombus is not yet definitively established,^{6,7} and it seems that technical factors as well as expertise influence the diagnosis. It seems unlikely that most colour duplex examinations can be performed at the bedside: the equipment is extremely cumbersome and, like the hippopotamus, prone to nervous shock.⁸ Again, the cost of such equipment exceeds that of conventional equipment, even with duplex facilities, by a factor of at least two. It is not yet widely available in British district hospitals, and the argument for such expensive equipment in district departments remains to be established.

We agree that compression ultrasonography is a highly accurate and simple non-invasive method for detecting proximal thrombosis and for excluding other causes of limb pain and swelling (which may occur in up to 15% of cases⁹), but contrast phlebography is still necessary when there is a negative diagnosis on ultrasonography. A compression ultrasound examination can be performed with equipment widely available in British hospitals and should be the initial diagnostic modality used in a patient with a clinical diagnosis of deep vein thrombosis.

We now routinely perform an initial ultrasound examination followed by contrast phlebography if the result of the ultrasound examination is negative. This is a rapid and cost effective approach and promises to eliminate the need for phlebography in up to a third of patients in whom deep vein thrombosis of the lower limb has been diagnosed clinically, in addition to identifying and avoiding inappropriate treatment with anticoagulant drugs in patients with other causes for their symptoms.

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Salmeterol in nocturnal asthma

SIR,—Dr M F Fitzpatrick and colleagues have gone to great lengths to produce a carefully controlled objective study,¹ but we have some reservations about the conclusion that inhaled salmeterol improves objective sleep quality in patients with nocturnal asthma.

This conclusion is based on an improved type 0-1 and type 4 sleep in the group of patients given 50 µg salmeterol compared with the placebo group, but this group of patients did not have significantly better sleep overall (sleep efficiency was not statistically significant), did not spend a significantly shorter period awake at night, and did not have a reduced use of rescue salbutamol. The significant difference in total wakefulness after sleep onset is likely to be explained by the treatment group taking a longer time initially to go to sleep. This would fit with the authors' proposals that salmeterol has some properties of a central nervous system stimulant. Most importantly, the patients themselves could detect no difference in their quality of the sleep, and the authors have not attempted to show improved daytime cognitive function with these borderline improvements in objective sleep quality.

Furthermore, it is difficult to see why patients given 50 µg salmeterol were deemed to have a better night than the group given 100 µg: their sleep efficiency was no different, they did not spend less time awake at night, they used more rescue salbutamol than the 100 µg group, and the number of nocturnal awakenings a night was identical. In fact, we are not told if there was a significant difference between these two groups for type 0-1 and type 4 sleep.

Regarding the statistical methods: two (10%) of the patients dropped out of the trial, and data from a third patient were only partly complete because he died while in the treatment arm of the study; also, figures 1 and 2 and table II show quite clearly that the magnitude of the differences between groups is small and the ranges large. Although statistically significant, these differences are not necessarily clinically important. The graphic data are presented as the mean and standard error of the mean whereas the tabular data are presented as the median and range (appropriate for non-parametric data such as this). If the graphic data were presented as they should be the differences between groups would become less apparent.

In conclusion, the data do not show that there is an objective improvement in sleep quality in asthmatic patients taking salmeterol. Rather, they would seem to suggest that reduced nocturnal rescue with salbutamol (the final determinant of the patient's subjective sense of wellbeing during the night) and improved sleep quality are mutually exclusive events while either 50 µg or 100 µg of inhaled salmeterol is being taken twice daily.

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AUTHORS' REPLY,—We showed statistically significant improvements in the objective sleep quality of patients with nocturnal asthma when they were taking inhaled salmeterol 50 µg twice daily—a mean 26% reduction in time spent awake or drowsy at night and a mean 30% increase in time spent in stage 4 (deep) sleep—as compared with placebo. Contrary to the speculation of Mr Sarin and colleagues, we found no significant difference