Difference in blood pressure readings between arms

A growing body of evidence suggests that a difference in systolic blood pressure of 10 mmHg or more or 15 mmHg or more between arms could identify patients at high risk of asymptomatic peripheral vascular disease and mortality, who might benefit from further assessment. Current NICE guidance recommends that blood pressure should routinely be checked in both arms as part of an initial assessment for hypertension.

Overview: Peripheral vascular disease is a risk factor for future cardiovascular events and mortality, and it is associated with reduced arterial pressure in legs. Early detection of the disease is important because interventions to promote smoking cessation, lower blood pressure, or offer statin therapy can reduce mortality. Most cases, however, are clinically silent. Non-invasive identification of this disease requires detection of a reduced ankle-brachial pressure index at rest or after a stress test. A difference in blood pressure readings between arms can be observed in various general populations, including people with peripheral vascular disease. The presence of a difference between arm measurements has been implicated in a delayed diagnosis of hypertension and is associated with a higher prevalence of poor control in hypertension, as failure to standardise measurement to the arm with the highest reading can mislead decisions about management.

Current advice: When considering a diagnosis of hypertension, NICE recommends measuring blood pressure in both arms. If the difference in readings between arms is more than 20 mmHg, repeat the measurements. If the difference in readings between arms remains more than 20 mmHg on the second measurement, measure subsequent blood pressures in the arm with the higher reading.

New evidence: A UK-based primary care cohort study of 230 people receiving treatment for hypertension assessed whether a difference in systolic blood pressure readings between arms can predict a reduced event-free survival after 10 years (Clark et al. 2012a). Results showed that a difference in systolic blood pressure of more than 10 mmHg or 15 mmHg between arms was associated with an increased risk of cardiovascular and all-cause mortality over 10 years (adjusted hazard ratio=3.6, 95% CI 2.0 to 6.5 and 3.1, 1.6 to 6.0 respectively). The risk of death was also increased in 183 participants without pre-existing cardiovascular disease, which seems to point to a level of risk for events of similar magnitude to that of participants with previously diagnosed cardiovascular disease (95% CI 2.6, 1.4 to 4.8 and 2.7, 1.3 to 5.4).

These results were confirmed in a systematic review and meta-analysis of 20 studies which investigated whether background difference in systolic blood pressure between arms, of 10mm Hg or more or 15 mmHg or more, is associated with central or peripheral vascular disease (Clark et al. 2012b).

The results of the meta-analysis showed that a difference of 15mmHg or more was associated with increased risk of peripheral vascular disease (2.5 times increased risk), pre-existing cerebrovascular disease (1.6 times
increased risk), and both cardiovascular mortality (70% increased risk) and all-cause mortality (60% increased risk). The risk of peripheral vascular disease was also increased at a difference of 10 mmHg or more.

The researchers suggest that a difference in systolic blood pressure of 10 mmHg or more or 15 mmHg or more between arms could identify patients at high risk of asymptomatic peripheral vascular disease and mortality who might benefit from further assessment, that is, bilateral brachial measurement, targeted screening for peripheral vascular disease and aggressive risk-factor management. The arm with the higher pressure can vary between individuals and it is the difference that counts, not which arm is higher and which is lower.

Further research is needed to establish the upper limit of normal between-arm differences, particularly for diastolic measurements.

**Commentary:** Brachial blood pressure reflects both central arterial blood pressure and the effect of increased peripheral resistance.

We regularly assess peripheral arterial disease by measuring ankle brachial pressure differences, lower ankle pressures are related to arterial stenoses caused by atheroma. Ankle pressure may also be elevated if arteries are less elastic due to arterial sclerosis and the pulse pressure wave is not absorbed.

In the same way, pressure differences between brachial arteries do not only reflect changes in central pressure, but may also suggest possible abnormalities of the arteries such as subclavian stenosis.

NICE guidance on the management of primary hypertension recommends that we measure blood pressure in both arms and use the arm with the higher readings for consistency.

This primary care cohort study demonstrates that if there is a significant difference in pressure between arms this is a marker for increased peripheral vascular disease and cardiovascular risk. The findings from this small study are confirmed by the meta-analysis of 20 trials in which the increased risk was present when the difference in systolic blood pressure was more than 10 mmHg, and increased further when the difference was 15 mmHg. It was also present with differences in diastolic pressure.

These data provide important pointers to a potentially simple test to identify people at increased cardiovascular risk but there is no evidence to recommend a treatment or management strategy at this stage; however, smoking cessation and lipid management would clearly be important steps.

This meta-analysis reinforces the advice from NICE to check the blood pressure in both arms, not just for consistency and accuracy, but also to detect a difference which is a marker of increased cardiovascular risk. – Dr Kathryn E Griffith, General Practitioner with a Special Interest in Cardiology, York.

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