

Scientists develop new techniques for detecting harmful blood clots/air bubbles in arteries

New techniques for detecting emboli (harmful blood clots/air bubbles in arteries) developed at the University of Leicester have played a major role in dramatically reducing stroke rates after carotid endarterectomy. This is an operation designed to remove narrowings in the main arteries supplying the brain before they can cause a stroke.

Before per-operative embolus monitoring was introduced in 1992, the intra-operative stroke rate during carotid artery procedures was 4%. Today it is 0.2%. Before post-operative monitoring was introduced in 1995, the post-operative stroke rate was 2.7%. Today it is extremely rare.

Overall, the 30-day death/stroke rate has fallen from 6% to 2.6%.

The emboli detection techniques developed by Professor David H Evans and Professor A Ross Naylor in the Department of Cardiovascular Sciences at the University of Leicester involve the use of Doppler ultrasound, the same technique used to detect the fetal heartbeat in pregnant women. The work was recently presented at an international conference on Ultrasound in Medicine in Australia.

In the case of emboli detection, the ‘transducer’ is placed on the side of the patient’s head, just in front of the ear, and is used to detect the movement of emboli through blood vessels in the brain. The technique is painless and harmless.

Patients undergoing various types of operation have this small ultrasound transducer attached to the side of their head to give early warning of embolism occurring.

If emboli are detected appropriate measures can be taken to reduce or prevent the embolism from occurring. In some patients the monitoring will continue for 1 or 2 hours post-surgery. This reduces the likelihood of the patient suffering a stroke.

Emboli may be pieces of atheroma that have been dislodged from diseased arteries, they may be blood clots, or they may be air bubbles accidentally introduced into the blood.

They travel through the circulation until they become ‘wedged’ in an artery. This prevents blood flow in that artery and therefore starves the territory supplied by the artery of its blood supply and thus oxygen.

This can lead to the death of the affected tissue. If this occurs in the brain it leads to stroke, if it occurs in the heart it leads to myocardial infarction. In general small solid emboli are much more likely to cause stroke than similarly sized gaseous emboli, and one of the techniques the Leicester scientists have developed helps them to distinguish one from the other.

Professor of Medical Physics at the University, David Evans, commented: “We have been involved in cerebral embolus research here in Leicester for over 15 years. Much of our work to date has centred on improving the safety of carotid artery surgery.

“More recently we have started to work with cardiac surgeons on embolism during open-heart surgery, in the hope of reducing potentially harmful effects on the brain of open-heart surgery.”

Professor Naylor (consultant vascular surgeon) commented; “The paradox with carotid endarterectomy is

that although this is a proven operation for preventing stroke in the long term, it is also directly responsible for causing a stroke in a small number of patients in the peri-operative period. The lower the initial risk, the greater the long term benefit.

“The research performed here in Leicester has contributed towards a 60% sustained reduction in the overall operative risk which translates into greatly enhanced long term benefit to the patient and considerable rehabilitation savings to the NHS.”

Dr Isabel Lee from The Stroke Association commented: “We are extremely encouraged by the results from this programme of research that was funded by The Stroke Association.

“It is encouraging to see how simple monitoring of patients following a carotid endarterectomy can reduce the risk of stroke by a significant amount. We look forward to seeing how this research translates into clinical practice, where it could lead to the prevention of many potentially devastating strokes.”

Source: University of Leicester

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