Size is everything when it comes to high blood pressure

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Credit: University of Bristol

The size of a grain of rice, the carotid body, located between two major arteries that feed the brain with blood, has been found to control your blood pressure.

A team of clinical scientists at the University of Bristol have found a new way to treat high blood pressure (hypertension). The research study,

entitled "Unilateral carotid body resection in resistant hypertension: a safety and feasibility trial," was led by Professor Julian Paton at the University of Bristol, and Dr Angus Nightingale (Cardiology Consultant) at the Bristol Heart Institute, Bristol, and was published recently in the *Journal of American College of Cardiology: Basic to Translational Science*.

The research indicates that the carotid bodies appear to be a cause of high blood pressure, and as such now offer a new target for treatment.

The clinical team have shown that removing one carotid body from some patients with high blood pressure caused an immediate and sustained fall in blood pressure.

Dr Nightingale said: "The falls in blood pressure we have seen are impressive – more than you would see with pharmacological medication – and demonstrate the exciting potential there now is for targeting the carotid body to treat hypertension."

The carotid bodies "sniff" the levels of oxygen in blood, and when this falls they raise the alarm of a potential emergency by signaling to the brain to increase breathing and blood pressure. The effect is similar to having the thermostat in your home set too high all the time.

Professor Paton explained: "Treating the carotid body is a novel approach and a potential game changer as we believe we are reducing one of the main causes for hypertension in many patients. High blood pressure treatment typically tackles the symptoms targeting the end organs such as the heart, kidneys and blood vessels, and not the causes."

"Most importantly, we have developed some unique tests to assess which patients have overactive carotid bodies. This now gives us a way to personalise treatment, which is essential as there are multiple reasons

why high blood pressure develops" said Dr Nightingale.

The clinical trial demonstrated that the carotid bodies in patients who responded to resection had raised carotid body activity. These patients breathed more at rest and produced exaggerated breathing responses when the oxygen level in their blood was lowered.

High blood pressure is the world's leading contributor to mortality. In the UK, its cost to the National Health Service is around £2 billion per year, and it remains poorly controlled, triggering heart and renal failure, and strokes. The World Health Organization has identified high blood pressure as the single most important risk factor for the global burden of disease and death.

"Although this surgical approach to controlling high blood pressure was successful, we don't think this will be the solution in the long term. We now need to find a drug that dampens down an overactive carotid body and resets the blood pressure thermostat to a normal level," Dr Nightingale said.

Professor Paton's team may have found such an alternative. Recent animal studies published last week in Nature Medicine, discovered that the energy molecule adenosine tri-phosphate appears to be responsible.

"We are very excited by finding that we can turn down the alarm signals emanating from the carotid body in conditions of hypertension, yet it remains fully operational should an emergency situation occur. The new drug target we found within the carotid body is a receptor for the ATP molecule called the P2X3 receptor" explained Professor Paton.

Professor Paton said: "This approach may lead us to the first novel anti-hypertensive treatment strategy in more than 15 years. It has taken almost 10 years of research effort, working with colleagues from the

University of Bristol, The University Hospitals Bristol NHS Foundation Trust, Medical University of Gdansk, Poland, the William Harvey Research Institute, London, Dartmouth Medical School, USA, the University of Sao Paulo, Brazil, the University of Auckland, New Zealand, Cibiem Inc., and Afferent Pharmaceuticals. Nor would it have been possible without funding from The British Heart Foundation."

More information: Krzysztof Narkiewicz et al. Unilateral Carotid Body Resection in Resistant Hypertension, *JACC: Basic to Translational Science* (2016). DOI: 10.1016/j.jacbts.2016.06.004