

Insertion of a Pressure Wire can Improve the Safety of Spasm Provocation Tests

Running title: Use of a pressure wire to diagnose vasospastic angina

Hiroshima, Japan – Spasm provocation tests (SPTs) are important for diagnosing vasospastic angina (VSA) but are sometimes associated with severe complications. A team of researchers from JR Hiroshima Hospital and Hiroshima University Hospital may have discovered a solution.

VSA is characterized by transient narrowing of the epicardial coronary arteries and coronary spasms, which may not only result in angina occurring at rest but can even lead to a sudden ischemic cardiac arrest. Therefore, its diagnosis is pivotal.

Many patients cannot be diagnosed with VSA based on electrocardiogram (ECG) changes alone due to their symptoms being difficult to detect or atypical. Consequently, pharmacological or non-pharmacological stimuli are often used to induce coronary spasms in such patients through SPTs. However, this procedure can be accompanied by severe complications, such as shock, ventricular fibrillation, ventricular tachycardia, and bradyarrhythmia.

Pressure wires have previously been used to assess intracoronary pressure in patients with moderate narrowing of the coronary arteries, known as organic coronary stenosis. Therefore, the team, led by Dr. Teragawa, decided to test whether pressure wires could also be used in SPTs to help improve their safety.

They enrolled 190 patients in their study who presented with chest symptoms that were mostly felt at rest. All patients were evaluated using an SPT, but a 0.014-inch pressure wire was advanced into the distal segments of the right coronary artery (RCA) and left anterior descending coronary artery (LAD) prior to the SPT in 103 of these patients (Group I), while no pressure wire was used in the remaining 87 (Group II).

Although the total fluoroscopic time was on average 2.5 min longer in Group I than in Group II due to the time required to insert the pressure wire and the higher frequency of fractional flow reserve (FFR) measurements, Group I required a smaller volume of contrast medium.

The use of a pressure wire also led to significantly fewer severe complications, including ventricular fibrillation and hemodynamic instability requiring adrenaline, despite there being no significant differences in risk factors between the two groups, such as smoking, family history of coronary disease, or blood chemistry parameters, indicating that this technique may improve the safety of SPTs.

And the benefits do not end there... This novel approach also allowed the prompt detection of a reduced blood flow to the heart, termed myocardial ischemia, through constant monitoring of the pressure ratio of the distal lesion to proximal lesion (Pd/Pa). “When using a pressure wire during an SPT, it is important to monitor the Pd/Pa continuously...If the Pd/Pa index decreased gradually

during the SPT, the occurrence of coronary spasm was anticipated. Furthermore, if a coronary spasm occurred with the reduction in the Pd/Pa index, an intracoronary infusion of NTG [nitroglycerin] was given to relieve the spasm and promptly elevate the Pd/Pa index to the baseline level,” says Dr. Teragawa. “Indeed, given the process of myocardial ischemia, a change in the Pd/Pa index may be the earliest marker of myocardial ischemia.”

Pressure wires have been used in many other clinical settings without any associated complications, and similarly it was found that they were inserted with a 98% success rate and did not cause vascular trauma or induce coronary spasm in any of the patients tested—although, as Dr. Teragawa cautions, “Naturally, a pressure wire should be inserted into the coronary artery more carefully and slowly during an SPT to avoid guidewire-induced coronary spasm.”

As with all techniques, this approach has some limitations, particularly in terms of cost. However, the improved safety of this procedure holds great promise for patients who are considered more likely to experience complications during an SPT, and the increased ability to establish a firm diagnosis of VSA will be of great value to cardiologists who need to clarify the disease status through a second SPT.

The article “Usefulness of a Pressure Wire for the Diagnosis of Vasospastic Angina during a Spasm Provocation Test” was published in *Journal of Clinical and Experimental Research in Cardiology* (Vol. 3).