Safety and Predictors of a Positive Result of Intracoronary Ergonovine Testing in Patients with Ischemic Heart Disease without Hemodynamically Significant Coronary Artery Stenosis in Taiwan

Ming-Yow Hung, Ming-Jui Hung, Chi-Wen Cheng, Ning-I Yang and Wen-Jin Cherng

Background: No information is available regarding the safety of intracoronary ergonovine provocation testing and the associated predictors in patients with suspected ischemic heart disease without hemodynamically significant coronary artery stenosis (CAS) in Taiwan.

Methods: Patients who underwent cardiac catheterization for suspected ischemic heart disease and were found to have no hemodynamically significant CAS between January 2000 and December 2004 were enrolled. Provocation testing for coronary vasospasm was undertaken by administering a step-wise dose of intracoronary ergonovine. Coronary vasospasm was defined as a reduction in luminal diameter 70% during the provocation testing which was associated with angina and/or ST-depressive or elevated changes.

Results: A total of 454 patients, including 193 with no hemodynamically significant CAS and no coronary vasospasm (control group) and 261 with coronary vasospasm without hemodynamically significant CAS (vasospasm group), were included in the analysis. The incidence of provoked coronary vasospasm was 57%. Patients with coronary vasospasm were more likely to be older, men, current smokers and to have a lower body mass index. The most significant independent predictor of coronary vasospasm was current smoker (odds ratio: 2.796, \( p < 0.001 \)). No myocardial infarction or death was noted during intracoronary ergonovine testing. Ventricular fibrillation occurred during provocation testing in 3 patients (0.66%), of whom 2 required electric cardioversion and 1 had spontaneous recovery without sequelae.

Conclusion: Intracoronary ergonovine provocation testing was not a risky intervention procedure for the diagnosis of coronary vasospasm. Current smoking was the most significant independent predictor of coronary vasospasm.

Key Words: Ergonovine • Coronary vasospasm • Ventricular fibrillation

INTRODUCTION

Coronary vasospasm has been proposed as a major cause of acute cardiac events, including myocardial infarction and sudden cardiac death. Administration of ergonovine has been suggested as a useful diagnostic test of coronary vasospastic angina. In patients with a coronary artery stenosis < 75%, the incidence of a positive result after ergonovine administration has been estimated to be 7.5%-9.5% by intravenous injection.
and 24% by intracoronary injection. Although some studies have reported complications of intravenous injection of ergonovine in patients who underwent cardiac catheterization, including myocardial infarction, third-degree atrioventricular block, ventricular tachycardia, ventricular fibrillation (VF), and death, the general consensus has been that intracoronary injection is safe because of negligible drug recirculation and avoidance of effects on branches with critical stenosis. Data on the safety of intracoronary ergonovine administration for the diagnosis of coronary vasospastic angina in Taiwan, however, is lacking. We recently reported that, as in Japanese, coronary vasospastic angina is relatively common in Taiwanese. By contrast, coronary vasospasm is relatively uncommon in Caucasians. In addition, a Japanese study found that smoking was a risk factor for coronary vasospasm. The aim of the present study was to assess the safety of intracoronary ergonovine administration and the predictors of coronary vasospasm in Taiwan.

**METHODS**

**Study patients**

Patients from outpatient and inpatient clinics with suspected ischemic heart disease by clinical history who underwent diagnostic coronary angiography and were found to have no hemodynamically significant coronary artery stenosis (CAS) between January 2000 and December 2004 were subjected to intracoronary ergonovine testing. Ischemic heart disease included stable angina pectoris, unstable angina, and acute myocardial infarction. Stable angina pectoris was defined as Canadian Cardiovascular Society angina class 2 or 3 that had been stable for > 2 months. Unstable angina pectoris was defined as angina pectoris with ≥ 1 of 3 features: (1) occurring at rest (or with minimal exertion) and usually lasting > 20 minutes (if not interrupted by nitroglycerin); (2) new onset of severe and frank pain (i.e. within 2 months); and (3) occurring in a crescendo pattern (i.e. more severe, prolonged, or frequent than previously). Diagnosis of acute myocardial infarction was based on satisfaction of ≥ 2 of the following criteria: (1) chest pain suggestive of myocardial ischemia lasting ≥ 30 minutes; (2) enzymatic evidence of acute myocardial necrosis (increased serum creatine kinase level of ≥ 2 times the normal value with an increased creatine kinase-MB isoenzyme of > 5%); and (3) new electrocardiographic changes, which included the development of Q waves and/or ST-T changes lasting for ≥ 48 hours. Since coronary vasospasm is a possible underlying pathology causing angina pectoris and acute myocardial infarction, intracoronary ergonovine testing was required to define the vasospasm-related coronary pathology. After diagnostic coronary angiography, patients were enrolled in the coronary vasospasm group based on all of the following characteristics: (1) occurring at rest and associated with ST-segment elevation or depression on electrocardiogram; (2) relieved by sublingual administration of nitroglycerin; (3) no hemodynamically significant CAS after intracoronary nitroglycerin administration on coronary angiography; (4) positive intracoronary ergonovine testing. Patient data for the coronary vasospasm group were compared with analogous information for patients in the control group. The control group included patients who presented with oppressive chest pain, had no hemodynamically significant CAS, and had no coronary vasospasm on intracoronary ergonovine provocation testing. Exclusion criteria were as follows: (1) lack of patient cooperation for any reason, such as psychological or severe systemic illness; (2) severe anemia with hemoglobin < 7.0 gm/dl; (3) severe symptomatic electrolyte imbalance; (4) decompensated congestive heart failure or acute pulmonary edema; (5) severe coagulopathy; (6) severe valvular heart disease; (7) aortic valve endocarditis; (8) unexplained fever; (9) severe uncontrolled hypertension. All patients gave written informed consent for participation. This study was approved by the ethics committee of our hospital.

**Clinical data**

Patients were assessed for the presence of cardiac risk factors, including cigarette smoking, diabetes mellitus, hypercholesterolemia and hypertension. Current smoker was defined as any smoking within 3 weeks before cardiac catheterization. Diabetes mellitus was defined as receipt of dietary treatment and/or medical therapy. Hypercholesterolemia was defined as serum total cholesterol > 200 mg/dl and hypertension as receiving medical therapy or a blood pressure of > 140/90 mm Hg.
Coronary angiography and intracoronary ergonovine testing

After informed consent was obtained, coronary angiography was performed using the standard Judkins technique via a femoral or a radial approach. Nitrates and calcium antagonists were withdrawn for ≥24 hours before coronary angiography. Selective left and right coronary angiography were done in multiple axial and hemi-axial projections. Hemodynamically significant CAS was defined as ≥50% diameter reduction in lumen caliber after intracoronary nitroglycerin 50-100 μg administration. Intracoronary ergonovine (Methergin® Novartis, Basel, Switzerland) provocation testing was performed in succession if no hemodynamically significant CAS was found based on the following considerations: (1) unexplained clinically suspected ischemic heart disease; (2) normal coronary arteries in the presence of acute myocardial infarction. This procedure was important to differentiate coronary vasospasm-related coronary pathology from normal coronary arteries. The contraindications to intracoronary ergonovine testing included pregnancy, severe hypertension (systolic blood pressure > 180 mmHg), moderate to severe aortic stenosis and uncontrolled ventricular arrhythmia. The stepwise doses (1, 5, 10, 30 μg) of ergonovine were administered into the right coronary artery first and subsequently into the left coronary artery. A 3-minute period was allowed to elapse between administration of escalating doses. The result of provocation testing for coronary vasospasm was considered positive when a reduction in luminal diameter ≥70% occurred during testing which was associated with angina and/or ST-depressive or elevated changes. The degree of ST-segment depression was measured 80 ms after the J point. Positive ST-segment change was defined as the occurrence of ≥1 of the following ischemia ST-segment changes during provocation testing: ST-segment increase ≥0.2 mV in ≥2 contiguous leads or ST-segment depression of 0.1 mV of a horizontal or downsloping type or >0.2 mV of a junctional type. After coronary vasospasm was diagnosed, the intracoronary ergonovine administration was stopped and reversal was achieved by administration of 50-100 μg intracoronary nitroglycerin (Millisrol®, G. Pohl-Boskamp, Hohenlockstedt, Germany). The observation of reversal change of coronary artery diameter further confirmed the diagnosis of coronary vasospasm.

Statistical analysis

Continuous variables with a skewed distribution were expressed as medians (25th, 75th percentiles), and those without skewness as means ± SDs. Logistic regression was used to identify independent risk factors and to estimate odds ratios and 95% confidence intervals for coronary vasospasm in patients without hemodynamically significant CAS. All variables with a p value < 0.05 were entered into the multivariate analysis to determine their predictive value in the diagnosis of coronary vasospasm in patients without hemodynamically significant CAS. Covariables used to control for possible confounding effects included age (years), male gender (no, yes), smoker (no, yes), and body mass index (kg/m²). A p value < 0.05 was considered statistically significant. Statistical analyses were performed with SPSS 11.0 for Windows (SPSS, Inc., Chicago, Illinois).

RESULTS

Clinical characteristics

A total of 454 patients were included in the final analysis. Among these patients, 193 had no hemodynamically significant CAS and no coronary vasospasm (control group), and 261 had coronary vasospasm without hemodynamically significant CAS (vasospasm group). The control group included 147 patients with stable angina pectoris, 43 patients with unstable angina pectoris, and 3 patients with acute myocardial infarction. The vasospasm group included 50 patients with acute myocardial infarction (Figure 1) and 211 patients with angina (127 patients of unstable angina pectoris and 84 patients of stable angina pectoris). Table 1 compares the clinical characteristics of the patients with and without coronary vasospasm. Patients with coronary vasospasm were more likely to be older, to be men, to have a lower body mass index, and to be current smokers, which was the most common cardiac risk factor. Single-vessel coronary vasospasm was the most common finding in patients with coronary vasospasm, and the right coronary artery the most common spasm- provoked coronary artery. In our
study, there were 99 hypertensive patients in the vasospasm group and 85 in the control group (Table 1). There were more patients using angiotensin-II receptor blockers and β-blockers in the control group than in the vasospasm group (p = 0.011 and < 0.001, respectively), while nitrates were used more often in the vasospasm group than in the control group (p < 0.001).

**Association between baseline characteristics and diagnosis of coronary vasospasm in patients without hemodynamically significant CAS**

Based on their significance in the univariate analysis (Table 2), the variables of age, male, body mass index and current smoker were entered into the multivariate analysis. This analysis demonstrated that current smoking was the most significant independent predictor of a diagnosis of coronary vasospasm in patients without hemodynamically significant CAS (Table 3; odds ratio: 2.796, 95% confidence interval: 1.700-4.601, p < 0.001).

In the vasospasm group, 20 patients had ST elevation and 241 patients had ST depression before coronary angiography. During intracoronary ergonovine administration, transient ST elevation, ST depression, and T-wave inversion developed in 3, 104, and 74 patients, respectively. The other 80 patients developed coronary arterial diameter reduction and chest pain without electrocardiographic changes during testing, indicating that we performed intracoronary nitroglycerin administration soon enough such that it prevented patients from developing electrocardiographic changes.

**Complications**

There were 2 patients who had acute myocardial infarction and life-threatening cardiac arrhythmias during admission. One had complete atioventricular block only and the other had complete atrioventricular block and ventricular fibrillation. However, these complications did not recur during intracoronary ergonovine administration. No acute myocardial infarction or death

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**Figure 1.** Electrocardiograms and right coronary arteriogram in a patient presenting as acute inferior myocardial infarction. (A) Electrocardiogram at the ER showing ST elevation at leads II, III, aVF; (B) baseline angiography showing no hemodynamically significant coronary artery stenosis; (C) nearly 100% vasospasm at distal site (arrow) after intracoronary administration of 46 g ergonovine; (D) electrocardiogram before discharge showing resolution of previous ST elevation with inverse T wave at leads III, aVF; (E) electrocardiogram at one year follow up showing T-wave becoming more upright at aVF, V4-6 under treatment with nifedipine 30 mg per day.
Table 1. Baseline characteristics of patients

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Vasospasm (n = 261)</th>
<th>No vasospasm (n = 193)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr)</td>
<td>59 ± 12</td>
<td>56 ± 13</td>
<td>0.004</td>
</tr>
<tr>
<td>Men</td>
<td>177 (68)</td>
<td>90 (47)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>25 ± 4</td>
<td>26 ± 4</td>
<td>0.015</td>
</tr>
<tr>
<td>Current smoker</td>
<td>117 (45)</td>
<td>38 (20)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>48 (18)</td>
<td>36 (19)</td>
<td>0.943</td>
</tr>
<tr>
<td>Hypertension</td>
<td>99 (38)</td>
<td>85 (44)</td>
<td>0.190</td>
</tr>
<tr>
<td>Cholesterol (mg/dL)</td>
<td>196 (179, 228)</td>
<td>202 (182, 226)</td>
<td>0.422</td>
</tr>
</tbody>
</table>

Provoked coronary artery
- Left anterior descending artery: 87 (33%)
- Left circumflex artery: 61 (23%)
- Right coronary artery: 186 (71%)

Number of provoked spastic artery
- 1-vessel spasm: 207 (79%)
- 2-vessel spasm: 28 (11%)
- 3-vessel spasm: 26 (10%)

Left ventricular ejection fraction (%): 67 (62, 73) vs. 70 (65, 76) (p = 0.076)

<table>
<thead>
<tr>
<th>Medications</th>
<th>Odds ratio</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrates</td>
<td>1.022</td>
<td>1.007-1.042</td>
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<tr>
<td>Calcium antagonists</td>
<td>2.412</td>
<td>1.643-3.400</td>
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<tr>
<td>Angiotensin-converting enzyme inhibitors</td>
<td>3.314</td>
<td>2.155-5.098</td>
</tr>
<tr>
<td>Angiotensin II receptor blockers</td>
<td>2.796</td>
<td>1.700-4.601</td>
</tr>
<tr>
<td>β blockers</td>
<td>1.532</td>
<td>1.981-2.394</td>
</tr>
<tr>
<td>α blockers</td>
<td>0.956</td>
<td>0.909-1.004</td>
</tr>
<tr>
<td>Diuretics</td>
<td>0.998</td>
<td>0.993-1.003</td>
</tr>
</tbody>
</table>

Continuous data with and without skewness are presented as: medians (25th, 75th percentiles) and means ± SDs, respectively.

Categorical data are presented as numbers of patients (%).

Table 2. Univariate analysis of association with coronary vasospasm

<table>
<thead>
<tr>
<th>Variable</th>
<th>p value</th>
<th>Odds ratio</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr)</td>
<td>0.004</td>
<td>1.022</td>
<td>1.007-1.042</td>
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<tr>
<td>Men</td>
<td>&lt; 0.001</td>
<td>2.412</td>
<td>1.643-3.540</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>0.016</td>
<td>0.944</td>
<td>0.901-0.989</td>
</tr>
<tr>
<td>Current smoker</td>
<td>&lt; 0.001</td>
<td>3.314</td>
<td>2.155-5.098</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>0.943</td>
<td>0.983</td>
<td>0.609-1.586</td>
</tr>
<tr>
<td>Hypertension</td>
<td>0.190</td>
<td>0.776</td>
<td>0.532-1.134</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>0.421</td>
<td>0.998</td>
<td>0.993-1.003</td>
</tr>
<tr>
<td>Left ventricular ejection fraction</td>
<td>0.078</td>
<td>0.984</td>
<td>0.966-1.002</td>
</tr>
</tbody>
</table>

Table 3. Multivariate analysis of four variables associated with coronary vasospasm

<table>
<thead>
<tr>
<th>Variable</th>
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<th>Odds ratio</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr)</td>
<td>0.002</td>
<td>1.025</td>
<td>1.009-1.042</td>
</tr>
<tr>
<td>Men</td>
<td>0.061</td>
<td>1.532</td>
<td>0.981-2.394</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>0.074</td>
<td>0.956</td>
<td>0.909-1.004</td>
</tr>
<tr>
<td>Current smoker</td>
<td>&lt; 0.001</td>
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</tr>
</tbody>
</table>

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occurred during the 454 intracoronary ergonovine administrations. VF occurred in 3 patients (0.66%) with coronary vasospasm and required cardioversion for termination in 2 patients (1 patient with acute myocardial infarction and 1 patient with unstable angina pectoris), while the other patient (presenting with unstable angina pectoris) recovered spontaneously without intervention (Figure 2). This patient, a 50-year-old man, was well until 2 months before hospital admission when he awakened at night due to severe anginal pain. There was no syncope episode. After administration of a cumulative dose of 16 µg intracoronary ergonovine into the right coronary artery, ostial spasm appeared immediately, then recovered 10 seconds later, followed by the appearance of proximal and middle multi-focal spasm. VF occurred at the same time but recovered spontaneously just before cardioversion was to be performed. The 3 patients remained asymptomatic throughout the examination.

**DISCUSSION**

This study had two main findings. First, complications were rare (0.66%) during intracoronary ergonovine provocation testing in patients without hemodynamically significant CAS. Second, current smoking was the most significant independent clinical predictor of coronary vasospasm in patients with angina without hemodynamically significant CAS.

**Previous studies**

The major complication rate in previous studies of intravenous administration of ergonovine ranged from 0.3-5%.6-8,9 A report of 5 patients by Buxton et al.10 found that intravenous ergonovine maleate-induced coronary vasospasm could be refractory to sublingual nitroglycerin. Three of these patients died as a result of the test despite intravenous nitroglycerin treatment. The 2 survivors, whose vasospasm was responsive to intra-

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**Figure 2.** Electrocardiograms, pressure tracing and right coronary arteriogram in a patient with unstable angina pectoris, presenting after wakening with resting chest tightness at night. (A) simultaneous lead I, II, aVR electrocardiogram and systemic arterial pressure tracing during intracoronary ergonovine testing; (B) baseline angiographically normal right coronary artery with minimal plaquing; (C) ostial spasm (arrow) immediately after intracoronary administration of 15 µg ergonovine; (D) in 10 seconds, the ostial spasm recovered spontaneously, multi-focal spasms appeared in the proximal and middle portion, and ventricular fibrillation occurred at the same time for 10 seconds and recovered spontaneously without intervention; (E) multi-focal spasms were relieved after intracoronary administration of 100 µg nitroglycerin. The patient’s consciousness remained clear throughout examination.
coronary nitroglycerin administration, differed from the nonsurvivors in the lower total doses of ergonovine given (100 and 150 μg versus 170, 300 and 300 μg, respectively). These findings suggest that intracoronary administration of nitroglycerin may favorably reverse refractory coronary vasospasm and that testing should be done only with full hemodynamic and electrocardiographic monitoring in a catheterization laboratory. Harding et al.18 studied the results of intravenous ergonovine maleate provocative testing in 3447 patients using doses of 50, 100, 150 μg in succession at 3-min intervals. They found that a history of smoking and the presence of coronary artery stenosis between 21% to 51% were markers of patients most likely to have a positive ergonovine test result. Complications during or after ergonovine testing occurred in 11 patients (0.3%). Myocardial infarction occurred in 4 patients (0.1%) and ventricular tachycardia or VF in 7 patients (0.2%). No procedure-related death occurred.

Sueda et al.19 compared the effects of 873 acetylcholine (Ach) and 635 ergonovine intracoronary spasm provocation tests in Japanese patients and found that Ach was not superior to ergonovine in terms of safety. Ergonovine was injected in a maximal dose of 40 μg into the right coronary artery and a maximal dose of 64 μg into the left coronary artery. Coronary vasospasm was defined as transient > 99% luminal narrowing. The incidence of vasospasm provoked by ergonovine in patients without fixed stenosis (< 75%) was 25.5%. Only one patient (1.6%) who underwent ergonovine tests had prolonged vasospasm of more than 15 minutes. Sueda et al.8 also investigated the incidence of vasospasm induced by intracoronary injection of ergonovine using the same method of administration and definition of vasospasm in 596 Japanese patients. They found that coronary vasospasm was provoked in 24% (105/437) of patients with lesions < 75% stenosis, a rate 3.2 times higher than that reported by Nosaka et al.6 In both studies, no serious or irreversible complications, such as ventricular tachycardia, VF, myocardial infarction or death, were observed.

Sugishii et al.15 showed that smoking was a major risk factor for coronary vasospasm and by contrast that hyperlipidemia, diabetes mellitus, hypertension and obesity had no role in the pathogenesis of vasospastic angina. Their findings suggest that the pathogenesis of coronary vasospasm unassociated with significant coronary ath-
taneous VF or nonsustained polymorphic ventricular tachycardia, structural heart disease was found in 98%, of whom 60% had CAS, 34% had dilated cardiomyopathy, and 4% had arrhythmogenic right ventricular dysplasia, and only 1 patient had no structural heart disease. Of VF episodes, 43% were asymptomatic and 40% were nonsustained. If VF was < 10 seconds in duration, the incidence of syncope or pre-syncope was 25%, compared with 62% if the arrhythmia was ≥ 10 seconds. Because there was no twisting QRS axis on simultaneous leads I, II and aVR electrocardiogram tracing (Figure 2) and no predisposing factors, such as congenital, severe bradycardia, potassium depletion, and use of medications (such as class IA, IC or III antiarrhythmic drugs), polymorphic VT was not likely in our patients.

In this study, ergonovine was injected into the right coronary artery and subsequently into the left coronary artery at a maximal dose of 46 μg, similar to the 60 μg maximal dose of used by Sueda et al. A positive test result was noted in 57% of our patients, which is higher than the 27% reported by Sueda et al, but this discrepancy may be partly attributable to the more rigorous definition of vasospasm used in their study (> 70% vs. > 99%).

According to ACC/AHA guidelines for coronary angiography in 1999, only nitrates and calcium antagonists must be withdrawn for ≥ 48 hours before testing to ensure a valid test. Angiotensin-converting enzyme inhibitor, angiotensin II receptor blocker, β-blocker or α-blocker are not considered to influence the test results. All of these drugs were used to treat hypertension and it was not ethical to discontinue treatment for any reason. Besides, severe hypertension was a contraindication to ergonovine testing.

This study has confirmed previous results from a smaller series that current cigarette smoking is an independent risk factor for coronary vasospasm in patients without hemodynamically significant CAS, although the mechanisms responsible for this association are not entirely clear. Further, the results of the two studies are very similar, with odds ratios for smoking of 2.41 in this study and 2.80 in the previous study. Cigarette smoking has been shown to cause ischemic disturbances of coronary flow mediated by vasoconstriction. In addition, Ota et al. found that cigarette-smoke extract markedly suppressed acetylcholine-induced endothelium-dependent relaxation, and that this suppression was prevented by antioxidants or superoxide dismutase in isolated rabbit aorta. Based on these findings, they speculated that smoking reduces nitric oxide activity by way of contained oxygen free radicals.

**Study limitations**

The differences between our study and Sueda et al. were not comparable due to the different definition of positive ergonovine provocation test result. However, the definition we used was that in Grossman’s Cardiac Catheterization, Angiography, and Intervention. This definition is stricter than the definition by ACC/AHA guidelines for coronary angiography in 1999.

**CLINICAL IMPLICATIONS**

The absence of refractory spasm, procedure-related mortality, and the low incidence of complications in this study suggest that intracoronary ergonovine provocation testing for the diagnosis of coronary vasospasm is not a risky procedure. Because VF is a possible complication following ergonovine administration, its use outside the cardiac catheterization laboratory is not recommended. As found in previous studies of Japanese, this study in Taiwanese showed that cigarette smoking was the most common clinical characteristic associated with coronary vasospasm.

**ACKNOWLEDGEMENT**

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台灣地區無冠狀動脈血行動力學有意義狹窄的缺血性心臟病患其冠狀動脈內給予麥角新素的安全性和陽性反應預測因子之研究

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桃園縣 財團法人長庚紀念醫院林口總院 心臟內科二科1
桃園縣 長庚大學 臨床醫學研究所2
基隆市 財團法人長庚紀念醫院基隆分院 心臟內科3

背景 在台灣地區，冠狀動脈內給予麥角新素之診斷檢查對冠狀動脈無血行動力學有意義狹窄的缺血性心臟病患其安全性和陽性反應預測因子尚未有研究資料。

方法 從 2000 年 1 月到 2004 年 12 月因疑似缺血性心臟病而接受心導管檢查的病患，若冠狀動脈血管攝影顯示無血行動力學有意義狹窄，則接著以冠狀動脈內給予劑量逐步漸增的麥角新素做冠狀動脈痙攣的檢查。冠狀動脈痙攣的定義為冠狀動脈內給予麥角新素後，冠狀動脈直徑減少超過 70%，並合併有胸悶或心電圖 ST 段下降或上升的變化。

結果 總共有 454 位病人進入研究分析，對照組為 193 位病人其冠狀動脈無血行動力學有意義狹窄且沒有冠狀動脈痙攣，冠狀動脈痙攣組為 261 位病人無血行動力學有意義狹窄，但有冠狀動脈痙攣。麥角新素誘發冠狀動脈痙攣的比例為 57%。有冠狀動脈痙攣的病人有較高的比例年長者，男性，抽煙且身體質量指數較低。最顯著的冠狀動脈痙攣預測因子是抽煙 (危險度 2.796, p < 0.001)。冠狀動脈痙攣攝影檢查沒有造成心肌梗塞或死亡。有 3 位病人檢查中發生心室顫動 (0.66%)，其中 2 位需要心臟電擊，另 1 位則是自行恢復正常心跳，但都無後遺症。

結論 對診斷冠狀動脈痙攣而言，冠狀動脈內給予麥角新素不是危險的侵入性檢查。抽煙是最顯著的冠狀動脈痙攣預測因子。

關鍵詞：麥角新素、冠狀動脈痙攣、心室顫動。