Case Reports

Anginal Attack Following a Sodium Bicarbonate and Hydrocortisone Injection

Der-Jinn Wu, M.D.,* Junichiro MIFUNE, M.D.,
Kuniaki TAGA, M.D., Senshu HIFUMI, M.D.,
Yoshifumi TAKAHASHI, M.D., Shigenori YAMASHIDA, M.D.,
Shinji NISHIOKA, M.D., Tatsuaki MURAKAMI, M.D.,
and Takashi TANAKA, M.D.

SUMMARY

A case of a 73-year-old man with variant angina who developed chest pain and shock following an injection of sodium bicarbonate and hydrocortisone is reported. The electrocardiogram (ECG) during the chest pain attack revealed ST elevation in leads II, III and aV_F. It returned to a normal pattern 10 min later. Coronary angiography, performed 2 hours after the anginal attack, showed no significant coronary arterial stenosis. One month later, an injection of ergonovine (16 µg) into the right and left coronary arteries induced spasms in segments 4 and 13, with ischemic ECG changes. Possible causes of the anginal attack are a coronary arterial spasm induced by the allergic reaction to hydrocortisone and/or serum alkalosis due to the sodium bicarbonate injection triggered by hyperventilation.

Additional Indexing Words:

Coronary artery spasm	Drug allergic reaction	Sodium
bicarbonate	Hydrocortisone	

MANY factors are known to induce coronary arterial spasms.¹⁾ Although there are also reports that coronary arterial spasms can be induced by allergic reactions to drugs and other factors,²⁾⁻⁸⁾ sodium bicarbonate has not been implicated. We report a case in which a patient's anginal attack was induced following sodium bicarbonate and hydrocortisone injection. He was shown to have an allergic reaction to a subsequent coronary angiography examination and an ergonovine provocation test for spasm was positive in the chronic stage.

From the Department of Internal Medicine, Fukui Cardiovascular Center, Fukui, Japan and
* the Department of Internal Medicine, Chung Shan Medical and Dental College Hospital, Taichung, Taiwan, Republic of China.

Address for reprints: Der-Jinn Wu, M.D., Internal Medicine, Chung Shan Medical and Dental College Hospital, 23, Section 1, Taichung Kang Road, Taiwan 40334, Republic of China.

Received for publication January 25, 1989.

Accepted May 24, 1989.

CASE REPORT

A 73-year-old man had dizziness in the morning. He had been well and had no allergic history to any drugs or foods, nor did he have any risk factors for coronary artery disease. On examination, the blood pressure was 182/84 mmHg with a heart rate of 62/min. No abnormal neurological signs were found. He received an intravenous injection of 7% sodium bicarbonate (Meylon^R, pH: 7.6–8.6) 40 ml and hydrocortisone sodium succinate (Saxizon^R) 100 mg to treat his dizziness. Ten minutes later, he developed urticaria followed by severe chest pain, and he immediately lost consciousness. After cardiac massage and injection of a vasopressor agent (noradrenaline), consciousness was recovered 10 min later. However, he had a persistent, oppressive sensation in his chest and the ECG showed ST elevation in leads II, III and aV_F. Despite hypotension, isosorbide dinitrate (Nitorol^R) 5 mg was given sublingually. The symptom was relieved and the ECG changes returned to normal 10 min later (Fig. 1A).

Coronary angiography was performed 2 hours after the attack. It

Fig. 1. A) Electrocardiograms (ECG) at attack and admission. It showed ST elevation in II, III and aV_F with reciprocal ST depression in I, aV_L, V₂₋₆ leads and it returned to a normal pattern at admission. B) Coronary angiography 2 hours later. No stenosis was found.

Fig. 2. Left and right coronary angiography before (C) and after intracoronary injection of ergonovine (E) and nitroglycerin (NG). Spasms were induced in segments 13 and 4 (arrows). There was a T wave inversion in the aV_L lead and minimal peaking of T wave in the III and aV_F leads of the ECG when spasm was induced in segment 13. A: left coronary angiography. B: right coronary angiography.

showed no significant stenosis (Fig. 1B). The laboratory data revealed nothing abnormal except leucocytosis (14,200/ul, ST: 8%, Seg: 80%). Subsequent ECGs and serial enzyme studies revealed no evidence of acute myocardial infarction. One month later, an ergonovine provocation test was performed. Following an intracoronary injection of ergonovine (16 μ g) into the right and left coronary arteries for a 5-min period, severe focal narrowings occurred in segments 4 and 13 (25% narrowings were changed into 95%) (Fig. 2). There was a T wave inversion in the aV_L lead and minimal peaking of T waves in the III and aV_F leads of ECG when focal narrowing (spasm) was induced in segment 13, which was reversed by intracoronary injection of nitroglycerin⁹⁾ (Fig. 2). However, the coronary arterial spasm was not induced following injection of 7% sodium bicarbonate (40 ml) at this time (Fig. 3). Following the examination, itching and urticaria appeared and hydrocortisone sodium succinate (Solucotef[®]) 300 mg was intravenously injected again. Ten minutes later, the patient experienced transient hypotension (systolic pressure 40 mmHg), but exhibited neither chest pain nor changes in the ECG. The blood pressure returned to normal and the skin eruption disappeared 1 hour later. The subsequent clinical course was uneventful, following daily treatment with nifedipine (30 mg) and isosorbide dinitrate (60 mg).

Fig. 3. Coronary angiography before (A) and after intravenous sodium bicarbonate (B). No change was observed.

DISCUSSION

This patient developed chest pain, transient shock and ECG changes of transmural ischemia following a drug injection. This case differs from previous reports about drug-induced anaphylactic reaction with a coronary arterial spasm in that no respiratory symptoms were observed.²⁾⁻⁵⁾ However, there was one previous case report of urticarial reaction associated with coronary vasospasm.⁶⁾ The ergonovine provocation test was positive in this patient. We suggest that bradycardia-hypotension secondary to a right coronary artery spasm was induced by either an allergic reaction to the agents injected or to other mechanisms.

Hydrocortisone can induce coronary artery spasm following allergic reaction.⁵⁾ However, after a second time of skin urticarial eruption and a subsequent hydrocortisone injection, the symptoms and signs of coronary arterial spasm did not recur. Since a sodium bicarbonate challenge test did not reproduce the spasm, we suggest that there was a temporal difference in the sensitivity of coronary vasculature to this drug.¹⁾ To our knowledge, there is no previous report that sodium bicarbonate can induce a coronary artery spasm. However, coronary artery spasms can be induced by hyperventilation and/or Tris-buffer infusions.^{7),8)} Since the patient was very anxious when the skin reaction occurred, serum alkalosis after the sodium bicarbonate injection and hyperventilation are also possible causal factors of the coronary

arterial spasm in this patient.

REFERENCES

1. Yasue H, Omote S, Takizawa A, Nagao M: Coronary arterial spasm in ischemic heart disease and its pathogenesis. *Circ Res* **52** (suppl): 147, 1983
2. Druck MN, Johnstone DE, Staniloff H, McLaughlin PR: Coronary artery spasm as a manifestation of anaphylactoid reaction of iodinated contrast material. *CMA J* **125**: 1133, 1981
3. Weber S, Genevay B, Chapsal J, Bonnin A, Degeorges M: Severe coronary spasm during drug-induced immediate hypersensitivity reaction. *Lancet* **II**: 821, 1982
4. Ahmad S: Severe coronary spasm during zomepirac-allergic reaction. *South Med J* **177**: 938, 1984
5. Egashira K, Origuchi H, Sagara T, Kikuchi Y: Coronary artery spasm during hydrocortisone-induced allergic reaction. *Am Heart J* **113**: 1516, 1987
6. Bristow MR, Ginsburg R, Kantrowitz NE, Baim DS, Rosenbaum JT: Coronary spasm associated with urticaria: report of a case mimicking anaphylaxis. *Clin Cardiol* **5**: 238, 1982
7. Takaoka K, Yasue H, Horio Y: Possible role of coronary spasm in acute myocardial infarction precipitated by hyperventilation. *Br Heart J* **59**: 256, 1988
8. Yasue H, Nagao M, Omote S, Takizawa A, Miwa K, Tanaka S: Coronary arterial spasm and Prinzmetal's variant form of angina induced by hyperventilation and tris-buffer infusion. *Circulation* **58**: 56, 1978
9. Feldman RL, Hill JA, Whittle JL, Conti RC, Pepine CJ: Electrocardiographic changes with coronary artery spasm. *Am Heart J* **106**: 1288, 1983