INTRODUCTION

Acute coronary syndromes including acute myocardial infarction and unstable angina pectoris are commonly caused by unstable coronary atherosclerotic lesions, which contain abundant matrix metalloproteinases and macrophages in lipid-rich core underlying thin fibrous cap [1-3]. The disorders usually develop as a result of concomitant conditions, including hypertension, dyslipidemia, diabetes, smoking, lack of exercise, and obesity [4-6], which mostly occur in male patients over the age of 40 [4,7,8]. Because acute coronary syndromes develop 7 to 10 years later in women than in men [4,9], they are extremely rare in young women. Here, we report an unusual case of a young woman aged 22 years old with unstable angina.

CASE REPORT

A 22-year-old woman, who had suffered from worsening effort angina for a month, was admitted to our department in Kurume University Hospital. She had a 3 pack-year smoking history from the age of 16 through 21. Further, she had taken 0.15 mg/day of desogestrel and 0.03 mg/day of etinilestradiol since 18 years old due to menstrual disorder. However, she did not have other past history of risk factors such as atherosclerosis, including hypertension, dyslipidemia, diabetes, obesity, Kawasaki disease or persistent fever of unknown cause. She had a habit of walking for 1 h every day. Her blood pressure was 110/62 mmHg, heart rate was 60 beats per minute, body weight was 57 kg, body height was 162 cm (BMI 21.7), and body temperature was 36.0 ºC. Other vital signs and physical findings were unremarkable. No abnormality was identified in laboratory tests (Table 1). Antinuclear antibodies and antineutrophil cytoplasmic antibodies were negative. Electrocardiography and chest X-ray did not show any specific abnormalities (Fig. 1). Cardiac ultrasound also showed no left ventricular abnormalities and no valvular diseases. Coronary computed tomography angiogram showed severe atherosclerotic changes with calcification in the proximal segment of the right coronary artery (Fig. 2). Coronary angiogram also showed severe atherosclerotic stenosis with calcification in the proximal segment of the right coronary artery (Fig. 3A). Optical frequency domain imaging showed eccentric intimal hyperplasia and calcification, both of which suggested the presence of neoaorterossclerosis (Fig. 4). Due to the positive exercise test (Fig. 5), we
performed percutaneous coronary intervention for the stenotic lesion, using drug-eluting balloon (Fig. 3B). Currently, she has no chest symptoms.

**DISCUSSION**

Acute coronary syndromes are one of the leading causes of death in adults. It has been reported that significantly less than 10% of all individuals presenting with documented coronary artery disease are under the age of 40 years [10]. It has been classically reported that cigarette smoking and contraceptive use were important risk factors in women [10], as was the case with this patient. Non-arteriosclerosis-related coronary artery diseases, such as idiopathic vasculitis syndrome, Kawasaki disease and Takayasu arteritis, were absent in the present case [11].

Although it is assumed that exposure to endogenous estrogens during the fertile period of life delays the manifestation of atherosclerotic disease in women [9], oral contraceptives may increase the risk of coronary artery diseases by activating coagulation factors

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**TABLE 1.**

*Laboratory data at the time of admission to our hospital*

| Parameter                  | Recorded value | Standard value       |
|----------------------------|----------------|----------------------|
| White blood cell count     | 5.8 × 10^3/μL | 3.3-8.6 × 10^3/μL    |
| Hemoglobin                 | 13.1 g/dL     | 11.6-14.8 g/dL       |
| Platelet                   | 245 × 10^3/μL | 158-348 × 10^3/μL    |
| C-reactive protein         | 0.05 mg/dL    | <0.14 mg/dL          |
| Aspartate aminotransferase | 23 U/L        | 13-30 U/L            |
| Alanine aminotransferase   | 23 U/L        | 7-30 U/L             |
| Blood nitrogen urea        | 10.3 mg/dL    | 8.0-20.0 mg/dL       |
| Creatinine                 | 0.6 mg/dL     | 0.4-0.8 mg/dL        |
| Sodium                     | 140 mmol/L    | 138-145 mmol/L       |
| Potassium                  | 4.1 mmol/L    | 3.6-4.8 mmol/L       |
| LDL cholesterol            | 117.8 mg/dL   | 65-139 mg/dL         |
| HDL cholesterol            | 88.4 mg/dL    | 40-103 mg/dL         |
| Triglyceride               | 110 mg/dL     | 30-149 mg/dL         |
| Glucose                    | 89 mg/dL      | 73-109 mg/dL         |
| NT-proBNP                  | 45.2 pg/mL    | <54.5 pg/mL          |
| Troponin-T                 | <0.010 ng/mL  | <0.10 ng/mL          |
| PT-INR                     | 0.95          | 0.85-1.15            |
| APTT                       | 34.9 sec      | 24-39 sec            |
| D-dimer                    | 0.5 μg/mL     | ≤1.0 μg/mL           |
| Protein C activity         | 90%           | 64-146%              |
| Protein S activity         | 84%           | 60-150%              |
| HBs antigen                | Negative      | Negative             |
| HCV antibody               | Negative      | Negative             |
| Syphilis serologic test    | Negative      | Negative             |
| Rheumatoid factor          | Negative      | Negative             |
| Antinuclear antibody       | Negative      | Negative             |
| Antineutrophil cytoplasmic| Negative      | Negative             |
| antibody                   |               |                      |
| Lupus anticoagulant        | Negative      | Negative             |
| Anticardiolipin antibody   | Negative      | Negative             |
| Immunoglobulin G4           | 21.8 mg/dL    | 4.8-105 mg/dL        |

PT-INR: international normalized ratio of prothrombin time, APTT: activated partial thromboplastin time
Fig. 1. Electrocardiogram and chest X-ray.

Fig. 2. Coronary computed tomography angiogram. Stenotic lesion with calcification in the proximal segment of right coronary artery.

Fig. 3. Coronary angiogram. A: Initial coronary angiogram. Stenotic lesion with calcification in the proximal segment of right coronary artery. B: Coronary angiogram after percutaneous coronary intervention.
such as fibrinogen [12]. Estradiol reduces the development of early lesions of atherosclerosis; however, once the atheroma is established, estrogens increase matrix metalloproteinases expression, which may promote disruption of the fibrous cap and subsequent rupture of the plaque [1,2,13]. It has been reported that an overall odds ratio of myocardial infarction was 2.5, and that smoking and hypertension increase the risk of myocardial infarction among oral contraceptive users [13,14]. In contrast, a prospective study has demonstrated that 53 out of 249,148 women (0.02%) who first used contraceptives at less than 20 years old had myocardial infarction during 11 years follow-up. That study also reported that the use of contraceptives was not associated with an increased risk of myocardial infarction, because most current users of contraceptives were taking low-dose estrogen and second- or third-generation progestins [15]. Further, in the United State, it has been reported that current use of low-dose contraceptives was unrelated to an increased risk of myocardial infarction among nonsmokers and light smokers, but not heavy smokers [16]. As we consider that our patient was a light smoker (10 cigarettes per day from 16 to 21 years old), it is unclear whether the combination of cigarette smoking and contraceptive use was the only cause of coronary atherosclerosis in the present study. However, it is still rare in a 22-year-old woman.

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