Case report - Congenital
Patch angioplasty and neo-ostium creation for intramural left coronary artery

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Abstract
Anomalous aortic origin of the coronary artery (AAOCA) is a rare cardiac anomaly which induces myocardial ischemia and is associated with sudden death. We operated on a 25-year-old female with syncopal episodes who had an intramural left coronary artery. A neo-ostium was created in the left sinus but the initial neo-ostium seemed small because of the hypoplastic intramural segment of the left coronary artery. Therefore, saphenous vein patch angioplasty was added for ostial enlargement. The patient was symptom-free at one year follow-up and exercise stress test was negative for ischemia.

Keywords: Congenital heart defects; Ischemic heart disease; Coronary surgery; Coronary anomaly; Patch angioplasty

1. Introduction
Incidence of anomalous aortic origin of the coronary artery (AAOCA) is approximately 1.0% [1]. AAOCA induces myocardial ischemia and causes sudden death even without prior clinical symptoms [2]. Physiologic repair has been reported lately because of inconsistent outcome of coronary artery bypass grafting (CABG) [3]. We describe our experience with a patient who underwent saphenous vein patch angioplasty in addition to neo-ostium creation for AAOCA.

2. Case report
The patient is a 25-year-old female who had first experienced chest discomfort on exertion and brief syncope at the age of 12. She had the same symptom one year later and underwent treadmill test and myocardial perfusion scintigraphy which were negative for ischemia. The patient, however, had progressively increasing symptom of chest discomfort three months prior to the operation, and chest pain was induced on treadmill test. Contrast computed tomography (CT)-scan revealed anomalous origin of the left coronary artery (LCA) from the right aortic sinus (Fig. 1a). Subsequent coronary angiography confirmed the diagnosis and also demonstrated normal right coronary artery (RCA) origin and no atherosclerotic coronary artery disease. Transthoracic echocardiography (TTE) showed preserved left ventricular ejection fraction and no valvular diseases. The patient subsequently underwent surgery under cardiopulmonary bypass with cardiac arrest in which the aorta and the pulmonary artery were completely transected for better exposure of the left main trunk (LMT). The LCA originated from the right aortic sinus with a small oval-shaped ostium, took an intramural course, and exited the aorta perpendicularly at the left aortic sinus.

Neo-ostium creation was chosen instead of total unroofing technique to prevent aortic insufficiency (AI) resulting from the detachment of the commissure. The initial neo-ostium, however, seemed too small to supply adequate left coronary flow, which was approximately 2 mm in diameter, and hence an incision was made longitudinally in the left aortic sinus extending to the epiaortic LMT. The left aortic sinus and the LMT were enlarged with a 25 mm long saphenous vein patch (Fig. 2). The native coronary ostium was left open to avoid possible thrombosis. Intraoperative transesophageal echocardiogram showed no AI.

Her postoperative course was uneventful. Postoperative contrast CT-scan showed wide-open left main orifice in the left sinus (Fig. 1b). The patient remains asymptomatic one year postoperatively, and exercise stress test was negative for ischemia.

3. Discussion
AAOCA is a rare cardiac anomaly with an incidence of 0.07% by coronary angiography, among which approximately 14% was anomalous LCA from the right aortic sinus [1]. AAOCA induces myocardial ischemia and causes sudden death even without prior clinical symptoms [2]. Hypoplasia...
and compression of the intramural segment of the coronary artery were reported as causes of ischemia, and the narrowing was further aggravated with exercise stress [1, 3, 4]. Surgical approaches include total unroofing procedure, creation of a neo-ostium without total unroofing of the intramural segment and direct coronary reimplantation [5–7].

Total unroofing procedure for the intramural segment crossing the aortic valve commissure would require detachment of the commissure which could result in AI [5].

Neo-ostium creation without total unroofing could be useful to avoid manipulation of the commissure [6]. Coronary reimplantation is reported to be useful for the limited number of patients with an anomalous left coronary artery with a distinct epiaortic segment which is not intramural course [7]. Coronary artery bypass grafting (CABG) could result in graft failure because the coronary artery stenosis is such a dynamic process in AAOCA [3].

Taking the anatomy of the present case into consideration, we adopted neo-ostium creation without total unroofing. Patch enlargement of the neo-ostium was also added because the initial neo-ostium seemed too small to provide adequate coronary flow [8].

We recommend patch enlargement of the small neo-ostium, which is determined by the narrow transitional area from the hypoplastic intramural segment to the epiaortic LMT.

Moreover, for fear of possible aortic perforation, it is considered difficult to adequately enlarge this transitional area only by incising the aortic wall. We anticipate that...
this approach decreases the remote risk for development of ostial stenosis as well. In terms of the patch material, we used a saphenous vein patch since it is thinner and easier to handle than an autologous pericardium and less susceptible to shrinkage of the repair site.

In conclusion, we performed saphenous vein patch angioplasty in addition to neo-ostium creation for anomalous LCA from the right aortic sinus with an intramural course and obtained good outcome. The neo-ostium could be small due to hypoplasia of the intramural segment as seen in the present case. Patch angioplasty is one of the useful options under this circumstance.

References


