Usefullness of a Transesophageal Echocardiography in Patients with Isolated Coronary Ostial Stenosis during a Surgical Angioplasty

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수술전 경감도 초음파도를 이용한 분리된 관상동맥
개구협착 환자의 치료

세종병원 심장내과 외래1· 평부외과2· 해부병리과3
고광곤·남기병·황홍곤·김관균·이상훈·최연현1· 최영희1
한재진2·이영탁2·박영원2·김주용2·윤동현3

=국문초록=

관상동맥 개구협착의 반도는 0.18%에서 2.7%로 보고되어 있으며, 분리된 개구협착의 반도는 더욱 적은 것으로 알려져 있으며 관상동맥수술이 우선적 치료법으로 되어 있다.

저자는 수술전 경감도 초음파도를 이용하여 심낭반의 개존과 좌심실벽 운동을 관찰한 경험을 하였기에 보고하는 바이다.

환자는 3명으로 평균나이 44±2세의 여자들로 8.7±8.3개월 동안의 운동시 홍통을 느껴 왔고, 설하 Nitroglycerin 투여로 홍통은 가라앉곤 하였다. 최근 들어 홍통의 정도와 횟수가 심해지기로 조사되었다. 이학적 소견상 3명 중 2명이 고혈압이 있고 마른체장지수(lean body mass index)는 각각 26으로 약간 비대한 편이었으나 3명 모두 검사상 당뇨병, 고지혈증, 매독, Takayasu 동맥염 소견은 없었고, 파거력상 혈면역과 가족력도 없었다. 운동부하검사상 2명은 Bruce법 위어양 업 단계와 I 단계내 각각 유도 II, III, aVF, 홍부유도 V3~6에서 하향방향 ST우부 3mm 하강소견을 보였고, 3명 모두 관상동맥 조영검사상 심한 좌측 개구협착을 보였다. 수술전 경감도 초음파도에서 3명 모두 좌측 개구협착을 보였다. 수술전 경감도 초음파도에서 3명 모두 좌측 개구협착을 보여 심낭을 이용한 개구성형술을 시행하였다. 수술중 혈착 부위에서
Introduction

The incidence of ostial stenosis has varied between 0.13 and 2.7%. In the majority of cases there is a coexisting disease in multiple coronary vessels. Isolated coronary ostial stenosis is a rare condition\(^1,2\).

Isolated ostial stenosis occurs predominantly in women, usually before menopause. It has been assumed that atherosclerosis, particularly early atheroma, is the most likely cause of this lesion\(^10\).

Surgical treatment is unanimously recognized as the treatment of choice for this condition. The conventional surgical treatment restores a less physiologic perfusion of the myocardium, leads to occlusion of the left coronary ostium and consumes an appreciable length of bypass material. Recently it has been reported that surgical angioplasty has its advocates in Europe and may be a preferable approach in the patient with isolated ostial or left main disease\(^3\).

We think that a transesophageal echocardiography(TEE) can help in getting diagnosis and extent of the coronary ostial stenosis. We also think that with the use of transesophageal echocardiography during a surgical angioplasty, we can know patency of the pericardial patch after weaning of the cardiopulmonary bypass and analyze ventricular wall motion from the short-axis view and help in improving surgical success rate and so, we did TEE in patients with isolated ostial stenosis.

Methods

Patients, between March 1989 and September 1990, 3 patients(0.74% of the total), all female, were found to have isolated coronary ostial stenosis among 406 patients undergoing coronary angiography. Isolated coronary ostial stenosis defined as a 50% or greater diameter stenosis of one or both coronary ostia.

Transesophageal echocardiography

Transesophageal color Doppler echocardiographic examinations were performed with an Aloka SSD-870 system(Tokyo) with the use of a transesophageal Doppler probe that included one 5-MHz transducer for transverse plane mounted on the end of a flexible endoscope from which the fiberoptics have been removed. Patients were fasted for at least 4 hours and received Buscopan\(^\text{®}\) 20mg and Valium\(^\text{®}\) 10mg, intramuscular 30 minutes before and mild local pharyngeal anesthesia immediately before the gastroscopy was inserted. The investigations were carried out in the supine left lateral position before an operation and supine position during an operation without any complication.

We observed patency of the pericardial patch with the basal short-axis scan and ventricular wall motion from the short-axis scan of the left ventricle at the chordal level with the transgastric approach.

Results

Clinical findings

Mean age of three patients was 44± 2 and all three were female. They presented with severe symptoms and there was no previous infarction. As risk factors for coronary disease, two of three had hypertensive history and all there were slightly obese because their lean body mass index were 26, 26 and 26. But they had no previous infarction. Also they had no previous history of diabetes mellitus, hyperlipidemia, smoking, family history
and Takayasu’s aortitis. Generally they presented with severe symptoms of short duration (8.7 ± 8.3 months) and a low incidence of coronary risk factors. Routine hematologic investigation in all showed a negative venereal disease research laboratory examination, sedimentation rate and lipid profile.

Case Reports

Case 1

A 45-year-old female visited our hospital for evaluation of frequent chest pain on exertion, first noted 18 months previously.

On physical examination, blood pressure was 180/100 mmHg. An electrocardiography revealed nonspecific ST-T change. An incomplete exercise electrocardiography revealed 3 mm downward ST segment depression in lead II, III, aVF, V3, V4, V5, and V6 at warming-up stage.

At cardiac catheterization the pressure, cardiac output, left ventricle function and its morphology all normal except a mild hypokinesia of basal septum. When the left coronary artery was engaged, there was abrupt fall in pressure at the catheter tip from 166 mmHg to 121 mmHg and there was a distortion of pressure wave configuration. Coronary angiography showed 90% ostial stenosis of the left coronary artery (Fig. 2). The right coronary artery showed patent. There was no complication in cardiac catheterization. A preoperative TEE showed a narrowing of the left coronary ostium. She underwent surgical angioplasty with a fresh autologous pericardial patch. Biopsy was performed at the aortic arteriotomy site. Operation finished after an intraoperative TEE.

Case 2

A 45-year-old female visited our hospital for evaluation of frequent chest pain on exertion, first noted six months previously.

On physical examination she was slightly obese, but had no previous history of hypertension, diabetes mellitus, hyperlipidemia and smoking. An electrocardiography showed a normal finding. An incomplete exercise electrocardiography revealed 2 mm downward ST segment depression in lead II, III, aVF, V3, V4, V5 and V6 at stage I (Fig. 1).

At cardiac catheterization the pressure, cardiac output, left ventricular function and its morphology were all normal. When the left coronary ostium was engaged, there was abrupt fall in pressure from 120 mmHg to 30 mmHg. Coronary angiography showed 80% ostial stenosis of the left coronary artery and patent right coronary artery.

There was no complication in cardiac catheterization. A preoperative TEE showed a narrowing of the left coronary ostium and slightly anomalous displacement of the coronary ostium from its usual position (Fig. 3).

She underwent surgical angioplasty with a fresh autologous pericardial patch. Biopsy was performed at the aortic arteriotomy site. Operation finished after an intraoperative TEE.

Case 3

A 41-year-old female presented with a two month history of typical angina of effort. On physical examination blood pressure was 180/110 mmHg. She was slightly obese but had no previous history of diabetes mellitus, hyperlipidemia and smoking. An electrocardiography showed a normal finding. An exercise electrocardiography was not done because of severe frequent chest pain.

At cardiac catheterization the pressure, cardiac output, left ventricular function and its morphology were all normal. When the left coronary ostium was engaged, there was abrupt fall in pressure.

Coronary angiography showed 90% ostial stenosis of the left coronary artery and patent right coronary artery. There was no complication in cardiac catheterization. A preoperative TEE revealed a narrowing of the left coronary ostium.
Fig. 1-A, B.  
A, an electrocardiography at rest was normal.  
B, an incomplete exercise electrocardiography revealed 2mm downward ST segment depression in lead II, III, aVF, V₃, V₄, V₅ and V₆ at stage I (case 2).

Fig. 2-A, B.  
Anteroposterior(A) and left anterior oblique cranial projection(B). Ninety percent of the left coronary ostium is apparent at the catheter tip(case 1).
three major coronary branches. Myocardial function was well preserved in all patients.

A unique feature was the complete absence of an angiographically definable collateral circulation from either ipsilateral or contralateral vessels.

Operative findings

Case 1. There was mild calcified yellow atheromatous material in the aortic wall and entire left main coronary artery, just before branching into the left anterior descending and circumflex coronary artery.

Case 2. The left coronary ostium displaced slightly posterior from its usual position. There was mild yellow atheromatous material in the aortic wall and the left coronary ostium. There was no calcification.

Case 3. There was mild yellow atheromatous material in the aortic wall and the left coronary ostium. There was no calcification.

Intraoperative TEE findings

Case 1. Left ventricular wall motion showed normal except a mild hypokinesia of basal septum from the short-axis view with the transgastric approach. The pericardial patch was patent wi-
without collapsed findings after weaning of the cardiopulmonary bypass with the basal short-axis scan(Fig. 4).

Case 2. With the basal short-axis scan, the pericardial patch was patent without collapsed findings and the left ostium showed a widened finding (Fig. 5).

Case 3. After weaning of the cardiopulmonary bypass the pericardial patch was patent without collapsed findings and the left ostium showed a winded appearance with the basal short-axis scan.

Histopathologic findings
All three patients showed atherosclerotic findings(Fig. 6).

Follow-up
The follow-up is complete and averages 7 months(5 to 9 months) in case 2 and 3. They are free of chest pains on exertion. Case 1 patient had had no problems by 4 hours after a surgical angioplasty but suddenly died. We think that the cause of death may be an acute myocardial infarct.

Fig. 6. Histologic section. This arterial vessel wall exhibits subintimal collections of lipid laden macrophages interspersed by collagen bundles, the finding of atherosclerotic plaque(case 3)(Hematoxylin-eosin×40).
Discussion

Thompson et al. reported that only 27 patients with isolated coronary ostial stenosis had been reported in the world literature and twenty five of these patients had been women and in one case sex was not specified. In marked contrast to patient with atherosclerotic ostial stenosis, patients with isolated coronary ostial stenosis are mostly young to middle-aged females and presented with severe symptoms of short duration and a low incidence of coronary risk factors.

The etiology is entirely unknown but the presence of Takayasu’s aortitis, syphilitic aortitis, iatrogenic causes, congenital ostial membrane of the left coronary artery and hypoplasia or atresia of coronary ostium have been reported. However, among adults it has been assumed that atherosclerosis, particularly early atheroma, is the most likely cause. Histologic studies revealed atherosclerotic changes in our three cases. By virtue of the extensive areas of myocardium placed in jeopardy, patients with coronary ostial stenosis, particularly of the left coronary artery, are at high risk of myocardial infarction and premature death. And so surgical treatment is unanimously recognized as the treatment of choice for this condition, with reported 5-year survival rates higher than 85%.

But conventional bypass grafting yields some unfavorable sequelae: occlusion of the left main coronary artery, competitive flow and even the steal phenomenon when two bypass grafts are used and retrograde perfusion of an extensive myocardial area when only one bypass graft is constructed. Moreover, saphenous grafts are not protected from the aortic systolic pressure wave. This may accelerate distal atherosclerosis.

Direct surgical angioplasty avoids these inconveniences and would even allow percutaneous transluminal coronary angioplasty of distal coronary stenosis developing at later stage. In the recent surgical angioplasty has its advocates in Europe. Dion et al. reported that a fresh autologous pericardial patch was preferred to a saphenous vein patch because of the excellent long-term appearance of such patches having been used for aortic root enlargement in contrast to the widely known prevalence of saphenous graft failure in the long term.

Although there is a selection bias in our cases, the incidence of isolated ostial stenosis is higher than that reported previously. With the case of transesophageal echocardiography during a surgical angioplasty, we can know patency of the pericardium patch with the basal short-axis scan after weaning of the cardiopulmonary bypass, reoperate if the finding of collapse is present and also analyzed ventricular wall motion from the short-axis view of the left ventricle at the chordal level with the transgastric approach, we can detect acute regional myocardial ischemia early and help in improving surgical success rate.

Case 2 and 3 patients increase exercise capacity and are free of exertional chest pain following surgical angioplasty until now. but case 1 patient suddenly died four hours later following surgical angioplasty. In case 1 patient, although there was no calcification or atherosclerotic changes in the left ostial stenosis on the preoperative angiogram, operative findings revealed that there was mild calcified atheromatous material in the aortic wall and entire left main coronary artery, just before branching into the left anterior descending and circumflex coronary artery. Operator decided to doing angioplasty without doing coronary bypass graft. The reasons for still attempting an angio- plast of the left ostium were the following: there was no calcification on the preoperative angiogram; there was no peripheral stenosis except the left ostial and entire left main stenosis; she was 45-year-old young female; left ventricular wall motion showed no acute regional myocardial ischemia with an intraoperative transesophageal
echocardiography.

By Dion et al\(^3\), five of 23 surgical angioplasties failed, four of five failures occurred in patients older than 60 years in whom calcifications of the left main stem had been on the preoperative angiogram. Four of five failed patients were asymptomatic without sequel by means of conventional grafting of the left anterior descending coronary artery.

In case 1, systolic blood pressure dropped 4 hours after an uncomplicated angioplasty for an ostial stenosis and cardiac arrest occurred. We planned emergency bypass graft while doing external cardiac massage and multiple defibrillation attempts but we failed to restore a satisfactory cardiac activity and death occurred 3 hours later. The patient’s family refused doing an autopsy and so we didn’t it. The cause of death may be an acute myocardial infarction. The reasons were followings: patency of the pericardium patch and left ventricular wall motion kept good with the use of an intraoperative TEE during a surgical angioplasty; cardiac arrest occurred 4 hours after an angioplasty; there was a ST segment elevation on an electrocardiographic monitoring before cardiac arrest occurred.

In case 2, the left coronary ostium displaced slightly posterior from the usual position. It is generally believed, however, that the slightly anomalous displacement of the coronary ostium from its usual position is of no consequence for the coronary circulation by Paulin’s report\(^2\).

The clinical and angiographic profile of our patients accorded to Thompson’s report well: histopathologic examinations all showed typical atherosclerosis; they presented with a short duration of severe angina; they had a low incidence of risk factors; there was the complete absence of an angiographically definable collateral circulation from either ipsilateral or contralateral vessels.

Conclusion

We suggest that with the use of a preoperative TEE, we can get more information about diagnosis and extent of the coronary ostial stenosis and also we can help in improving surgical success rate by observing patency of the pericardium patch and analyzing ventricular wall motion with the use of an intraoperative TEE during a surgical angioplasty.

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References


