Indications of Operation upon the Heart as viewed from Coronary Arteriographic Findings

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With the purpose of establishing diagnosis in cases of chest pain or arrhythmias of unknown etiology and of determining indications for surgical operation selective coronary arteriography was performed above 300 times in a series of 75 such cases with satisfactory results and without any serious complications.

Surgery is decided upon when medical treatment has proved to be ineffective or when there is definite heart failure due to coronary insufficiency using coronary arteriographic findings, clinical symptomatology and ECG as reference. At the present time transplantation of a blood vessel into the myocardium is generally considered to be indicated in cases of grade I by the severity classification of the New York Heart Association but with evidence of stenosis involving 2 or more branches on roentgenologic examination or in those of grades 2 and 3 of the above classification showing a high degree of stenosis of more than one branch.

In the following some illustrative cases are briefly described.

Case 1 is a 54-year-old male who had anterior chest pain radiating to the back of about 5 years' duration and who presented inverted T waves and ST depression on ECG and was classified as grade 2.

On coronary arteriography, however, the trunks of coronary arteries were somewhat thinner than normal and sclerotic but without any localized stenosis. Changes were thus not marked enough to warrant surgery and the patient is now under observation (Fig. 1).

Case 2 is a 53-year-old male who had had hypertension and nocturnal cardiac asthma-like attacks for the past 2 years or so, during which time he had several episodes of heart failure. There were atrial fibrillation, depression of ST segment and inverted T waves on ECG and a cardiac enlargement on chest X-ray, leading to the probable diagnosis of heart failure due to hypertension and coronary insufficiency. Coronary arteriography revealed underdevelopment of the circumflex branch with a 50 to 90% stenosis of the anterior descending branch. Transplantation of the arteria thoracica interna was performed with favorable postoperative course. Unfortunately, however, he died then of cerebral hemorrhage at the 11th postoperative day (Fig. 2).

In case 3 the patient was a 52-year-old male, who developed anginal attacks (while at rest of grade 3) subsequently to left anterolateral infarction. ECG demonstrated ST depression and inversion of T waves, while coronary arteriography revealed a 50 to 90% stenosis of the anterior descending branch and above 90% stenosis of the circumflex branch. The arteria thoracica interna sinistra was transplanted into the anterolateral wall of the left ventricle. The patient is now progressing favorably after the operation (Fig. 3).

Case 4 is a 55-year-old male patient who developed angina pectoris on exertion 3 years previously. His condition then progressed to the point of attacks occurring even at resting now. Before hospitalization he had 5 to 6 episodes of attacks daily and his state was of grade 3 of the aforementioned classification. ST depression recognizable on resting ECG became more extensive and pronounced during an attack. Coronary arteriography demonstrated above 90% stenosis of the orifice of the left coronary artery and a well developed bypass connecting between the

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right coronary artery and the left anterior descending branch. These cardiovascular changes were supposed to be of syphilitic origin, the patient giving a strongly positive Wassermann reaction. There was also noted a mild degree of ASI. In view of the presence of an extensive ischemic area surgical treatment was carried out by transplanting the left internal thoracic artery.
Fig. 5.

Fig. 6.

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and the right gastroepiploic artery into the anterior wall and lateral wall respectively of the left ventricle. In a matter of 3 months after operation the patient was entirely free from anginal attack and discharged (Fig. 4).

Case 5 is a 42-year-old male patient with exertional angina pectoris belonging to the category of grade 2 according to the said classification. Whereas almost no abnormalities were seen on resting ECG, definitely positive findings including ST depression and emergence of inverted U waves were obtained on Master's two-step test. Coronary arteriography demonstrated a 50 to 90% stenosis of the anterior descending branch in a portion just distal to its origin, thinning and hence sclerosis of peripheral portions of the anterior descending and circumflex branches, and a well delineated bypass between the right coronary artery and a distal portion of the anterior descending branch. In this case the left internal thoracic artery was transplanted into the anterior wall of the left ventricle. His postoperative course was uneventful and he soon was discharged entirely freed from the attack (Fig. 5).

Lastly, a comparison was made between changes in resting ECG and roentgenographic findings by collating ECGs in leads of I, aVr, V₂ and V₆ with radiographic findings of the left coronary artery and ECGs in leads II, III and aVF with radiographic findings of the right coronary artery, respectively. The results may be summarized as follows (Fig. 6):
1. There were not a few instances in which abnormal coronary arteriographic findings were obtained in the presence of normal ECG;
2. There were also many cases who conversely showed abnormal ECG findings with an apparently normal ECG; and
3. Most severe degrees of changes in coronary arteries, e.g., above 90% stenosis or obstruction, were always associated with abnormal ECG findings.

From the case report and the results of the comparative study of ECG and roentgenographic findings mentioned above it is apparent that there is not necessarily a correlation between coronary arteriographic findings and resting ECG changes. We believe that decision as to whether or not surgery should be resorted to in a given coronary artery disease patient must be made on the basis of proper evaluation of existing clinical symptoms, coronary arteriographic findings as well as of ECG findings obtained both at resting and during exercise.