

## Adult Patient with Anomalous Origin of Anterior Interventricular Artery at Main Pulmonary Artery

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From all congenital cardiopathies, anomalous origin of anterior interventricular artery occurs once per 300,000 live births, reporting high mortality in the first year after birth. However, if good collateral circulation is available for the artery related to the abnormality, the patient may be kept asymptomatic until mature age. This is the report on a rare case of a 43-year-old patient who was oligosymptomatic, with normal ventricular function in this pathology presentation. The patient was submitted to surgical treatment with no extracorporeal circulation.

### Introduction

Anterior interventricular artery from main pulmonary artery is a rare, low incidence and high mortality rate disease within the first year of life, and is responsible for approximately 0.24% of congenital cardiopathies<sup>1</sup>. Given the early manifestation of symptoms – most times quite severe – high mortality is reported in the first year of life<sup>2</sup>. If symptoms are not manifested in childhood, this cardiopathy may reach diagnosis in the second or third decade in life. The presence of collateral circulation on anterior interventricular artery distal groove explains the few number of symptoms or their absence<sup>3,4</sup>. Surgical treatment is the choice option for such cases; however, hardly ever can it be postponed until adult life<sup>1</sup>.

Our purpose is to report on a case of anomalous origin of anterior interventricular artery from main pulmonary artery. The adult patient presented coronary heart disease symptoms which disappeared after surgical treatment without extracorporeal circulation.

### Case Report

A 43-year-old male patient, working as a street sweeper, was assisted for complaints of precordial pain on light effort. The pre-ordial pain had been associated to dyspnea for

8 years, with relief at rest. The patient denied any other risk factor for coronary atherosclerotic disease. The patient reported having been treated for urinary infection one month prior to hospitalization, as well as previous surgical correction for bilateral inguinal hernia, and surgery on right knee meniscus. The patient was on propranolol (80 mg/day), isosorbide (30 mg/day) and acetylsalicylic acid (200 mg/day). Blood pressure was 110 x 80 mmHg and heart rate 60 beats per minute on physical examination. The patient was feverish, acyanotic, presented facial redness and good peripheral perfusion. Cardiopulmonary auscultation was normal, with no abdominal mass or visceromegalies on palpation. Peripheral pulses were symmetric and normal.

Laboratory exams showed total cholesterol at 172 mg/dl, HDL 54 mg/dl, LDL 105 mg/dl, triglycerides 93 mg/dl, glycemia 93 mg/dl and all other exams within normal range. Sinus-ECG, no conduction disorders or ischemic changes. Thoracic X-ray showed normal cardiac area and pulmonary vasculature. Tread mill test was positive for myocardial ischemia.

In the face of the diagnostic hypothesis of atherosclerotic coronary heart disease, the indication was cinecoronariography, which did not give evidence of coronary lesions, but did show that anterior interventricular artery originated from main pulmonary artery; left coronary branch was formed by circumflex and diagonalis arteries (calibrous), and right coronary was non-dominant (Figure 1). Left ventricle was normal. By the end of contrast injection in right coronary artery the anterior interventricular artery could be seen up to pulmonary branch through collateral circulation (both from right coronary artery and circumflex artery). Systolic, mean, an diastolic pulmonary pressures were respectively 44mmHg, 22 mmHg, and 12 mmhg.

Once anomalous origin diagnosis had been defined for anterior interventricular artery at main pulmonary artery, myocardial revascularization surgery with no extracorporeal circulation (ECC) was the choice for treatment. The patient was referred to surgical treatment, which included: median sternotomy with posterior dissection of left internal thoracic artery; opened pericardium view showed cardiac chambers slightly enlarged; anterior interventricular artery was then exposed and stabilizer was put in place; anterior interventricular artery was opened and intracoronary perfusor (shunt) deployed to keep native blood flow; termino-lateral anastomosis of left internal thoracic artery was initiated with the interventricular artery larger than 3.5 mm-diameter; perfusor was removed before full closing of anastomosis; anterior interventricular artery was then ligated at its origin at pulmonary artery; after hemostasis review, a

### Key words

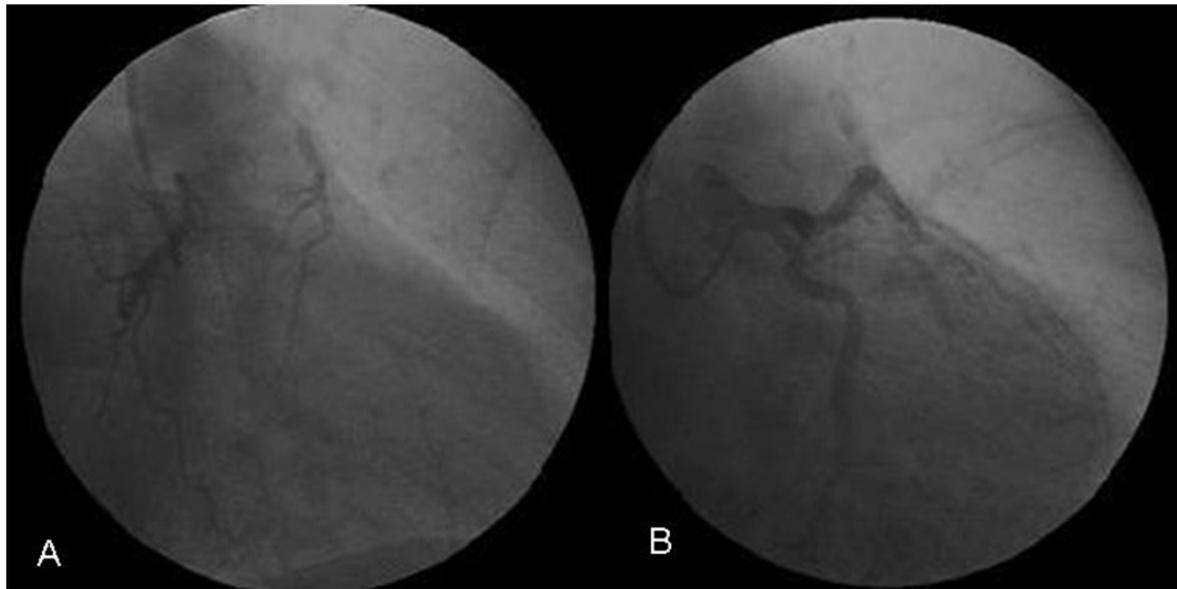
Adult; heart defects, congenital; pulmonary artery/surgery.

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**Figure 1** - Diagnostic Cineangiography. A: Through collateral circulation, contrast injection in right coronary fills anterior interventricular artery, which drains to main pulmonary artery . B: Injection in left coronary branch also filling anterior interventricular artery.

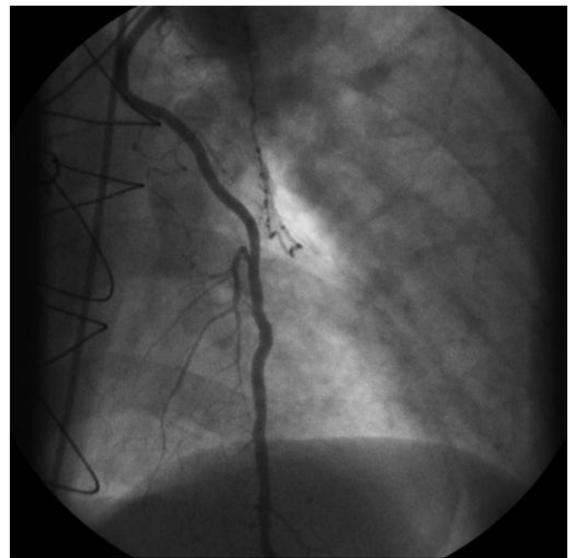
mediastinal drainage was put in place as well as a temporary pacemaker electrode in right ventricle anterior wall; esternal and skin suture followed. No intercurrents were reported postoperatively and the patient was discharged from the ICU after two days. Hospital discharge occurred on day 5 after the surgery. No intercurrents were reported.

Post-surgical course was excellent, and the patient has been asymptomatic ever since. On June 15, 2006, 33 months after the surgery, a control heart catheterism was performed. Excellent late surgical results were reported (Figure 2). The patient was submitted to effort test in January, 2007, with negative results for ischemia.

## Discussion

The anomalous origin of anterior interventricular artery at main pulmonary artery is a rare congenital abnormality. Incidence is 0.24%; occurrences are 1:300,000 live births. Mortality rate is high, ranging from 80%<sup>2</sup> to as high as 93%<sup>1</sup> in the first year after birth. This myocardial ischemia causing cardiopathy presents the following predominant symptoms: heart failure typically associated to enlarged cardiac area, and signs of mitral regurgitation from papillary muscle ischemia. Symptoms manifestation usually occurs in the first weeks after birth, but may be discreet or non-existent, which would reveal cardiopathy only in adult age<sup>3,5</sup>.

The availability of collateral circulation for an ischemic area may protect it from a more relevant muscular loss under an acute scenario. Chronic coronary occlusion may occur concurrently to totally normal ventricular function<sup>4</sup>. Coronary artery disease patients submitted to elective percutaneous coronary angioplasty are excellent



**Figure 2** - Contrast injection in anastomosed left internal thoracic artery in anterior interventricular artery.

illustrations to confirm the relevance of collateral circulation in preserving or reducing muscular loss in a coronary acute occlusion. Cohen & Rentrop<sup>4</sup> have demonstrated the direct relationship between the degree of collateral circulation, the electrocardiographic changes, and ischemia area on left ventriculography. Likewise, patients on well-developed collateral circulation report less precordial pain on effort after coronary occlusion<sup>4</sup>.

## Case Report

The anomalous origin of anterior interventricular artery at pulmonary branch is rare, and its manifestation at adult age is even less frequent, especially if the patient presents very few symptoms. Surgical treatment should be the conduct whenever necessary, provided there is myocardial viability<sup>5</sup>. However, when identified after birth, the surgical approach must be postponed and replaced by drug therapy in the period between 18th month and 7 years of age<sup>1</sup>. That could be done in three different ways: 1) ligation of main branch anterior interventricular artery only<sup>5</sup>. Pressure gradient between coronary arterial system and pulmonary branch lead flow from anterior interventricular artery to the pulmonary system via well-developed collateral circulation, in which case ligated anterior interventricular artery redirects collateral circulation to myocardial musculature<sup>3</sup>, which could be – or not – sufficient to eliminate symptomatology<sup>4,5</sup>; 2) anterior interventricular artery reimplantation in the aorta; 3) a combination between anterior interventricular artery ligation and left internal mammal artery anastomosis or saphenous vein graft in AD.

Myocardial revascularization through venous graft without the use of ECC has become widely utilized in medical practice since last decade. Acquired experience and technical

improvement contributed for its use in other areas which had not been investigated before<sup>6</sup>. Today, left internal thoracic artery anastomosis to anterior interventricular artery is utilized as a choice option due to lower morbidity and mortality rates, in addition to the elimination of symptoms and long-term permeability<sup>6</sup>. The conclusion is that for these patients, the use of the myocardial revascularization technique without the use of ECC and using left internal thoracic artery, followed by anomalous artery ligation in its origin – pulmonary branch – was shown to be an excellent therapeutic method. Despite being a single case, it presented good late development.

### Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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### Study Association

This study is not associated with any graduation program.

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