A large pseudoaneurysm of the left cardiac ventricle in a 57-year-old patient after urgent coronary artery bypass grafting and surgical mitral valve replacement due to acute myocardial infarction

Joanna Wieczorek, Katarzyna Mizia-Stec, Anna Rybicka-Musialik, Piotr Janusiewicz, Marcin Malinowski, Marek A. Deja

Independent Public Clinical Hospital No. 7, Medical University of Silesia in Katowice, Prof. Leszek Giec Upper Silesian Medical Centre, Katowice, Poland

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CASE REPORTS

Abstract
We present a rare case of a left ventricular pseudoaneurysm in a patient after inferior wall myocardial infarction. The infarction was complicated with acute mitral insufficiency, pulmonary edema, and cardiogenic shock. Urgent surgical mitral valve replacement and coronary artery bypass grafting were performed. After several months, the patient was hospitalized again because of deterioration of exercise tolerance and symptoms of acute congestive heart failure. A large pseudoaneurysm of the left ventricle was recognized and successfully treated surgically.

Key words: left ventricular pseudoaneurysm, acute myocardial infarction.

Streszczenie
W pracy zaprezentowano rzadki przypadek tętniaka rzekomego u pacjenta po zawale ściany dolnej mięśnia sercowego. Zawał powikłany był ostrą niedomykalnością zastawki mitralnej, obrzękiem płuc i wstrząsem kardiogennym. W trybie pilnym wykonano pomostowanie aortalno-wieńcowe oraz implantowano zastawkę mechaniczną w pozycję mitralną. W ciągu kilku następnych miesięcy u chorego zaobserwowano pogorszenie tolerancji wysiłku i zaostrzenie niewydolności serca. Podczas ponownej hospitalizacji u pacjenta rozpoznano ogromnego tętniaka rzekomego ściany dolnej, którego z dobrym efektem leczono chirurgicznie.

Słowa kluczowe: tętniak rzekomy, ostry zawał mięśnia sercowego.

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Address for correspondence: Joanna Wieczorek, Independent Public Clinical Hospital No. 7, Medical University of Silesia in Katowice, Prof. Leszek Giec Upper Silesian Medical Centre, Katowice, Poland, 45/47 Ziolowa St., 40-635 Katowice, phone: +48 504 243 701, e-mail: wie.joanna@gmail.com
a small paravalvular leak directed into the false aneurysm’s lumen was visualized (Fig. 1B). Coronary angiography demonstrated an 80% constriction in the right coronary artery with its distal occlusion as well as diffuse lesions up to 40% in the circumflex artery and the marginal branch. By-pass angiography visualized the normal functioning of the Ao-RCA bypass with mural changes; the Ao-OM bypass or its stump were not visualized. Contrast-enhanced multislice computed tomography of the heart confirmed the presence of a large false aneurysm exiting the posterior and inferior wall; max. dimensions: 79.3 mm × 75.3 mm, entrance size: 51.8 mm (Fig. 2).

After consultation with a cardiac surgeon, the patient was qualified for surgical treatment. Under extracorporeal circulation, a large aneurysm was found on the inferior wall at the base of the heart; it was strongly attached to the pericardial sac and perforated during attempts to dissect it. The aneurysm’s entrance encompassed the area from the interventricular septum and the mitral annulus on one side to the origin of the anterolateral papillary muscle on the other, extending across approximately half of the inferior wall in the direction of the apex. A Dacron patch (approx. 5 × 5 cm in size) was fixed on the side of the left ventricular lumen with single 2-0 polyester mattress sutures on Teflon pledgets and tied on Teflon strips on the side of the free wall, thus recreating the normal shape and dimensions of the left ventricular cavity. The remaining wall of the aneurysm was closed in an overlapping tile-like manner above the Dacron patch (Fig. 3).

Control echocardiography revealed: 4C – end-diastolic volume (EDV) 182 ml, end-systolic volume (ESV) 122 ml, left ventricular ejection fraction (LVEF) 33%; 2C – EDV 165

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**Fig. 1.** Echocardiographic examination. **A)** Apical two-chamber view. **B)** Apical two-chamber view: the jet of a paravalvular leak directed into the false aneurysm cavity.

**Fig. 2.** Contrast-enhanced computed tomography of the heart – before the cardiac procedure. **A)** Longitudinal section of the left ventricular wall and the sac of the false aneurysm. **B)** Three-dimensional reconstruction. **C)** Ventriculographic reconstruction (“glass heart” technique).
A large pseudoaneurysm of the left cardiac ventricle in a 57-year-old patient...

ml, ESV 133 ml, LVEF 19% (initially: 4C – EDV 184 ml, ESV 129 ml, LVEF 30%; 2C – EDV 478 ml, ESV 455 ml, LVEF 5%). No perioperative complications were noted. Three months after the surgery, the patient was in functional NYHA class II. Control echocardiography and computed tomography (Fig. 4) confirmed a reduction of left ventricular dimen-

Fig. 3. Intraoperative photographs. A) The opened pericardial sac and the aneurysm, partially dissected from the parietal pericardium; bloody material effusing through the thinned wall. B) The interior of the left ventricle after the opening of the aneurysm, its thin wall, the mitral valve on the right side, and LVOT on the left. C) The partially sutured Dacron patch. D) The patch after completion of suturing. E) The ventricular wall is sutured over in layers with the aneurysm tissue; on the right side, a Teflon strip is visible, strengthening the area of the aneurysm entrance. F) The final result – control uncovering of the heart after restoration of circulation.
sions, an improvement of left ventricular ejection fraction (35%), and no signs of an aneurysm.

**Discussion**

A myocardial pseudoaneurysm (false aneurysm) is a complication that is rare and difficult to discover during a routine examination, but which can result in severe consequences. It develops as a result of myocardial free wall rupture, and its external boundary is constituted by the pericardium. Pseudoaneurysms, even if small and asymptomatic, tend to rapidly expand their dimensions, which increases the risk of their rupture and consequent life-threatening tamponade [1, 2]. Late myocardial rupture, as in the described case, occurs within days or years after the myocardial infarction or the cardiac surgery procedure and results in the development of a false aneurysm; if the lesion does not cause any symptoms, it may go unnoticed and therefore remain untreated [3].

The factors predisposing to the development of a left ventricular pseudoaneurysm include primarily: myocardial infarction, cardiac surgery procedures (especially mitral valve replacement and coronary bypass grafting), injuries, and infections [4]. False aneurysms are encountered in 4% of patients who suffered an infarction and in 23% of patients who died as a result of it [5]. It is postulated that inferior wall infarctions are the most common risk factor for left ventricular pseudoaneurysm development, predisposing to this lesion twice more frequently than anterior wall infarctions [6]. False aneurysms are most often located on the anterior, inferior, or lateral wall or on the apex of the heart [1, 6], which stems from the protective action of the pericardial sac and the restricted possibility of aneurysm expansion in these locations. Due to the overlap of several factors, the described patient was burdened with a relatively high risk of pseudoaneurysm development.

The most frequently observed subjective symptoms, also typical of, e.g., coronary artery disease, include symptoms of congestive circulatory failure (36%), anginal pain (30%), and dyspnea (25%); less commonly, ventricular arrhythmias may be encountered, as well as less specific symptoms: cough, vertigo, or impaired mental function [3, 6, 7]. Notwithstanding, it is estimated that over 10-12% of patients may remain asymptomatic [1, 6, 7]. The situation is similar as regards objective signs. Changes observed in chest X-ray (cardiac silhouette enlargement), ECG (persistent postinfarction ST-segment elevation, which can also occur in the case of a true left ventricular aneurysm [5]), and physical examinations (murmurs present in approximately 70% of patients [3]) are often nonspecific; however, in combination with detailed medical history and risk factor evaluation, they may suggest a preliminary diagnosis [6]. The symptoms may often erroneously suggest mitral insufficiency. In patients after mitral valve replacement, as was the case with our patient, the possibility of a dysfunction of the prosthetic valve or a paravalvular leak should also be taken into consideration [6]. The frequency of false aneurysm development after mitral valve replacement is

**Fig. 4.** Contrast-enhanced computed tomography of the heart – after the cardiac procedure. **A, B)** Longitudinal section of the left ventricular wall. **C)** Three-dimensional reconstruction
low, being estimated at between 0.02% and 2.0% [2]. In
the case of the described patient, it is difficult to unequivo-
cally pinpoint the moment at which the false aneurysm de-
veloped. The process was most likely initiated during the
perioperative period; it is worth underscoring that the pro-
cedures of coronary artery bypass grafting and mitral valve
replacement were performed in emergency mode during the
acute phase of myocardial infarction.

Cases of embolism with thrombotic material originating
from the lumen of the false aneurysm have been described
[1, 3]. Another factor predisposing the studied patient to
embolism was paroxysmal atrial fibrillation. However, the
patient received continuous anticoagulative treatment (on
account of the prosthetic mitral valve), and no systemic
embolism was observed. On the other hand, the paraval-
cular leak flowing in the direction of the aneurysm cavity
restricted the possibility of thrombus formation.

In order to determine the further course of action, it is
important to differentiate between true and false an-
erysms – in the case of the former, the myocardium un-
dergoes local dilatation, not rupture. False aneurysms are
characterized by a relatively high risk of rupture; there-
fore, urgent surgical treatment is recommended. The op-
erative risk in this case is lower than the risk associated
with further conservative treatment [4-8]. The establish-
ed methods of examination aimed at forming a diagno-
sis include transthoracic/transesophageal echocardiogra-
phy, magnetic resonance tomography, ventriculography,
computed tomography, and radionuclide imaging [5, 6,
8]. Echocardiography is a useful form of preliminary ex-
amination, enabling the assessment of myocardial injury
or dyskinesia as well as the maximal dimensions of the
aneurysm’s entrance and sac. The diagnosis of a false an-
erysm may be indicated by myocardial rupture as well as
by a clear boundary between the ventricular wall and
the aneurysm wall, usually constituted by thickened peri-
cardial plaques. A narrow aneurysm entrance followed by
a large dilation of the aneurysm sac may also indicate this
diagnosis [2]. However, echocardiography is not always
able to distinguish between the two lesions, especially if
they are chronic in nature. In the case of a true aneurysm,
the myocardial layer may be very thin, but the differentia-
tion may be further impeded in the presence of increased
fibrosis. In the described case, the echocardiographic im-
age suggested a rupture of the inferior wall, but the wide
entrance was not typical of a false aneurysm. In order
to obtain a precise view of the pathology and determine
a treatment strategy, additional imaging techniques had
to be used. Ultimately, computed tomography confirmed
the preliminary diagnosis. It also proved useful in monitor-
ing the long-term effects of the procedure.

From the surgical point of view, there are important
differences in the methods of treating inferior wall an-
erysms and the more common apical or anterior wall
aneurysms. In the case of anterior-apical lesions, Dor’s
technique with Menicanti’s modification is used; it in-
volves reducing the aneurysm entrance with purse-string
sutures, while a Dacron patch, oblong and relatively small,
serves to recreate the proper shape of the heart’s left ven-
tricle and prevents the left ventricular cavity from being
too small [9]. In the case of very large aneurysms and sig-
nificant left ventricular remodeling, it is possible to recre-
ate the normal shape and size of the left ventricle without
the use of the patch [10]. In the case of inferior wall aneu-
rysms, the purse-string suture is not used, and the shape
and size of the aneurysm entrance are not modified, but
closed with a patch. Any attempt to suture an inferior wall
aneurysm together without the use of a patch is doomed
to failure due to the excessive tension of the wall and
the proximity of the mitral annulus. Another issue is the
influence of inferior wall aneurysm repair on mitral valve
function. Due to the proximity of the valve apparatus, the
proper selection of the size and shape of the patch may
facilitate the abatement of ischemic mitral insufficiency.
Nonetheless, it should be remembered that, for the same
reasons, the operation may intensify mitral insufficiency.
In the described case, the presence of the previously im-
planted mechanical mitral prosthesis, in a sense, facili-
tated the surgeon’s task.

Disclosure

Authors report no conflict of interest.

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