

Aortic pseudoaneurysm in a patient after Bentall de Bono surgery Tętniak rzekomy aorty u pacjenta po operacji Bentalla de Bono

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Abstract

Pseudoaneurysm is an aneurysm arising as a result of rupture with all layers of the artery wall. It differs from the true aneurysm in the wall structure, aetiology, complications and indications for invasive treatment. Postoperative pseudoaneurysms of the thoracic aorta are rare complications, but extremely dangerous and life-threatening. Therefore, it is important to keep in mind crucial factors that can lead to its appearance. The method of treatment depends on localization with median sternotomy in the surgical approach to a pseudoaneurysm of the ascending aorta. Most frequently surgeons excise the aneurysm and sew appropriate prosthesis in the place of the excision. As a result, the Bentall de Bono procedure is widely used, when the aortic root replacement is required.

This study presents a case of a 59-year-old man with a huge pseudoaneurysm of the ascending aorta 3.5 months after the Bentall de Bono operation. The patient's treatment included resternotomy with the use of a similar technique once again. EuroScore II was high and amounted to 21.94%. Additionally, hypothermia was used to increase the effectiveness of the procedure, i.e. to minimize blood loss, protect the central nervous system from the risk of ischaemia and facilitate the patient's recovery. Pseudoaneurysm can develop for years without any symptoms, and its rupture can be fatal. Finally, detection and removal of the lesion at the beginning of its formation has a positive impact on the patient's prognosis.

Key words: pseudoaneurysm, aortic operation, aortic root, surgery, Bentall de Bono, invasive treatment, reoperation

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Streszczenie

Tętniak rzekomy jest tętniakiem powstającym w wyniku pęknięcia wszystkich warstw ściany tętnicy. Różni się od prawdziwego tętniaka strukturą ściany, etiologią, powikłaniami i wskazaniami do leczenia inwazyjnego. Pooperacyjne tętniaki rzekome aorty piersiowej są rzadkimi powikłaniami, ale niezwykle niebezpiecznymi i zagrażającymi życiu. Dlatego ważne jest, aby pamiętać o kluczowych czynnikach, które mogą prowadzić do jego pojawienia się. Metoda leczenia zależy od lokalizacji ze sternotomią pośrodkową w podejściu chirurgicznym do tętniaka rzekomego aorty wstępującej. Najczęściej chirurgicy wycinają tętniaka i wszyciąją odpowiednią protezę w miejscu wycięcia. W rezultacie procedura Bentalla de Bono jest szeroko stosowana, gdy wymagana jest wymiana korzenia aorty.

W niniejszej pracy przedstawiono przypadek 59-letniego mężczyzny z dużym tętniakiem rzekomym aorty wstępującej 3,5 miesiąca po operacji Bentalla de Bono. Leczenie pacjenta obejmowało resternotomię z zastosowaniem podobnej techniki po raz kolejny. EuroScore II był wysoki i wyniósł 21,94%. Dodatkowo zastosowano hipotermię w celu zwiększenia skuteczności zabiegu, tj. zminimalizowania utraty krwi, ochrony ośrodkowego układu nerwowego przed ryzykiem niedokrwienia oraz ułatwienia powrotu pacjenta do zdrowia. Tętniak rzekomy może się rozwijać przez lata bez żadnych objawów, a jego pęknięcie może być śmiertelne. Wreszcie, wykrycie i usunięcie zmiany na początku jej powstawania ma pozytywny wpływ na rokowanie pacjenta.

Słowa kluczowe: tętniak rzekomy, operacja aorty, korzeń aorty, chirurgia, Bentall de Bono, leczenie inwazyjne, reoperacja

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Introduction

Postoperative pseudoaneurysms of the thoracic aorta are rare complications, extremely dangerous and occur in less than 0.5% of patients undergoing cardiac surgery with violation of the aorta [1]. Nowadays, differentiation between a pseudoaneurysm and a true aneurysm is based on the wall structure, aetiology, complications and indications for invasive treatment [2, 3] (Table I).

The pseudoaneurysm occurs relatively rarely and it is important to keep in mind that some factors can lead to its appearance. The puncture sites below the common femoral artery, the use of antiplatelet medications or anticoagulants constitute its major risk factors [4]. In the case of surgical therapy, it is advisable to excise the pseudoaneurysm and suture the artery wall. Even though, the most common is to sew an appropriate prosthesis in the place of the excision, the danger of a new aneurysm at the place of connection between the prosthesis and the vessel cannot be forgotten [2, 5]. The treatment option depends on the localization of the disease. Therefore, median sternotomy is recommended for patients with pseudoaneurysm located in the ascending aorta or aortic arch [5]. The Bentall de Bono procedure is widely used in patients requiring aortic root replacement, which is based on the use of a composite graft wherein a mechanical valve and artificial graft are sutured in advance [6, 7]. The implantation of a mechanical valve provides a durable solution but requires life-long anticoagulation associated with an increased risk of bleeding [6]. This study presents a case of a 59-year-old man after the Bentall de Bono operation with a huge pseudoaneurysm of the ascending aorta.

Case report

A 59-year-old man with ischaemic heart disease, left ventricular heart failure and ejection fraction at the level of 45% was transferred to the Cardiac Department from the Cardiac Rehabilitation Department. The patient 3.5 months earlier underwent Bentall de Bono procedure using extracorporeal circulation in the centre. The operation included aortic root replacement with a composite vascular graft (28 mm), biological aortic valve implantation (25 mm) and coronary artery bypass grafting (CABG): LIMA-LAD, Ao-SVG-OM and Ao-SVG-PDA. After the procedure, the patient received 3 units of red cell concentrate (RCC). It is worth noting that the patient was treated in the

postoperative period due to an infection of the sternum wound and sepsis with accompanying fever.

The X-ray examination showed a shading in the left lower pulmonary field and a fluid in the pleural cavity with the possibility of overlapping atelectatic lesions. Angio CT of coronary arteries showed the presence of a pseudoaneurysm emerging from the area where the aortic valve was sewn and rested against the lateral wall of the pulmonary trunk (Fig. 1). Changes in soft tissue organizing exudation in the pericardial sac were observed. Additionally, massive atherosclerosis of coronary arteries and stenosis of the Ao-SVG-PDA bridge were noted as well.

Taking into consideration the patient's medical history and high risk of death (EuroSCORE II: 21.94%), the man was qualified for reoperation based on the Bentall de Bono procedure. Within the operating theatre, transoesophageal echocardiography (TEE) revealed pathological structures surrounding the ring of the aortic prosthesis in the form of aneurysmal spaces moving the prosthesis shaft in the cephalic direction, without changes in the valve. The pseudoaneurysm site and its extent were established.

A cut in the right groin allowed to reveal and dissect the femoral vessels. Under TEE control the femoral artery and vein were cannulated after heparin administration. Then, the extracorporeal circulation was connected and started with hypothermic conditions at 25 degrees Celsius. Subsequently, cardiac output was decreased to prevent the patient from major bleeding and a median resternotomy was performed with an oscillating saw. It revealed bleeding from a ruptured pseudoaneurysm adhering to the sternum. When the sternum was completely cut, a vent was inserted into the aneurysm entry and the left ventricle was drained. This allowed for peaceful extracorporeal circulation and further surgery. Moreover, the preparation of the surrounding structures was very difficult since the boundaries of the pseudoaneurysm framed the aortic prosthesis at nearly 320 degrees. The previously implanted conduit was almost completely separated from the left ventricular outflow tract (LVOT) — only 2 out of 17 felt patches were in place. Next, the prosthesis of the ascending aorta was clamped below previously implanted coronary bypass grafts and cut above the coronary ostia. Afterwards, coronary ostia were cut off leaving part of the prosthesis. The vascular conduit was removed along with the previously implanted aortic valve. Measurement (25 mm) and inspection of LVOT did not reveal

Table I. Comparison of pseudoaneurysm and true aneurysm

Features	Type of aneurysm	
	Pseudoaneurysm	Aneurysm
Wall structure	Surrounding tissues	Tunica intima, media and adventitia
Etiology	Blunt trauma, iatrogenic, aortic infections	Traumatic, postinflammatory, atherosclerotic, genetic disorders
Complications	Rupture, fistula and compression of surrounding tissues	Rupture and delamination of a vessel

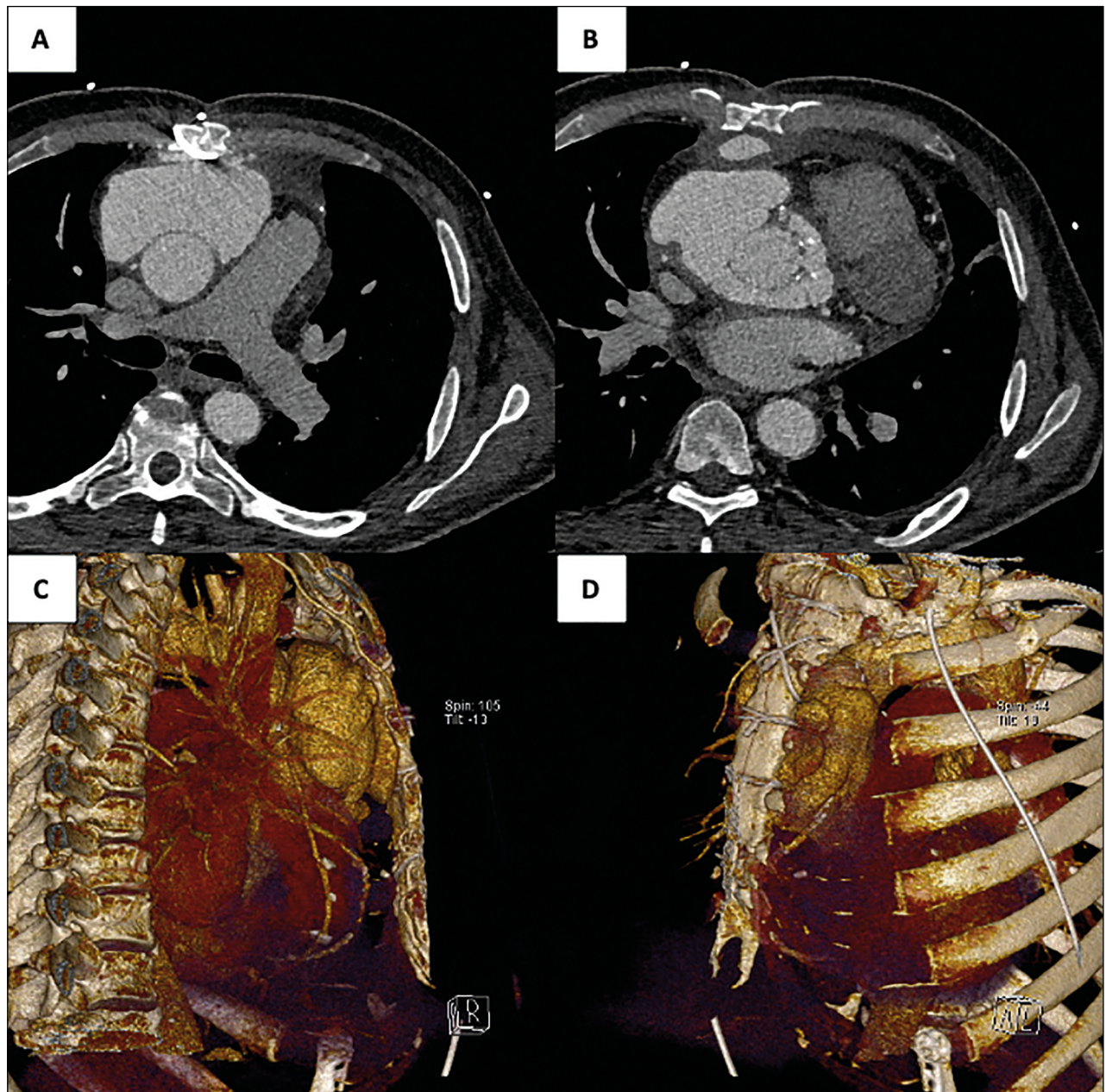


Figure 1. Picture A+B (2D-CT) & Picture C+D (3D-CT): Aneurysm arises from the aortic prosthetic valve, frames the prosthesis at nearly 320 degrees, invades the ascending aorta, and attaches to the sternum at the length of 45 mm

other pathologies. A new aortic conduit was created by implanting a biological aortic valve prosthesis (23 mm) into the composite vascular prosthesis (26 mm) with continuous 5/0 prolene sutures. Consequently, created conduit was implanted into the outlet of the left ventricular outflow tract with single sutures on 12 felt patches from the outside. Then, openings in the prosthesis were created and the coronary ostia were transplanted. Everything was sealed with tissue glue and a distal anastomosis of the previously implanted ascending aorta was performed. The patient was warmed up, the lungs were

partially ventilated, and the heart was vented after the puncture of the prosthesis. The man was defibrillated at the temperature of 32 degrees Celsius establishing sinus rhythm. Two epicardial electrodes were placed on the right atrium and ventricle. After the patient was warmed up and proper reperfusion was conducted, the extracorporeal circulation (207 min) was completed. Intraoperative TEE showed the proper function of the mitral valve, the prosthesis without any leakage and good cardiac contractility. Protamine was administered and acceptable haemostasis was achieved.

Femoral vessels were decannulated and the right groin was closed. Overall, the patient received 2 units of red cell concentrate (RCC) and 10 units of platelets. A pericardial patch was left covering the right ventricle and aortic prosthesis. Two drains were placed — under the sternum and to the right pleural cavity. The sternum was rejoined with steel wires. Finally, the subcutaneous tissue and the skin were sutured.

After the surgery, the X-ray showed only spilt fluid in the pleural cavity with the possibility of overlapping atelectatic changes in the left lower pulmonary field. Postoperative echocardiography did not reveal any fluid in the pleural cavities or the pericardial sac. The patient was transferred to the Cardiac Rehabilitation Department, later discharged with recommendations from the hospital and remains in overall good health these days.

Discussion

Sepsis and vicinity of sternum infection in the postoperative period following the first surgical intervention are considered as probable aetiology of pseudoaneurysm in presented case study and may have contributed to the separation of the previously implanted conduit [8]. Every patient with a pseudoaneurysm needs an invasive treatment or open operation [3]. The authors of the “Surgical treatment of pseudoaneurysm of the thoracic aorta” dissertation suggest that median sternotomy is performed in patients with pseudoaneurysms located in the ascending aorta or aortic arch. Due to the size of the aneurysm, the patient required conduit replacement to repair the ascending aorta. Consequently, the Bentall de Bono procedure was carried out, which is often used in treatment among patients with pseudoaneurysms. Among others, the most frequent obstacles following this procedure are major bleedings and thromboembolic complications. According to The Society of Thoracic Surgeons database, early mortality in adult patients undergoing root reconstruction with a valve conduit stood at 8.9% between 2000 and 2011 [6]. Induced hypothermia, which usefulness and effectiveness were confirmed in numerous scientific papers allowed the authors to conduct the whole procedure safely [1, 9]. Although hypothermia may lead to ventricular fibrillation and distension, the use of this method reduces blood loss to a minimum, protects the central nervous system from the risk of ischaemia and facilitates the patient’s recovery [8]. Despite the increasingly frequent use of the axillary and subclavian arteries for cannulation, access via the femoral artery and vein is dominant and was performed in our patient likewise [1, 5].

Conclusions

All in all, aortic pseudoaneurysms are rare and extremely life-threatening. Long-term observation of the person undergoing cardiac surgery is important, especially among those with biological or artificial conduits. Pseudoaneurysm can develop without any symptoms for years, and its rupture can be fatal. Deep hypothermia reduces blood loss, protects the central nervous system from the risk of ischaemia and facilitates recovery. Detection and removal of the lesion in the initial stages of formation have good outcomes and increase chances for satisfactory therapeutic effect and long-term survival.

Conflict of interest

None declared

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