Insertion of ventriculoatrial (VA) shunts is an effective method of draining cerebrospinal fluid from the cerebral ventricle to the right atrium and significantly improves the survival of patients with hydrocephalus. Some patients who received a VA shunt subsequently developed complications, including thrombus formation around the intracardiac end of the catheter and thromboembolism. The relative rarity of complications and the long latency between shunt insertion and the development of symptoms in VA shunt recipients may result in misdiagnosis or delayed diagnosis. The case presented suggests that such patients may require routine echocardiography at regular intervals. Otherwise, the indwelling foreign body may become the source of a life-threatening thrombotic mass, if not recognised and treated appropriately. **Key words:** ventriculoatrial shunt, complications, diagnosis.

**1. INTRODUCTION**

Shunting of cerebrospinal fluid is an accepted form of treatment of hydrocephalus. Insertion of ventriculoatrial (VA) shunts is an effective method of draining cerebrospinal fluid from the cerebral ventricle to the right atrium and it significantly improves the survival of patients with hydrocephalus (1, 2). Some patients who received a VA shunt subsequently developed complications, including thrombus formation around the intracardiac end of the catheter and thromboembolism (3). VA shunts are currently utilized as a second alternative to ventriculoperitoneal shunts, the gold standard for treating patients with hydrocephalus. Clinicians may still be faced with adult patients who received VA shunts in the past. The relative rarity of complications and the long latency between shunt insertion and the development of symptoms in VA shunt recipients may result in misdiagnosis or delayed diagnosis (4). In this paper we report on a patient with a large calcified right atrial and pulmonary artery mass, 20 years after VA shunt insertion.

**2. PATIENT AND METHOD**

A 53-year-old male with VA-shunt inserted 20 years ago was admitted to our Center with symptoms of progressive heart failure. Transthoracic echocardiogram showed a right atrial mass attached to the tricuspid valve, prolapsing into the right ventricle during diastole. Transesophageal echocardiogram showed a «band-like» mass with pendulous motion, 5.5 cm in size, attached to the tricuspid valve, prolapsing into the right ventricle. Another mass was located in the vena cava superior, 6.6 cm in size. There was also an unclear mass in the pulmonary artery; dilatation of the right heart chambers; tricuspid regurgitation of 2+; mitral regurgitation of 1+; ejection fraction of 55%. MSCT angiography showed a calcified thrombotic mass from the vena jugularis externa, to vena cave superior, right atrium and right ventricle, 32 cm in length and a thrombosclerotic mass at the bifurcation of the main pulmonary artery 35x28 mm (Figure 1).

The patient underwent standard median sternotomy and use of cardiopulmonary bypass, mild hypothermia and cannulation of the ascending aorta, vena cava inferior and vena brachiocephalica. Standard right atriotomy was performed with extraction of the distal part of the shunt catheter with attached calcified masses (Figure 2). Secondarily, pulmonary arteriotomy was performed with extraction of a 3x3 cm calcified mass (Figure 3, 4). The post-operative course was complicated by the development of a right pleural effusion requiring drainage and decortication. A control transthoracic echocardiogram...
showed no residual masses, but persistent dilatation of the right heart chambers, and a preserved ejection fraction of 50%. The patient was discharged on the 18th postoperative day in a good condition. Anticoagulant therapy was initiated. Four weeks later he remained asymptomatic and in excellent condition.

3. DISCUSSION

Introduction of shunt procedures for the treatment of hydrocephalus resulted in a decrease in the mortality rate from 80% to 15-20% (5). When clinical conditions do not permit the use of peritoneal cavity for cerebrospinal fluid drainage, VA shunts are alternatively used (6). Despite improvements in shunt procedures, shunt complications remain common, especially thromboembolic complications and all of them are potentially fatal. Thromboembolic complications present clinically in 0,3% of patients, whereas autopsy series reveal an incidence of up to 60% (1, 3). The incidence of the significant pulmonary emboli is reported to be 3,2%, in patients with VA shunts, however they are found in 50-100% of patients with VA shunts on postmortem examination (7).

Thrombus formation on the intracardiac end of the catheter is rare, but it can lead to life-threatening events (8). A right atrial thrombus is the most common cardiac complication described and it is probably caused by: the damage of the endothelial surface, altered laminar flow in the atria or reaction to a foreign body (9). The possibility of thrombosis is much higher, if the end of the catheter rubs against the free atrial wall, which predisposes for platelet aggregation and thrombus formation to a damaged endothelium (10). The relative rarity of the problem and the long latency between shunt insertion and complications may result in a mis or delayed-diagnosis. It may be important to monitor patients for evidence of thrombus formation or embolization by echocardiography at regular intervals (11). There are currently no standard recommendations for the treatment of thrombus formation after VA shunt insertions. Medical treatment is inadequate, the simple withdrawal of the distal end of VA shunt is contraindicated because of the risk of embolization. Surgical removal of the thrombus is the treatment of choice, even if the operation is difficult and has the mortality rate of 21-67% (12). Whether patient with VA Shunts should be anticoagulated routinely is still a matter of debate, where some authors suggested the therapeutic anticoagulation for at least 1 year, or 3 months with anticoagulation therapy, followed by, either removal of catheter or the continued anticoagulation therapy (13).

4. CONCLUSION

Patients with VA shunts represent a patient group at risk for thrombosis. Although VA shunts are seldom used at present, there are many patients who had such shunts inserted in the past. The case presented suggests that such patients may require routine echocardiography at regular intervals. Otherwise, the indwelling foreign body may become the source of a life-threatening thrombotic mass, if not recognised and treated appropriately. Whether all patients with indwelling VA shunts should be anticoagulated is not known, but once a large thrombotic mass is identified, the urgent operation and anticoagulation therapy, may be necessary treatment of choice on the long term basis.

REFERENCES