CASE REPORTS

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Floating right atrial thrombus associated with submassive pulmonary embolism

Flotirajući tromb desne pretkomore udružen sa submasivnom embolijom pluća

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Abstract

Introduction. Massive free-floating thrombi in the right heart are rarely seen in everyday clinical practice and are most often the result of embolization by thrombotic masses from the veins of the lower extremities. Thrombi in the right heart represent a great risk for life-threatening submassive or massive pulmonary embolism, making early diagnosis and adequate treatment crucial. **Case report.** We present the case of a 56-year-old male patient who developed submassive pulmonary embolism as a consequence of a large floating thrombus in the right heart, rapidly diagnosed by echocardiography. On admission, the patient was hemodynamically stable with a blood pressure of 140/100 mmHg. The initial risk assessment was performed using the Pulmonary Embolism Severity Index score, which was 86, that placed the patient in class III, indicating a moderate risk of mortality within 30 days of the event. Given the patient's hemodynamic stability and the massive size of the right heart thrombus, thrombolytic therapy was avoided due to the risk of dispersal of thrombotic masses, additional embolization, and hemodynamic load of the pulmonary circulation. Catheter-based procedures were not feasible as such interventions are not performed at the treating institution. Due to all of the above, it was decided that surgical thrombectomy was the most appropriate and safest solution for the patient. A surgical thrombectomy was successfully performed. The postoperative course was uneventful, and the patient recovered quickly. **Conclusion.** Massive pulmonary embolism concomitant with right heart thrombosis is associated with high mortality. This case highlights the importance of rapid diagnosis, a multidisciplinary approach, timely decision-making, and individualized treatment, which reduce mortality in these patients.

Key words:
diagnosis; echocardiography; heart atria; pulmonary embolism; thrombectomy; thrombosis.

Apstrakt

Uvod. Masivni flotirajući trombovi u desnom srcu retko se viđaju u svakodnevnoj kliničkoj praksi, a najčešće su rezultat embolizacije trombotičnim masama iz vena donjih ekstremiteta. Trombovi u desnom srcu predstavljaju veliki rizik za nastanak submasivne ili masivne embolije pluća, zbog čega je važno rano ih dijagnostikovati i adekvatno lečiti. **Prikaz bolesnika.** Prikazan je 56-godišnji bolesnik kod kojeg je nastala submasivna plućna embolija na terenu velikog flotirajućeg tromba u desnom srcu koji je brzo dijagnostikovan ehokardiografijom. Bolesnik je na prijemu bio hemodinamski stabilan sa vrednostima krvnog pritiska 140/100 mmHg. Inicijalna procena rizika učinjena je pomoću skora *Pulmonary Embolism Severity Index* koji je iznosio 86 što je bolesnika svrstalo u klasu III, odnosno umereni rizik od mortaliteta unutar 30 dana od događaja. S obzirom na to da je bolesnik bio hemodinamski stabilan, a imajući u vidu masivnost tromba u desnim srčanim šupljinama, nije primenjena trombolitička terapija zbog rizika od rasipanja trombnih masa, dodatne embolizacije i hemodinamskog opterećenja plućne cirkulacije. Nije bilo moguće razmatrati katetersku proceduru s obzirom na to da se takva vrsta procedure ne radi u centru gde je bolesnik lečen. Zbog svega prethodno navedenog, odlučeno je da je hirurška trombektomija najprihvatljivije i po bolesnika najbezbednije rešenje. Hirurška trombektomija je uspešno obavljena. Postoperativni tok protekao je bez komplikacija i bolesnik se brzo oporavio. **Zaključak.** Masivna plućna embolija udružena sa trombozom desnog srca povezana je sa visokim mortalitetom. Ovaj slučaj ističe važnost brze dijagnoze, multidisciplinarnog pristupa, pravovremenog donošenja odluke i individualizovanog lečenja, čime se smanjuje smrtnost ovih bolesnika.

Ključne reči:
dijagnoza; ehokardiografija; srce, pretkomora; pluća, embolija; trombektomija; tromboza.

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Introduction

Free-floating thrombus (FFT) masses in the right heart in patients without predisposing conditions, such as structural heart disease or atrial fibrillation, are of rare occurrence. A mobile clot within the right heart poses a high risk for further embolization. In almost all cases, there is an associated pulmonary embolism (PE) [1]. They most often occur as a result of traveling thrombi from the deep veins of the lower extremities. Right heart FFT masses have a high mortality rate and therefore represent a real emergency and require prompt treatment [2]. The lack of randomized control trials makes the management of right heart thrombi in transit controversial. There are several treatment modalities, which include systemic anticoagulation, thrombolysis (systemic or catheter-directed), catheter-based thrombectomy, and surgical thrombectomy [1].

We present a case of a patient with submassive PE concomitant with a large thrombotic mass in the right heart, which was surgically removed. This case emphasizes the importance of a multidisciplinary approach to treating right heart thrombi and highlights the need for individualized treatment strategies in these patients.

Case report

A 56-year-old male patient was admitted to the Cardiology Clinic, Clinical Center of Montenegro, Podgorica, Montenegro, because of chest pain, difficulty breathing, weakness, and dizziness. He had no previous cardiac conditions. He denies any other medical conditions, and he was not taking any regular medications. His physical examination was within normal limits. The patient was hemodynamically stable on admission. His blood pressure was 140/100 mmHg with a regular heart rate of 120 beats *per* minute, and oxygen saturation of 94% on room air. Electrocardiographically mild ST depressions in leads V4-V6, as well as a deep S wave in lead D1, were recorded. Laboratory findings showed markedly elevated values of D-dimer (35.2 μg/mL; normal range < 0.5 μg/mL) and troponin (1,112 ng/L; normal range < 15 ng/L). The platelet count, prothrombin time, and partial thromboplastin time were within the normal range. Additionally, other laboratory results, including complete blood count, urea, and creatinine, were within normal limits.

An emergent computed tomography (CT) scan of the pulmonary arteries was performed, which showed filling defects in the terminal branches of both pulmonary arteries as well as in all lobar and segmental branches bilaterally, corresponding to thrombi, i.e., PE (Figure 1). The initial risk assessment was done using the Pulmonary Embolism Severity Index score, which was 86, that placed the patient in class III, with a moderate risk of mortality within 30 days of the event.

Upon admission, echocardiography was performed, and it revealed a large floating mass in the right atrium, measuring up to 43 mm in diameter. The mass prolapsed into the right ventricle and, based on its characteristics, mostly resembled a large thrombotic mass (Figure 2).

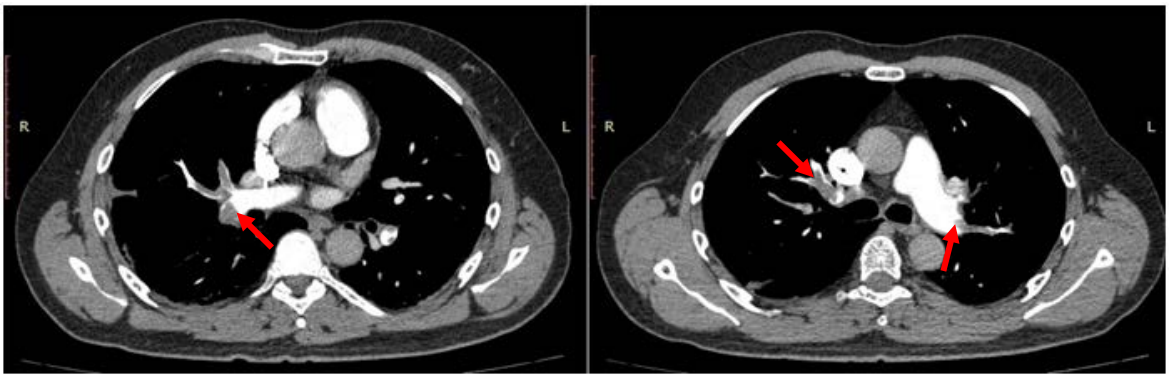

Fig. 1 – Computed tomography scan showing the presence of thrombi in the main pulmonary branches (red arrows).

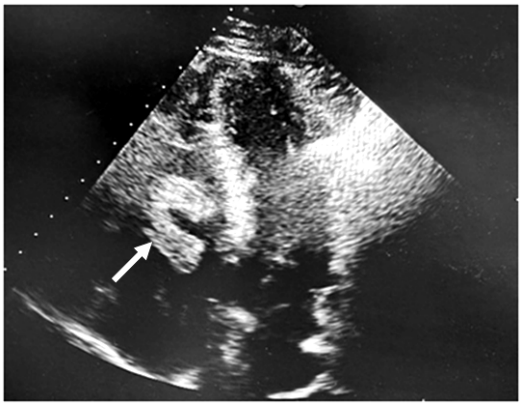

Fig. 2 – Transthoracic echocardiogram showing a large "worm-like" thrombus (white arrow) in the right atrium passing through the tricuspid valve to the right ventricle.

The peak pulmonary artery pressure was 45 mmHg. Due to dilatation of the right ventricle, paradoxical movements of the septum were registered. A Doppler of the lower extremities was performed, which showed signs of chronic venous thrombosis with recanalization in the area of the distal third of the saphenous vein, superficial femoral vein, and popliteal vein. Doppler sonographic findings of the arterial blood vessels of the lower extremities were normal. Although the patient remained hemodynamically stable, evidence of right ventricular dysfunction confirmed by laboratory markers (elevated troponin) and imaging studies was consistent with a diagnosis of submassive PE. Since there was a high risk that the administration of thrombolytic therapy would lead to the lysis of thrombus and the dispersion of thrombotic masses into the pulmonary circulation, which was already burdened with numerous thrombotic masses seen on the previous CT scan of the pulmonary arteries, and since the patient was hemodynamically stable and without comorbidities, a decision was made to perform a surgical intervention. After consultation with a cardiac surgeon, a surgical thrombectomy was performed, and a large thrombus was removed from the right atrium, being 50 mm in its largest diameter (Figure 3).

The surgical procedure as well as the postoperative course were without complications. The removed thrombotic mass was sent for pathohistological analysis, and the results confirmed that it was a fibrinous thrombus (Figure 4).

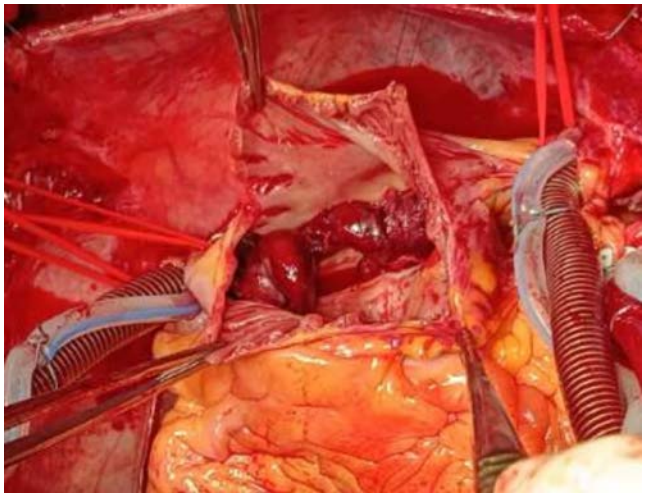

Fig. 3 – Intraoperative finding of a large thrombotic mass in the right atrium.

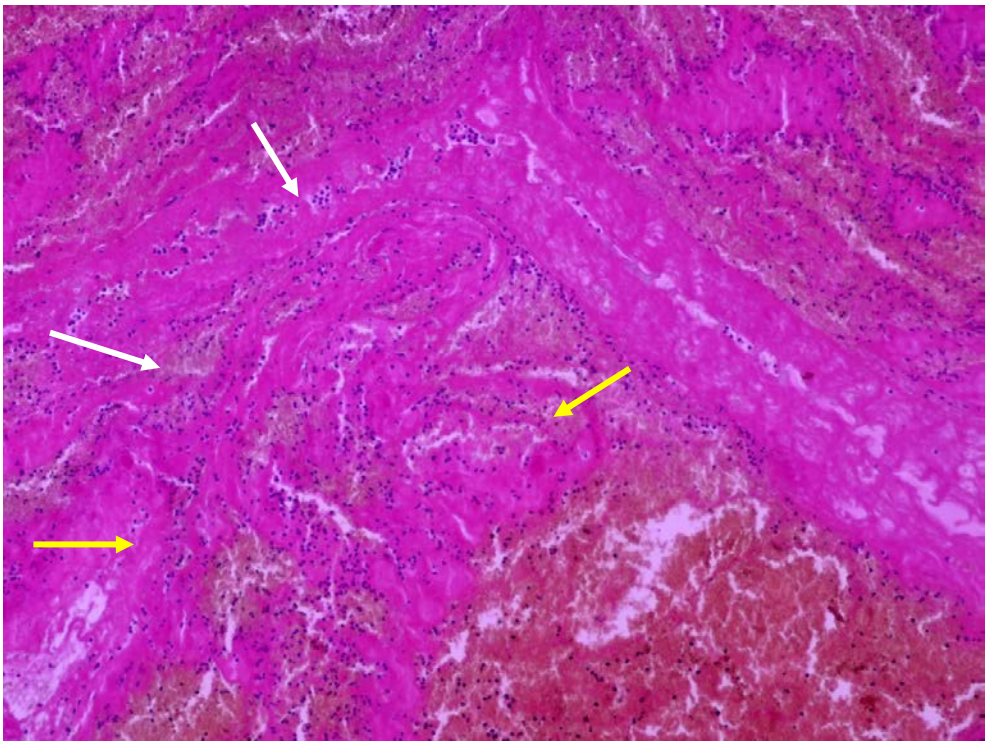

Fig. 4 – Pathohistological finding of a thrombus composed predominantly of fibrin (white arrows), which is permeated with erythrocytes and granulocytes (yellow arrows) (hematoxylin and eosin staining, ×100).

Additional diagnostics did not indicate the potential existence of malignancy. Screening for thrombophilia was negative. At discharge, the patient was hemodynamically stable, without complaints, and the echocardiographic findings were normal. Standard therapy for PE was prescribed, including subcutaneous enoxaparin sodium administered twice daily. Six months after the operation, the patient remains well, and follow-up echocardiographic findings were normal. The successful outcome in this case can be attributed to rapid diagnosis using transthoracic echocardiography and CT, prompt decision-making to proceed with surgical intervention, and efficient postoperative care.

Discussion

The presence of massive FFT masses in the right heart is not often seen in everyday clinical practice. It is most often the result of embolization by thrombotic masses from the veins of the lower extremities. Mortality in these patients is very high (27–50%), especially if the right heart thrombus is associated with PE [1–4]. In a study by Chartier et al. [1], nearly all patients with large right heart thrombi were either in cardiogenic shock or classified as New York Heart Association class IV. However, those who were not in cardiogenic shock had a higher survival rate. Our patient was hemodynamically stable throughout the entire hospitalization. That is why urgent diagnosis and prompt treatment are necessary. Echocardiography is the most important diagnostic tool when it comes to thrombosis of the right heart. The main role of echocardiography is certainly the visualization of thrombotic masses. Thrombi of the right heart can be morphologically presented in three forms, type A, which has a worm-like shape, type B, which is similar to the left heart thrombi, which means that it has a broad base and is mostly adhesive to the wall of the ventricles or atria, and type C, which has the characteristics of both of the previously mentioned types [5, 6]. Type A is very mobile and its presence usually indicates the origin of the thrombus from the deep veins of the legs, while type B mostly occurs *in situ* [5]. They can easily mimic myxoma on echocardiography. When there is ambiguity, transesophageal echocardiography can be helpful [7]. Echocardiography revealed a type A, or "worm-like", thrombus configuration, most likely resulting from blood flow dynamics and the thrombus's migration path to the heart. This indicates that the thrombus did not originate *in situ* in the right heart. In addition to the visualization of thrombus, echocardiographic signs of right ventricular strain, pulmonary hypertension, and paradoxical septal movements are most often seen [1, 6, 8]. In our patient, all the mentioned signs were present. As already mentioned, FFT masses in the right heart are an emergency condition with a high mortality rate, and therefore, prompt treatment is necessary [9]. Despite advances in early diagnosis, the management of PE complicated by free-floating right heart thrombus remains very debatable due to the lack of consensus and evidence-based guidelines. Treatment can be surgical, pharmacological (thrombolytic or anticoagulant therapy), and interventional (percutaneous techniques) [8]. Some studies suggest that the best outcomes are with thrombolytic therapy [2, 10, 11]. In a study by Rose et al. [2] involving 177 patients with right heart thrombus, the mortality rate was lower in patients who received thrombolytic therapy (11.3%) compared to those who underwent surgical thrombectomy (23.8%). Thrombolytic therapy has its advantages as it quickly leads to the lysis of the thrombus, thus improving right heart function in a short time. Additionally, at the same time, it acts on thrombi in the lungs and, if present, in the deep veins of the lower extremities [12]. Ferrari et al. [13] showed that after thrombolysis, 50% of the clots disappeared within 2 hrs. The risk of clot fragmentation and subsequent cardiogenic shock following thrombolysis of a large right heart thrombus remains unclear [14]. Although some case reports describe successful outcomes with anticoagulant therapy alone, most researchers indicate that anticoagulation is insufficient because the thrombus may not break down, and the probability of embolization is higher [15]. Percutaneous catheter-based treatments are considered an alternative to thrombolysis in patients with PE who have contraindications to thrombolytic therapy or remain hemodynamically unstable even after the application of fibrinolysis [8]. However, there are no clear guidelines when it comes to the use of catheter-based procedures in the treatment of FFT in the right heart. Percutaneous mechanical thrombectomy is increasingly being employed as an alternative for managing right heart thrombotic masses. Other techniques, such as fragmentation of blood clots with aspiration and intrapulmonary administration of fibrinolytics, have also been utilized [16]. Torbicki et al. [17] compared mortality in patients treated with anticoagulant therapy, thrombolysis, and surgical procedures, and reported that the mortality rate is highest among patients treated with anticoagulant therapy (60%), followed by thrombolysis (40%), and surgical interventions (27%), which suggested that the surgical approach is the most effective. Surgical thrombectomy is a treatment option that has good outcomes and is mainly used in hemodynamically unstable patients [18–20]. Chartier et al. [1] reported in their study that mortality is not directly correlated with the type of treatment, but they recommend surgical treatment if there are no contraindications. Delay in thrombus removal surgery can result in early mortality [21]. Our patient was hemodynamically stable throughout the entire hospitalization and had no comorbidities, and after consultation with a cardiac surgeon, we decided to proceed with surgical thrombectomy. Surgical thrombectomy has the advantage of allowing complete removal of the thrombus with minimal risk of potential fragmentation, dispersal, and embolization. However, it cannot resolve thrombi distally in the pulmonary circulation, so additional pharmacological treatment is necessary [22]. Several potential complications due to surgical thrombectomy are described in the literature, among them the most significant are postoperative bleeding, cardiac tamponade, and sternal wound infection [23]. Surgical thrombectomy carries the risk of inherent delay of a few hours due to patient preparation, but when the patient is hemodynamically stable, this is acceptable.

Conclusion

The presence of massive free-floating thrombotic masses in the right heart is a rare phenomenon and mostly arises as a consequence of traveling thrombi from the veins of the lower extremities and usually coexists with an already massive pulmonary embolism. Due to the high mortality rate, it represents an emergent, life-threatening condition that must be quickly diagnosed and adequately treated in order to increase the probability of survival.

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