

Right Heart, Wrong Place: Surgical Thrombectomy of a Septic Catheter Related Right Atrial Thrombus

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Abstract

Case Report

Central venous catheters are commonly used in dialysis dependent patients and often offer reliable vascular access for long term dialysis while awaiting eventual AV fistula creation and maturation. However, complications from these catheters should not be overlooked and precautionary assessments should be routinely implemented to avoid or detect early complications. We describe a case report of a patient with end stage renal failure, presenting with a septic right atrial thrombus secondary to a right internal jugular vein dialysis catheter, requiring a sternotomy and excision of the right atrial thrombus.

Keywords: hemodialysis catheter, right atrial thrombosis, end-stage renal failure, MRSA bacteremia, pulmonary embolism, central venous catheter.

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INTRODUCTION

Catheter related right atrial thrombosis (CRAT) is a potentially serious complication related to the use of Central Vein Catheters (CVC) for hemodialysis. The location of the catheter in the internal jugular vein is often preferred over femoral sites due to higher risk of infection in the latter group. Despite the benefits of placing a catheter in the internal jugular vein, it is important to note the complications of long dwelling catheters in the right atrium. Catheter related right atrial thromboses, albeit rare with possible underreporting, poses significant morbidity and mortality. Despite regular catheter care guidelines for infection control, there are no guidelines in relation to screening or routine assessments for CRAT. Hence, early presentations are rare and most patients present with sequelae of these thromboses in the form of sepsis or with pulmonary embolism. As with any disease, early recognition and treatment is key,

CASE PRESENTATION

A 42-year-old lady with end stage renal failure secondary to chronic uncontrolled diabetes mellitus was started on regular hemodialysis since July of 2025. A right internal jugular central venous catheter was inserted and dialysis was initiated uneventfully. She underwent an AV fistula creation over her left forearm, however the

fistula failed to mature and still required dialysis via the initial central catheter.

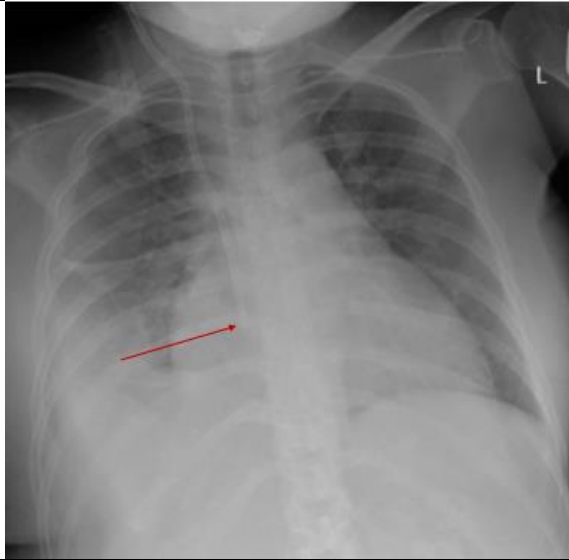
She presented 6 months later in early December with necrotising fasciitis over her left shin that was initially treated by the orthopedics team with aggressive debridement and healing with secondary intention. During this admission, it was noted that the culprit organism for the infected wound was Methicillin-Resistant Staphylococcus Aureus (MRSA) that was also isolated in the peripheral blood culture and the central blood culture taken from her dialysis catheter. Unfortunately, in her case, the right internal jugular catheter was removed just to be replaced with another catheter placed in the same site due to difficult vascular access. Despite targeted antibiotics, her blood cultures still revealed persistent MRSA bacteremia.

She underwent a CT scan to rule out pulmonary embolism due to difficulty in weaning her oxygenation. The CTPA revealed subsegmental pulmonary embolism however a significant filling defect was noted in the right atrium. An echocardiography assessment revealed a right atrial thrombus attached to the wall of the right atrium. The morphology of all valves, namely the tricuspid valve was normal with only mild tricuspid regurgitation.

After 6 weeks of targeted antibiotics and anticoagulant therapy, her MRSA bacteremia was

successfully treated, however there was no resolution or reduction in size of the right atrial thrombus. The patient was prepped for surgery under the cardiothoracic surgery

unit. To assess her operative risk, she was scored using the internationally validated EUROSCORE II [5] and had an estimated mortality risk of 9.15%.



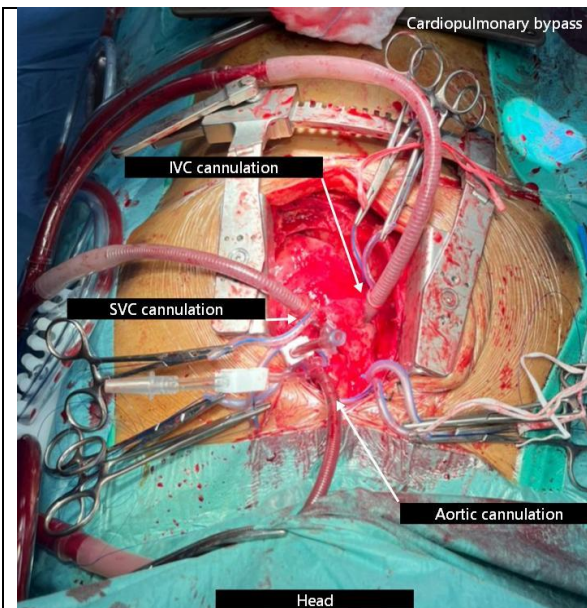
Chest xray showing the tip of the internal jugular catheter in the right atrium.



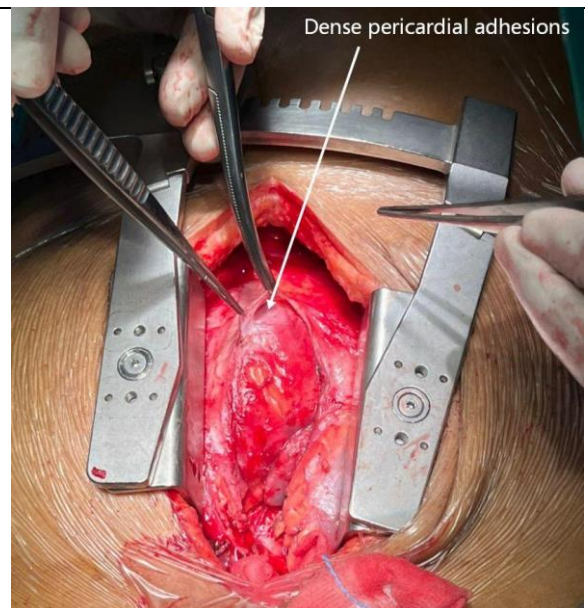
**Yellow arrow showing the thrombus in the right atrium with an area of 3.17cm²
Red arrow showing the tip of the internal jugular catheter in contact with the wall of the right atrium.**

She underwent a primary median sternotomy, and put on cardiopulmonary bypass via standard aortic cannulation and bicaval venous cannulation after systemic heparinisation. Dense pericardial adhesions were encountered upon opening the pericardium. Antegrade cardioplegia was delivered and the right atrium was inspected. The intraoperative findings correlated with the echocardiographic findings of a right atrial mass representing dark fibrinous material. The

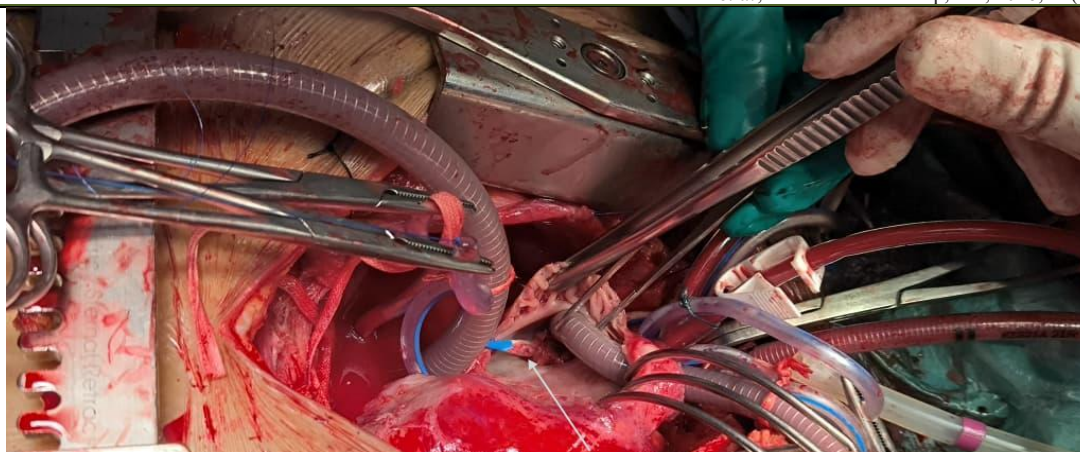
thrombus was excised and shaved off the wall of the right atrium. Tricuspid valve leaflets were normal and competent. Interestingly, it was noted that the visualised tip and body of the IJV catheter was surrounded by a thick thrombus. The thrombus from the IJV catheter was removed and the catheter was withdrawn during surgery. The patient was weaned off cardiopulmonary bypass and was transferred to the cardiothoracic ICU for post operative care.



Cardiopulmonary bypass



Dense pericardial adhesions encountered upon opening the pericardium.



Thick thrombus surrounding the tip of the Internal Jugular Vein catheter. Thrombus removed from catheter before removal of the catheter.

She made an unremarkable recovery and further dialysis was done via a catheter placed in her femoral vein. She was discharged after 7 days and is on routine follow up with serial echocardiography.

The intraoperative specimens sent did not reveal growth of any organisms. The histopathological examination of the excised right atrial mass was consistent with the morphology of a thrombus.

DISCUSSION

Catheter related right atrial thrombosis (CRAT) is a potentially life-threatening complication of central venous catheters. Incidence of CRAT ranges from 2-29% with mortality up to 18% [1]. Right heart thrombi can be classified into Type A and Type B thrombi. Type A thrombi originate from deep vein thromboses whereas Type B thrombi are formed directly in the right atrium.

In the setting of an indwelling catheter, the position of the catheter has been identified to be a significant risk. Ideal position of the catheter should be at the cavo atrial junction. Placement of the catheter too deep into the right atrium resulting in mechanical irritation of the right atrium due to direct contact of the catheter to the wall of the atrium. This results in endothelial damage and activation of the coagulation cascade [2]. Lower right heart pressure predisposes to blood stasis, thus increasing risk of thrombus formation [2]. In our case, it is noted that the tip of the internal jugular catheter was situated in the right atrium. Back and forth movement of the catheter tip can be visualised in the transthoracic echocardiography, close to the site of the right atrial thrombus.

Although the formation of the thrombi is essentially sterile, patients on hemodialysis are prone to bacteremia [3]. The thrombus now serves as a nidus of infection resulting in an infected thrombus. Fatal complications such as pulmonary embolism and right heart failure can result from the dislodgement of the

thrombi. Aside from embolic events, sepsis is a treatment challenge in these patients. As antibiotic penetration into the core of the thrombus is questionable, the sole role of antibiotics may not always be a viable option.

There are currently no routine screening modalities or guidelines for long term indwelling catheters, and patients typically present with complications of the septic thrombus in the form of sepsis, pulmonary embolism or valvular insufficiencies in cases where the thrombus is situated on the tricuspid valves. A transthoracic echocardiography is the most commonly used modality. Transoesophageal echocardiography offers better resolution images with lesser acoustic shadowing as compared to a transthoracic echocardiography, but was not available in our setting.

The treatment of catheter related atrial thrombus mainly involves anticoagulation therapy and surgical thrombectomy [4]. Ideally the catheter should be removed or exchanged in circumstances with poor vascular access. Catheter removal and initiation of anticoagulants is recommended as the first line treatment [6]. As there are no guidelines regarding the management for these conditions, a systematic review by *The First Affiliated Hospital of Chongqing Medical University* [4] suggested that surgery should be considered in patients with contraindication to anticoagulant therapy, large thrombus ≥ 40 mm, failed thrombolysis, infected thrombi, presence of patent foramen ovale or patients that develop complications that can be treated simultaneously with surgery. Immediate consideration for surgery should be considered for patients who have failed anticoagulant therapy or have developed new complications.

For surgical thrombectomy, patients require a median sternotomy, and establishment of cardiopulmonary bypass via standard bicaval cannulation after systemic heparinisation. Heart needs to be arrested with cardioplegia and direct access into the right atrium via right atriotomy. With modernisation and

advancement in surgery, future options should as minimally invasive surgery via thoracotomy with peripheral cardiopulmonary bypass could be considered as opposed to the conventional sternotomy. For patients who are at high risk for surgery, another considerable option is the use of catheter-directed suction thrombectomy, however it is not without its complications and may not be effective in more organized or solid thrombi with possible dislodgment and fragmentation of thrombi during procedure. Surgery however is still the most valuable modality in when other treatment options have failed [6]. Relative contraindications to establishment of cardiopulmonary bypass such as bleeding risks that could be exacerbated with systemic heparinisation, severe sepsis or presence of significant organ impairment must be factored into the decision making prior to surgery. Patient assessment pre operatively such as frailty, mobility, history of previous sternotomy or previous cardiac surgeries should also be taken into serious consideration.

Early detection of catheter related thrombosis definitely plays a role in initiating early treatment and preventing potential life-threatening complications. Patients on long term internal jugular or subclavian vein catheters should be assessed routinely for emergence of catheter related complications. This case report alongside multiple other case reports on this condition should serve as a basis for the formulation of guidelines for screening of patients on long term catheters as well as the development of a systematic treatment guideline for patients who have developed catheter related atrial thrombosis.

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