

# Central Venous Catheter Associated Cardiac and Upper Extremity Deep Venous Thrombosis in a Patient with Diabetic Ketoacidosis

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## Abstract

Diabetic ketoacidosis is rarely associated with venous thrombosis in adults. We report here a 21 year-old woman with a history of type I diabetes mellitus who developed upper extremity and right atrial thrombosis following central venous catheterization during an episode of ketoacidosis. A detailed investigation to rule out prothrombotic conditions was done and negative. The patient was not compliant with her treatment and the cardiac thrombus resolved only after hospitalization. This case highlights the importance recognizing the increased risk of thrombosis in patients with ketoacidosis especially after central venous catheter use. The mechanism leading to this prothrombotic state is also discussed.

## Keywords

Catheter; Diabetes; Ketoacidosis; Thrombosis

## Abbreviations

DKA: Diabetic Ketoacidosis; DM: Diabetes Mellitus; CVC: Central Venous Catheter; HbA1c: Glycated Hemoglobin; MRI: Magnetic Resonance Imaging; SVC: Superior Vena Cava; INR: International Normalized Ratio; bpm: beats per minute; CT: Computed Tomography; SV: Subclavian Vein; DVT: Deep Venous Thrombosis; CRAT: Catheter Related Right Atrial Thrombus

## Introduction

Diabetic ketoacidosis is one of the most severe and life threatening complications of DM [1]. Diabetes mellitus has been associated with a prothrombotic state and venous thromboembolism has been described many times in diabetic hyperosmolar non-ketotic coma patients. On the other hand, though arterial thrombosis is common, venous thrombotic complications are rarely reported to be associated with DKA episodes, especially in adults [2]. We herein report a 21 year-old woman with a history of type I DM who developed right atrial and upper extremity deep venous thrombosis following central venous catheter insertion during an episode of DKA.

## Case Report

A 21-year-old female was referred to our clinic for uncontrolled DM. She had a history of type I DM since 8 years. Her medication was 4 daily injections of insulin (insulin glargine and insulin aspart) at a total daily dose of 44 units. Her HbA1c was 11.6% and she had a history of hospital admission 6 months earlier with a diagnosis of DKA which was mainly due to the noncompliance. At that time, she had undergone a transient central venous catheter insertion via subclavian vein. She had been treated with standard intravenous fluid and insulin infusion. Fifteen days after being discharged, she had been readmitted to the same hospital with the complaint of dyspnea with exertion. During transthoracic echocardiography a 2.2x3.8 cm mass in the right atrium, suspicious for thrombus, had been noted. Cardiac MRI had confirmed the presence of thrombi in the right atrium and SVC. Following systemic thrombolytic therapy with tissue plasminogen activator, the patient had been started on anticoagulation with warfarin with a target INR of 2-3. During the follow-up visits, her INR was below the target range and the cardiac thrombus was found to be progressed. As she had also uncontrolled DM, she was referred to our clinic for further investigation.

The initial physical examination was not notable except for a mild tachycardia at a rate of 110 bpm and mild tachypnea. She had no personal or family history of clotting disorder, no recent immobilization, trauma, oral contraceptive use or no documented progressive thrombocytopenia.

The blood count was within normal limits and INR was 1.0. Fasting blood glucose was 170 mg/dl (normal, 60 to 100 mg/dl). Other laboratory work-up including erythrocyte sedimentation rate, C-reactive protein, liver and kidney function tests, lipid profile, and urinalysis were within normal limits. D-dimer level was 1500 mg/L (normal, <150 mg/L). The patient's plasma osmolarity was increased and found to be 320 mOsm/kg. Arterial blood gas analysis and chest x-ray were normal. The electrocardiogram revealed sinus tachycardia with a heart rate of 110 bpm. Thoracic computed tomography angiography was significant for hypodensities in the SV and SVC compatible with thrombi and there was not any pulmonary embolism. Transthoracic echocardiography revealed a 1.1x2.8 cm mobile and organized mass in the right atrium (Figure 1a). Specific tests to rule out protein C, S and antithrombin 3 deficiency and genetic analysis for factor V Leiden and prothrombin G20210A mutation were performed and within normal limits. Homocysteine level was normal. Antinuclear antibody, lupus anticoagulant and anticardiolipin antibodies were all negative. With no evidence of any underlying hypercoagulable state, the cardiac and venous thrombosis in this patient was attributed to the insertion of a CVC during an episode of DKA.

The patient was started on anticoagulation with warfarin. Low molecular weight heparin was added to the therapy and continued until the INR was above 2. Serial echocardiographic examinations were done. The intracardiac thrombus completely disappeared 2 months later (Figure 1b) and upper extremity CT angiography revealed resolution of the hypodensities seen previously in SV and SVC. Anticoagulation was continued during 6 months. At her last follow-up visit, the patient was free of symptoms and had no thrombus on imaging studies.

## Discussion

Diabetic ketoacidosis is a devastating complication of particularly type I but also type II DM. It is

characterized by relative or absolute insulin deficiency and usually presents with hyperglycemia, ketonemia, and acidosis. Dehydration, and hyperosmolarity can also be present and by inducing a decrease in tissue perfusion, lead to a prothrombotic state during DKA [3].

In the previous studies, enhanced activation of coagulation along with decreased anticoagulation response has been shown in adults with DM [4, 5]. Increased platelet activation, endothelial damage due to the hypertonicity, reduced nitric oxide synthesis, acidosis induced increased red cell rigidity, and transient hyperhomocysteinemia have also been proposed as contributing factors to the prothrombotic state seen during DKA [5]. In our case, a detailed investigation to rule out a hypercoagulable state was done and negative. The patient's homocystein level was also normal. However, her plasma osmolarity was increased and found to be 320 mOsm/kg. This may in part explain the thrombosis seen in our patient. Similarly, although we could not directly assess the red cell rigidity which may be induced by the acidosis seen during DKA, this may have been contributed to the thrombosis seen in our patient.

Interestingly although arterial thrombosis is relatively common, venous thrombosis rarely complicates DKA, especially in adults [2, 5-7]. A recent study evaluating venous thrombosis risk related to DM failed to demonstrate a significant relationship between DM and incident DVT in adults after adjusting for other risk factors such as hospitalization, major surgery, medical illness, and nursing home confinement. The authors were also unable to demonstrate increased incidence of DVT in patients with DKA although the sample size was too small to exclude such a relationship [8]. Similarly, death related to venous thrombosis was uncommon in a case series of DKA conducted by Biegelman et al [5]. On the other hand, increased incidence of DVT was reported in children with DKA mainly in association with CVC compared to age-matched control patients with CVC in shock [5].

Central venous catheters are commonly used in clinical practice and CRAT is a life threatening complication associated with CVC use. The incidence of CRAT varies between 2-29% and a mortality rate as high as 40% has been reported especially in patients not undergoing hemodialysis. Endothelial damage caused by mechanical irritation of the right atrial wall by the catheter tip, alteration in the right atrium fluid dynamics and hypercoagulability may all play a role in the formation of intraluminal clot. The majority of the cases with CRAT are asymptomatic and they may present with several complications such as systemic and pulmonary embolism, sepsis related to the infected thrombus and hemodynamic instability [9]. Interestingly our case presented with dyspnea on exertion. On the other hand, her thorax CT angiography revealed no pulmonary artery embolism and arterial blood gas analysis was within the normal limits. Although thorax CT angiography is a well-defined and approved imaging modality in the diagnosis of pulmonary embolism, its sensitivity has been reported to vary from 53% to 91% and 83% to 100% depending on whether single-detector or multidetector CT are used, respectively. It is clear that our patient had no visible thrombi in the pulmonary macrocirculation but we can not completely exclude small invisible thrombi in the pulmonary microcirculation which could theoretically lead to the dyspnea on exertion. It is important to note that our patient was already started on anticoagulation, had no hemodynamic instability and the clinical picture has improved overtime; thus no further investigations were done.

There is no consensus on the treatment of CRAT. Oral anticoagulation, thrombolytic agents and surgery can be used depending on the patient clinical situation [9]. The necessity and the potential

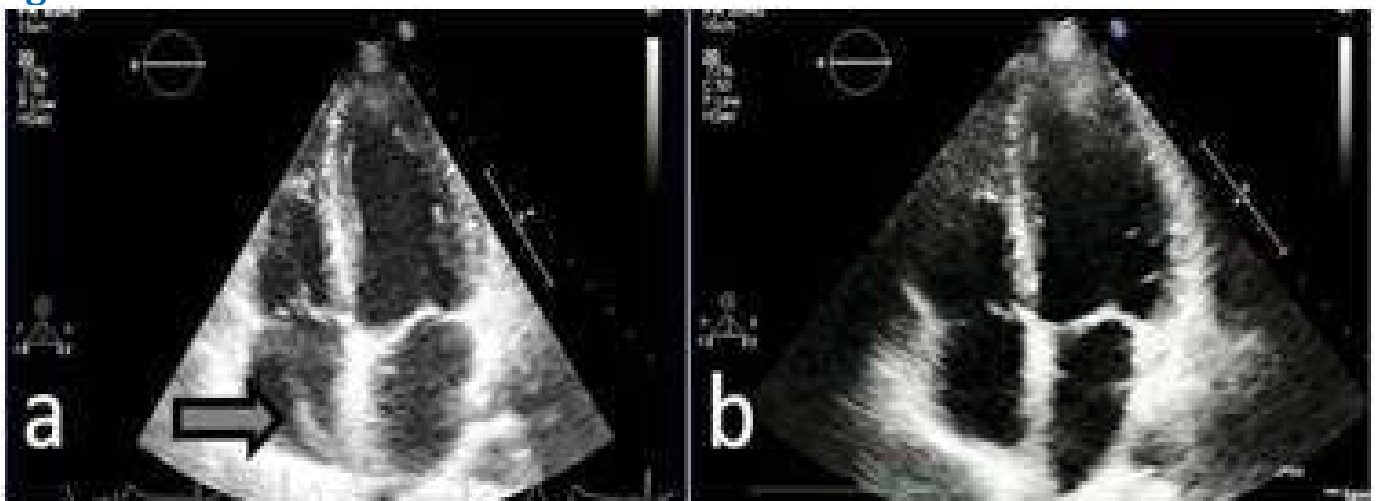
benefit of prophylactic anticoagulation in order to prevent CRAT are controversial [11].

We presented here a young patient with uncontrolled type I DM who developed right atrial and upper extremity deep venous thrombosis after short-term central venous catheterization during an episode of DKA. To our knowledge, there had been only one case reported in the literature in whom a right atrial thrombus developed after short term CVC use during an episode of DKA, as in our patient [6]. There was also another patient with patent foramen ovale who presented with cerebral infarct and DKA. The embolism was originating from a thrombus in the lower part of the internal jugular vein through which a central venous line had been obtained [7].

## Conclusion

This case highlights the importance of recognizing CVC use during DKA as a possible cause of venous thrombosis. The increasing use of central venous lines in patients with DKA may put them at special risk in terms of upper extremity and right atrial thrombus. Taking into consideration the high mortality rate associated with these complications which are usually asymptomatic; recognition of the risk factors and earlier detection of the cases are very important. Also, the role of prophylactic anticoagulation and measures that should be taken in order to prevent these complications are needed to be clarified.

## Figure



**Figure 1:** (a) Apical four chamber transthoracic echocardiographic view shows a prominent thrombus in the right atrium before treatment (gray arrow), (b) Resolution of the thrombus after treatment

## References

1. Lin KD, Hsieh MC, Hsin SC, Hsiao ZY, Hung WW, Shin SJ. Acute brachial artery thrombosis: a rare complication of diabetic ketoacidosis. *Kaohsiung J Med Sci.* 2006; 22: 44-48.
2. Gill GV, MacNamara G, English P. Diabetic ketoacidosis complicated by axillary vein thrombosis. *Diabetes Res Clin Pract.* 2006; 73: 104-106.
3. Lebovitz HE. Diabetic ketoacidosis. *Lancet.* 1995; 345: 767-772.
4. Carr ME. Diabetes mellitus: A hypercoagulable state. *Journal of Diabetes and its Complications.* 2001; 15: 44-54.
5. Cherian SV, Khara L, Das S, Hamarneh WA, Garcha AS, Frechette V. Diabetic ketoacidosis complicated by generalized venous thrombosis: a case report and review. *Blood Coagulation & Fibrinolysis.* 2012; 23: 238-240.

6. Morita Y, Ariyama J, Mieda T, Terao K, Ueshima H, Imanishi H, et al. [Inferior vena cava thrombosis reaching the right atrium after removal of the central venous catheter at femoral vein in a patient with diabetic ketoacidosis]. *Masui*. 2014; 63: 564-567.
7. Batsis JA, Craici IM, Froehling DA. Central venous catheter thrombosis complicated by paradoxical embolism in a patient with diabetic ketoacidosis and respiratory failure. *Neurocrit Care*. 2005; 2: 185-188.
8. Heit JA, Leibson CL, Ashrani AA, Petterson TM, Bailey KR, Melton LJ, 3rd. Is diabetes mellitus an independent risk factor for venous thromboembolism?: a population-based case-control study. *Arterioscler Thromb Vasc Biol*. 2009; 29: 1399-1405.
9. Hussain N, Shattuck PE, Senussi MH, Velasquez Kho E, Mohammedabdul M, Sanghavi DK, et al. Large right atrial thrombus associated with central venous catheter requiring open heart surgery. *Case Rep Med*. 2012; 2012: 501303.
10. Remy-Jardin M, Pistolesi M, Goodman LR, Geftter WB, Gottschalk A, Mayo JR, et al. Management of Suspected Acute Pulmonary Embolism in the Era of CT Angiography: A Statement from the Fleischner Society. *Radiology*. 2007; 245:315-329.
11. Wilson JD, Alred SC. Does prophylactic anticoagulation prevent PICC-related upper extremity venous thrombosis? A case-control study. *J Infus Nurs*. 2014; 37: 381-385.

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