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CASE REPORT

Deep Vein Thrombosis, Septic Pulmonary Emboli and Methicillin-Resistant Staphylococcal Aureus Bacteremia Complicated by a Furuncle in a Child

UROOSA SAMAN, SAIRA ABRAR AHMED, MUHAMMAD KAMRAN YOUNUS, Hanif Kamal, Muhammad Ali, Anwarul Haque

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ABSTRACT

Staphylococcal aureus infection in children is a major public health problem globally. It causes a varied spectrum of clinical disease including bacteremia, endocarditis, skin and soft tissue infection, pleuro-pulmonary and osteo-articular infection. Deep vein thrombosis (DVT) is a known complication of staphylococcal infection. We report a case series which included, 10-year old boy developed DVT, septic pulmonary emboli and Methicillin-resistant Staphylococcal aureus (MRSA) bacteremia following a furunculosis and 13 year old girl with thrombosis of internal and external jugular vein, cavernous sinus with pulmonary emboli and MRA bacteremia. Both patients are previously healthy showed complete recovery after aggressive appropriate antibiotics, anticoagulants and supportive care. The high index of suspicion of DVT in MRSA infection is needed, prompt diagnosis and aggressive appropriate therapies improve the outcomes and minimize the complications.

Key Words: *Deep vein thrombosis, Methicillin-resistant staphylococcal aureus bacteremia and septic pulmonary emboli*

Correspondence to:

Saira Abrar Ahmed,
Department of Pediatrics, Liaquat
National Hospital and Medical
College, Karachi

E-mail:
sairabrar.ahmad@gmail.com

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INTRODUCTION

The incidence of Venothromboembolism (VTE) in children is increasing, range from 30 to 58 per 10000 pediatric hospital admissions.¹ This rise can be due to greater exposure to risk factors as well as improved diagnostic modalities. Deep venous thrombosis (DVT) and pulmonary embolism (PE) are the two most important manifestations of VTE. Harms from VTE include death, pulmonary embolism, stroke, organ dysfunction, post-thrombotic syndrome and pain. VTE is associated with increase hospital stay and cost. VTE in children is mostly related to presence of central venous catheter, malignancy, congenital heart diseases, hematological conditions,

rheumatologic diseases and presence of congenital or acquired hypercoagulable states.^{2,3} VTE is also reported after Staphylococcal aureus infection.^{4,5} The causative agents are the various exotoxins released by staphylococcal bacteria. Alpha-toxin causes cell wall lysis, aggregation of platelets and vasospasm. Coagulase promotes clot formation after interaction with fibrinogen. These factors generate Virchow triad of thrombosis leading to DVT after focal infection like furuncle and osteomyelitis due to staphylococcal aureus infection.^{6,7} The triad of DVT, septic PE and bacteremia due to acute staphylococcal aureus infection in children is scarce in literature.^{8,9} We report 2 cases of DVT, septic PE complicated by a furuncle leading to Methicillin-

resistant Staphylococcal (MRSA) bacteremia and sinusitis followed by MRSA. Both cases recovered completely with medical therapies including anti-staphylococcal drug, anticoagulant therapy and supportive care.

CASE REPORT 1

A 10-year old, previously healthy boy, presented with fever and pain in left lower extremity for 10 days. Due to severe pain, he was unable to walk hence was taken to the local emergency where ultrasound of hip and Doppler was performed. DVT was suspected and referred to our tertiary-care hospital. He had a furuncle over his left leg a week ago, which resolved. There was no significant past or family history.

Upon arrival to ER the child was hemodynamically stable. Examination showed swelling and tenderness of left lower extremity. He was intermittently febrile (approaching 39F) and tachycardic (heart rate 160/min) with hip movements that were painful and no fullness over groin. There was mild tachypnea (35/min) without recession, normal lung auscultation and normal cardiac auscultation. There was significant hepatosplenomegaly. Doppler US and CT with contrast confirmed DVT of femoral vein. It involved popliteal vein and extended up to the common iliac vein of left side. There was no psoas abscess or septic arthritis of hip joint. Multisystem Inflammatory due to COVID (MSI-C) was suspected so work up was sent alongside blood culture. His first CXR was normal. He was started on IV Vancomycin and Meropenem initially. He remained clinically stable. On day 3, he developed dyspnea with increased oxygen requirement and bilateral infiltrates on CXR. CT-angiography chest was done which revealed multiple septic pulmonary emboli. He was started on high-flow nasal cannula for respiratory support. Blood Culture grew Methicillin-resistant Staphylococcal aureus (MRSA). His COVID rapid antigen as well as COVID antibody came negative. EKG and ECHO were done whose findings were not consistent with acute pulmonary embolism. He was continued on low-molecular weight heparin in therapeutic dose (dose was titrated based on therapeutic range), IV Vancomycin (serial monitoring of Vancomycin trough-level and assessment of renal function was

done) and supportive care. His rheumatologic workup came out to be negative. He improved clinically after three days of aggressive therapy with close monitoring. He neither required invasive mechanical ventilation nor any interventional therapy for the clot. His repeat blood culture came out negative after day 7. US Doppler showed resolution of clot while CT venogram showed complete patency of venous system of pelvic and lower extremity. He recovered successfully with appropriate medical therapy and was discharged home safely on day 27 on oral Linezolid for three weeks as well as oral Rivaroxaban for three months with follow-up in pediatric infectious disease and hematology clinic.



Fig 1; CT Angio showed occlusion of Right Femoral Vein due to Thrombi

CASE REPORT 2

A 13 year old, previously healthy girl, presented to us with complaint of fever for 3-4 days. Fever was undocumented, followed by flu, cough and nasal congestion. She was on symptomatic treatment from peripheral clinic but the complaints did not improve. She also started experiencing headache which was frontal in origin, accompanied by left eye and neck swelling. The patient developed left sided weakness for which they came to the hospital for further management,

On examination, she was found to have rhinitis as well as left eye and neck swelling. The swelling was red in color and tender on touch. Left sided

weakness was present with decreased power of 3/6 on left upper and lower limb. Patient was vitally unstable with findings of tachycardia and fever.

CT angiography head and neck was done that showed thrombosis of internal and external jugular vein with cavernous sinus thrombosis as well as multiple small pulmonary thromboses. Thrombophilic workup alongside septic and autoimmune workup was sent. Patient tested positive for MRSA and Covid antibodies but rest of the workup was negative.

Treatment was started according to the culture sensitivity. Antithrombotic medications were given. Patient recovered and was successfully discharged home on oral medications with close follow up.

DISCUSSION

Owing to the frequency of these cases as presented above, we should have a high index of suspicion for Staphylococcal infection as an underlying cause of DVT when a child presents with fever and swelling of extremity with pain after a furuncle. Staphylococcal infection, especially MRSA, is a major human pathogen with very invasive phenotypes that can cause a wide range of clinical diseases.¹⁰ The spectrum includes bacteremia, endocarditis, pleuro-pulmonary, osteo-articular, skin and soft tissue infection and device-related infections. Many pediatric-case series on invasive staphylococcal infection have been published in the literature.¹¹ Thrombotic complications related to Staphylococcal infection are rare in children.^{6,7} MRSA has a propensity to develop thrombotic complications related to exotoxins production, which is associated with serious morbidities and mortality. Most of MRSA strains contain the virulent factor Panton-Valentine Leukocidin (PVL). This strain has been associated with serious and life threatening infections including DT and septic pulmonary emboli.¹² Wong *et al* described a case series of seven children (aged 12 days – 16 years) of MRSA bacteremia with septic pulmonary complications from Taiwan.¹³ Sridhar *et al* did retrospective chart review and found 16 pediatric patients with DVT and staphylococcal infections over a 5-year period and they found that the most common underlying infections were osteomyelitis

(56%, 9/16) and soft tissue infection (13%, 2/16)⁵ Parsad *et al* described a pediatric-case series of four children (age 6 Mon -11 years) of MRSA bacteremia with DVT.¹⁴ Few case reports like these have been published.^{9,15} As pediatricians, we need to be aware of the association of DVT and MRSA infection in children presenting with fever and painful swollen limb in the absence of osteo-articular infection. Prompt diagnosis with aggressive management alongside appropriate antibiotics and anticoagulant drugs improve the outcomes in such cases. This also minimizes the complications in the suspected case of DVT with MRSA infections.

Authors' affiliation

Uroosa Saman, Saira Abrar Ahmed, Muhammad Kamran Younus, Hanif Kamal, Muhammad Ali, Anwarul Haque

Department of Pediatrics, Liaquat National Hospital and Medical College, Karachi

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