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ACUTE KIDNEY INJURY (AKI) INDUCED THROMBOPHLEBITIESASSOCIATEDWITH SECONDARY SEPSIS: A RARE CASE STUDY

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ABSTRACT

Thrombophlebitis is the inflammation of a vein associated with the formation of a blood clot (thrombus). It commonly occurs in the superficial veins of the lower extremities, thoughitcanalsoaffectdeeperveins.Thisconditionpresentswithredness,swelling,pain,and warmthalongtheaffectedvein.Thrombophlebitiscanbeclassified intotwotypes:superficial thrombophlebitis, which is confined to veins near the skin surface, and deep vein thrombosis (DVT), which involves deeper venous structures and developed risk for complications, such as pulmonary embolism. Risk factors include prolonged immobility, trauma, varicose veins,infections,andhypercoagulablestates.A75-year-oldIndianmalepresentedwithafever, with a temperature of up to 100.4 F associated with chills, Cough with expectoration, breathlessnessonexertionandleftlowerlimbswellingfrom3days.Laboratoryinvestigations revealed decreased levels of red blood cell count (RBC), hemoglobin (Hb) and WBC count and Neutrophils counts and serum creatinine levels were all elevated. The patient was treated withantibioticsimprovingpatient'scondition.ThrombophlebitiswastreatedwithHeparinand Benzyl nicotinate ointment for thromboprophylaxis and to reduce the swelling, pain and inflammation.

Key Words: Thrombophlebitis, Pulmonary embolism, Serum Creatinine, Heparin, Benzyl Nicotinate

Introduction:

Sepsisismarkedbyadysregulatedimmuneresponseto infection,resultinginlife-threatening organ dysfunction, frequently including acute kidney injury (AKI).Among critically ill patients, withthe sepsis condition for 45–70% of allAKI cases. Sepsis-associatedAKI (SA-AKI) worsens prognosis and is linked to extended stays in the intensive care unit (ICU) and hospital,highermortality,increasedlikelihoodoflong-termdisability,anddecreasedquality of life in children and adults[1].

Advances in understanding clinical risk factors, the underlying pathobiology, treatment responses, and factors in renal recovery have improved ourcapacityto prevent,detect, andtreat SA-AKI [2].AKI arises fromacomplexinteractionbetweenthe initialinjuryandtheactivationofinflammationandcoagulationpathways. Renal tubular dysfunction and activation of the tubule glomerular feedback mechanism are key contributors to sepsis-induced AKI [3]. Currently, thrombophlebitis induced by sepsis- associatedAKI is a rare occurrence. In this article we introduce a unique case studyon critical care management of sepsis and its complications.

CaseReport:

A 75-year-old Indian male presented with a fever, with a temperature of up to 100.4 F associated with chills, Cough with expectoration, breathlessness on exertion and left lower limb swelling from3 days. His red blood cellcount (RBC), hemoglobin(Hgb) was reduced and WBC count and Neutrophilscountswere allincreased (Table 1). He wasadmittedto the intensivecareunit ofAkash Super SpecialityHospitalinDevanahalli.Thepatient wasafarmerwho lived ina small village environment. Before this, he was with good health and had no additional chronic diseases.

In initial physical examination, the patient's body temperature was 100.4 F, pulse rate was 130 beats per minute, blood pressure was 130/80 mmHg and systemic examination of respiratorysystem revealed expiratorywheezing and auscultation indicated vocal resonance and basalcrackles.Thepatient showeda leanphysiqueandanotablypaleskin complexion while maintaining mentalclarity. No rash or bleeding point was identified allover his body. A scar was visible in the left lower limb, but there were no other apparent abnormalities.

Preliminary laboratory examination showed a significant decrease in hemoglobin (Hb), RBC count,PCV, MCV, MCH, Lymphocytes, Eosinophils. The WBC count with a predominance of neutrophils were elevated. Serum levels ofalanine aminotransferase (ALT), aspartateaminotransferase(AST),alkalinephosphatase (ALP) andRoutineurineexamination were all normal. The elevated serum Creatinine levels, Uric acid and SerumUrea levels indicating Acute kidney injury(AKI) (Table-1).Results were found as negative in occultblood instooltest.Allthereportsforbacteria,TrichomonasVaginalis, yeast cellsinurinewerenegative. The patient was subjected to Peripheral smear examination of blood reported

Microcytic hypochromic Anemia with neutrophilic leucocytes.

The patient has a scar on his left lower limb, caused few days before hospitaladmission (Figure 1). The patient underwent Electrocardiography(ECG) for heart wasperformed and it showed normal sinus rhythm and no ST -T changes. A Chest,FRNP->A X-ray revealed lower respiratorytract infection (LRTI) with right lower lobe pneumonia (Figure 2). A USG- left lower limb venous doppler was performed and the findings showed no evidence ofdeep veinthrombosisofleft lower limb, multipleenlargedinguinallymphnodes andsubcutaneous edema of lower limb and dorsum of foot suggesting of left lower limb cellulitis.

The general physical examination showed pitting Edema up toKnee joint and on hourly monitoringpatient'sbloodpressurewasred ucedto90/60mmHgandpatient wasshiftedto MICU for hypotension and later shifted back to general ward.

Thepatient wasdiagnosedwithsecondarysepsis induced bypneumoniaand associatedwith acute kidney injury marked by increase in creatinine levels and thrombophlebitis on both hands was attributed to the IV catheterization withsymptoms of swelling and redness at catheter site (Figure 3), which likely became a source of infection and contributed to the patient'ssepsis.The patient was promptly started on broad-spectrum IV antibiotics (Ceftriaxone and Salbactum) and antibioticswere narrowedto Ceftazidimeand Tazobactumtotarget both typicalandatypicalpathogensandinclude dantibacterialtherapywithMetronidazole. Tomanage AKI, the patient wasgivenIV fluids for hydrationand monitored closely for renal function. Due to the development of thrombophlebitis, the IV lines in the hands were swapped often and started on Heparin and Benzyl nicotinate ointment for thromboprophylaxisandtoreducetheswelli ng,painand inflammation.Theaffectedhands were managed with ice compress to reduce inflammation.

Frequent monitoring ofkidney function was essential, with daily creatinine and urine output assessments. Close attention was paid to ensure that the infection did not spread further to otherpartsofvascularsystemorleadto moreseverecomplicationlikedeepveinthr ombosis.

Overthenext fewdays,thepatient'sfeversubsided,andhi srespiratorysymptomsimproved with appropriate antibiotics. The swelling and erythema in both hands gradually resolved with conservative management. Kidney function showed gradual improvement, with serum creatinine decreasing by 7 days. The patient was monitored closely for any progression of thrombophlebitis,but there were no signs of complications like DVT or septic emboli.

The patient was discharged after 10 days of hospitalization with a 14-day course of oral antibioticsandreferralforoutpatient follow-uptomonitorkidneyfunctionand managethe residual effects of thrombophlebitis.

Discussion:

Unlike a simple, localized infection, sepsis involves a complex disturbance of the delicate immunebalancebetweeninflammationan danti-inflammation.Thisdysregulationcausesan extensive release of mediators, cytokines,and pathogen-related molecules, which in turn activates the coagulation and complement cascades on a systemic level [4]. The prevailing pathophysiological model suggests that decreased renal blood flow, leading to tubular epithelial cell necrosis from hypoperfusion and shock, is the primary cause of AKI[5,6].

However,ourfindings indicatethatfactorsbeyondhypoperfusion alsocontributeforAKI.

As per the2016 guidelinespublisheddefinesepticshockass epsiswithcirculatory,cellular,and metabolic dysfunction that is associated with a higher risk of mortality. The most common cause of sepsis is Pneumonia. Although manypatients with sepsis have fever, the clinical manifestation can be subtle, particularly in geriatricspopulation and those in immunocompromised patients[7]. Outcomes in sepsis have significantly improved overall, undoubtedly becauseofanenhanced focusonearlydiagnosisand fluid resuscitation, therapid deliveryof effective antibiotics, and other improvements insupportive care for critically illpatients [8].

SA-AKI is classified as early, occurring within the first 48 hours ofsepsis, and late, developingin between 48 hours and 7 days after sepsis onset [9]. According to the 2020 KDIGO (Kidney Disease: Improving Global Outcomes) Consensus, AKI is defined by an increase inserumcreatinineofat least 50%within7days, ariseofat least 0.3mg/dLwithin 2 days, or reduced urine output (oliguria) lasting at least 6 hours [10].

Inadditionto urine output and serum creatinine levels,other biomarker shave been developed to diagnose SA-AKI. Due to their shorter half-lives compared to serumcreatinine, cystatinC and plasma proenkephalin A 119–159 (pen Kid) are increasingly used in serum testing [11].

OtherpotentialserumbiomarkersforSA-AKI include interleukinsIL-6andIL-8,the cytokine osteoprotegerin,presepsin, and galectin-3[1,12,13].

Septicor suppurativethrombophlebitis(STP)ischarac terized byanendovascular thrombus associated with a bacterial or fungal infection. Venous infections may be an outcome from an intravenouscatheter, skinbreakdown, orspreadfromnearbynonvascularstructure s[14].In this case report, the patient's thrombophlebitis was attributed to IV catheter use.

Theendovascularnatureofthese infectionscanleadto secondarymetastaticdiseases, suchas pneumonia, endocarditis, and arthritis,

due to septic embolization or hematogenous bacterial spread. Proper diagnosis and management of these infections require a high level of clinical suspicion, the use of imaging studies, and prompt initiationofempiricalantibacterialtherapy [15]. Diagnosis is based on clinical symptoms, culture results, and radiographic evidence of thrombosis. Although various clinical conditions have been identified depending on the affected vessel, the underlying pathogenic mechanisms are generally similar [16].In our study, the patient has undergone chest X-ray, USG doppler test and culture tests to diagnose as sepsis associated AKI induced thrombophlebitis.

The standard treatment principles for septic pulmonary embolism associated with septic thrombophlebitisinvolvethepromptadmini strationofintravenousantibiotics, identifying and removing any potentially infected devices (such as intravenous catheters), and considering surgical intervention to drain purulent collections [17].

Anticoagulation is a keytreatment for deep venous thrombosis, but its use in septic thrombophlebitis is controversial. The goal of anticoagulation therapy is to reduce theseverityand durationofsymptoms during the acute thrombotic event bypreventing thrombus progression, minimizing the risk of recurrent thrombosis, and lowering the chances of pulmonaryemboliccomplications[18]. Inourcase,anticoagulationwasalso initiatedearlyin the thrombophlebitis to prevent further complications.

The use of anticoagulation in septic thrombophlebitis carries the potential risk of increasing septicembolismratesortriggeringhemorrha gicconversionofmetastatic lesions,particularly in the central nervous system. This concern is often drawn from experiences with infectious endocarditis [19].A recent comprehensive systematic review examined 14 case series involving 216 patients to assess the role of intravenous heparin combined with antibiotics in treating septic thrombophlebitis [20]. However, in our case, the patient did not experience these specific complications with the use of anticoagulation alongside appropriate antibiotic therapy.

TABLE1:Laboratoryresultatadmission and Before discharge

Project	Onadmission	Beforedischarge	Referencerange
Hemoglobin(Hb)	9.8gm%	7.9gm%	13.5-18.5gm%
RBCcount	4.12mlln/cu.mm	3.33mlln/cu.mm	4.5-6.5mlln/cu.mm
PCV	31.2%	25.1%	40-54%
MCV	75.8fL	75.4fL	76-96fL
MCH	23.8pg	23.8pg	27-32pg

WBCcount	14,600cells/cu.mm	11,500cells/cu.mm	4000-11500cells/cu.mm
Neutrophils	77.8%	68.5%	40-75%
Lymphocytes	13.1%	13.4%	20-40%
Monocytes	7.6%	15.3%	2-12%
Eosinophils	0.5%	2.0%	3-8%
Creatinine	1.65mg/dL	-	0.7-1.25mg/dL
Uric acid	8.2mg/dL	-	3.4-7.0mg/dL
Urea Serum	99.4mg/dL	-	10-50mg/dL

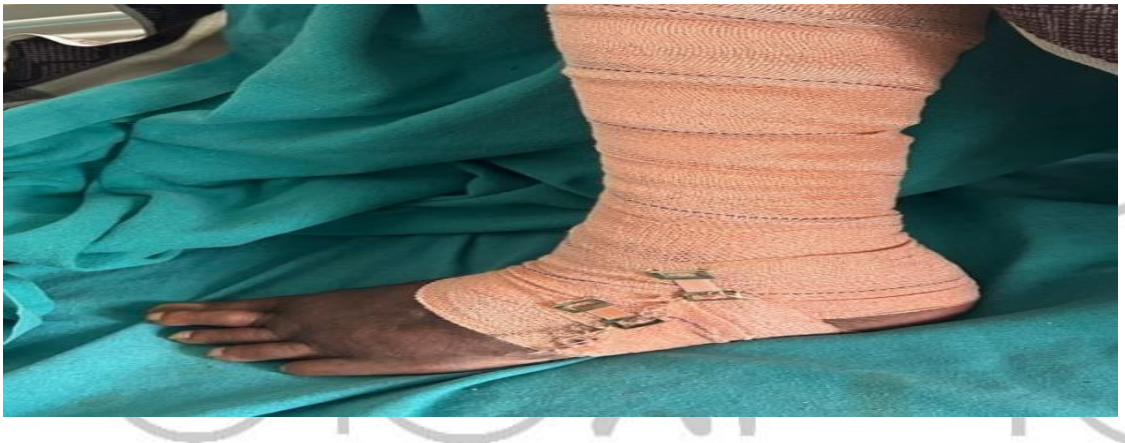
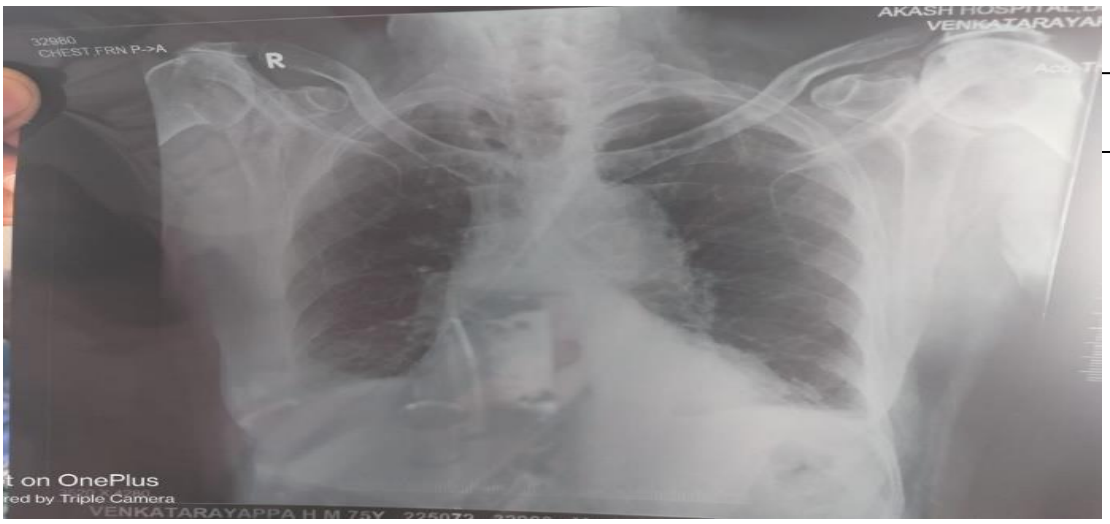


Figure1:Scarandswellingofpatient'sleftlowerlimb



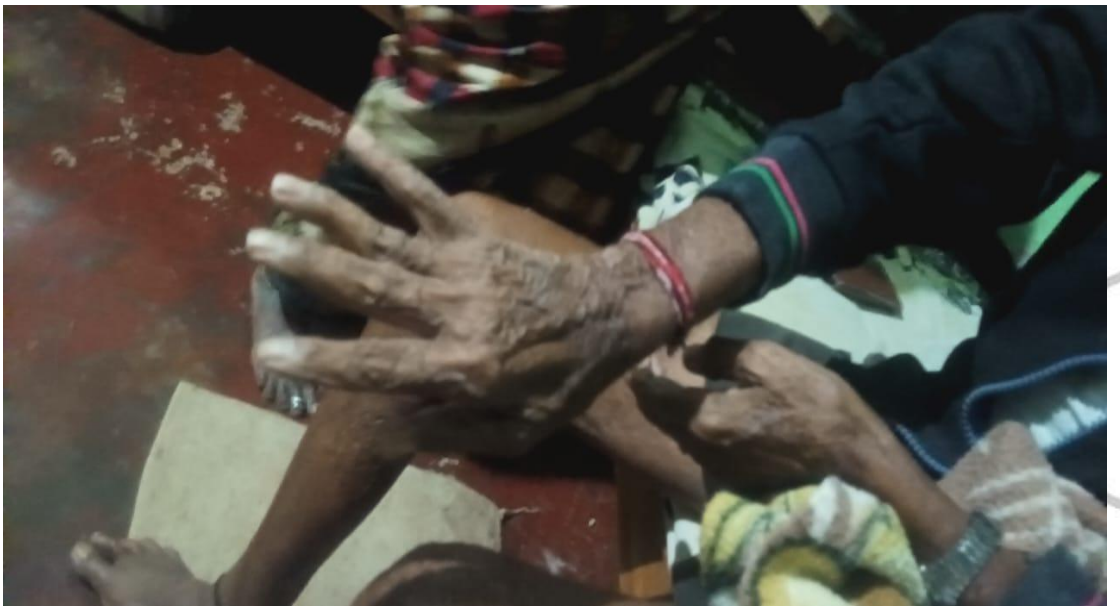


Figure3:Swellingandrednessatcathetersite(Thrombophlebitis)

Conclusion:

This case emphasizes the importance of recognizing secondarycomplications such as AKI and thrombophlebitis in patients with sepsis, especially in the elderly. Prompt diagnosis, appropriateantibiotictherapy,antimicrobialtherapy, fluidmanagementandsupportivecare are essentialfor improving patient outcomes. Inthiscase, earlyinterventionhelped prevent further deterioration, and the patient had a favorable recovery. This case also underscores theneed forcarefulmonitoringofIVaccesssitestoreducetheriskofthrombophlebitisand other vascular complications.

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