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Septic Shock Secondary to Klebsiella Pneumoniae Catheter-Related Bloodstream Infection in A Patient with Displaced Double J Stent: A Case Report

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Abstract: Sepsis is a life-threatening condition caused by a dysregulated host immune response to infection leading to organ dysfunction. Septic shock is a severe form characterized by circulatory and metabolic abnormalities with high mortality. It is diagnosed when vasopressors are required to maintain a mean arterial pressure (MAP) ≥65 mmHg despite adequate fluid resuscitation. Sepsis commonly originates from respiratory, gastrointestinal, genitourinary, or skin infections. Early diagnosis and prompt management with fluids, antimicrobial therapy, and vasopressor support are essential to improve survival.

Case Presentation: A 54-year-old male was admitted to Ballari Medical College and Research Centre (BMCRC), Ballari, Karnataka, with complaints of giddiness and bilateral lower limb swelling with difficulty walking for three days. He had a history of bilateral ureteric calculi with double J (DJ) stent placement and had undergone three cycles of maintenance hemodialysis. On examination, the patient was hypotensive (80/60 mmHg) and tachycardic (102 beats/min). Laboratory investigations showed severe anemia, leukocytosis, elevated creatinine and urea, and high inflammatory markers including procalcitonin and C-reactive protein. Blood culture revealed *Klebsiella pneumoniae*. Ultrasonography showed bilateral pyelonephritis with cystitis and displacement of the right-sided DJ stent. The patient received intravenous fluids, vasopressors, antibiotics, and supportive care with clinical improvement.

Case Discussion: Urinary instrumentation and indwelling devices increase the risk of bloodstream infections. In this case, septic shock was associated with *Klebsiella pneumoniae* infection and displacement of the DJ stent. Early diagnosis and culture-guided antibiotic therapy were important for effective management.

Conclusion: Sepsis due to catheter-related bloodstream infection requires early recognition, prompt antibiotics, and effective source control. Multidisciplinary care and monitoring are essential to improve outcomes, especially in patients with chronic kidney disease and urinary devices.

Keywords: Bloodstream infection, Vasopressor therapy, Organ dysfunction, Intensive care management, Infection-induced shock

INTRODUCTION:-

Sepsis is a life-threatening condition caused by a dysregulated immune response to infection, leading to organ dysfunction. Septic shock is a severe form of sepsis characterized by significant circulatory, cellular, and metabolic abnormalities that markedly increase mortality. It is diagnosed when vasopressors are required to maintain a mean arterial pressure (MAP) ≥65 mmHg and serum lactate is >2 mmol/L despite adequate fluid resuscitation, in the absence of hypovolemia. Sepsis shows a bimodal age distribution, affecting infants and adults over 60 years due to immature or weakened immunity. Males are at higher risk, possibly because female hormones provide some protective effects. Comorbid conditions such as renal failure, malignancy, diabetes, chronic lung disease, heart failure, and immunosuppression increase susceptibility. Common triggers include pulmonary and abdominal infections, while factors like low socioeconomic status, malnutrition, limited education, and genetic variations may further elevate risk.[1]

ETIOLOGY:-

Sepsis most commonly arises from infections of the respiratory, gastrointestinal, genitourinary, and skin or soft tissues, together accounting for over 80% of reported cases. Among these, pneumonia is the leading cause. Less frequent sources include infections related to indwelling medical devices, infective endocarditis, and central nervous system infections such as meningitis or encephalitis.

Bacteria are the primary causative organisms, including both gram-negative and gram-positive species. Some patients may have polymicrobial infections. A smaller proportion of cases result from fungal, viral, or parasitic pathogens. In nearly half of patients treated for sepsis, no causative organism is identified despite investigation; this condition is referred to as culture-negative sepsis. Respiratory infections are more often culture-negative, whereas urinary tract infections are typically culture-positive.[2]

CLINICAL MANIFESTATION:-

Sepsis and septic shock affect multiple organ systems. Cardiovascular signs include tachycardia, hypotension, warm flushed skin, poor capillary refill, and occasionally a new heart murmur. Constitutional symptoms commonly include fever, chills, malaise, myalgia, sweating, and loss of appetite. Cutaneous findings may present as rashes, petechiae, ecchymosis, erythema, ulceration, or purulent lesions. Gastrointestinal symptoms include abdominal pain, distention, diarrhoea, vomiting, and reduced bowel sounds. Genitourinary features include dysuria, frequency, haematuria, and flank pain. Musculoskeletal symptoms involve joint or muscle pain and weakness. Neurologic manifestations include headache, confusion, seizures, and neck stiffness. Respiratory symptoms include cough, dyspnea, chest pain, and tachypnoea.[2]

PATHOGENESIS:-

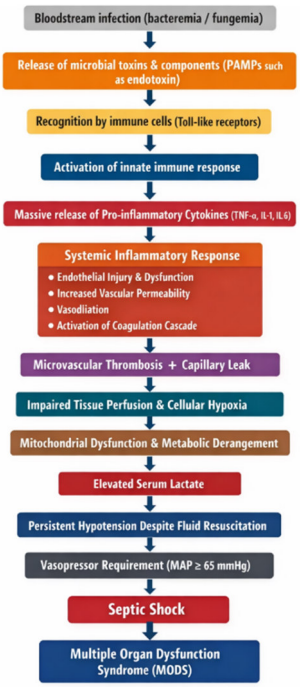

Fig 1: Pathophysiological Mechanisms of Sepsis and Septic Shock Secondary to Bloodstream Infection.[3]

DIAGNOSIS:-

Evaluation of sepsis includes complete blood count, metabolic panel, lactate, procalcitonin, liver enzymes, coagulation profile, urinalysis, and blood cultures. Acid–base status should be assessed. Imaging, such as chest radiography or CT, helps identify infection sources. Elevated procalcitonin suggests bacterial infection, while increased lactate indicates tissue hypoperfusion and guides prognosis and fluid resuscitation.[2]

TREATMENT:-

Table 1: Adjunctive and Supportive Therapies in the Management of Sepsis and Septic Shock [2,4]

THERAPY	CLINICAL APPLICATION
Corticosteroids	Hydrocortisone:- 200 mg per day
Blood product therapy (packed red blood cells transfusion)	Packed red blood cells transfusion is recommended only when the haemoglobin level is 7 g per dL (70 g per L) or less in the absence of myocardial ischemia, severe hypoxemia, or acute haemorrhage
Vasopressor therapy	Norepinephrine is the first-line vasopressor agent for hypotension that is not responsive to fluid resuscitation; vasopressin or epinephrine may be added as a second-line agent
Sodium bicarbonate therapy	Not recommended in patients with hypoperfusion-induced lactic academia with a pH of 7.15 or greater
Nutrition	Enteral nutrition should be used instead of parenteral nutrition if possible; dextrose infusion should be administered over the first seven days
Antimicrobial therapy	• Amikacin: High, single dose and extended interval dosing • Daptomycin: Higher doses (10–12 mg/kg/day) to increase MIC (> 0.1 mg/L) • Vancomycin: loading dose of 25–30 mg/kg, followed by 15–20 mg/kg every 8–12 h if MIC > 1 mg/L and no renal impairment

CASE PRESENTATION:-

A 54-year-old male patient was admitted to Ballari Medical College And Research Centre (BMCRC), Ballari (Karnataka) with chief complaints of giddiness in the form of spinning of self and surroundings. No history of nausea, vomiting, headache. Bilateral lower limb swelling positive[+], patient was unable to ambulate the pain and swelling since 3 days.

Social history:- Alcoholic [+], smoker[+] left 5 years back

Past history:- Bilateral Ureteric calculi, **s/p DJS (Double J Stent).** S/P 3 cycles Maintenance Haemodialysis

Past medication:- No records available

Family history:- Nothing significant

PICCLE:- Negative

On Examination :-

Table 2: Clinical examination of the patient

Blood Pressure	80/60 mmHg
Pulse Rate	102 beats per minute
Oxygen Saturation	96% on room air
General Random Blood Sugar	109 mg/dl
Central Nervous System	Conscious and oriented, b/l pupil equal and reactive
Cardiovascular System	S1 S2 heard, no murmur
Respiratory System	B/l normal vesicular breathing sounds [+]
Per Abdomen	Soft and non tender, no organomegaly

LABORATORY PARAMETERS:-

Table 3: Laboratory examination of the patient

Parameters	Result (7-2-26)	Result (10-2-26)	Result (14-2-26)	Result (16-2-26)	Reference Range
Haemoglobin	5.5	5.0		7.7	12-16g/d
RBC	2.21			2.39	4.3-5.9x10^6/mm^3
Haematocrit	21.1			22.4	39-49%
WBC	16690	13220		8390	4500-11000 cells/cumm
Sr. Creatinine	2.7	3.7	4.1	3.0	0.6-1.2 mg/dl
Sr. Urea	73	119	127	118	20-50 mg/dl
Troponin I	1.8				0-0.4 ng/ml
CK-MB	1.8				0-5 ng/ml
Procalcitonin	77.4				<0.5 ng/ml
CRP	83.4				0-6 mg/dl

OTHER INVESTIGATIONS:-

- **Blood culture and sensitivity:** Klebsiella pneumoniae, sensitive- gentamicin, cotrimoxazole, meropenem, Fosfomycin
- **ECG:** Sinus tachycardia, LVH [+]
- **USG Abdomen:** Bilateral moderate pyelonephritis, cystitis

TREATMENT :-

Table 4: Treatment regimen in hospital

Name of Medications	Dose	Route	Frequency
INJ. IVF – NS	2 PINT NS	IV	100ML/HR FOR 10 DAYS
INJ. NORADRENALINE	2 AMP in 100ml NS	IV	16DROPS/HR FOR 10 DAYS
INJ. PANTOPRAZOLE	40mg	IV	OD FOR 10 DAYS
INJ. SODIUM BICARBONATE		IV	TID FOR 10DAYS
INJ. CEFTRIAXONE	1g	IV	BD FOR DAY 1
INJ. PARACETAMOL	1g	IV	TID FOR 10DAYS
INJ. CEFTRIAXONE	1g	IV	BD FOR 7 DAYS
INJ. VANCOMYCIN	500mg	IV	OD FOR 10 DAYS
INJ. DOPAMINE	2AMP in 100ml NS	IV	10ML/MIN DAY3-10
INJ. TRAMADOL	500mg in 100ml NS	IV	SOS DAY 5-10
SYP. SUCRALFATE	10ml	PO	TID DAY 6-10
INJ. MEROPENEM	1g	IV	TID DAY 8-10

DISCHARGE MEDICATIONS:-

Table 5: Discharge medications

Name of Medications	Dose	Route	Frequency
TAB. FAROPENEM	200mg	PO	BID FOR 5 DAYS
TAB. PANTOPRAZOLE	40mg	PO	OD FOR 5 DAYS
TAB. SODIUM BICARBONATE	500mg	PO	BID FOR 15 DAYS
TAB. PARACETAMOL	500mg	PO	BID FOR 5 DAYS
SYP. SUCRALFATE	10ml	PO	OD FOR 5 DAYS
TAB. ONDASTERON	4mg	PO	BID FOR 5 DAYS
SYP. B COMPLEX	15ml	PO	OD FOR 15 DAYS

The patient was found to have a displacement of the right-sided double J stent on evaluation.

CASE DISCUSSION:-

Sepsis remain one of the major cause of morbidity and mortality worldwide usually associated with infections originating from medical devices. Catheter related blood stream infections (CRBSI) represents hospital acquired infection and are common in patients with multiple comorbidities, prolonged hospitalization and invasive procedures.

In our case, patient developed sepsis with septic shock secondary to blood stream infection, associated with urinary tract instrument placement and displacement of a double J stent. The patient had C/o hypotension (80/60mmHg), tachycardia, elevated inflammatory markers and high procalcitonin levels along with severe systemic inflammatory response. These evidences fulfil diagnostic criteria for septic shock define by persistent hypotension requiring vasopressor therapy to maintain blood pressure ≥ 65 mmHg. This patient had chronic kidney disease requiring maintenance haemodialysis and prior intervention with double J stenting significantly increased risk of infection.

Detection of Klebsiella pneumoniae in blood culture supports diagnosis of catheter associated blood stream infection. Klebsiella are well recognised opportunistic pathogens in hospital settings, commonly causing urinary tract infection(UTI), bloodstream infections and sepsis especially in immunocompromised patients.

Lab investigations revealed leucocytosis, elevated CRP, increased procalcitonin(77.4ng/ml) and worsening renal parameters including serum creatinine and serum urea. These symptoms are commonly found in systemic infections accompanied by renal dysfunction. Elevated prolactin levels are used as a biomarker for bacterial sepsis and corelated disease severity with prognosis. Anaemia condition of patient could further contribute to tissue hypoxia and worsen clinical outcome.

Early as well as aggressive management is needed to improve septic shock. The treatment included prompt fluid resuscitation, early administration of broad spectrum antibiotics and hematologic correction with vasopressors in case of hypotension. Here I.V were administered with vasopressors like noradrenaline and dopamine to maintain adequate blood pressure. Antibiotic ceftriaxone and vancomycin were started initially, shifting to meropenem based on severity of infection and microbiological findings. Culture and sensitivity report showed susceptibility to several antibiotics such as gentamicin, cotrimoxazole for supporting appropriateness of antimicrobial strategy employed.

Another important aspect in this case was displacement of right sided double J stent. Prolonged retention of ureteric stents can lead to urinary stasis, infection and subsequent bacterial infections. Removal or correction of source of infection is critical in management of sepsis, if not may lead to further complications. Supportive treatment such as administration of proton pump inhibitors, analgesics, sodium bicarbonate for metabolic acidosis and GI protective agents helped in managing complications and improve patients condition. Monitoring renal parameters along with haematology was also essential as patient was under dialysis.

The case highlights early recognition of sepsis using clinical parameters and biomarkers such as procalcitonin in order to initiate rational treatment.

CONCLUSION:-

Sepsis with septic shock secondary to catheter related blood stream infection refers to a serious and potentially life threatening condition requires early detection and aggressive management. This cause emphasizes importance of early diagnosis, timely initiation of broad spectrum antibiotics, adequate haematological support along with effective source control in improving patient outcomes.

Patients with urinary devices, chronic kidney disease and with urological interventions are at increased risk of developing severe infections and need regular monitoring. Culture and sensitivity guided antibiotic. Monitoring along with multidisciplinary management involving physicians, clinical pharmacists, nursing staff are important to ensure optional treatment and prevent further complications.

This case emphasizes role of early detection and intervention and individualized treatment option approaches in managing septic shock. Improved patient awareness, proper antibiotic selection adherence to infection control can create a good impact in reducing of secondary infections in clinical atmosphere.

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