SEPSIS | SEPTICEMIA

There are important definition in infectious system to be known:

Infection : Invasion of normally sterile tissue by microorganism .

Bacteraemia : Viable bacteria in the blood which may be overcome by immune system .

Systemic inflammatory response syndrome (SIRS) : It mean inflammatory response of the body against infective and inflammatory causes like pancreatitis ,vasculitis ,trauma ,cardiopulmonary bypass surgery ….etc . It characterized by two or more of the followings : 1- fever > 38 ℃ or hypothermia < 36 ℃ . 2- Tachycardia > 100 bates | minutes . 3- Tachypnea respiratory rate > 20 | minutes . 4- Hypocapnea $Paco_2$ < 4.3 kpa (<32 mmHg) . 5- leucocytosis WBC > 12×10^9|f or leucopenia < 4×10^9|f .

Sepsis : Systemic inflammatory response syndrome (SIRS) proved by infection .

Sever sepsis (septicemia): Sepsis with early organ dysfunction or hypotension .

Septic shock : Sepsis associated with organ failure and hypotension (Systolic pressure < 90 mmHg or postural hypotension >40 mmHg) unresponsive to fluid resuscitation .

Multiple organ dysfunction syndrome (MODS) : Development of organ dysfunction in patient critically ill with SIRS . If prompt treatment of underlying cause and suitable organ support if not achieved then multiple organ failure will be ensue which is life threatening condition .

Local infection → Bacteremia → SIRS → Sepsis syndrome→ Septic shock→ MOF→ Death

Pathophysiology of sepsis :

Infection occur in local tissue or organ lead to local inflammation to prevent bacteria to produce extended damage , if bacteria reach blood stream depending on the virulence of microorganism and patient immunity , the bacteria either eradicated by the body (Bacteraemia) or it cause severe infection which stimulate the immune system and interaction between white cell count, coagulation pathway ,platelets and endothelium (systemic inflammatory response syndrome) ,this disrupt the

endothelium function in that fluid and protein exvasated to tissue lead to tissue oedema and this lead to cellular and tissue hypoxia .Endothelial injury occur which stimulate mediators like endothelin 1 which is a promote vasoconstrictor , prostacycline and nitric oxide (NO) which are arteriolar , venodilator and cardiac depressant (decrease cardiac output) which leads to arteriolar and venodilation (venoarterial shunting) leads to hypotension (septic shock) , all these lead to tissue hypoxia . Microvascular thrombosis occur. These consequences lead to multiorgan failure, in lungs acute respiratory distress syndrome (ARDS) in kidneys acute tubular necrosis lead to renal failure and disseminated intravascular coagulation (DIC) .

Common pathogens for sepsis

1- Bacteria : Gram ′s positive bacteria Staphylococcus aureus including multi drug resistant staphylococcus aureus (MRSA) and coagulase negative staphylococci , Streptococcus pneumonia and other streptococci . Gram ′s negative bacteria like E. coli ,pseudomonas aeruginosa and yersina pestis and multi-drug resistant Gram ′s negative bacteria .Enterococci, Nisseria meningitdis , Polymicrobial Gram ′s negative and anaerobes bacteria .
2- Mycobacteria tuberculosis and mycobacteria Avium complex usually in HIV .
3- Fungi like candida and histoplasma called fungemia in immunocompromissed patient .
4- Parasites like Malaria or strongyloid stercoralis in immunocompromised patients .

Clinical features

Patients at risk of sepsis are elderly patients ,immunocompromised , after invasive procedures or surgical conditions like pancreatitis ,perforated viscus …etc ,diabetes mellitus ,burn ,chronic diseases (heart ,lungs ,kidneys and liver) . The main site of infection either evident or not immediately presented with septicemia and septic shock knowing the primary site is important for presumption type of bacteria and antibiotics . The patient is febrile ,chill or hypothermia(bad sign) ,tachypnic ,tachycardia , the patient has hypotension not responding to intravenous fluid later if vasodilatation and warm extremities (warm shock) later pallor and cold extremities (cold shock) in Nisseria meningitidis septicemia the patient has petechial and echymotic rash . The patient has respiratory distress syndrome , acute renal failure ,delirium ,confusion and coma in late stage , cardiac decompensation ,disseminated intravascular coagulation ,bowel ischemia and hyperbilirubinemia where called multiorgan failure if two or more organs failed ,four organs failure associated with 80% mortality .

Diagnosis :

The aim of investigations to detect primary site of infection to presume bacteria like chest X-ray for pneumonia ,ultrasound or CT –scan of abdomen for abdominal abscess ….etc . Type of bacteria which cause sepsis syndrome Blood culture 3 times and culture any invasive infected tool like CVP line ,catheter ….etc . Severity of sepsis and MOF by serum Lactate ,renal function test ,chest x-ray ……etc .

Management

Antibiotic use is crucial management which must not delay for blood culture and should be use to cover Gram ′s positive ,negative and anaerobes till results of blood culture is available .Antibiotics used according to source of infection possibility ,empirical treatment include vancomycin ,pipercillin –tazobactum and aminoglycosides then shifted according to results of blood culture and sensitivity test . Oxygen supply because patient is hypoxic . intravenous fluid supply to correct hypotension we use crystalloids or colloid fluid , blood transfusion if patient is anemic to maintain haemoglobine to 10 gm% . If no response to intravenous fluid vasoconstrictor like epinephrine or norepinephrin infusion or dobutamine infusion for inotrope . Hydrocortison vial which improve shock state . Now recombinant activated protein C which improve the mortality .

Prognosis

Septicemia is serious and still medical challenging condition unless primary infection is diagnosed and treated and organs supported it progress to multiorgan failure and as number of organ whom failed increase mortality rate is increase also four organs failure and more associated with 80% mortality .