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Septic Thrombophlebitis of the Umbilical Vein Complicating an Intrahepatic Umbilical Venous Catheter in a Premature Newborn

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Abstract:- Septic thrombophlebitis of the umbilical vein (SVT) is a serious pathology in neonates, characterized by inflammation of the umbilical vein due to bacterial infection, with 90% of cases linked to the use of central venous catheters (CVCs). This inflammation can lead to thrombus formation as part of the immune system's response.

Premature newborn, 33 weeks gestation, delivered vaginally, with history of gestational diabetes, twin pregnancy, macrosomia and premature rupture of membranes (57 hours), initially well adapted to extrauterine life, with a birth weight of 1575 g. The infant was admitted to neonatology for respiratory distress, and an intrahepatic umbilical catheter was inserted. On the 5th day of hospitalization, the infant developed a nosocomial Klebsiella pneumoniae infection, complicated by a fulminant hemorrhagic syndrome with hematemesis and melena. The clinical course was further complicated by multivisceral failure, requiring hepatic Doppler ultrasound, which revealed umbilical vein thrombosis.

The newborn was treated with curative doses of Lovenox, while targeted antibiotic therapy was maintained for three weeks after negative blood cultures, resulting in significant clinical and biological improvement.

Based on this case, we conclude that it is advisable to think about umbilical vein thrombosis and to perform an abdominal ultrasound in the presence of any digestive hemorrhage in a newborn or an intrahepatic or peripheral umbilical venous catheter, or in subjects at risk (hypotrophy, polycythemia, transfusion on the catheter) in order to screen for possible umbilical or portal vein thrombosis.

Keywords*: Newborn, Thrombosis, Infection, Lovenox.*

I. INTRODUCTION

Septic thrombophlebitis of the umbilical vein (SVT) is a serious and potentially fatal condition in neonates, resulting mainly from bacterial infections that cause inflammation of the umbilical vein. This pathology is particularly alarming because of its close association with the use of central venous catheters (CVCs), essential devices in neonatal intensive care units for administering prolonged intravenous treatment. Studies show that around 90% of cases of SVT are linked to the insertion of these catheters, which, despite their medical necessity, create a pathway for bacterial colonization and infection.

Once the bacteria have invaded the umbilical vein, the body's immune response triggers inflammation, but this also leads to damage to the vein's inner walls. As part of the immune response, a thrombus forms, which can exacerbate the disease. If left untreated, infection and thrombus can lead to serious complications, including the spread of infection into the bloodstream (sepsis) and the possibility of clot migration, creating further vascular problems. Early recognition and intervention are therefore essential to mitigate the associated risks and improve neonatal outcomes.

II. CASE REPORT

A premature newborn at 33 weeks of gestation, the second twin of a bi-chorionic, bi-amniotic twin pregnancy, was delivered vaginally. The mother had gestational diabetes, and the infant was macrosomic, with a history of premature rupture of membranes lasting 57 hours. The infant demonstrated good adaptation to extrauterine life, with a birth weight of 1575 g. The first twin was born macrosomic and had a malformation syndrome.

The newborn was admitted from the delivery room for neonatal respiratory distress and was managed with continuous positive airway pressure (CPAP). An umbilical catheter was placed on day 1 of life in an intrahepatic position but was removed after 6 hours and subsequently repositioned to the peripheral vein, where it remained for 2 days. On day 5 of hospitalization, the infant developed a nosocomial infection due to Klebsiella pneumonia, complicated by a fulminant hemorrhagic syndrome characterized by hematemesis and melena.

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The clinical course was marked by multi-visceral distress, which prompted a hepatic Doppler ultrasound that revealed thrombosis of the umbilical vein.

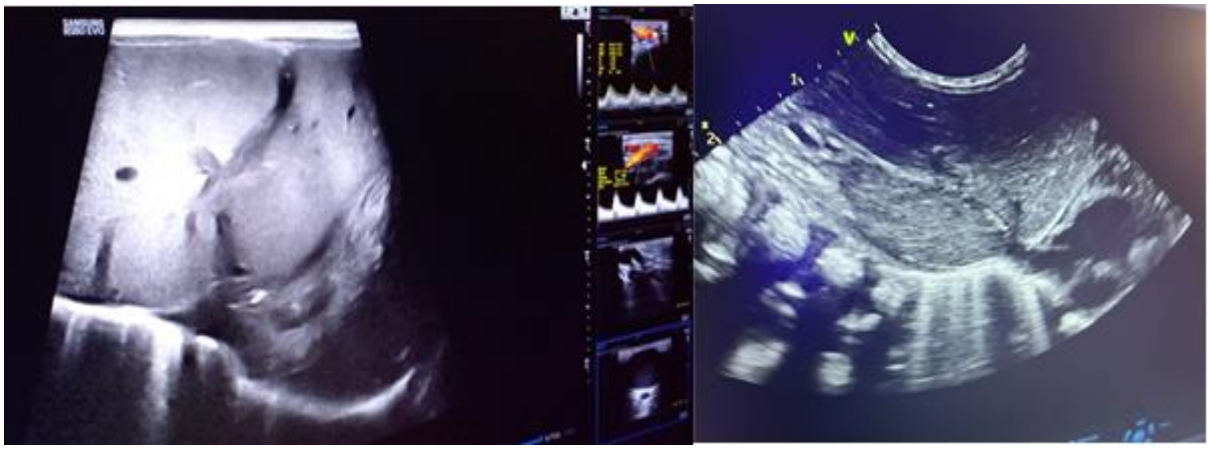

Fig 1 and 2: Presence of Echogenic Material within the Umbilical Vein, with a Patent Portal Vein.

The newborn was started on Lovenox at a dose of 1 mg/kg every 12 hours subcutaneously, with targeted antibiotic therapy maintained for 3 weeks following negative blood cultures. Demonstrating significant clinical and biological improvement.

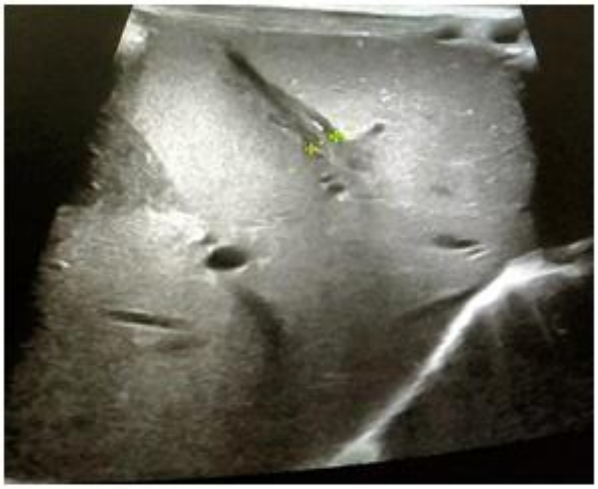

Fig 3: Decrease in the Caliber of the Umbilical Vein

III. DISCUSSION

Septic umbilical vein thrombophlebitis (SVT) is a serious condition in neonates characterized by inflammation of the umbilical vein due to bacterial infection, with 90% of cases related to central venous catheter (CVC) use. This condition can lead to thrombus formation as a result of an inflammatory response and immune system activation [1, 22].

Umbilical vessel thrombosis is extremely rare, unpredictable, and associated with high perinatal mortality. Few cases of neonatal survival have been reported. This condition can potentially spread to the portal venous system, increasing the risk of severe complications, including septic embolisms, sepsis, and other health issues [2, 3].

Bacteria are potent stimulators of thrombosis, acting either directly by releasing prothrombotic factors or indirectly through tissue damage caused by toxins. Thrombi can harbor bacteria in their deeper layers, preventing effective antibiotic penetration. Cases of viral infections such as cytomegalovirus (CMV), herpes simplex, measles, human immunodeficiency virus, and hepatitis have also been documented.

Infection is related to omphalitis, neonatal umbilical sepsis, and potentially to endothelial injury caused by prolonged umbilical vein catheterization [5]. Catheter-related infections are the third leading cause of infections associated with intensive care.

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Table 1 Definition of a Catheter Infection (SRLF Consensus 2002): [8]

Non-Bacteremic ILC	Non-CVC Infection	CVC-Related Bacteremia
● Culture CVC≥103ufc/ml and ● Total or partial regression within 48 hours or ● Purulent orifice or tunnelitis	● CVC Sterile or <103 ● Positive CVC culture, different strain and/or other infectious focus present and the infectious syndrome does not regress with removal of the CVC ● CVC culture and other site positive and infectious syndrome does not regress with CVC removal	● Bacteremia within 48 hours and ● Culture insertion site + same germ or CVC culture ≥103 ufc/ml–same germ or Quantitative BC ratio KT/ BC peripheral ≥5 Or Difference in rising time ≥2h

➢ CVC: central venous catheter; ILC: Catheter-related infections; KT: catheter; BC: blood culture

For short-term catheters, bacteria predominantly originate from the catheter insertion site [9].

Main risk factors for catheter-related infection include [11, 12, 13]:

- The use of parenteral nutrition, which is strongly associated with a higher risk of infection.
- Prolonged invasive ventilation
- The presence of a positive blood culture within 48 hours before CVC placement.
- Prematurity or other neonatal pathologies.
- Low birth weight.
- Persistence of bacteremia despite the removal of the catheter should suggest endocarditis, suppurative thrombophlebitis, or a secondary location.

The most frequently encountered microorganisms belong to the resident skin flora (coagulase-negative Staphylococcus and Staphylococcus aureus) or are exogenous (Enterococcus spp., Enterobacteriaceae, Pseudomonas spp., Acinetobacter spp., Candida spp.) from the patient or healthcare personnel. These bacteria are prolific producers of "slime" (a polysaccharide substance that promotes adhesion to the surface of inert materials), which enhances their ability to colonize catheters and, once established, to resist antibiotics and phagocytosis. Over the last decade, Gram-negative bacilli have become increasingly significant, now accounting for almost half of the microorganisms involved [7].

In addition to infection, thrombophilia is a major risk factor for venous and portal thrombosis. Other contributing factors include the intrahepatic position of the central venous catheter, hypotrophy, polycythemia, hepatic vascular malformations, and transfusions of packed red blood cells via the catheter.

The goals of treatment are to eradicate bacterial infection, prevent thrombus propagation, and minimize the risk of complications. The management of septic thrombophlebitis involves removing the infected catheter and initiating antibiotic therapy, ensuring adequate hydration, providing appropriate nutrition, and closely monitoring the clinical condition, including controlling fever and pain. In some cases, curative heparin therapy may continue for more than three weeks after the patient becomes afebrile and/or following negative blood cultures.

The initial choice of antibiotic therapy is based on the likely pathogens, necessitating broad-spectrum coverage. The duration of treatment for septic thrombus depends on several factors, including the severity of the infection, thrombus location, response to treatment, and bacterial culture results. Treatment can be adjusted based on the patient's clinical course and laboratory findings. The literature remains inconclusive regarding the optimal treatment duration; a minimum of three to four weeks, extending up to eight weeks, is generally recommended [18]. More recent guidelines suggest continuing therapy for at least three weeks beyond clinical resolution [19]. A treatment duration of fewer than 14 days increases the risk of recurrence unless coagulase-negative Staphylococcus or Enterobacteriaceae are involved. In such cases, a seven-day treatment course may be considered if clinical improvement is observed 48 hours after catheter removal (resolution of septic syndrome and negative blood cultures). In cases of infection due to S. aureus, Candida spp., or other implicated microorganisms, failure to improve or worsening of the septic syndrome 48 hours after the start of treatment should prompt investigation for secondary deep foci (e.g., arthritis, osteitis, endocarditis) or septic thrombophlebitis.

Anticoagulation may be initiated cautiously in some cases to prevent thrombus propagation, inhibit platelet function, enhance antibiotic penetration into the thrombus, and provide anti-inflammatory effects. Low molecular weight heparin (LMWH) is preferred due to its lower risk of hemorrhage and secondary thrombocytopenia. Monitoring anti-Xa activity is recommended after one to two weeks of treatment at a therapeutic dose [10]. The use of oral anticoagulants (vitamin K antagonists) is avoided in infants under two months of age [16]. Some studies in newborns have reported 70% spontaneous recanalization when the thrombus is partially occlusive and 30% when it is fully occlusive [17]. The role of anticoagulant therapy remains controversial in newborns, and its use requires expert medical and radiological assessment [14].

In children, the duration of treatment lacks consensus; in newborns, treatment is typically prescribed for six weeks to three months based on ultrasound monitoring data. The therapeutic range for anti-Xa levels is 0.50 to 1.0 units/mL in blood samples taken four to six hours post-administration, with twice-daily subcutaneous LMWH recommended [9].

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Continuous intravenous infusion is also an option. Close monitoring for side effects is essential, including the risk of bleeding, accidental overdose, and, in rare cases, heparin-induced thrombocytopenia (HIT).

The use of fibrinolytic therapy remains controversial and is rarely feasible. Surgical intervention may be necessary in cases where well-conducted medical treatment fails (persistent positive blood cultures after five days of effective therapy). In certain situations, drainage of perivenous abscesses may be required. Vein ligation or removal of a septic thrombus, a classic treatment for superficial thrombophlebitis, is generally not feasible in central veins and is rarely necessary [20, 21].

IV. CONCLUSION

It is essential to consider umbilical vein thrombosis in newborns presenting with digestive hemorrhage, particularly in the presence of an intrahepatic or peripheral umbilical catheter, or in high-risk individuals such as those with hypotrophy, polycythemia, or those who have received transfusions via the catheter. Performing an abdominal ultrasound in these cases allows for the rapid detection of potential umbilical or portal vein thrombosis. Furthermore, when a newborn is diagnosed with umbilical vein thrombosis, it is crucial to exclude portal vein thrombosis and to conduct a thorough screening for thrombophilia to ensure comprehensive and appropriate management of the affected infants.

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