Case Reports

Femoral Venous Thrombosis in a 5-week Old with Diabetic Ketoacidosis and a Femoral Venous Catheter

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Children with diabetic ketoacidosis (DKA) may require central venous catheters (CVC) for fluid resuscitation. CVC-related thrombus has been reported in a variety of conditions but only rarely in association with DKA and never in a child under one. The case of a five week old child with DKA and a CVC-related thrombus is presented.

Key words: *Central venous catheter, Diabetic keto-acidosis, , Venous thromboembolism.*

Children with DKA may require central venous access for resuscitation purposes. This route of vascular access, however, is associated with a variety of complications(1) including venous thromboembolism (VTE)(2). Whilst children with thrombophilia, malignancy, congenital cardiac disease, acute infection, trauma and surgery are known to be at high risk from central venous catheter (CVC) related VTE(1), few cases have been reported in association with DKA(3,4) and no cases have been reported in a child under one. We report the case of a five-week-old child with DKA who developed a femoral DVT following insertion of a femoral CVC for fluid resuscitation. The literature surrounding DKA and CVC-related VTE is reviewed.

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Case Report

A five-week-old Somalian boy was brought to the Emergency Department (ED) with a 24 hour history of being non-specifically unwell, off his feeds and vomiting. A diagnosis of viral illness had been made twelve hours prior to his attendance. However, overnight he had become increasingly unwell and was brought to the ED by his parents. He was born at term with a birth weight of 3.87 kg and had been previously well. His parents and 3-year-old brother were all well.

On examination he was a febrile, irritable, tachypneic (rate 36 breaths/minute), tachycardic (170 beats/minute), drowsy and approximately 10% dehydrated (estimated by a sunken fontanel, sunken eyes and reduced skin turgor). An initial venous blood gas revealed: pH 6.99, CO_2 21.2 mmHg, base deficit 25.6 mmol/L, bicarbonate 5.7 mmol/L, lactate 2.4 mmol/L, sodium 153 mmol/L, potassium 5.3 mmol/L and glucose 45 mmol/L. These results were confirmed in the laboratory. A diagnosis of DKA was made; a femoral CVC was inserted, and the infant was treated with intravenous fluids and insulin according to local guidelines and transferred to the pediatric intensive care unit (PICU). Fluid resuscitation occurred over 48 hours ensuring that serum sodium and osmolarity did not alter rapidly. Acidosis and ketonuria ceased within 36 hours.

Four days after admission he was transferred to the ward. On removal of the left femoral CVC it was noted that his left leg was swollen. An ultrasound scan (USS) demonstrated an extensive left femoral vein thrombosis extending to the lower left thigh. He was commenced on Clexane® which continued until an USS demonstrated clot resolution six weeks later.

Discussion

In children with critical illness requiring fluid and other medication, a CVC may be the only vascular access obtainable. VTE is a known complication with pediatric VTE registries reporting that 28-50% of VTE episodes in children

are CVC-related(5,6). The reported incidence in PICU varies according to whether the diagnosis is made clinically or radiologically, with one study suggesting an incidence of 18.3% based on radiological diagnosis(2).

In children, the majority of cases of CVC-related thrombosis occur in association with malignancy, congenital cardiac disease, acute infection, short gut syndrome, renal disease, thombophilias and trauma(1). Whilst DKA has not been identified as an isolated risk factor for CVC-related VTE, in adult(7). Additionally, two recent studies(3,4) suggest that DKA may predispose children to the development of CVC-related VTE.

Gutierrez's retrospective case-control study(3) looked specifically at children admitted to PICU with DKA who had femoral CVC insertion. Each child was age-matched with two controls consecutively selected from a database of CVC placements. All controls had femoral CVC insertion for shock (defined by the authors as arterial hypotension, requirement of ≥40 mL/kg fluid resuscitation or the need for inotropes/ vasopressors). Children with known risk factors for CVC-related VTE were excluded. Eight children out of 154 with DKA required a femoral CVC. Four children, all under three years of age with normal thrombophilia screens, developed CVC-related VTE. None of the sixteen control patients did (P = 0.007). The authors concluded that young children with DKA requiring femoral CVC placement are at an increased risk of developing CVC-related VTE.

Worly, *et al.*(4) retrospective cohort study found similar results and the authors reached similar conclusions. Six out of 113 children admitted to PICU with DKA required a femoral CVC. Three developed CVC-related VTE. In comparison, only six out of 413 non-DKA children with femoral CVCs developed CVC-related VTE (P<0.001). All three children were under two years of age and developed signs within 48 hours of CVC insertion. Subsequent thrombophilia screens were un-remarkable.

Femoral CVCs may increase the risk of VTE in children with DKA for a number of reasons: DKA-associated dehydration may increase the risk of VTE. Dehydration, however, has never been implicated specifically as causative in either adults or children and Gutierrez, *et al.*(3) specifically report that there was no difference in hydration between children with DKA/VTE and the controls; platelet aggregability increases in the presence of hyperglycemia(7), possibly as a result of reduced nitrous oxide availability; hyperglycaemia and acidosis increase red cell rigidity which in turn increases viscous resistance and impairs blood flow [8]; in adults hyperglycaemia is associated with hyperfibrinogenemia and hyperviscosity(9); and the hyperosmolarity associated with DKA may contribute(8).

The number of reported cases of CVC-related VTE in association with DKA is small. This complication, however, may have life-threatening complications. Whilst evidence is limited and further studies are needed, the judicious use of femoral CVCs, particularly in children under three years of age with DKA is recommended. Where essential for resuscitation purposes, these lines should be removed as soon as possible, particularly as CVC-related VTE appears to occur within the first 24-48 hours after insertion.

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Capillaria hepatica Infestation

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Capillaria hepatica is a very rare zoonotic infestation which primarily infest rodents and is rarely found in humans. The presenting features are fever of unknown origin, hepatomegaly and peripheral eosinophilia. Liver biopsy remains the cornerstone of diagnosis. Treatment of choice is Albendazole and outcome is generally good.

Capillaria hepatica primarily infests rodents and is rarely found in humans. Till date only 37 cases have been reported worldwide out of which two are from India. We hereby report a fourteen-month-old child who presented with pyrexia of unknown origin; later diagnosed to have *Capillaria hepatica* infestation.

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A fourteen-month-old male child, resident of Nasik, was brought to our hospital with moderate to high grade fever for one month. This was preceded by loose stools for three days. On examination, the child was active and playful and weighed 10 Kg. Systemic examination was normal except for mild hepatomegaly.

Investigations revealed hemoglobin 8.7 g/dL, total leucocyte count–24,900/cumm, polymorphs–18%, lymphocytes–25%, eosinophils–55% and monocytes–2%. Liver function tests revealed mildly raised liver enzymes, *viz*., alanine aminotransferase–116 IU/L, aspartate aminotransferase–138 IU/L. Ultra-sound of the abdomen revealed mild hepatomegaly with a liver span of 9.7 cm, no intrahepatic biliary canalicular (IHBC) dilatation; portal vein and common bile duct were normal. There were enlarged lymph nodes in porta hepatis region, the largest one measuring 9 mm. CT abdomen revealed retropancreatic and preportal lymph nodes which were subcentrimetric. Bone marrow study was normal.

Meanwhile, the child continued to have moderate grade fever and was given symptomatic treatment. A liver biopsy was planned in absence of any diagnostic clues. The histopathological examination revealed classic spindle shaped eggs of nematode *Capillaria hepatica*. The eggs forms were pathog-nomic with outer striated wall and polar plugs on both end of the spindle. Some fibrosis was also seen (*Fig.1*). Albendazole was started and child became afebrile, liver size regressed, serum transaminase levels became normal within 2 weeks of starting therapy.