NEONATAL ISCHEMIA OF THE LOWER LIMB – CASE REPORT

S Cerbu[1], F Bîrsăşteanu[1], ER Heredea[2], D Iacob[3], ER Iacob[4], MC Stănciulescu[4], CE Timofte[5], DM Timofte[6], ES Boia[4]

Abstract

We present a case with acute ischemia of lower limb seven hours after delivery. He was admitted in the Surgery department of Emergency Pediatric Hospital, on 30rd of April 2016. Angiography computed tomography was performed as an emergency measure that found vascular obstructions at the level of the left common femoral artery and the popliteal artery. An arteriotomy was immediately performed in order to extract the thrombi from the common femoral and popliteal vessels with clinical improvement immediately post-surgery. The histopathological examination found that the thrombi originated from the placenta.

Keywords: vascular anomalies, arterial ischemia, limb, neonate, placental emboli

Introduction

The acute limb ischemia is a rare phenomenon in the newborn. The most frequent causes are arterial or venous catheterization, neonatal infections and dehydration. Other causes that are less commonly found are metabolic disorders (gestational diabetes) and congenital hypercoagulability disorders (e.g. thrombophilia) [1-3]. The first case ever reported was described by Martini et al. Since then, more than one hundred cases have been reported in the literature [1].

Aim

The purpose of this article is to present the management of a very rare case of neonatal acute ischemia of the lower limb caused by placental emboli without a specific explanation (an idiopathic thrombosis).

Case

A male newborn, 4020 g, naturally delivered (cephalic presentation) after a 38 weeks gestation in the hospital without any complications, was transferred from maternity at 17:42, on 30rd of April 2016. The mother was under 30 years old, with no health problems reported and no drugs or other toxic substances taken during the pregnancy. Two hours after the delivery, the lower left limb (below the knee) was cyanotic. Also, the absence of posterior tibial artery pulse and a temperature difference between the legs were found (Figure 1).

The symptoms did not improve after heparin administration. The medical staff from neonatology department decided the transfer into the surgery department, 6 hours after birth. The emergency CT scan arteriography detects two obstructions on the common femoral artery (10 mm diameter) and the popliteal artery (6 mm) on the left lower limb. No causes of extrinsic compression were found in order to explain the complete stop of contrast agents. No infection or malformations of the arterial or venous system were detected (Figure 2).

Three hours after the admittance in the pediatric surgery department, an arteriotomy of the left common femoral artery and popliteal artery was performed. Two thrombi from each level were extracted. The intervention was followed by the subsequent heparinization of the arteries. The macroscopic appearance of thrombus from the common femoral artery was yellow-gray color and its consistency was hard. The thrombus extracted from the popliteal artery was red and had a soft consistency.

Shortly after the surgical intervention, the clinical symptomatology improved: the color of the shank returned to normal and the skin temperature started rising. Postoperatively, the patient was transferred into the Intensive Care Unit in order to adjust and monitor the anticoagulant therapy. In the 14th post-operative day, the Enoxaparin therapy was suppressed, but the antiplatelet therapy was continued. The blood testing showed no coagulation abnormalities, no deficiencies of protein C, S or antithrombin III.

[1]Department of Radiology, "Victor Babeş" University of Medicine and Pharmacy, Timişoara, Romania
[2]Department of Pathology, "Louis Ţurcanu" Emergency Children Hospital, Timişoara, Romania
[3]Department of Neonatology, "Victor Babeş" University of Medicine and Pharmacy, Timişoara, Romania
[4]Department of Pediatric Surgery, "Victor Babeş" University of Medicine and Pharmacy, Timişoara, Romania
[5]Department of Radiology, "Pius Brînzeu" Emergency County Hospital, Timişoara, Romania
[6]Department of Cardiology, Institute of Cardiovascular Diseases, Timişoara, Romania
E-mail: cerbusimona@yahoo.com, fbirsasteanu@yahoo.com, heredea.rodica@yahoo.com, danielariacob@yahoo.com, radueiacob@umft.ro, corinastanciulescu@yahoo.com, cristian.timofte@icloud.com, cristian.timofte@icloud.com, boiaeugen@yahoo.com

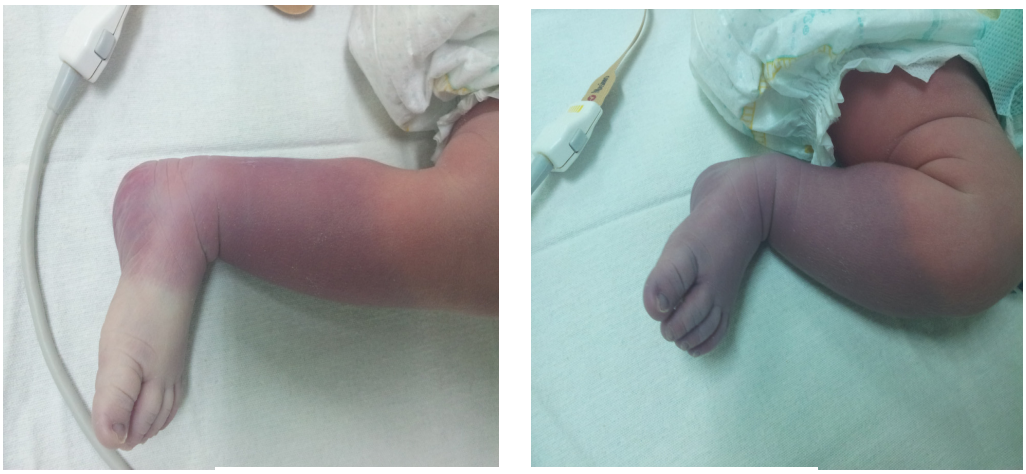

Figure 1. The clinical aspect of the lower limb ischemia.

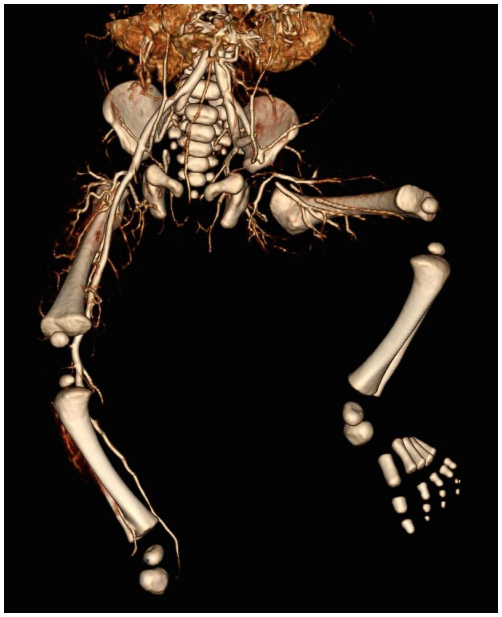

Figure 2. CT arteriography aspect – Contrast cessation at the level of femoral artery with distal reinfusion at the level of the thigh and occlusion at the level of popliteal artery.

The samples extracted from the thrombi were examined in hematoxilin-eosin (HE) coloration. The fragments were irregular masses consisting of fibrin and platelet-type nuclear detritus, mixed cell groups including lymphocytes and granulocytes interspersed with hematic - properly thrombus recently. No cholesterol crystals or hemosiderin pigment were found. The Masson's trichrome coloration did not show collagen deposition or muscle tissue. The Giemsa coloration identified no microorganisms and the Perl coloration did not show deposits of iron at the level of histiocytes. The final histologic diagnostic was arterial thrombi with rolling macrophage inclusions arterial (Figure 3).

Fourteen months after the surgery a discrete asymmetry between the left and right lower limb could be observed, but without any consequences on the walking abilities. The Doppler ultrasound showed patent arteries without any visualized thrombi.

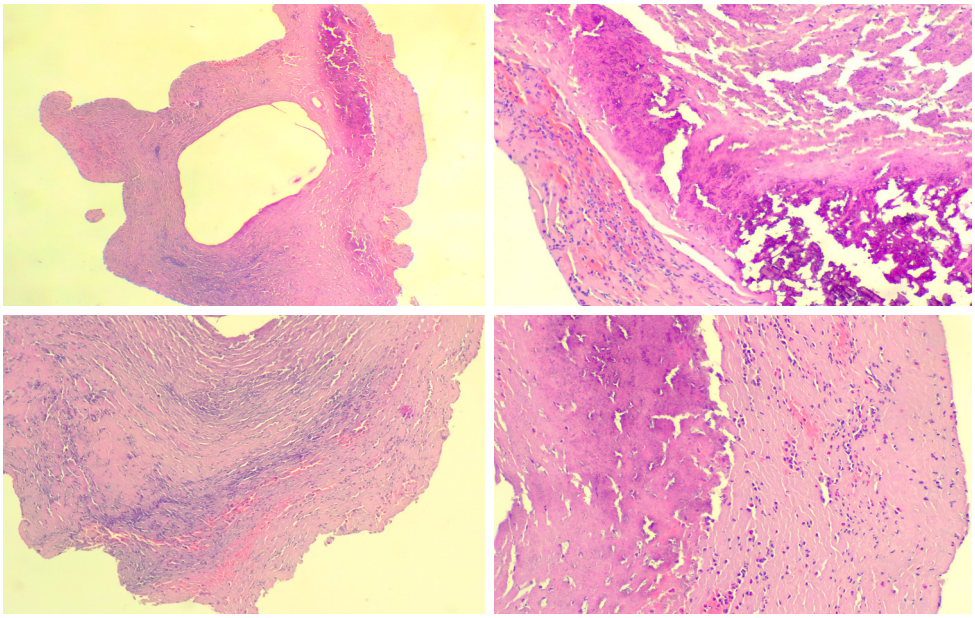

Figure 3. Microscopic aspects in HE coloration: the fibrin mass that includes lymphocytes, granulocytes, histiocytes and nuclear detritus. (ob. 4x,10x,20x).

Discussions

This is the first presented Romanian case of neonatal ischemia of the lower limb. The incidence of neonatal acute limb ischemia due to the thrombosis is increasing [4].

The diagnosis of thrombosis was established using an emergency CT scan after the exclusion of any vascular malformations or compressive tumors [5].

There are three major factors presented by Virchow that contribute to the formation of thrombus: abnormalities of the vessel wall, changes in blood coagulation and disturbances of the blood flow [6].

In our case, the mother was diagnosed with a low profile of thrombophilia with Factor V H1299R (R2) mutant heterozygote and MTHFR A1298C mutant heterozygote, without any depicted symptoms. In this case, the maternal thrombophilia profile could be considered the cause of the embolus from the maternal artery system to the neonatal lower limb. The cause of thrombosis in the neonatal period is often difficult to depict.

Hyperviscosity of the blood is reported in 1-5% of the newborns [7-9]. The delayed cord clamping can increase the risk of the hyperviscosity which can affect the blood flow, leading to local hypoxia and acidosis and that may be the trigger of the coagulation system [10,11].

Arterial puncture is also known to increase the arterial thrombosis; the infused substances can irritate the vessels [12, 13]. Our patient suffered no femoral arterial puncture and no catheterization.

Inherited deficiencies of antithrombin III and protein C can be a cause of fetal thrombosis [14,15]. In our case, the patient had no deficiency of antithrombin or protein C.

The early recognition of ischemia, the thrombolytic treatment and the thrombectomy are very important in order to obtain a good outcome. The thrombolysis is successful in 85% of cases of heparin resistant femoral thrombosis, [16-18]. In case of arterial thrombosis, the thrombolysis has been recommended as the first line treatment while the thrombectomy is reserved for the cases that do not respond to this treatment [19].

In very young infants, the risk of reclotting after thrombectomy is known to be considerable [20]. An explanation for this could be that a Fogarty catheter inserted into a small vessel could fissure the intima and mobilizing a vessel has been reported to cause thrombosis in this age of group [21,22]. In one case, it is presented that the limb of an infant was salvaged using postoperative thrombolytic treatment [23]. Fortunately, our patient did not suffer any clots formation after the surgical intervention. The thrombectomy was successful and the post-operative ultrasound examination revealed an appropriate blood flow on Doppler arterial examination, with a peak difference between the two legs. Fourteen months after the surgery, a discrete asymmetry between the left and right lower limb (1 cm) could be observed, but without any consequences on the walking abilities.

Conclusions

The early clinical recognition of limb ischemia is very important. Furthermore, a diagnostic algorithm of the possible causes must be performed as soon as possible. In children, vascular malformations must be also ruled out.

The thrombolytic treatment has become the mainstay treatment strategy, but thrombectomy is also associated with good outcome. There is a risk of thrombosis after the intervention. In order to avoid this, the surgery should be combined with anticoagulant treatment.

References

1. Blank JE, Dormnas JP, Davidson RS. Perinatal limb ischemia: Orthopedic implications. J Pediatr Orthop, 1996,16:90-96.
2. Coombs CJ, Richardson PW, Dowling GJ, Johnstone BR, Monagle P. Brachial artery thrombosis in infants: an algorithm for limb salvage. Plas Reconstr Surg, 2006,117:1481-1488.
3. Nagai MK, Littleton AG, Gabos PG. Intrauterine gangrene of the lower extremity in the newborn a report of two cases. J Pediatr Orthop, 2007, 27:499-503.
4. Oski FA, Naiman JL. Hematologic problems in the newborn. Third edition, WB Saunders, Philadelphia, 1982, 1-360.
5. Cerbu S, Arghirescu TS, Stănciulescu MC, Timofte CE, Mussuto E, Heredea ER, Horhat ID, Iacob ER, Bîrsăşteanu F, Boia ES. Role of imagistic techniques in diagnosing soft-tissue vascular anomalies in pediatric population – a 5-year experience. Rom J Morphol Embryol 2019, 60(2), 495-500.
6. Virchow R. Phlogose und Thrombose im Gefassysten. In: Virchow, ed. Gesammelte Abhandlungen zur Wissenschaftlichen Medizin, Frankfurt a/m: Meidinger Sohn, 1856:458.
7. Linderkamp O. Blood rheology in the newborn infant. Bailliere's Clinical Haematology, 1987, 1:801-826.
8. Brooks GI, Backes CR. Hyperviscosity secondrary to polycythaemia in appropiate for gestational age neonate. Journal of the American Obstretic Association, 1981, 80:415-418.
9. Black VD, Lubchenco LO. Neonatal polycythaemia and hyperviscosity. Pediatr Clin North Am, 1982, 29:1137-1148.
10. Peters M, ten Cate JW, Koo LH, Breederveld C. Persistent antithrombin III deficiency: risk factor for thromboembolic complications in neonates small for gestational age. J Pediatr, 1984, 105:310-314.
11. Cerbu S, Bîrsăşteanu F, Heredea ER, Iacob D, Iacob ER, Stănciulescu MC, Boia ES. Acute limb ischemia in neonates: etiology and morphological findings – short literature review. Rom J Morphol Embryol 2018, 59(4),1041-1044.
12. Perry MO. Iatrogenic injuries of arteries in infants. Surg Gynecol Obstet, 1983, 157:415-418
13. Wehbe MA, Moore JH. Digital ischemia in the neonate following intravenous therapy. Pediatrics, 1985, 76:99-103.
14. Bjarke B, Herin P, Blomback M. Neonatal aortic thrombosis. A possible clinical manifestation of congenital antithrombin III deficiency. Acta Paediatr Scand, 1974, 63:297-301.
15. Seligsohn U, Berger A, Abend M, Rubin L, Attias D, Zivelin A, Rapaport SI. Homozygous protein C deficiency manifested by massive venous thrombosis in the newborn. N Engl J Med, 1984, 310:559-562.
16. Wessel DL, Keane JF, Fellows KE, Robichaud H, Lock JE. Fibrinolytic therapy for femoral arterial thrombosis after cardiac catheterization in infants and children. Am J Cardiol, 1986, 58:347-351.
17. Ino T, Benson LN, Freedom RM, Barker GA, Aipursky A, Rowe RD. Thrombolytic therapy for femoral artery thrombosis after pediatric cardiac catheterization. Am Heart J, 1988, 115:633-639.
18. Brus F, Witsenberg M, Hofhuis WJD, Hazelzet JA, Hess J. Streptokinase treatment for femoral artery thrombosis after arterial cardiac catheterization in infants and children. Br Heart J, 1990, 63:291-294.
19. Davison PM, Sully L. Microvascular surgery to preserve a preterm infant's ischemic arm. BMJ, 1988, 297(6651):788.
20. Smith C, Green RM. Pediatric vascular injuries. Surgery, 1981, 90:20-31.
21. Stavorovsky M, Iellin A, Spirir Z. Acute ischemia of the limb in a newborn treated successfully by thrombectomy. Am J Surg, 1975, 129:337-340.
22. Cahill JL, Talbert JL, Ottesen OE, Rowe RD, Haller Jr JA. Arterial complications following cardiac catheterization in infants and children. J Pediatr Surg, 1967, 2:134-143.
23. Kay S, Gilpin DJ. Combined microsurgical and thrombolytic salvage of an ischaemia lower limb in a 1079 gram preterm neonate. Br J Plast Surg, 1991, 44:310-311.

Correspondence to:

Emil Radu Iacob
"Victor Babes" University of Medicine and Pharmacy,
P-ta E. Murgu no. 2, 300041,
Timisoara, Romania
E-mail: radueiacob@umft.ro