Successful Early Surgical Treatment in Neonatal Compartment Syndrome: Case Report

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Neonatal compartment syndrome is rare, and the diagnosis is often missed or delayed because other ischemic diseases can mimic clinical signs observed on the skin. A premature newborn infant presented with skin lesions during the first hours of life that were recognized as the sentinel finding in compartment syndrome of the newborn. We restored normal function by emergency surgery. The authors highlight the importance of effective collaboration between pediatricians and surgeons to improve the management of this neonatal condition. (J Hand Surg 2013;38A:1185–1188. Copyright © 2013 by the American Society for Surgery of the Hand. All rights reserved.)

Key words  Neonatal compartment syndrome, fasciotomy.

CASE REPORT

A male infant, weighing 1,590 g, was born at 32 weeks of gestation after a twin bi-amniotic pregnancy induced by clomiphene. Pregnancy was complicated by premature labor treated by betamethasone. Premature rupture of membranes occurred at 30 weeks, requiring treatment with amoxicillin and clavulanic acid. These complications were also exacerbated by maternal nicotine addiction. Fetal respiratory distress at delivery required resuscitation and mechanical ventilation for 6 days. Several minutes after birth, the left forearm was erythematous with blisters, and we observed a constriction band on the proximal third of the forearm. Two hours later, the arm was cyanotic with blisters on the forearm and ischemia in the hand, but the fingers remained vascularized (Fig. 1). The lesions were extensive (blisters, then hemorrhagic blisters and necrotic skin) on the dorsal surface of the forearm, wrist, and hand. Doppler ultrasonography showed persistence of radial and ulnar vascular flows but suggested decreased blood flow compared with the left side. Emergency surgical decompression (skin incision and forearm compartments fasciotomy) revealed muscle ischemia despite incision of the constrictive band. We performed fasciotomy...
from the upper arm to the wrist, allowing recovery of
good muscle color (Fig. 2). After 4 days, the forearm
and hand edema had decreased and the hand was well
vascularized. We performed resection of the constric-
tion band with double z-plasty. The skin edges of the
fasciotomy were progressively closed, with good heal-
ing of the superficial necrotic areas (Fig. 3). The parents
observed a certain degree of lack of sensation during the
first 3 months of life, after which the child recovered
complete forearm and hand function with no signs of
contracture. Five years later, the limb presented normal
function, with no clinical (Fig. 4) or radiographic (Fig. 5)
growth anomalies compared with the right side.

DISCUSSION

The diagnosis of neonatal compartment syndrome in
this case was based on the sudden onset of ischemia; the
presence of skin blisters; the site of the lesion, typically
involving the dorsal surface of the forearm, wrist, and
hand; the absence of distal necrosis; and the good
outcome in response to fasciotomy. The neonatal form
of compartment syndrome is rare. Only a few cases
have been reported in the literature.4,7 In 2005, Ragland
et al8 published a series of 24 cases, often with poor
results because of delayed diagnosis. Sequelae were
Volkmann syndrome (71%), bone changes (75%), and
nerve lesions (67%). This condition can be misdiag-
nosed because of its rarity and because skin lesions can mimic other ischemic diseases of the newborn. In gangrene of the newborn, lesions usually involve the distal extremities and often the lower limb. This condition must be distinguished from necrotizing fasciitis, but the general condition and the fulminating course of sepsis and skin lesions usually guide the diagnosis. Aplasia cutis congenita, congenital absence of skin, is characterized by skin ulcers sometimes covered by a thin epithelial membrane at birth that usually heal spontaneously during the first weeks of life. These lesions often involve the scalp, trunk, and extremities, with a symmetrical distribution.

Differential diagnosis is difficult because these diseases may stem from the same causes. Several compression factors and neonatal conditions can induce neonatal compartment syndrome. Local mechanical causes may be present: umbilical cord loops, fetal posture and oligoamnios, twin pregnancy, maternal uterine malformation, and amniotic band constriction. This mechanical compression can be accentuated by maternal and neonatal conditions such as respiratory distress, vascular insufficiency, clotting disorders, and maternal diabetes. Several of these factors were associated in the case reported here. The presence of an amniotic constriction band at birth was exacerbated by the neonatal condition (preterm twin, respiratory distress, and low cardiac output).

Compartment syndrome requires emergency surgical management, and therefore requires early recognition and cooperation between medical and surgical teams. Diagnosis and assessment of skin lesions can be difficult in small babies because they are sometimes sedated. The indication for surgery is guided by calculating the difference between diastolic blood pressure and compartment pressure, as recommended in adults. For many surgeons, fasciomy is recommended when the pressure difference is less than 30 mm Hg. However, in neonates, the mean diastolic blood pressure is about 40 mm Hg or less, a small increase in compartment pressure may thus be difficult to identify, and muscle viability may be already compromised. Doppler ultrasonography can sometimes provide information about radial and ulnar blood flow that can contribute to the diagnosis. However, these investigations must not delay surgical decompression. The procedure usually required is decompressive fasciomy, and a good result can be expected when this is performed within the first hours after delivery, as in the case reported here.

The prognosis of compartment syndrome is closely correlated with the time to diagnosis and early referral to the surgeon. Effective collaboration between pediatricians and surgeons is essential to ensure assessment and early treatment. Most published cases were associated with late referral to the surgeon at the stage of irreversible
muscle damage responsible for Volkmann syndrome, with contractures and major functional sequelae including nerve dysfunction and growth disorders of the forearm.\textsuperscript{4–6}
The long-term results are disappointing, with muscle contracture and growth disorders of the radius and ulna that can cause deformities.\textsuperscript{2,5,11} Rehabilitation and secondary surgery can limit the consequences of Volkmann syndrome, but the functional results are poor.\textsuperscript{9} Long-term follow-up is required. Early recognition and treatment may obviate these problems.

REFERENCES


FIGURE 5: X-ray of the involved left forearm 5 years later, compared with the uninvolved side, showing no bone change and no growth arrest.