



# Severe Compartment Syndrome Following Extravasation of Fluids in a Critically Ill Neonate



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## INTRODUCTION

Intravenous therapy is generally a safe and effective way to administer different therapies to patients of all ages. Despite its ubiquitous use in modern medicine, it is not devoid of complications. Hematoma formation, phlebitis, infection, and tissue infiltration are some common complications of the use of peripheral IV catheters. Here we report a case in which peripheral IV fluid extravasation caused severe compartment syndrome in a critically ill preterm neonate undergoing exploratory laparotomy in the NICU.

## CASE REPORT

Our patient was a 22-day-old, 1.2 kg, ASA IV premature boy born at 27 weeks of gestational age after prolonged premature rupture of membranes. His hospital course was complicated by respiratory distress syndrome requiring ventilatory support. At 21 days of age, the patient developed necrotizing enterocolitis and septic shock requiring aggressive fluid, vasopressor therapy and increased ventilatory support. An exploratory laparotomy was performed with removal of 29 cm of distal ileum and cecum and creation of an ileostomy with mucous fistula. Anesthesia management consisted of fentanyl, pancuronium, and oxygen therapy. Intravenous access included a peripherally inserted central catheter in the left saphenous vein that was used for the administration of parenteral hyperalimentation and vasopressor therapy. There was also a 24 G peripheral IV in the right hand and an arterial line in the right posterior tibial artery. Due to anemia and hypotension the patient was given 30 cc/kg crystalloid, 40 cc/kg albumin, and 40 cc/kg packed red blood cells through the 24 G IV on the patient's right hand. During the administration of these fluids, a significant increase in resistance was noticed, which was attributed to the viscosity of the fluid. Due to the lack of direct access to the patient during the case, we were precluded from directly examining the IV insertion sites.

At the end of the 120 min procedure and upon removal of the drapes, we found an impressively phlyctenoid right forearm. The palmar and dorsal surfaces of the hand and all muscular groups of the forearm were swollen and with large bullae. (Fig. 1) The peripheral IV was immediately discontinued, but no pulses, capillary refill or Doppler signal could be obtained. At this point, the diagnosis of compartment syndrome was made and plastic surgery consultation was obtained. One hour later the patient underwent emergent fasciotomy with immediate improvement in limb perfusion and recovery of pulses. Complete healing and full recovery of function occurred approximately 10 days after the operation. (Fig. 2)

## DISCUSSION

Critically ill neonates requiring surgery are often operated on in the NICU in order to avoid the risks of transport, such as interruption of monitoring, inadvertent removal of vascular access or endotracheal tubes, and hypothermia. A potential drawback of this approach is decreased access to the patient by the anesthesiologist. In this case the anesthesia team was unable to promptly diagnosis an IV that had infiltrated. The rate of IV infiltration in newborns varies between 23% and 63%; most cases occur in preterm babies.<sup>1</sup> When this occurs, edema within a fascial compartment will raise the

intra-compartment pressure. This in turn will compromise venous and lymphatic drainage; as pressure continues to increase, arteriolar bed flow becomes compromised and perfusion diminishes until all flow ceases. The normal mean interstitial tissue pressure is near zero mmHg in non-contracting muscle. If this pressure becomes elevated to greater than 30 mmHg, small vessels in the tissue become compressed, leading to compartment syndrome. Untreated compartment syndrome leads to eventual irreversible damage and death of the tissues within the compartment. As reported in the literature, the majority of IV extravasations are self-limited and resolve after stopping IV infusions,<sup>2</sup> but that was not the case with this patient.

Premature babies are at increased risk for these complications due to the immaturity of the blood vessels and the overall fragility of the tissue. Close vigilance of peripheral IV catheter insertion sites in the neonatal population should be routine practice during anesthetic care. Insertion sites should be checked regularly during a prolonged procedure and, if the site is compromised, then the IV discontinued immediately. Prompt intervention may increase the chances of limb salvage and potentially save the baby from a devastating, lifelong complications.

### References

1. Clifton-Koeppel R, et al. Newborn and Infant Review 2006
2. Hummel F, et al. Neonatal Network 2001



Fig. 1



Fig. 2