SHORT COMMUNICATION

# Intravenous Adrenaline for Shock in Neonates

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Dopamine and dobutamine have been widely used to treat shock with variable success in newborns. In this retrospective data analysis, we report on the use of adrenaline in 20 neonates with birth asphyxia and shock that was refractory to dopamine and dobutamine. We concluded that adrenaline is a safe and effective drug that can be used as an add-on therapy to dopamine and/or dobutamine in newborns with shock secondary to birth asphyxia.

**Keywords:** *Adrenaline, Birth asphyxia, Neonate, Refractory shock.*

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Dopamine and dobutamine are widely used to treat shock in newborns. However, clear cut consensus is lacking regarding the use of adrenaline in neonatal shock. We present the outcome of 20 newborns in whom adrenaline was used for the treatment of shock refractory to dopamine and dobutamine.

## METHODS

This was a retrospective study conducted at a teaching hospital in which data of all the newborns admitted over a period of 18 month from August 2007 to December 2008 was screened. Data of neonates with perinatal asphyxia (Apgar score <7 at 5min) with shock within 24 hrs of birth, which was refractory to fluid resuscitation, dopamine and dobutamine administration was analyzed. Twenty such newborns were identified.

All these babies had received standard management of shock at our unit, which included care under a radiant warmer with constant oxygen saturation monitoring, and fluid delivered by a syringe infusion pump. All babies were initially given a fluid challenge of 10 mL/kg as central venous pressure (CVP) monitoring was not possible. Fluid refractory shock was managed by dopamine infusion which was rapidly increased to a maximum of 20 µg/kg/min followed by dobutamine (upto a maximum dose of 20 µg/kg/min), through an umbilical venous catheter. The blood pressure (BP) was measured non invasively using an appropriate sized cuff and urine output was monitored. Non responders received adrenaline through a separate infusion starting with a dose of 0.3 µg/kg/min, increased rapidly as needed (maximum 1.5 µg/kg/min).

The primary outcome measure was improvement in mean arterial blood pressure (MAP) and the ultimate survival of the patient.

## RESULTS

Of the 20 patients who fulfilled our inclusion criteria, 15 (75%) were outborn and 10 (50%) were full term. Adrenaline infusion was given for a mean duration of 53±29 h in 14 survivors (***Table* I**). The rise of MAP by at least 20% was seen in the 17 (85%) patients while the patient was on maximum adrenaline infusion. The total duration of hospital stay ranged from 10-25 d in the survivors. Tachycardia was the only side effect encountered in 6 (33%) patients, which responded to a reduction in the dose of dopamine infusion.

Six neonates died; 3 out of these died at least 4 days after stopping all ionotropic support indicating

**WHAT THIS STUDY ADDS?**

- Adrenaline is an effective ionotrope in refractory shock in newborns with perinatal asphyxia.

that they had actually recovered from shock but succumbed to other complications of the illness. Rest of the three patients died while on adrenaline.

## DISCUSSION

Adrenaline increases the myocardial contractility and peripheral vascular resistance by acting on both $\alpha$ and $\beta$ receptors(1). It is not used as a first line agent for shock but can be used as an adjunct. Studies regarding the use of adrenaline in newborns with shock have been inconclusive(2). Daga, *et al*.(3) showed that adrenaline is useful in neonates with septic shock. Adrenaline is an effective ionotrope which increases BP and decreases blood lactate levels in other age groups as well(4). There have been concerns regarding rise in peripheral vascular resistance and decrease in cardiac output and tissue perfusion, hypertension, tachycardia and tissue necrosis with extravasation of infusate.

**TABLE I** PATIENT CHARACTERISTICS AND OUTCOME

| Birth-weight (kg) | Gestation (weeks) | *Age (h) | Duration of adrenaline infusion(h) | Outcome |
|---|---|---|---|---|
| 1.4 | 30 | 24 | 36 | Died† |
| 1.6 | 38 | 22 | 24 | Discharge |
| 1.8 | 34 | 26 | 96 | Died |
| 2.5 | 38 | 20 | 36 | Discharge |
| 2.7 | 37 | 24 | 36 | Discharge |
| 1.2 | 32 | 30 | 48 | Died† |
| 2.1 | 36 | 25 | 48 | Died |
| 2.2 | 38 | 20 | 90 | Discharge |
| 2.3 | 39 | 32 | 72 | Discharge |
| 2.7 | 38 | 30 | 24 | Died† |
| 1.5 | 30 | 28 | 72 | Discharge |
| 1.8 | 37 | 30 | 18 | Discharge |
| 2.2 | 38 | 26 | 90 | Discharge |
| 3.4 | 39 | 29 | 70 | Discharge |
| 1.5 | 32 | 26 | 68 | Discharge |
| 1.8 | 34 | 26 | 108 | Discharge |
| 1.6 | 32 | 24 | 40 | Discharge |
| 1.3 | 34 | 28 | 12 | Died |
| 1.6 | 34 | 30 | 48 | Discharge |
| 2.6 | 37 | 29 | 20 | Discharge |

**Age at start of adrenaline infusion; †patients who died at least 4 days after stopping all ionotropes.*

A major lacunae of the present study is its retrospective nature and absence of a control group. All the 20 newborns whom we analyzed had shock which was refractory to the routine management. Adrenaline infusion was effective in two-third babies and out of the 6 neonates who ultimately died, it was found to be effective in at least 3 newborns as they recovered from shock although they succumbed to other complications. No significant side effects were encountered apart from tachycardia. Adrenaline was found to be safe and effective and a very useful ionotrope, which is easily available and is cheap and therefore may be used as an add-on ionotrope. Controlled studies are needed to validate our experience.

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