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Block 3 CAT

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Burgert, Johnson, Garcia-Blanco, Froehle, Morris, Althusius, Richards, and Castano (2016). The Effects of Proximal and Distal Routes of Intraosseous Epinephrine Administration on Short-term Resuscitative Outcome Measures in an Adult Swine Model of Ventricular Fibrillation: A Randomized Controlled Study. *American Journal of Emergency Medicine*. Volume 34(1), 49-53.

**Question:**

Does the anatomical distance from site of epinephrine administration through an IO have any effect on resuscitation efforts in ventricular fibrillation, and does IO compare favorably with IV administration of epinephrine.

**Introduction:**

In patients presenting to the ED in ventricular fibrillation arrest, IV access is paramount for administration of medications per the ACLS algorithm. In patients with difficult venous access an IO is commonly placed. The most common locations for IO placement are the humeral head and inferior to the tibial plateau. A common question that I have had when I have had an arresting patient is whether medications administered through IO were as effective as those through venous access, and whether the anatomical location of IO has any effect on the effectiveness of these medications.

There have been multiple studies that found that IV administration of epinephrine was superior to intraosseous administration. These studies found that the time to maximal concentration of blood levels of epinephrine were longer in intraosseous administration.

**Methods:**

Adult swine model was utilized, a total of 32 Yorkshire-cross adult male swine with a weight between 60-80 kg. The 32 swine were randomly assigned to 4 treatment groups: IV with defibrillation, IV with defibrillation and epinephrine, humeral IO (HIO) with defibrillation and epinephrine, and tibial IO (TIO) with defibrillation and IO.

The swine were intubated and sedated prior to placement of IO and induction of ventricular fibrillation. Ventricular fibrillation was electrically induced, chest compressions were begun after 4 minutes using "thumper" mechanical compression device, and medication/defibrillation was started at 6 minutes. Resuscitative efforts were continued until ROSC had been obtained, with epinephrine being dosed q 4min and defibrillation q 2min. Resuscitation efforts were discontinued after 26 min if ROSC was not obtained. If ROSC occurred, animals were observed for 30 min to determine prolonged survival.

**Results:**

There was no significant difference in ROSC between the HIO, TIO, and IV epinephrine with defibrillation groups. There was a significant difference in ROSC between the HIO, TIO, and IV administration of epinephrine when compared with the control group that only received defibrillation. There was no significant difference between the HIO and TIO groups.

**Discussion:**

This is a small study, but there are some interesting points it presents. First, there appears to be no significant difference between administration of epinephrine through an IV or IO and its effect on obtaining ROSC. Second, there is no significant difference in ROSC when comparing IO or IV administration

of epinephrine. Third, there is no significant difference between the TIO and HIO groups. Finally, it appears there is actually a significant increase in ROSC with administration of epinephrine.

There still is probably some merit to the fact that higher drug concentrations are reached faster when administering through IV vs. IO. This higher concentration does not necessarily improve mortality, but I think given a choice I would rather have IV access over IO. I think that obtaining IO access initially while IV access is being obtained is probably the best route, and if no other access is able to be obtained, then IO access is probably sufficient for resuscitative efforts. The location of IO is probably more a matter of convenience, but I think digging into this deeper would be helpful to determine what drug concentrations are correlated with ROSC, and if time to concentration for different sites is significantly different.

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