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Low Volume Fluid Therapy

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Small Volume Fluid Resuscitation in Horses

The use of hypertonic saline solution (HSS) and hydroxyethyl starch (hetastarch, hextend) in horses with different types of shock followed by isotonic fluids has been shown to be safe and highly beneficial. Hypertonic saline rapidly increases intravascular volume by mobilizing fluid from the interstitium, endothelial cells, and erythrocytes. It also causes arteriole vasodilation which decreases systemic vascular resistance. For each ml of hypertonic saline infused, plasma volume increases by 3ml. To sustain this affect, this can be followed by a colloid such as hetastarch, which increases plasma oncotic pressure. The recommended dose of hypertonic saline is 5ml/kg as a bolus which can be followed by 5-10 ml/kg of hetastarch as a bolus. When using small volume fluid resuscitation, isotonic fluids should be given immediately afterwards to maintain vascular volume, interstitial and cellular fluid volume, and normalize electrolyte imbalances.

Case example:

You want to use small volume resuscitation on an average size mare with acute diarrhea and endotoxemia. How much HSS would you give her IV?

$450\text{kg} (5\text{ml/kg}) = 2250\text{ml}$ or 2 liters of HSS

If she was estimated at 10% dehydrated, how much isotonic fluid would you need to give her to follow this to help correct her deficit?

$450\text{kg} (.10) = 45$ liter deficit

Gave 2 liters of HSS = $2000\text{ ml} (3) = 6$ liter increase in plasma volume

Remaining deficit = 31 liters $(45 - 6)$

Bolus 10-15 liters of isotonic fluids at least as soon as possible and follow with maintenance plus remaining deficit.

If suspect oncotic pressure is low, it would be best to follow HSS with 2-4 liters of hetastarch to maintain fluid volume in vascular system. Then follow with isotonic fluids.

References

Fielding CL, Magdesian KG: A comparison of hypertonic (7.2%) and isotonic (0.9%) saline for fluid resuscitation in horses: A randomized, double-blinded, clinical trial. *J Vet Intern Med* 25:1138-1143, 2011.

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