

Is mannitol contra-indicated in the setting of end stage renal disease?

Mannitol, a sugar alcohol usually formulated as a 20% solution in water, is a hypertonic solution that when given IV acts as an osmotic diuretic. By increasing the osmotic pressure of glomerular filtrate, it inhibits tubular reabsorption of water and electrolytes and increases urinary output. Additionally, it is thought to decrease ICP by two mechanisms: reduction of blood viscosity leading to increased cerebral blood flow and subsequent constriction of pial arterioles; and withdrawal of water from brain parenchyma. Indications for mannitol administration in the neurosurgical realm include the reduction of acutely increased ICP, treatment of cerebral edema and facilitation of brain relaxation during craniotomy.

In general, contraindications to mannitol administration include severe renal disease or anuria as the osmotic action of mannitol may lead to an expanded plasma volume without the subsequent diuresis. This in turn could potentially lead to volume overload, pulmonary edema and respiratory compromise, heart failure, arrhythmias or other undesirable consequences. However, there is little clinical evidence to support this notion.

The only published evidence regarding the use of mannitol in patients with renal failure is a small case series by Hirsch et al who retrospectively examined all episodes of acute increased ICP or transtentorial herniation requiring hyperosmolar therapy over a 6 year period from 2002-2008 at their institution and identified 11 instances in which the patient had previously identified renal failure on renal replacement therapy. In all events, the patient received hypertonic saline and in 10/11 events, the patient also received mannitol at a dose of 1-2 g/kg. They report no incidences of clinical volume overload or radiologic pulmonary edema and go on to state that hyperosmolar therapy is both safe and effective in this patient population. Limitations of this study certainly include its small size and retrospective nature. Further studies are needed to confirm this finding.

Based on the available evidence, the use of mannitol in patients with end stage renal disease should not be strictly contraindicated, however its use should be individualized to the patient/clinical situation and the relative risk benefit profile should be considered. If mannitol is administered, careful attention to cardiorespiratory function is important to avoid complications.

References

Sterns, RH. Complications of Mannitol Therapy. UpToDate, May 2019.

Hirsch, KG et al. Treatment of Elevated Intracranial Pressure with Hyperosmolar Therapy in Patients with Renal Failure. *Neurocrit Care* (2012) 17:388–394.