A Single-center retrospective analysis of 76 consecutive patients, between January 2015 and January 2018, with clinical signs of intracranial hypertension received 23.4% NaCl through either central venous catheter or intraosseous access.

Intraosseous cannulation was successful on the first attempt in 97% of patients. No immediate untoward effects were seen with intraosseous cannulation. Time to treatment with 23.4% NaCl was significantly shorter in patients with intraosseous access compared to central venous catheter ($p < 0.0001$).

Intraosseous cannulation resulted in more rapid administration of 23.4% NaCl with no immediate serious complications. Further investigations to identify the clinical benefits and safety of hypertonic medication administration via intraosseous cannulation are warranted [1)].

2016

A retrospective review of patients with severe TBI admitted to the pediatric intensive care unit (PICU) was conducted. Inclusion criteria were ICP monitoring and administration of a hyperosmolar agent (20 % mannitol or 3 % hypertonic saline) within 48 h of PICU admission; for which dose and timing were recorded. For the first two boluses received for increased ICP (>20 mmHg), the impact on ICP and CPP was assessed during the following 4 h, using repeated measures ANOVA. Co-interventions to control ICP (additional hyperosmolar agent, propofol, or barbiturate bolus) and serum sodium were also documented.

A tertiary care pediatric hospital center.

Children aged 1 month to 18 years, with severe traumatic brain injury (Glasgow Coma Score ≤ 8) and intracranial pressure (ICP) monitor.

Sixty-four patients were eligible, of which 16 met inclusion criteria. Average age was 11 years (SD ± 4) and median Glasgow Coma Score was 6 (range 4-7). Seventy percent of boluses were 3 % hypertonic saline, with no identified baseline difference associated with this initial choice. Both mannitol and hypertonic saline were followed by a non-significant decrease in ICP (mannitol, $p = 0.055$ and hypertonic saline, $p = 0.096$). There was no significant change in CPP post bolus. A co-intervention occurred in 69 % of patients within the 4 h post hyperosmolar agent, and eight patients received continuous 3 % saline.

In pediatric TBI with intracranial hypertension, mannitol and 3 % hypertonic saline are commonly used, but dose and therapeutic threshold for use vary without clear indications for one versus another. Controlled trials are warranted, but several barriers were identified, including high exclusion rate, multiple co-interventions, and care variability [2)].

Mannitol and hypertonic saline are routinely employed hyperosmolar agents in North America. Specific circumstances may prompt selection of a specific agent. Hypertonic saline administration may be hazardous for a hyponatremic patient.

Although mannitol can be used as a resuscitation fluid, its eventual diuretic effect is undesirable in hypotensive patients and attention needs to be paid to replacing intravascular volume loss.

While mannitol was previously thought to reduce intracranial pressure through simple brain dehydration, both mannitol and hypertonic saline work to reduce intracranial pressure, at least in

part, through reducing blood viscosity, leading to improved microcirculatory flow of blood constituents and consequent constriction of the pial arterioles, resulting in decreased cerebral blood volume and intracranial pressure.

RECOMMENDATIONS Level I, II, and III • Although hyperosmolar therapy may lower intracranial pressure, there was insufficient evidence about effects on clinical outcomes to support a specific recommendation, or to support use of any specific hyperosmolar agent, for patients with severe traumatic brain injury.

As noted below, the Level II and III recommendations from the 3rd Edition of these guidelines were not carried forward because they were derived from studies that do not meet

Prompt treatment of acute intracranial hypertension is vital to preserving neurological function and frequently includes administration of 23.4% NaCl. However, 23.4% NaCl administration requires central venous catheterization that can delay treatment. Intraosseous catheterization is an alternative route of venous access that may result in more rapid administration of 23.4% NaCl.

1)

Wang J, Fang Y, Ramesh S, Zakaria A, Putman MT, Dinescu D, Paik J, Geocadin RG, Tahsili-Fahadan P, Altaweel LR. Intraosseous Administration of 23.4% NaCl for Treatment of Intracranial Hypertension. Neurocrit Care. 2018 Nov 5. doi: 10.1007/s12028-018-0637-2. [Epub ahead of print] PubMed PMID: 30397844.

2)

Roumeliotis N, Dong C, Pettersen G, Crevier L, Emeriaud G. Hyperosmolar therapy in pediatric traumatic brain injury: a retrospective study. Childs Nerv Syst. 2016 Aug 27. [Epub ahead of print] PubMed PMID: 27568371.