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Hypertonic Saline Solution Versus Mannitol for Brain Relaxation During Craniotomies: A Systematic Review and Updated Meta-Analysis

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Abstract

Background and objectives: The preferred osmotic agent used for brain relaxation during craniotomies remains unclear, either mannitol (MAN) or hypertonic saline (HTS). Hence, we sought to compare these solutions in this population.

Methods: MEDLINE, Embase, and Cochrane databases were systematically searched until August 02, 2023. Data were examined using the Mantel-Haenszel method and 95% CIs. Heterogeneity was assessed using I2 statistics. Meta-regression analysis was conducted to evaluate a possible link between Brain Relaxation Score and tumor volume. R, version 4.2.3, was used for statistical analysis.

Results: A total of 16 randomized controlled trials and 1031 patients were included, of whom 631 (61%) underwent surgery for supratentorial tumor resection. Compared with MAN, HTS achieved better rates of brain relaxation (80% vs 71%; odds ratio [OR] 1.68; 95% CI 1.22-2.33; P = .001; I2 = 0%), which was also demonstrated in the subgroup analysis of patients with supratentorial brain tumor (78% vs 65%; OR 2.02; 95% CI 1.36-2.99; P = .0005; I2 = 0%); a minor number of patients requiring a second dose of osmotic agent (14% vs 28%; OR 0.43; 95% CI 0.27-0.69; P = .0003; I2 = 0%); a lower fluid intake (mean difference -475.9341 mL; 95% CI -818.8952 to -132.9730; P = .007; I2 = 88%); and lower urine output (mean difference -462.0941 mL; 95% CI -585.3020 to -338.8862; P = <.001; I2 = 96%). Hospital length of stay and focal neurological deficits did not reach a statistically significant difference between groups.

Conclusion: In this updated meta-analysis, consistent results suggest that HTS is associated with more beneficial outcomes than MAN in patients undergoing craniotomy.