In the child with gastroenteritis that is unable to tolerate oral fluids, are there effective alternatives to intravenous hydration?

Take Home Message: Nasogastric hydration is an effective alternative to intravenous hydration when oral hydration fails.

Methods:

Data Sources: MEDLINE, EMBASE, the Cochrane library, Global Health and CINAHL inclusive through December 2009; key references from included articles were also reviewed.

Study Selection

All published reports mentioning the effectiveness or complications of alternative hydration by nasogastric tube (NG), intraosseus (IO), intraperitoneal, subcutaneous, or proctoclysis routes in pediatric patients were included. Case reports, case studies and consensus papers were included; however, editorials and non-English papers were excluded. The selection of studies was conducted by one author and those studies felt to be borderline were further examined by two or more authors to reach consensus on inclusion.

Data Extraction and Synthesis

Individual study methodology and quality was not formally assessed and no bias assessment for the included studies was performed. Due to the heterogeneous nature of the reports, a meta-analysis was not performed and this review represents a descriptive summary and discussion of the included study results. The results of this review are limited

by different individual study inclusion criteria and protocols, primary outcomes and the definitions of dehydration.

Results

The initial search strategy yielded 1436 articles with an initial manual search narrowing the possible articles to 82. Thirty-eight articles selected for inclusion: 3 on subcutaneous rehydration, 12 on NG rehydration, 7 on IP rehydration, 16 on IO rehydration, and none on proctoclysis. Of the articles meeting inclusion criteria, only 5 were randomized controlled trials (RCTs) comparing an alternative hydration route to IV hydration (Table).

Overall, 4 RCTs demonstrated NG hydration had an efficacy similar to that of IV hydration with a 2% failure rate.

Table: Summary of the included RCTs:

Study (N)	Route	Control	Alternative Route Rate	Outcome
Gremse (24)	NG	IV	Estimated fluid deficit over 6 hours	Shorter hospitalizations, earlier formula intake with NG
Hidayat, et al. (75)	NG	IV	WHO standard ORS therapy	No outcome differences
Nager and Wang (90)	NG	IV	50 mL/kg Pedialyte® over 3 hours	IV insertion failure rate was higher than NG failure rate; no therapeutic outcome differences
Varavithya et al (22)	NG	IV	10-20 mL/kg over 2 hours followed by 130mL/kg over 22 hours	No outcome differences
Banerjee et al (60)	IO	IV	20-30mL/kg bolus	IO placement was faster; no therapeutic outcome differences

Abbreviations: NG – nasogastric; IV – intravenous; IO – intraosseous; WHO - World Health Organization; ORS – Oral Rehydrating Solution

A single RCT showed similar efficacy between IO hydration and IV hydration. However, IO hydration was faster and more reliable than IV hydration, and neither group suffered short-term complications. The most common adverse events associated with NG hydration were noted in a separate study: multiple insertions (34%) cough (16%) and sore throat (13%).[1]

There were no RCTs examining alternative hydration using the subcutaneous or intraperitoneal routes. In addition, no studies using proctoclysis met the inclusion criteria.

Commentary:

Acute gastroenteritis is a common pediatric diagnosis generating more than 1.5 million outpatient visits and 200,000 hospitalizations annually in the United States.[2] Despite limited data, the Centers for Disease Control recommendations which were endorsed in 2004 by the American Academy of Pediatrics list hydration via the oral or NG route as the preferred therapy for children exhibiting mild to moderate dehydration.[2] This recommendation has been echoed for patients with diarrheal illness and poor oral intake by a pediatric multidisciplinary panel in the United Kingdom.[3]

Although demonstrated as a safe procedure in children, NG tube placement has also been ranked as a highly painful and distressing procedure,[6] with the potential for this adverse effect to be magnified by multiple insertion attempts. This risk may be outweighed by the benefit of earlier rehydration via the NG route when the oral route has failed and IV access is difficult to obtain. In this context, NG placement may also help avoid more invasive vascular access such as intraosseous or central line placement. The decision to use NG or

IV hydration should be considered in the context of the patient's clinical condition, the available resources, and the ease of IV or NG placement in each individual patient. Given the routine availability of IV hydration as a treatment option in U.S. emergency departments, it is unlikely that subcutaneous infusion or intraperitoneal hydration will gain traction as alternatives.

This is a clinical synopsis, a regular feature of the Annals' Systematic Review Snapshot (SRS) series. The source for this systematic review snapshot is: Rouhani S, Meloney L, Ahn R, Nelson, BD, Burke TF. Alternative rehydration methods: A systematic review and lessons for resource-limited care. *Pediatrics* 2011; 127 (3): pp. e748-e757. DOI: 10.1542/peds.210-0952.

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