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What is the Best Pain Management During Gastric Tube Insertion for Infants Aged 0–12 months: A Systematic Review

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ABSTRACT

Problem: Synthesized evidence on the effectiveness of pain management for nasogastric tube (NGT) and orogastric tube (OGT) insertions in infants is lacking. This paper is a systematic review of the effectiveness of pain management for gastric tube (GT) insertion in infants.

Eligibility Criteria: Randomized control trial (RCT) or quasi-experimental studies published up to April 2016, on pain management strategies during GT insertions (either NGT or OGT) in infants up to 12 months of age. Databases searched included seven English databases and three Chinese databases.

Results: Six English studies out of 1236 screened met the eligibility criteria and were included in the review. Two studied OGT insertion and four studies focused on NGT insertion. All six studies evaluated oral sweet solutions (24%–30% sucrose and 25% glucose) compared to placebo (water) or no treatment and all focused on newborn infants. Data from four studies which used the Premature Infant Pain Profile (PIPP) were pooled for meta-analysis. Results showed a significant reduction in PIPP scores during or immediately after the procedure for sweet solution interventions (MD = -2.18 , 95% CI (-3.86 , -0.51), $P = 0.01$), compared to no intervention or placebo.

Conclusions: Small volumes of oral sweet solutions reduce pain during GT insertion procedure in newborn infants.

Implications: Oral sweet solutions can be recommended before GT insertion for newborns in clinical practice. Further studies determining the effect of sweet solution beyond the newborn period, different concentrations of sweet solution and comparison with other pain management strategies are warranted.

Systematic review registration number: CRD42016038535. <http://www.crd.york.ac.uk/prospero/>.

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Background

Nasogastric tubes (NGT) and orogastric tubes (OGT) are commonly used in hospitalized infants for enteral feeding, medication administration, drainage of stomach/small bowel contents or decompression (Klasner, Luke, & Scalzo, 2002; Society of Pediatric Nurses (SPN) Clinical Practice Committee et al. (2011)). Preterm infants commonly require either NGT or OGT feeding until they are able to coordinate their sucking, swallowing, and breathing (Kristoffersen, Skogvoll, & Hafström, 2011; Watson & McGuire, 2013). However, NGT and OGT insertion procedures are painful and distressing for patients of all ages (Kuo, Yen, Fetzer, & Lee, 2010; Farrington, Bruene, & Wagner, 2015; Craig et al., 2015). For example, a prospective observational study showed NGT insertion to result in severe distress for young children in an emergency department (Babl et al., 2012). It is known that untreated or undertreated pain can lead to infant and parental distress during the procedure, and repeated exposure to pain may alter pain responses and result in poor adherence to subsequent medical care (Taddio & Katz, 2005; Harrison et al., 2014; Ravishankar et al., 2014). Furthermore, neonatal pain is increasingly being recognized as causing long-term harm to the developing brain. Recent studies have reported that the number of painful procedures is the strongest predictor of poor outcomes ranging from structural differences in the brain, to cognitive, behavioral, emotional, and learning disabilities (Doesburg et al., 2013; Grunau, 2013; Ranger & Grunau, 2014; Valeri, Holsti, & Linhares, 2015). Painful and invasive procedures for monitoring, diagnostic and therapeutic interventions are however, an inevitable part of NICU care, and the interdisciplinary health care team has a responsibility to prevent or minimize pain during these procedures.

Reducing pain during NGT or OGT procedures may make insertion of the gastric tubes easier and faster, decrease adverse events, and improve patient and provider satisfaction (Kuo et al., 2010). Therefore, it is important to explore effective pain management strategies during gastric tube insertion in infants and to synthesize the published evidence.

Systematic reviews of pain management strategies for painful procedures showed that breastfeeding (Shah, Herbozo, Aliwalas, & Shah, 2012), sweet solutions (Bueno et al., 2013; Harrison et al., 2010; Kassab, Foster, Foureur, & Fowler, 2012; Stevens, Yamada, Lee, & Ohlsson, 2013), and skin-skin care (Johnston et al., 2014) reduced pain, however, pain and distress during gastric tube insertion was not the focus of the reviews. No systematic review has been conducted on the effectiveness of pain management specifically for OGT or NGT insertion in infants. Our aim was therefore to conduct a systematic review to synthesize and evaluate the effectiveness of pain management interventions for OGT or NGT insertion in infants.

Objective

To evaluate the effect of pain management strategies (i.e. oral sucrose/glucose/breast milk/formula with or without pacifier, distraction, skin-to-skin care, nebulized or atomized local anesthetic (i.e. lidocaine/lignocaine)), before or during gastric tube insertion via nose or mouth into the stomach or upper small intestine.

Methods

This systematic review was registered on the website: <http://www.crd.york.ac.uk/prospero/>
The registration number is CRD 42016038535.

Search Method

The following electronic databases for published Randomized Controlled Trial (RCT) or quasi-experimental studies were searched up to April 2016: MEDLINE (1946–April 2016), Embase (1947–April 2016), PsycINFO (1967–April 2016), CINAHL (1982–April 2016), all EBM review, Cochrane Library (Issue 4 of 12, April 2016), Web of science (1900–April 2016) and Chinese databases, including the China National Knowledge Infrastructure (CNKI) (1979–2016. 04), WanFang database (1900–2016. 04), VIP journal integration (1989–2016. 04). No language restrictions were applied. Reference lists for relevant articles were also hand searched. Search terms included: oral gastric tube, nasal gastric tube, gastric tube, feeding tube, nasogastric*, orogastric*, baby, neonat*, newborn*, infant*, premature*. Endnote software was used to manage the literature search and screening. Two authors independently searched articles, screened titles and abstracts to identify potentially eligible studies following removal of duplicates. Conflicts were resolved through a consensus process, with a third review author if required. Full text articles of all potentially relevant abstracts were retrieved and independently assessed for inclusion by two review authors.

Inclusion criteria for studies were as follows: (1) Randomized control trial (RCT) or quasi-experimental studies; (2) Infants <12 months (including preterm newborns and neonates) undergoing NGT or OGT insertion; (3) Intervention: Any pain management strategy (oral sucrose/glucose/breast milk/formula with or without pacifier, distraction, kangaroo mother care, nebulized or atomized local anesthetic (i.e. lidocaine/lignocaine)) alone or in combination before or during gastric tube insertion; (4) Control: no intervention, oral water (i.e., sterile water), and any kind of pain management strategy before or during gastric insertion. (5) Outcomes: The primary outcome was pain scores assessed by validated pain scales, behavioral indicators (i.e. duration of crying in seconds, crying proportion), physiological indicators (i.e. heart rate (HR), heart rate variability, respiratory rate (RR), oxygen saturation (SpO₂)), adverse events, and incidence of successful placement).

Exclusion criteria were: (1) Infants' age of >1 year old or adults or animals; (2) not RCT or quasi-experimental study; (3) intervention did not involve pain management strategy or painful procedure did not involve gastric tube insertion; (4) outcome was not related to measurement of pain; (5) duplicate or full texts not available.

Assessment of Risk of Bias

Two authors independently assessed risk of bias for each study, using the criteria outlined in the Cochrane Handbook for Systematic Reviews of Interventions (Higgins & Green, 2011). The criteria included random sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data, selective reporting and other biases. Possible responses

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