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Gastroschisis: ward reduction compared with traditional reduction under general anesthesia

Mark W. Davies[a,b,c,*], Roy M. Kimble[c], David W. Cartwright[a]

[a]*Grantley Stable Neonatal Unit, Royal Women's Hospital, Brisbane, Queensland, 4029 Australia*
[b]*Perinatal Research Centre, The University of Queensland, Royal Women's Hospital, Brisbane, Queensland, 4029 Australia*
[c]*Department of Paediatrics and Child Health, The University of Queensland, Royal Children's Hospital, Brisbane, Queensland, 4029 Australia*

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Abstract

Background/Purpose: In gastroschisis it is proposed that gut reduction may be achieved without intubation or general anesthesia (GA) through ward reduction. The authors aimed to determine if ward reduction decreased morbidity and duration of treatment.

Methods: Infants born from January 1, 1995, to December 31, 2001, with gastroschisis were managed with either reduction under GA in the operating theatre (OT group)—up to September 1999, or ward reduction (when eligible) in the neonatal unit without GA/ventilation (ward reduction [WR] group)—from September 1999.

Results: Of the 37 infants, 31 were eligible for ward reduction—15 from the OT group, 16 from the WR group. All infants in the OT group had at least 1 episode of ventilation and 1 GA: 62% of infants in the WR group avoided ventilation ($P = .0002$) and 81% avoided GA ($P < .0001$). Infants who had ward reduction had significantly shorter durations of ventilation and oxygen therapy. Septicemia occurred in 31% of the WR group and 7% of the OT group ($P = .17$). Infants who had ward reduction left intensive care 16 days earlier ($P = .02$) and tended to reach full enteral feeds 8 days sooner ($P = .06$) and be discharged from hospital 15 days earlier ($P = .05$).

Conclusions: Infants who had ward reduction do better in terms of avoiding GA/ventilation, establishing feeds, and going home earlier. A randomized, controlled trial comparing the 2 approaches is feasible, safe, and worthwhile.

Gastroschisis is a congenital anterior abdominal wall defect with the uncovered abdominal contents (usually small and large bowel) protruding through the defect. Reduction of the abdominal contents is required within hours after birth as the infant is at risk for water and heat loss from the exposed bowel, compromised gut circulation, and infection. The traditional approach to management has been attempted reduction of the gut under general anesthesia (GA) in the operating theater.

To avoid the problems associated with GA and mechanical ventilation it has been proposed that the reduction of abdominal contents can be achieved in the neonatal unit

* Corresponding author. Department of Neonatology, Royal Women's Hospital, Butterfield St, Herston, Brisbane, QLD, Australia, 4029. Tel.: +61 7 3636 2245; fax: +61 7 3636 5259.
E-mail address: Mark_Davies@health.qld.gov.au (M.W. Davies).

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without endotracheal intubation or GA. Bianchi and Dickson [1] were the first to report a series of patients to undergo this form of ward reduction in which the infants with gastroschisis had their gut reduced in the neonatal unit without GA, sedation, or analgesia. Concern has been voiced regarding the lack of analgesia [2]. Further caution was urged after a report of 4 patients where only 1 had an uncomplicated course after ward reduction [3]. Kimble et al [4] have reported the largest, most recent case series. Ward reduction in the neonatal unit without GA, ventilation, or surgical incision was attempted in 29 of 35 infants and was successful in 25.

Whether outcomes are improved after ward reduction compared with the traditional surgical approach is unknown. Only separate case series have been described for each approach [1,2,5-7] and comparisons between these do no allow us to determine which is better. Case series describing the traditional approach usually report outcomes on all cases of gastroschisis, whereas those reporting ward reduction are selective and the outcomes are usually better.

It may well be beneficial to avoid GA and mechanical ventilation; however, it is not known whether this benefit would be accompanied by any disadvantages. Potentially, outcomes such as mortality, amount of gut loss, incidence of septicemia, duration of total parenteral nutrition (TPN), and duration of intensive care nursery (ICN) and hospital stay may be increased or decreased with ward reduction. A recent Cochrane systematic review found no evidence from randomized, controlled trials (RCTs) to either support or refute the practice of ward reduction [8]. To provide data comparing outcomes between the 2 approaches, and to enable sample size calculations for a proposed RCT, we examined a retrospective cohort of infants with gastroschisis. We hypothesized that a policy of ward reduction would decrease the need for, and duration of, mechanical ventilation, decrease the duration of TPN and hospital stay, and possibly decrease other complications. Our aim was to determine whether a policy of ward reduction leads to decreased morbidity in infants with gastroschisis.

1. Materials and methods

In this retrospective cohort study, all infants born from January 1, 1995, to December 31, 2001, with gastroschisis were identified from the neonatal database at the Royal Women's Hospital, Brisbane. The database contains data, on all infants admitted to our neonatal unit, collected contemporaneously with the infant's admission. Details are complete to the time of the infant's discharge home (including data from hospitals that the infant is transferred to before going home). Data retrieved from the database included birth weight; gestational age; sex; method of gastroschisis reduction; whether the infant had a general anesthetic or not; whether subsequent procedures were required after the initial attempt at reduction; mortality; septicemia (blood culture–positive); need for a silo before final reduction; and duration of mechanical ventilation, oxygen therapy, and ICN and hospital stay. Hospital chart notes were examined and the age at commencing enteral feeds, reaching feed volumes of 60 mL/kg per day, and reaching full enteral feeds were noted. Full enteral feeds were defined as either 150 mL/kg per day if less than 3 months old or 120 mL/kg per day if more 3 months old.

1.1. Surgical management

During the study period overall management of infants with gastroschisis was similar in both groups. All had their eviscerated bowel covered with polyethylene "kitchen-wrap" soon after birth and were then admitted to the neonatal ICN. A nasogastric tube was inserted, left on free drainage, and aspirated every 15 minutes. Intravenous antibiotics (metronidazole, gentamicin, penicillin) and maintenance fluids were started.

Up to September 1999, infants were then managed in the traditional manner with attempted reduction of the gut under GA in the operating theater (the OT group). After stabilization the infant was transferred to the operating theater where they had a general anesthetic and the eviscerated bowel was manually returned to the abdomen with or without first extending the abdominal wall defect. After full reduction, the abdominal wall was then closed in 2 layers with sutures. Postoperatively the infant was transferred back to the ICN while still intubated and ventilated. Mechanical ventilation was weaned over the next few days and the infant was extubated when breathing adequately.

From September 1999, infants were managed as per a ward reduction protocol (the WR group). Once stable, the infant was given paracetamol (acetaminophen, 20 mg/kg) rectally. The fully conscious neonate was then placed supine, the abdomen draped with sterile towels, and the bowel gently washed with warm saline. The bowel was carefully inspected and any minor adhesions divided. An assistant would "tent" the abdomen by firm upward traction on the umbilical cord that had been kept deliberately long. Reduction of the gut was then accomplished slowly over 10 to 30 minutes by manually returning the bowel, loop by loop, until the entire bowel was within the abdomen. Monitoring the heart rate and pulse oximetry assessed the effects on the infant. The abdominal wall defect was then closed by apposing the skin with adhesive strips with the cord placed over the residual defect and held down with a semiocclusive dressing. Infants experiencing significant respiratory embarrassment before, during, or after the reduction were intubated and ventilated. Ventilation and extubation were then managed as for the OT group.

In both groups, if it was felt that the intraabdominal pressure was too high during the initial reduction, then an artificial pouch (silo) was placed around the gut and attached to the edge of the defect so that it contained the