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The influence of delay in closure of the abdominal wall on outcome in gastroschisis

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Abstract To evaluate the effect of a delay in closure of the abdominal wall (AWC) on outcome in the management of gastroschisis, a retrospective analysis of 91 babies admitted over a 7-year period (1992–1998) to a single neonatal surgical unit with a diagnosis of gastroschisis was carried out. Antenatal diagnosis was made in 89 (98%) cases. Surgical intervention occurred in 90 babies at a median of 4 h (standard error 0.345, range 0.5–17) post-delivery. In 72 (80%) cases primary closure of the abdominal defect was achieved, with a silo fashioned in the remaining 18 (20%). One infant died prior to AWC. The median time to full oral feeding was 22 days (2.96, 5–160), and to discharge 28 days (4.03, 11–183). There was no correlation between time to AWC and any measured outcome parameter. There was no significant difference in mortality in those patients having closure before 6 h. Thus, no correlation between time to AWC and outcome was demonstrated. This would suggest that the time taken to optimally resuscitate a newborn infant prior to surgical closure does not have an adverse influence upon outcome and is to be recommended.

Keywords Gastroschisis · Neonatal surgery · Total parenteral nutrition

Introduction

The ideal management of gastroschisis (GS) remains elusive, even in the present era of single-figure mortality. Although morbidity and mortality have fallen significantly in the past 25 years, due mainly to advances in neonatal intensive care and parenteral nutrition (TPN) techniques [11, 13, 20], several aspects of treatment continue to provoke debate. Primary closure of the abdominal wall (AWC) with umbilical preservation is widely recognised as the surgical technique of choice [3, 14]. However, the value of prenatal intra-uterine transfer [12, 19, 20] and the optimal technique of delivery remain controversial [6, 8, 17, 19, 20].

It is accepted that the abdominal wall should be closed as soon as possible after delivery, but few reports have looked specifically at the effects of a delay in closure [12, 15, 20]. The purpose of this study was to determine whether the time to AWC, by skin or silo, had an influence upon eventual outcome.

Patients and methods

With assistance of the clinical audit department, 91 patients presenting to a single neonatal surgical unit (NSU) over a 7-year period (1992–1998) with a diagnosis of GS were identified. In addition to basic maternal and neonatal demographic data, the technique of closure, number of operations, time to full oral feeds, length of hospital stay, and mortality were recorded.

In all cases diagnosed by antenatal ultrasound, the mother was transferred prenatally to the regional obstetric unit at St Mary’s Hospital for delivery. The obstetric policy was of induction at 37–38 weeks, with caesarean section reserved only for obstetric indications. Following delivery, the herniated bowel was placed in a plastic “bowel bag” to minimise heat and water loss and positioned to avoid interference with venous drainage. A nasogastric tube was inserted and an intravenous infusion commenced. Following appropriate resuscitation, the infant was moved to the adjacent NSU. In those cases where delivery was in a peripheral unit, usually due to premature labour, the baby was transferred urgently to the NSU.

When haemodynamically stable, the infant was transferred to the operating theatre for closure of the GS. A primary repair was attempted in all cases. If this was not possible due to concern about abdominal tension, a silo pouch was fashioned. Postoperatively, the baby was mechanically ventilated, with paralysis if required, and a morphine infusion commenced for analgesia. Ventilation was gradually discontinued in primary closure, but continued electively in the case of silo repair until complete closure of the abdomen was...
achieved, usually within 5–7 days. TPN was routinely started within 48 h via a central or peripheral long line, and continued until the baby was established on enteral feeds. The baby was discharged when full oral feeding had been achieved, or in cases of short gut, transfer to the regional paediatric gastroenterology service was arranged.

**Results**

An antenatal diagnosis of GS was made in 89 (97%) cases and 81 (89%) were delivered “in house”. Surgical intervention occurred in 90 babies, at a median of 4.0 h (standard error 0.345, range 0.5–17) post-delivery (Fig. 1). In 72 (80%) cases primary AWC was achieved, with a silo fashioned in the remaining 12 (20%). One infant died from a subdural haemorrhage prior to AWC. The median time to full oral feeding was 22 days (2.96, 5–160), and to discharge 28 days (4.03, 11–183). There was no correlation between the time to AWC and oral feeding ($P = 0.284$, Fig. 2) or hospital stay ($P = 0.151$, Fig. 3).

AWC was undertaken 6 h or longer after delivery in 20 patients. Of these, 5 were born outside the receiving centre and were transferred ex utero for surgery, and 1 required prolonged resuscitation prior to attempting closure. In the remaining infants, availability of a surgeon or operating theatre was the limiting factor. In this group in whom AWC was delayed, there was no greater requirement for silo closure ($P = 0.611$) or any increase in mortality ($P = 0.469$).

There were 7 deaths in the series (7.7%), 3 within the 1st week. Of these early deaths, 1 patient had a subdural haemorrhage secondary to a tentorial tear, 1 premature infant had a fatal intracranial bleed, and the 3rd required prolonged resuscitation before closure of the defect could proceed and died of septic shock on day 3 of life. Of the late deaths, 2 were secondary to complications of “short gut”, and overall 5 (71%) deaths were due to overwhelming sepsis. There was no difference in time to closure between survivors and non-survivors ($P = 0.436$).

**Discussion**

It is considered accepted surgical practice to close the abdominal wall defect as rapidly as possible following delivery of a child with GS. Indeed, immediate closure in an adjacent operating theatre has even been advocated in an attempt to improve outcome [4]. This study has shown that the time from delivery to AWC, by silo or primary closure, does not influence eventual outcome. It should be noted, however, that in only 11 (12%) infants was closure achieved beyond 8 h after delivery, and it is not possible to comment on the effects of prolonged delay.