Influence of place of delivery on outcome in babies with gastroschisis

N Stoodley, A Sharma, H Noblett, D James

Abstract
In order to determine whether the elective delivery of babies with gastroschisis confers advantages in outcome, the case-notes of all babies referred to Bristol with gastroschisis over a 10 year period were reviewed. Various factors were compared between babies born in Bristol and those born elsewhere in the South West region. One neonate from the outborn group died after transfer to Bristol but otherwise there was no evidence that transfer and elective delivery in Bristol conferred any advantage. The important of effective resuscitation of outborn babies before transfer is emphasised and guidelines for resuscitation given.

(Arch Dis Child 1993;68:321–323)

The incidence of anterior abdominal wall defects is approximately one in 2500 births.¹ This figure has been falling over the past decade.² The ratio of exomphalos to gastroschisis is about 3:1. While the prognosis for exomphalos depends on whether there are any associated defects, especially chromosomal,¹ ³ gastroschisis is invariably an isolated lesion with an excellent outlook.³

Because of the wide availability of α-fetoprotein and ultrasound screening in pregnancy it is now common for anterior wall defects to be diagnosed in the first half of pregnancy. In the South West region when such a diagnosis is made it is normal practice for the diagnosis to be confirmed at the tertiary referral centre in Bristol and in cases of exomphalos to offer fetal karyotyping.⁴ Those women with an isolated defect also meet paediatric surgeons, paediatricians, and visit the special care baby unit. They are electively delivered in Bristol at St Michael’s Hospital (formerly Bristol Maternity Hospital).

The purpose of this elective delivery in Bristol at term is to reduce the delivery-surgery interval with a presumed reduction in neonatal morbidity and even mortality.

We conducted an audit of this practice over 10 years concentrating on cases of gastroschisis only. The aim was to assess whether there was any evidence to support the assumption that delivery in Bristol with its effect on delivery-surgery interval had any influence on infant outcome.

Patients and methods
A retrospective study was undertaken of case-notes of newborns with gastroschisis referred for surgery to the Bristol Royal Hospital for Sick Children (BRHSC) over the period 1981–90. During this period most patients in whom an antenatal diagnosis of an abdominal wall defect had been made were transferred in utero and delivered at the Bristol Maternity Hospital. In a larger number of patients, however, the diagnosis was not made before birth and the babies were born in their local district general hospital and transferred after birth after discussion with the regional paediatric surgical team.

BRHSC is the regional centre for paediatric surgery in the south west. Its eccentric position within the region leads to a marked disparity in the distance between the nearest and the most distant district general hospitals that it serves (4 miles and 180 miles respectively).

Non-parametric methods were used for statistical analysis; χ² with Yates’s correction for comparison of frequencies and Mann-Whitney U for comparisons of medians.

Results
GENERAL
Over the 10 year period 53 infants with gastroschisis were referred for surgery. In three cases the notes were untraceable and in another case the relevant operative details were missing. Therefore 49 cases were available for analysis.

The annual rates of referral over the 10 years were 4, 3, 2, 2, 5, 5, 9, 7, and 14 respectively. Of the 49 cases where the complete case-notes were available for analysis, 30 babies (61-2%) were outborn and transferred after delivery and 19 (38-8%) were inborn at Bristol Maternity Hospital.

PREGNANCY DETAILS (TABLE 1)
As expected, significantly more babies in the

Table 1 Pregnancy details. Figures are number (%)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Inborn (n=19)</th>
<th>Outborn (n=30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antenatal diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;20</td>
<td>17 (89-5)</td>
<td>4 (13-3)*</td>
</tr>
<tr>
<td>21–25</td>
<td>8 (42-1)</td>
<td>12 (40-0)</td>
</tr>
<tr>
<td>26–30</td>
<td>5 (26-3)</td>
<td>8 (26-7)</td>
</tr>
<tr>
<td>31–35</td>
<td>1 (5-0)</td>
<td>2 (6-7)</td>
</tr>
<tr>
<td>Primiparity</td>
<td>14 (73-7)</td>
<td>25 (83-3)</td>
</tr>
<tr>
<td>Induced labour</td>
<td>2 (10-5)</td>
<td>0</td>
</tr>
<tr>
<td>Mode of delivery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vaginal</td>
<td>15 (79-0)</td>
<td>21 (70-0)</td>
</tr>
<tr>
<td>Emergency caesarean</td>
<td>3 (15-8)</td>
<td>8 (26-7)</td>
</tr>
<tr>
<td>Elective caesarean</td>
<td>1 (5-2)</td>
<td>1 (3-3)</td>
</tr>
</tbody>
</table>

*p<0.0005; all other differences are not statistically significant.
Table 2 Preoperative details

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Inborn (n=19)</th>
<th>Outborn (n=30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median (range) gestation in weeks</td>
<td>38 (36-41)</td>
<td>37 (31-40)</td>
</tr>
<tr>
<td>Median (range) birth weight in g</td>
<td>2430 (1800-3800)</td>
<td>2310 (1440-3540)</td>
</tr>
<tr>
<td>No (%) with 5 min Appear score &lt;8</td>
<td>9 (47%)</td>
<td>5 (16.7%)</td>
</tr>
<tr>
<td>No (%) ≤3rd centile</td>
<td>13 (68.4%)</td>
<td>15 (50.0%)</td>
</tr>
<tr>
<td>No (%) girls</td>
<td>9 (47.4%)</td>
<td>16 (53.3%)</td>
</tr>
<tr>
<td>Median (range) delivery-operation interval in hours</td>
<td>3 (0-5-7)</td>
<td>6 (3-9-12)*</td>
</tr>
<tr>
<td>Median (range) serum albumin in g/l</td>
<td>320 (210-400)</td>
<td>280 (210-350)</td>
</tr>
</tbody>
</table>

*p<0.0001; none of the other differences are statistically significant.

The inborn group had the diagnosis of gastroschisis made antenatally (p<0.0005). None of the other differences between the outborn and inborn groups were statistically significant.

**PREOPERATIVE DETAILS (TABLE 2)**

There were no significant differences between the outborn and inborn groups in terms of gestation, birth weight (absolute and on or below the third centile), Apgar scores at 5 minutes, or sex. As expected there was a highly significant difference between the two groups in delivery-operation interval. The median time for the inborn babies was three hours whereas it was six hours for the outborn infants (p<0.0001).

One baby in the outborn group was very ill on arrival in Bristol. She was delivered at 36 weeks and weighed 2450 g. The baby had to be transferred 180 miles and arrived shocked and dehydrated. She died on day 3 after surgery. The remaining babies in both outborn and inborn groups were generally well preoperatively with no clinical differences. Though the median serum albumin concentration in the outborn group (280 g/l) was lower than the value in the inborn (320 g/l), this difference was not statistically significant.

**OPERATIVE DETAILS**

Fifteen of the inborn babies (78-9%) had a 'simple' gastroschisis. The four that were complicated had evidence of bowel ischaemia requiring resection. One of these subsequently developed the short bowel syndrome.

Twenty five of the outborn infants (83-3%) had a simple gastroschisis. Three of the remainder had bowel ischaemia and the other two had bowel atresia. All five required bowel resection. Two of the five developed the short bowel syndrome. None of these differences were statistically significant.

Thirteen of the inborn babies (68-4%) and 22 of the outborn infants (66-7%) had their operations completed as a one stage procedure.

**POSTOPERATIVE DETAILS (TABLE 3)**

There were no significant differences between the two groups postoperatively. One outborn baby died on day 3 (see above). One inborn baby had to have a second laparotomy to correct intestinal obstruction caused by adhesions.

**LONGTERM OUTCOME**

Three infants developed short bowel syndromes: one from inborn group and two from the outborn group. The remaining 18 inborn and 27 outborn babies were all well at follow up (six months) and growing normally.

**Discussion**

The incidence of gastroschisis referrals over the 10 year period seems lower than one would expect from the reported incidence of the problem. However, of the 53 referrals only 13 were referred in the first five years whereas there were three times as many in the second half of the decade. Previous studies in the south west of England have suggested that in the early 1980s termination of pregnancy was being offered to mothers where gastroschisis was diagnosed in the first half of pregnancy without the benefit of a second opinion and on the presumption of a poor prognosis. The dramatic increase in referrals in the last five years studied possibly reflects an improved communication between obstetricians and paediatricians in Bristol and their regional colleagues.

With one important exception, there was no evidence in this audit that delivery in Bristol conferred any great clinical benefit to the baby despite the fact that the delivery-operation interval was halved. Nevertheless, the one case that is the exception represents a strong argument for continuing the practice. When the baby arrived in Bristol she was virtually moribund and in many ways it is remarkable that she lived three days. It was the stated opinion of those caring for her that her death was preventable and certainly would have been less likely to occur if the delivery had taken place in the tertiary centre.

Yet to advise delivery of fetuses with gastrochisis in Bristol as the counsel of excellence takes no account of the fact that babies with the condition will still deliver in district hospitals around the region. The diagnosis may not be made antenatally or the mother

Table 3 Postoperative details

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Inborn (n=19)</th>
<th>Outborn (n=30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median (range) days of ventilation</td>
<td>3 (0-11)</td>
<td>2 (0-6)</td>
</tr>
<tr>
<td>Median (range) days of total parenteral nutrition</td>
<td>14 (7-417)</td>
<td>17 (8-380)</td>
</tr>
<tr>
<td>Median (range) days to bowels open</td>
<td>12 (4-29)</td>
<td>12 (1-35)</td>
</tr>
<tr>
<td>Median (range) days to full feeds</td>
<td>19 (10-417)</td>
<td>21 (12-380)</td>
</tr>
<tr>
<td>Median (range) days stay hospital</td>
<td>31 (14-430)</td>
<td>29 (15-395)</td>
</tr>
</tbody>
</table>

None of the differences are statistically significant.

Table 4 Suggested guidelines for transfer of babies with abdominal wall defects

1. Inform regional paediatric surgical unit
2. Place a urine collection bag on baby and put the entire lower half of the baby within an intestinal bag, for example Aldon Intestinal Bag (Aldington Laboratories)
3. Pass a nasogastric tube and aspirate regularly replacing losses intravenously with an equivalent volume of normal saline
4. Set up an intravenous infusion and give a bolus of plasma (10-20 ml/kg) before maintenance fluids
5. Commence intravenous broad spectrum antibiotics
6. Do NOT use warm saline packs on bowel (risk of cooling and hypothermia)
may go into labour before the planned delivery date. It is of note that most of babies in the outborn group delivered at or below 37 weeks. Furthermore, the baby that died was delivered after spontaneous labour at 36 weeks. The increase in numbers of hospitals with trust status is likely to represent another factor that may influence antenatal referral practices. Thus advising delivery near the place of surgery in cases of gastroschisis recognised during pregnancy is the preferred option to minimise the rare case of the delay resulting in severe deterioration of the baby’s condition. However, for those babies who deliver in the district hospitals there should be a clear set of guidelines for the management of such babies before and during transfer. Our suggested guidelines are summarised in table 4.

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