Growth and Neurodevelopmental Outcome of Infants with Abdominal Wall Defects

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BACKGROUND

Anterior Abdominal Wall Defects are congenital birth defects that allow the intestines or liver to protrude. The most common congenital anterior abdominal wall defects are gastroschisis and omphalocele. Gastroschisis is characterized by an intact umbilical cord and evisceration of the bowel through a defect in the abdominal wall, generally to the right of the cord, with no membrane covering (Weir, 2003). On the other hand, omphalocele is characterized by herniation of the bowel, liver and other organs into the intact umbilical cord, the tissues being covered by membranes unless the latter are ruptured (Weir, 2003). Congenital defects of the abdominal wall occur in 1 in 4,000 to 10,000 live births, although the prevalence of gastroschisis appears to be increasing. Infants with abdominal wall defects have significant mortality during the neonatal period, however little data on long term growth and neurodevelopment is available.

Although both are congenital defects of the anterior abdominal wall, they have many differences. In cases of gastroschisis, a sac is usually absent, associated anomalies are rare, the defect occurs to the right of the umbilicus, and the mother is fairly young (less than 25 years) (Weir, 2003). In contrast, in cases of omphalocele, a sac is present, associated anomalies resulting from chromosomal abnormalities (most commonly trisomy 18) are common, the defect occurs within the umbilicus, and the mother is generally older (Weir, 2003).

OBJECTIVE

To examine the long term growth and neurodevelopmental outcome of infants with gastroschisis and omphalocele, in order to aid antenatal counselling and improve patient management.

METHODS

Participants

Participants consisted of 62 premature infants born less than or equal to 41 weeks gestation. Data for this study was retrieved from the 2008-2009 cohorts and consisted of both boys and girls. The participants were assessed in the follow-up clinic for a mean of 18.5 months, ranging from 4-36 months corrected age.

Instruments

The Ages and Stages Questionnaire (ASQ) or the BSID-III were used to evaluate cognitive and motor development in children with major congenital anomalies and the predictability of development. These tests were used on the population group and performed in the follow-up clinic between 18 and 36 months.

Procedure

Families who agreed to participate in the study were brought into the follow-up clinic. Neurodevelopmental assessments were performed at 4, 8, 12, 18 and 24 months of age. Demographic variables and data on the severity of the illness, neurodevelopmental outcomes and associated abnormalities were collected. Data on growth and feeding difficulties was also collected.

RESULTS

- 62 infants were admitted during the study period. 4 died before discharge, and 12 declined to attend follow-up or could not due to distance. Thus the follow-up rate was 81%. Infants were followed for a mean of 18.5 months, (range 4-36 months).
- Abdominal Wall Defects, 2008-2009 is shown in Figure 1.
- Images of Gastroschisis and Omphalocele are shown in Figure 2.
- Demographic variables and length of stay are shown in Table I.
- Mortality in the gastroschisis group include (n=2): Baby 1- Died day 5 of life due to prematurity, large gastroschisis, multiple organ failure, and multiple dysmorphic features; Baby 2- Died day 1 of life due to prematurity, large gastroschisis, and respiratory failure.
- Causes of mortality in omphalocele include (n=2): Died day 16 of life and at 4 months due to prematurity, omphalocele, congenital heart disease, respiratory failure and multiple dysmorphic features.
- Persistent growth failure and feeding difficulties are common in infants with abdominal wall defects (Table II).
- Major motor and cognitive delays were seen in 23.1% of infants with omphalocele; however, major motor and cognitive delays were also seen in 15.2% of infants with gastroschisis (Table III).

CONCLUSION

In this study, the number of cases of gastroschisis in this time period is greater than the number of omphalocele, suggesting an increase in the occurrence of gastroschisis. Although gastroschisis is more prevalent, omphalocele cases tend to have poorer growth and neurodevelopmental outcomes. As previously reported, cases with omphalocele had older mothers, more chromosomal anomalies and a higher mortality rate. Our study suggests that a significant proportion of infants with abdominal wall defects have persistent feeding problems, growth failure and developmental delay. Thus, these infants require careful nutritional and neurodevelopmental follow-up.

REFERENCES

- Major cognitive delay was defined on Bayley Scales of Infant Development or equivalent testing as MDI <70 or more than 2 SD below the mean on the ASQ and minor cognitive delay as MDI 70-84.
- Major motor impairment was defined as non-ambulatory cerebral palsy or more than 2 SD below the mean on the gross motor section of the ASQ.
- Blindness was considered a major impairment and a vision impairment corrected by glasses was considered minor.
- Hearing loss was categorized as major if aids or cochlear implants were required and minor if hearing loss was identified.
- The REEL-2 (2nd Ed.) was used for speech and language assessment.
- Data were analyzed using descriptive statistics and Chi-Square analyses for categorical variables.

Table I. Demographic Characteristics of the Study Population

<table>
<thead>
<tr>
<th>Abdominal Wall Defect</th>
<th>Total number</th>
<th>BW in grams (Median [Range])</th>
<th>GA in weeks (Median [Range])</th>
<th>Sex</th>
<th>M:F</th>
<th>Mortality</th>
<th>Hospital Stay Median (Range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastroschisis</td>
<td>46</td>
<td>2555 (770-3880)</td>
<td>37 (26-41)</td>
<td>23.23</td>
<td>4 (4.3%)</td>
<td>2 (4.3%)</td>
<td>30 (1-150)</td>
</tr>
<tr>
<td>Omphalocele</td>
<td>16</td>
<td>3245 (1590-5470)</td>
<td>33.5 (32-39)</td>
<td>8.8</td>
<td>2 (12.5%)</td>
<td>3 (18.8%)</td>
<td>19 (6-121)</td>
</tr>
</tbody>
</table>

* P Value <0.05

Table II. Nutritional Outcomes & Growth Delays

<table>
<thead>
<tr>
<th>Abdominal Wall Defect</th>
<th>Gastro Esophageal Reflex</th>
<th>Medications for GER</th>
<th>Feeding Difficulties</th>
<th>Weight &lt; 5 th centile</th>
<th>Height &lt; 5 th centile</th>
<th>Head Circumference &lt; 5 th centile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastroschisis n=33</td>
<td>5 (15.2%)</td>
<td>5 (15.2%)</td>
<td>9 (27.3%)</td>
<td>4 (12.1%)</td>
<td>6 (18.2%)</td>
<td>2 (6.1%)</td>
</tr>
<tr>
<td>Omphalocele n=13</td>
<td>3 (23.1%)</td>
<td>3 (23.1%)</td>
<td>3 (30.8%)</td>
<td>3 (23.1%)</td>
<td>2 (17.3%)</td>
<td>1 (7.7%)</td>
</tr>
<tr>
<td>P-Value</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
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</tbody>
</table>

Table III. Neurodevelopmental Outcomes

<table>
<thead>
<tr>
<th>Abdominal Wall Defect</th>
<th>Motor</th>
<th>Cognitive</th>
<th>Hearing</th>
<th>Vision</th>
<th>Expressive Speech Delay</th>
<th>Overall Major Delay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastroschisis n=33</td>
<td>5 major, 7 minor delay (36.6%)</td>
<td>5 major, 3 minor delay (24.2%)</td>
<td>1 minor (3.9%)</td>
<td>12 (36.4%)</td>
<td>5 (15.2%)</td>
<td></td>
</tr>
<tr>
<td>Omphalocele n=13</td>
<td>3 major, 2 minor delay (38.5%)</td>
<td>5 major delay (38.5%)</td>
<td>-</td>
<td>8 (61.5%)</td>
<td>3 (23.1%)</td>
<td></td>
</tr>
<tr>
<td>P-Value</td>
<td>NS</td>
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