Original Article

Dandy–Walker syndrome

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Received 17 November 2013; revised 24 December 2013; accepted 7 January 2014
Available online 9 July 2014

Abstract

Objectives: Dandy–Walker syndrome is a rare disorder characterised by complete or partial agenesis of the vermis, cystic dilatation of the fourth ventricle and an enlarged posterior fossa. The precise aetiology is unknown, although there have been reports of associations with risk factors like maternal virus infections (rubella, toxoplasma, and cytomegalovirus) and alcohol consumption. The reported incidence varies between one per 2500 births to one per 100,000 births. This huge difference may be due to the limited published case series, as most of the available data are sporadic case reports or series.

Methods: A retrospective review was conducted of medical records of neonates with Dandy–Walker syndrome admitted to the neonatal intensive care unit of a university hospital between January 2001 and December 2010.

Results: Eight infants with Dandy–Walker syndrome were admitted during the study period, giving an overall incidence of 1/400 live births. The female-to-male ratio was 1.7:1 (one infant had ambiguous gender but was later found to be male). The mean gestational age was 39.0 weeks (range, 36–40 weeks), and the mean birth weight was 2716 g (range, 1965–3335 g). The syndrome was diagnosed in half the infants prenatally. All infants had associated hydrocephalus, and five had other neurological anomalies; extra-cranial anomalies were seen in 50% of infants. All infants survived to discharge.

Conclusion: Although many of our results were consistent with published data, the incidence of Dandy–Walker syndrome in our study was much higher than any previously reported.
Introduction

Dandy–Walker syndrome is a rare condition, which consists of hypoplasia of the cerebellar vermis, dilatation of the fourth ventricle and an enlarged posterior fossa. The syndrome is considered to be the commonest cerebellar malformation. It is poorly understood, and the incidence is unknown. Although this malformation can be diagnosed prenatally by neuroradiology, identifying patients is difficult, as there is no specific symptom or sign. It is not uncommonly detected from the associated hydrocephalus. The outcome is highly variable and ranges from normal or nearly normal development to profound disability or even early death. Data on this disease in Saudi Arabia are limited.

This study involved examination of the records of all infants with Dandy–Walker syndrome seen at our centre in the past 10 years and an analysis of the clinical and epidemiological aspects.

Materials and Methods

This retrospective study was carried out at the neonatal intensive care unit of the largest teaching hospital in the region and the only Government hospital that provides level III neonatal services in the city. The intensive care unit has a capacity of 18 beds.

All cases of Dandy–Walker syndrome born at or referred to the centre between January 2001 and December 2010 were reviewed. The information obtained from the files included gestational age, sex, Apgar score, birth weight, head circumference, place and mode of delivery, nationality, length of hospital stay, associated morbidity and mortality rate.

Microsoft Excel spreadsheets were used for data collection, and the data were analysed with SPSS version 15.0. Means, ratios and percentages were calculated. The study was authorised by the ethical committee.

Results

During the study period, eight infants with Dandy–Walker syndrome were admitted to the neonatal intensive care unit (Table 1), giving an overall incidence of 1/400 live births. Seven infants were Saudis. Three were born vaginally and five by caesarean section. Two infants were boys, five were girls, and one infant was born with ambiguous genitalia but was later found to be male, giving a female-to-male ratio of 1.7:1. The mean gestational age was 39.0 weeks (range, 36–40 weeks); one infant was borderline premature, but all the other infants were born at term. The mean birth weight was 2716 g (range, 1965–3335 g). The mean head circumference was 35.6 cm (range, 31–43.5 cm). The mean Apgar scores were 6 and 7 at the 1st and 5th minute, respectively.

Table 1: Overall findings in eight infants born with Dandy–Walker syndrome.

<table>
<thead>
<tr>
<th>Patient</th>
<th>Sex</th>
<th>Mode of delivery</th>
<th>Gestational age (weeks)</th>
<th>Nationality</th>
<th>Birth weight (g)</th>
<th>Length (cm)</th>
<th>Head circumference (cm)</th>
<th>Apgar score 1st min</th>
<th>Apgar score 5th min</th>
<th>Diagnosed by</th>
<th>Hydrocephalus</th>
<th>Other cranial findings</th>
<th>Extra-cranial</th>
<th>Hospital stay (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F</td>
<td>Vaginal</td>
<td>39</td>
<td>Saudi</td>
<td>1965</td>
<td>45.0</td>
<td>30.5</td>
<td>7</td>
<td>8</td>
<td>CT</td>
<td>Present</td>
<td>Encephalocele and lissencephaly</td>
<td>Intrauterine growth restriction, micrognathia, microtia and patent ductus arteriosus</td>
<td>25</td>
</tr>
<tr>
<td>2</td>
<td>F</td>
<td>Caesarean section</td>
<td>39</td>
<td>Saudi</td>
<td>3080</td>
<td>45.5</td>
<td>37.0</td>
<td>5</td>
<td>8</td>
<td>CT</td>
<td>Present</td>
<td>None</td>
<td>None</td>
<td>41</td>
</tr>
<tr>
<td>3</td>
<td>M</td>
<td>Vaginal</td>
<td>39</td>
<td>Algerian</td>
<td>2500</td>
<td>46.0</td>
<td>31.0</td>
<td>7</td>
<td>7</td>
<td>CT</td>
<td>Present</td>
<td>None</td>
<td>None</td>
<td>58</td>
</tr>
<tr>
<td>4</td>
<td>F</td>
<td>Vaginal</td>
<td>39</td>
<td>Saudi</td>
<td>2840</td>
<td>50.0</td>
<td>35.5</td>
<td>6</td>
<td>6</td>
<td>CT</td>
<td>Present</td>
<td>Multiple cysts and skull defect</td>
<td>None</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>Caesarean section</td>
<td>40</td>
<td>Saudi</td>
<td>3125</td>
<td>47.0</td>
<td>40.0</td>
<td>6</td>
<td>9</td>
<td>CT</td>
<td>Present</td>
<td>Joubert’s syndrome</td>
<td>None</td>
<td>27</td>
</tr>
<tr>
<td>6</td>
<td>F</td>
<td>Caesarean section</td>
<td>41</td>
<td>Saudi</td>
<td>2090</td>
<td>46.0</td>
<td>30.5</td>
<td>3</td>
<td>6</td>
<td>MRI</td>
<td>Present</td>
<td>Hydrancephaly</td>
<td>None</td>
<td>18</td>
</tr>
<tr>
<td>7</td>
<td>M</td>
<td>Caesarean section</td>
<td>39</td>
<td>Saudi</td>
<td>2795</td>
<td>47.0</td>
<td>37.0</td>
<td>5</td>
<td>7</td>
<td>MRI</td>
<td>Present</td>
<td>Lissencephaly</td>
<td>None</td>
<td>21</td>
</tr>
<tr>
<td>8</td>
<td>M</td>
<td>Caesarean section</td>
<td>36</td>
<td>Saudi</td>
<td>3335</td>
<td>51.5</td>
<td>43.5</td>
<td>2</td>
<td>2</td>
<td>CT</td>
<td>Present</td>
<td>Corpus callosum agenesis</td>
<td>Patent ductus arteriosus</td>
<td>21</td>
</tr>
</tbody>
</table>

a Ambiguous genitalia.
The incidence of extra-cranial anomalies was 50%, and all were cardiac: two were isolated cardiac defects, and the other two were associated with urinary anomalies or dysmorphism. One infant had associated Joubert syndrome. No chromosomal abnormalities were observed. All the infants had hydrocephalus, and five had other neurological anomalies (encephalocoele, lissencephaly, agenesis of the corpus callosum, hydrancephaly or brain cysts) (Table 2).

In five infants, a ventriculo-peritoneal shunt was inserted before they left hospital to relieve the intracranial pressure, while the remaining infants were discharged to be followed-up if shunting became indicated.

Discussion

Dandy–Walker syndrome (Figure 1) has been known for more than a century; however, many aspects (aetiology, biology, types and outcome) are not well understood. Thus, the data vary in the medical literature. The reported incidence also varies, ranging from one per 2500 to one per 100,000 births; however, our cohort showed an incidence of 1/400 live births, which is much higher than any reported previously. This figure remains high even if the cases diagnosed prenatally are omitted in order to eliminate referral bias (1/800 live births).

Unless the syndrome is detected prenatally, by ultrasound or magnetic resonance imaging or increased head circumference (prenatally or postnatally), the diagnosis is challenging because of a lack of specific symptomatology. In our study, the diagnosis was made prenatally in 50% of the infants. Although the remaining 50% were found to have ventriculomegaly on prenatal ultrasound, Dandy–Walker syndrome was not diagnosed.

The aetiology is unclear, although its association with risk factors like maternal viral infection (e.g. rubella, toxoplasma, cytomegalovirus) and alcohol ingestion have been proposed. Genetic and chromosomal abnormalities have also been found. We found none of these risk factors, except in the case associated with Joubert’s syndrome, in which there was a family history of this syndrome.

The pathogenesis is also unknown, although several theories have been proposed. One is embryonic arrest of the rhombencephalon, with failure of cerebellum fusion in the midline between weeks 7 and 10 of gestation. This leads to persistence of the anterior membranous area, which expands and interposes itself between the hypoplastic vermis and the choroid plexus. Furthermore, the roof of the fourth ventricle expands upward through an agenetic corpus callosum. The clinical presentation can be variable. Hydrocephalus is common prenatally or during the neonatal period, although this is a complication rather than part of the disease. Most cases are diagnosed during infancy. In our cases, hydrocephalus was observed prenatally in all the infants.

Older patients might be asymptomatic, with normal or near-normal neurological examinations. They usually present with neurological manifestations such as developmental delay, spasticity, poor head control and seizures. Some children present with symptoms suggestive of increased intracranial pressure and posterior fossa tumour, like nystagmus, cranial nerve palsy or truncal ataxia.

The severity of Dandy–Walker syndrome depends on the presence of associated anomalies. Two thirds of patients have associated central nervous system abnormalities, the most important being brain-stem dysplasia and absence of the corpus callosum, as in our study. About one-third have non-neurological problems, including cleft lip and palate, cardiac and urinary problems or associated syndromic disorders, such as were found in our study.

The treatment of Dandy–Walker syndrome consists of dealing with hydrocephalus by various approaches, although this is still controversial. The prognosis depends largely on the associated anomalies. The mortality rate ranges from 27% to 50%, and hearing and/or visual problems are associated with poor intellectual development.

Conclusion

Dandy–Walker syndrome is a rare yet serious disorder. Many aspects of this malformation remain poorly understood. Further research is needed to clarify the aetiology, pathogenesis and treatment of this condition.
understood. There are few local published case series, and more publications are required in order to explore the demographic and environmental factors that might influence different aspects of this anomaly. Although the number of infants in our study was small, most of our findings were consistent with the current literature. The incidence was, however, significantly higher than any reported previously. This important finding warrants a detailed search to elucidate the reasons, probably in a larger study with a prospective approach.

Conflict of interest

None declared.

References