SHORT REPORT

Birth injury as a causative factor of syringomyelia with Chiari type I deformity

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Abstract
The epidemiology of syringomyelia with Chiari type I deformity was investigated with particular reference to perinatal problems. All subjects in our study were born by vaginal delivery and had a high incidence of perinatal accidents (abnormal presentations, birth injuries, and neonatal asphyxia). This study suggests that these may be strong causative factors for syringomyelia associated with Chiari type I deformity.

(J Neurol Neurosurg Psychiatry 1994;57:373–374)

The pathophysiology of syringomyelia with Chiari type I deformity is still controversial.1,2 Gardner’s theory postulates that congenital abnormality accounts for its pathogenesis.2 Some workers, however, have reported a high incidence of difficult labour in mothers of patients with syringomyelia, or a high incidence of birth injury in these patients.3,4 This study provides more precise perinatal information than previous reports.

Results
Birth order
Birth order ranged from first to fifth. Eight subjects (35%) were born first, 11 (48%) second, three (13%) third, and one (4%) fifth.

Age of mother at delivery
The age of the mother at the time of delivery ranged from 19 to 35 years (mean (SD) 26.8 (3.9) years).

Pregnancy
There were no abnormalities, including infection or toxæmia, during pregnancy. The term

Summary of clinical data

Subject No. | Age (years) | Sex* | Birth order | Age of mother (years) | Term of pregnancy (weeks) | Delivery presentation | Delivery time (hours) | Presence of neonatal asphyxia* | Presence of birth injury* | Birth height (cm) | Birth weight (g) | Head circumference (cm)
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1 | 20 | F | 1st | 27 | Cephalic | 16 | - | - | 48 | 2680 | 32
2 | 29 | M | 1st | 19 | Cephalic | 2 | - | - | 46 | 3008 | 35
3 | 6 | M | 1st | 28 | Cephalic | 6 | - | - | 49.8 | 3220 | 33.5
4 | 15 | F | 2nd | 24 | Cephalic | 6 | - | - | 52 | 3300 | 33
5 | 19 | F | 2nd | 28 | Cephalic | 7 | - | - | 48 | 2900 | 34
6 | 19 | M | 1st | 22 | Unknown | 13 | + | - | 53 | 4200 | 34.5
7 | 12 | M | 2nd | 35 | Cephalic | 8 | - | - | 54 | 3575 | 34.5
8 | 17 | F | 3rd | 25 | Cephalic | 3 | - | - | 50 | 3800 | 35
9 | 14 | F | 1st | 27 | Cephalic | 5 | - | - | 48.5 | 2750 | 33.5
10 | 23 | F | 1st | 32 | Occipital | 4.5 | - | - | 47 | 3575 | 35.5
11 | 19 | M | 3rd | 30 | Unknown | 45 | - | - | 45 | 2350 | 31
12 | 21 | M | 5th | 32 | Unknown | 45 | - | - | 45 | 3575 | 35.5
13 | 1 | F | 1st | 28 | Cephalic | 1 | - | - | 47 | 2680 | 31
14 | 27 | F | 2nd | 25 | Cephalic | 2.5 | + | - | 50 | 3700 | 32
15 | 19 | F | 2nd | 25 | Unknown | 5 | - | - | 50 | 3200 | 33.5
16 | 27 | F | 1st | 32 | Cephalic | 1 | - | - | 47 | 2680 | 31
17 | 27 | F | 1st | 32 | Breech | 1 | - | - | 47 | 2680 | 31
18 | 21 | F | 2nd | 24 | Unknown | 45 | - | - | 45 | 2350 | 31
19 | 25 | F | 1st | 23 | Breech | 2 | - | - | 47 | 2680 | 31
20 | 22 | F | 1st | 23 | Cephalic | 2 | - | - | 47 | 2680 | 31
21 | 20 | M | 2nd | 26 | Cephalic | 15 | - | - | 52 | 3780 | 36
22 | 29 | M | 2nd | 27 | Breech | 2 | - | - | 47 | 2680 | 31
23 | 21 | F | 2nd | 34 | Cephalic | 1-5 | - | - | 53 | 3250 | 33.5

* F = Female; M = male; + = present; and - = absent.
of pregnancy ranged from 37 to 43 weeks (mean (SD) 39.8 (1.32) weeks.

DELIVERY PRESENTATION
Normal cephalic presentation occurred in 14 of 23 (61%) subjects, breech presentation in two (9%) subjects, and occipital and footling presentation in one subject each (4% each). Presentation was unknown in five subjects. There were thus four (22%) abnormal presentations among the 18 subjects.

DELIVERY TIME
The amniotomy to delivery time was obtained in 19 subjects. In four (21%) subjects this time was less than two hours, in eight (42%) it was between two and six hours, in four (21%) it was between six and 12 hours, and in three (16%) it was more than 12 hours. The time was unknown in four subjects.

ABNORMALITIES DURING PARTURITION
Abnormal presentation was observed in four of 23 subjects (17%). Of these four subjects (cases 10, 16, 20, 22) forces were used in two (8%). Neonatal asphyxia was seen in six (26%) subjects. Birth injury (fractures of the clavicle or humerus, or head injury) was also seen in six (26%) subjects. These abnormalities overlapped in some subjects; abnormalities during parturition were present in eight of 23 (35%) subjects in total. All subjects were born by vaginal delivery; there was no caesarean section in this series.

BIRTH HEIGHT, WEIGHT, AND HEAD CIRCUMFERENCE
The birth height of subjects ranged from 46 to 54 cm (mean (SD) 49.6 (2.4) cm), birth weight ranged from 2050 to 4200 g (mean (SD) 3173 (533) g), and head circumference ranged from 31 to 36 cm (mean (SD) 33.6 (1.5) cm). All these measurements were within the normal range. There was no case of hydrocephalus.

Discussion
The pathogenesis of syringomyelia with Chiari type I deformity remains controversial.1178 There are a few reports on the relation between birth injury and syringomyelia with Chiari malformation.114

Williams reported a high incidence of difficult labour in mothers of subjects with syringomyelia, and that a high proportion of patients had forceps deliveries and were the first child born in their family. Newman et al also reported a high incidence of traumatic birth in patients with syringomyelia due to Chiari deformity or basal arachnoiditis, but not in subjects with Chiari deformity without syringomyelia. It is hard to compare these results with ours as the manoeuvres of delivery have improved with time. The finding of a high incidence of birth injury in subjects with syringomyelia, however, is in agreement with that reported here.

In our study, abnormal presentation was observed in four (17%) of 23 subjects. Forceps were used in 8%, and neonatal asphyxia and birth injury were seen in 26%. According to a population-based control study of 1323 subjects in Fuchu city (Japan), abnormal presentation occurred in 2.9%, caesarean section in 6%, forceps delivery in 0.9%, neonatal asphyxia in 4.2%, and birth injury in 0.1% of all deliveries.9 Compared with these figures, our results show a high incidence of abnormal presentations, birth injuries, and neonatal asphyxia in our subjects. As in our study there were no caesarean sections, these suggest that vaginal delivery accompanied by some birth injury may be an important factor in the pathogenesis of syringomyelia.

Williams suggested that birth injury might be a cause of tonsillar descent through the foramen magnum. Some workers stress that birth injury might cause subarachnoid haemorrhage and subsequent arachnoiditis around the foramen magnum.9 10 12

Birth height, weight, and head circumference were within the normal range in all our subjects; there was no case of hydrocephalus. These findings indicate that the pathogenesis of syringomyelia in this series cannot be explained by Gardner’s theory.2

This study adds further proof to the hypothesis that there is an association between perinatal accidents and the incidence of syringomyelia with Chiari type I malformation.

This study was supported by Grant 2A-9 from the National Center of Neurology and Psychiatry of the Ministry of Health and Welfare, Japan.