SHORT REPORT

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

Kazutoshi Hida, Yoshinobu Iwasaki, Hiroyuki Imamura, Hiroshi Abe

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.

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Department of
Neurosurgery,
University of Hokkaido
School of Medicine,
Sapporo, Japan
K Hida
Y Iwasaki
H Imamura
H Abe

Correspondence to:
Dr Kazutoshi Hida,
Department of Neurosurgery,
University of Hokkaido
School of Medicine,
North 15, West 7, Kita-ku,
Sapporo, 060 Japan.

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The pathophysiology of syringomyelia with Chiari type I deformity is still controversial.¹⁻³ 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.³⁻⁶ This study provides more precise perinatal information than previous reports.

Subjects and methods

An epidemiological investigation was carried out for patients who had preserved medical

records (mainly the *Maternal and Child Health Handbook of Japan*, Ministry of Health and Welfare, Tokyo, Japan). There were 23 patients, eight males and 15 females, ranging in age from one to 29 years (mean 16.9 years). These patients form the basis of this study. A questionnaire was given asking about birth date, sex, age, birth order, age of mother at delivery, abnormalities during pregnancy, term of pregnancy, delivery presentation, delivery time, abnormalities during parturition, whether forceps were used, whether the infant showed neonatal asphyxia or birth injuries, and weight, height, and head circumference at birth.

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)
1	20	F	1st	27	40	Cephalic	16	-	-	48	2680	32
2	29	M	1st	19	39	Cephalic	2	-	-	46	3508	35
3	6	M	2nd	28	39	Cephalic	6	-	-	49.8	3220	33.5
4	15	F	2nd	24	40	Cephalic	6	-	-	52	3300	33
5	19	F	2nd	28	40	Cephalic	7	-	-	48	2900	34
6	19	M	1st	22	42	Unknown	13	+	+	53	4200	34.5
7	12	M	2nd	35	40	Cephalic	8	-	+	54	3575	34.5
8	17	F	3rd	25	40	Cephalic	3	-	-	50	3800	35
9	14	F	1st	27	43	Cephalic	5	-	-	48.5	2750	33.5
10	23	F	3rd	28	40	Occipital	4.5	-	-	49	3575	35.5
11	19	M	3rd	30	37	Unknown	5	-	-	45	2350	31
12	21	M	5th	32	Unknown	Unknown	Unknown	+	+	Unknown	Unknown	Unknown
13	1	F	1st	28	38	Cephalic	1	-	-	Unknown	Unknown	Unknown
14	27	F	2nd	25	40	Cephalic	2.5	+	-	Unknown	Unknown	Unknown
15	19	F	2nd	25	Unknown	Unknown	Unknown	+	+	Unknown	2050	Unknown
16	27	F	1st	32	40	Breech	1	-	-	47	2680	31
17	27	F	2nd	25	40	Cephalic	1	-	-	50	3700	32
18	21	F	2nd	24	Unknown	Unknown	Unknown	-	-	50	3200	33.5
19	25	F	1st	23	41	Cephalic	2	-	-	50	2800	34
20	22	F	1st	22	40	Breech	2	+	+	48.5	3100	35
21	20	M	2nd	26	38	Cephalic	15	-	-	52	3780	36
22	29	M	2nd	27	40	Footling	Unknown	+	+	49.5	3050	32
23	21	F	2nd	34	39	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) forceps 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.^{1,2,7} There are a few reports on the relation between birth injury and syringomyelia with Chiari malformation.^{3-6,8}

Williams³ 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. Newman⁵ *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 Fuchuu 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.^{3,6,10-12}

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.

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