

NEONATAL HIP INSTABILITY

Incidence, Diagnosis and Treatment at the University Hospital, Uppsala, 1960-1964 and 1970-1974

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Neonatal hip instability, its incidence, diagnosis and treatment, has been studied retrospectively for the periods 1960-1964 and 1970-1974. The respective populations for the two periods amounted to 13,065 and 16,274 children all born at the same hospital. During the first period 191 children (14 per mille) were referred from the maternity ward to the orthopaedic department with suspected hip instability; 109 (8.3 per mille) children were considered by the orthopaedic consultant to have unstable hips. During the second period the corresponding figures were 503 (31 per mille) referred to the orthopaedic department and 189 verified as unstable (11.6 per mille). During the first period, 177 children were treated with Frejka pillows for about 3 months, only 14 being left untreated. In seven children the initial treatment was completed with a plaster cast. The results were uniformly good. During the second period, 195 children were treated with a von Rosen-splint for 6 weeks followed by Frejka pillows for another 6 weeks (seven completed treatment with plaster); in 143 cases Frejka pillows were the sole treatment and 161 had no treatment at all. There was one primary plaster. The treatment resulted in normal hips in all but one girl. In the non-treated group three sublaxations were verified after the neonatal period. There were seven "missed" cases (diagnosed after the first month of life) in the first population (0.5 per mille), 15 in the second (0.9 per mille). This difference is not statistically significant. The calculated incidence of dislocations if no treatment had been instituted in the neonatal period is 1.5 per mille in the first population, and 2.5 per mille in the second. The difference is not statistically significant.

Key words: CDH; hip instability; neonatal; incidence

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In 1956, Severin calculated the incidence of children with congenital dislocation of the hip in Sweden. The children with this diagnosis were traced via the orthopaedic departments throughout the country. They were generally more than 1-year-old when diagnosed. No treatment had been given during the neonatal

period at that time (1936-1945). Severin found that 0.9 per mille of children born alive had CDH. He remarked that this figure was a minimal one.

During the past 25 years, early treatment of neonatally unstable hips has become standard practice in Sweden. Many large materials have been pre-

Table 1. Incidence of neonatal hip instability.

Author and date of study	Comments	Incidence (Per mille)
<i>Sweden</i>		
Palmén 1961	Own material	5.7
Palmén 1961	Obstetric clinics (1953–1960)	2.2
Palmén 1961	Obstetric clinics (1953–1960) with provoked instability test	5–6
Palmén 1961	Clinics in Gothenburg and Malmö	2.0
Emnéus 1966	63/16,638	3.8
James & Hierton 1968	All cases admitted for orthopaedic consultation	20.0
Emnéus & Undeland 1970		4.5
von Rosen 1970	1956	1.3
	1965	12.9
	Average	4.7
Hirsch & Scheller 1970	1961	13.0
	1962	12.9
Palmén & von Rosen 1975	For the whole country (1963)	5.6
Fredensborg 1975		9.3
<i>Elsewhere</i>		
Barlow 1962		14.9
Finlay et al. 1967		5.0
Williamson 1972	192/29,000	6.6
MacKenzie 1972	1969–1970	21.8
Bjerkreim 1974		8.0
Artz et al. 1975		13.3
Nielsen 1975		0.74

sented, especially of the pioneering work of Palmén and von Rosen. The incidence of neonatal hip instability has been calculated. Table 1 gives some of these figures, as well as the incidence in some other countries.

In the thesis presented by Fredensborg in Malmö (1975), it was stated that early diagnosis and treatment had been very successful during the period 1956–1972; only 0.07 per mille were diagnosed after the neonatal period (= first month of life). Other investigators have found, however, that early diagnosis and treatment has not considerably reduced the number of so-called “missed” cases (Williamson 1972, MacKenzie 1972, Bjerkreim 1974, Nielsen 1975). Even in Sweden when one compares the last few years with the mid-sixties (Palmén & von Rosen 1975, Palmén 1977, personal communication), there is a tendency for

more cases to be diagnosed during the age of 1–6 months.

In Uppsala early diagnosis and treatment started in the late fifties. It is now an established routine procedure, in principle the same as in other Swedish maternity wards with regular examinations by paediatric consultants. Nevertheless there are a few “missed” cases every year, which are picked up later in the Paediatric Health Care Centres. The following study has been undertaken with the purpose of elucidating and examining the effectiveness of our diagnostic and therapeutic routines.

MATERIAL AND METHODS

The material consists of all children who have been referred, in the neonatal period (= first month of life), from the maternity ward to the orthopaedic department in the University Hospital of Uppsala, with signs of hip instability,

during the years 1960–1964 and 1970–1974. These children have been examined by a consultant paediatrician once during their first 24 hours, and again before leaving the hospital at about 1 week of age. The orthopaedic examination was done 1–4 days after the paediatric examination in the majority of the cases. When indicated, treatment was started immediately after the orthopaedic examination. Retrospectively, the material has been classified according to diagnosis, type and results of treatment. The 5-year incidence of neonatal instability has been calculated for the two periods. The incidence of late (= after the first month of life) diagnosis has been estimated separately.

RESULTS

Diagnosis

In Table 2 the total number of infants born alive each year and the total number referred for orthopaedic examination during the same period are presented. There is a rapid increase during the early years of the sixties. During the later period the total number of patients referred has more than doubled compared with the first.

At the orthopaedic examination, the paediatric diagnosis of hip instability has been verified in a number of cases. Verified instability means a positive Ortolani sign and/or a positive provoked instability test, or a totally dislocated hip (rare). Table 3 presents the number of children with verified hip instability (A) and the number where instability could not be verified (B). This table also presents the number of children referred after the neonatal period ("missed" cases) (C). None of these had been referred for orthopaedic examination during the period in the maternity ward. They were discovered at an age of 6 weeks to 20 months, being mainly referred from the paediatric Health Care Centres.

During the first period instability was verified in 109 newborn patients. The total population was 13,065, giving an incidence of $109/13,065 = 8.3$ per mille. The corresponding figure for the second

Table 2. Number of children referred from the maternity ward for orthopaedic examination.

Year	No. born alive	No. referred from maternity ward	Per mille
1960	2295	1	0.4
1961	2193	8	3.6
1962	2468	41	16
1963	2803	68	24
1964	3306	73	22
	13,065	191	14.6
1970	3096	117	37
1971	3363	99	29
1972	3296	130	39
1973	3215	80	24
1974	3304	77	22
	16,274	503	30.9

period is $189/16,274 = 11.6$ per mille. There is a statistically significant difference between these two figures. The number of patients in group B shows an increase from $82/13,065 = 6.3$ per mille to $314/16,274 = 19.2$ per mille. In group C the small difference between the incidence in the first and the second period (0.54 versus 0.92 per mille) is not statistically significant.

Treatment

As can be seen from Table 4, during the period 1960–1964 the treatment always started with a Frejka pillow for about 3 months. Nearly every child referred to the department had this treatment even if the hips were considered stable at the orthopaedic examination. This simple treatment was in seven cases completed with plaster. The reason for the treatment with plaster was persisting instability after the Frejka treatment in two cases and persisting X-ray changes interpreted as "dysplasia" in five cases.

All hips, including those with plaster, remained stable after this treatment. X-ray examinations at 3 months and/or at 1 year or later displayed normal development, except in one case which had

Table 3. Number of children: A. With verified instability at the orthopaedic examination during the neonatal period. B. With stable hips at the orthopaedic examination during the neonatal period. C. Referred after the neonatal period with unstable hips.

Year	No. born alive	A	B	C
1960	2,295	1	—	1
1961	2,193	7	1	3
1962	2,468	26	15	1
1963	2,803	40	28	1
1964	3,306	35	38	1
	13,065	109 (8.3 per mille)	82 (6.3 per mille)	7 (0.54 per mille)
1970	3,096	38	79	1
1971	3,363	53	46	5
1972	3,296	52	78	4
1973	3,215	24	56	3
1974	3,304	22	55	2
	16,274	189 (11.6 per mille)	314 (19.2 per mille)	15 (0.92 per mille)

Table 4. Various forms of treatment in children referred for neonatal hip instability and number of children treated.

Year	von Rosen splint (+ Frejka pillow)	Only Frejka pillow	Plaster	No treatment	Total
1960	—	1	—	—	1
1961	—	7	—	1	8
1962	—	32	(4) *	9	41
1963	—	67	(3) *	1	68
1964	—	70	—	3	73
		177	(7) *	14	191
1970	44	55	(1) *	15	114
1971	54	18	(5) *	27	99
1972	50	33	1 (+ 1) *	46	130
1973	25	20	—	35	80
1974	22	17	—	38	77
	195	143	1 (+ 7) *	161 **	500

* The figures in parentheses indicate cases where treatment started with Frejka pillow or von Rosen splint but later changed to plaster. These are included in the group according to initial treatment.

** In this group three children were treated after the neonatal period.

been treated with plaster, where slight dysplastic changes were still visible at 2.5 years of age.

During the years 1970–1974 a von Rosen splint for (4–)6 weeks, followed by a Frejka pillow for another 6(–8)

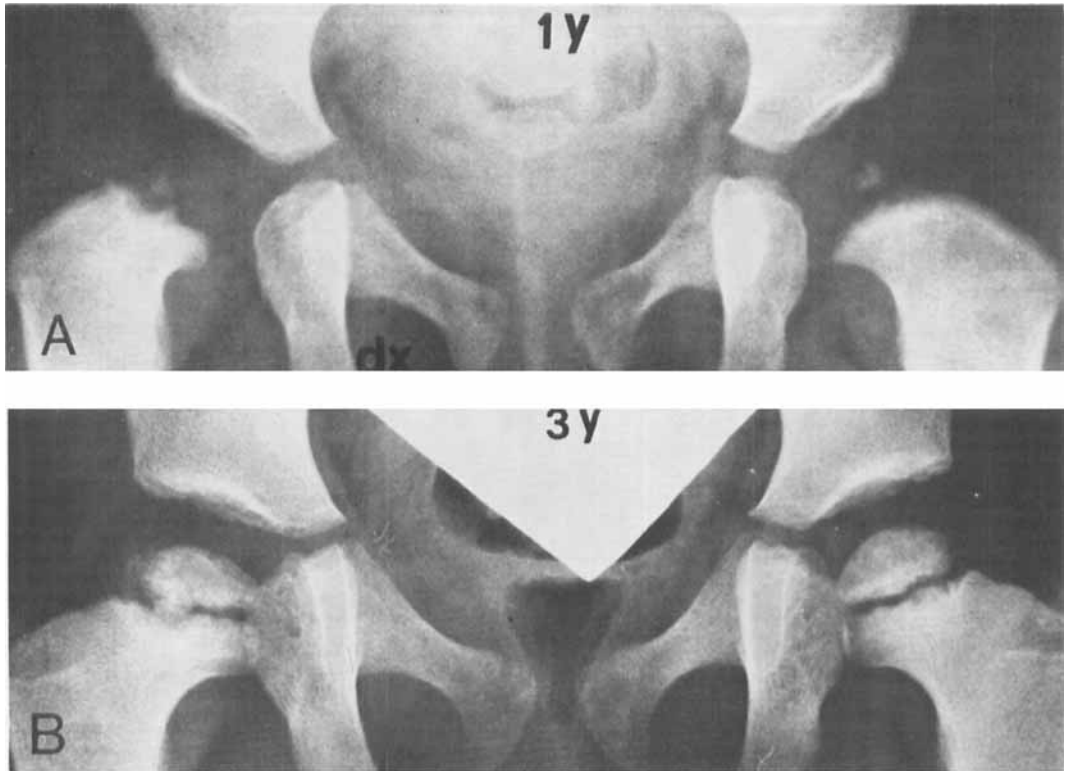


Figure 1. Girl with very unstable hips bilaterally when newborn, even when fixed in a von Rosen splint. She was treated from the start in abduction plaster. Irregular ossification in the epiphysis and metaphysis was seen for the first time at 11 months (Figure 1 A). X-ray at 3 years (Figure 1 B).

weeks has been the normal treatment in newborn cases with verified instability. In six cases the splint was changed to plaster after a short time because of persistent instability at the check-ups. In one case sufficient stability could not be attained with a splint, and treatment with plaster was started at once. In another case treatment in an abduction splint was prolonged because the X-ray check-up at 4 months showed signs of dysplasia.

All cases treated with von Rosen-Frejka, with the exception of those mentioned above, were clinically normal within 12 weeks. A final clinical and X-ray examination was done at about 4 months.

The cases treated in plaster have stable hips except in one bilateral case, where

one hip remains unstable even after a series of operative procedures. The girl who was treated in plaster from the start is clinically normal but X-ray examination has shown some structural defects in the hip (avascular necrosis?) (Figure 1).

Children, where instability could not be verified, were either treated with Frejka pillows for about 6 weeks (161) or were not given any treatment (143). The examining orthopaedic surgeon selected the cases on an individual basis. The children treated with Frejka pillows have all responded satisfactorily. Three cases in the non-treated group presented later (6 weeks–4 months) with restricted abduction in the suspected hip. Arthrographies of the hips showed instability



Figure 2. Girl born 24 April, 1974. Examinations in the maternity ward: 25 April, normal hips; 28 April, positive Ortolani bilaterally; 30 April, laxitas (?). Examinations by orthopaedic surgeon: 29 April, 13 May, 10 June, normal hips; 3 July, restricted abduction, left side, 21 August, same + leg shortening; X-ray: Acetabular dysplasia + subluxation, left side. Arthrography: Unstable caput femoris, left side, with cranial dislocation of the labrum (arrow).

and dysplasia (Figure 2). After treatment in plaster the hips became stable with normal X-ray appearance.

DISCUSSION

Incidence

During the period 1960–1964 8.3 per mille of the newborns were verified as having unstable hips by the orthopaedic specialist, compared with 11.6 per mille during the second period. This difference is statistically significant. There was at the same time no significant change in the number of cases diagnosed after the neonatal period (Table 3).

Bjerkreim (1974) calculated the incidence of neonatally diagnosed cases in south-east Norway for the period 1965–1969 to be 8 per mille. Cases diagnosed later (> 1 month) amounted to 2 per mille, mostly subluxations and dysplasia. During the sixties he noticed an increasing number of neonatal as well as late cases when less serious cases were included. Palmén (1977, personal communication) has during more recent

years (1973–1975) found a large number of cases diagnosed in the age group 1–6 months in all of Sweden. Bjerkreim and Palmén feel that this increase is due to the increased activity at the Paediatric Health Care Centres, where much attention has been directed towards the problem of unstable hips in infants.

The experience of the Malmö region as presented by Fredensborg (1975) is quite contrary to this. There was an increase in the number of neonatal cases in Malmö in the middle of the sixties, but late cases were extremely rare (four in 16 years). The increase in neonatal cases is thought to be due to the fact that many different doctors were involved in the examination of the newborns (Fredensborg et al. 1977).

It is generally assumed that the increase in the number of diagnosed cases is the result of intensified diagnostic work and thus not a true increase in hip instability. Of course one cannot exclude the possibility that some change in the environment can influence the occurrence of neonatal instability. The examination itself may be of some importance.

Changes in obstetric technique could also be a contributing factor. Artz et al. (1975) have found a higher frequency of neonatal instability among children delivered by caesarean section even if there is a vertex position.

Whatever the explanation is, the present study shows that early diagnosis in Uppsala has not been successful in one very important aspect, that is to catch all cases within the first 4 weeks of life (Table 3).

Barlow (1962) reports in his well-known paper that there is a spontaneous tendency towards stability among children with neonatal hip instability. Within 2 months about 88 per cent were stable whether treated or not. Severin's figure of 0.9 per mille CDH diagnosed after the first year of life would thus correspond to roughly eight times that in neonatal instability, i.e., 7 per mille.

In the population from 1960–1964, 8.3 per mille (109/13,065 children) had unstable hips (Table 3). If no treatment has been started this would according to Barlow result in about $\frac{109}{8} \approx 13$ obvious manifestations of CDH. A source of error is of course the hips considered stable by the orthopaedic consultant but treated nevertheless (68 children). Seven cases were diagnosed after the neonatal period (Table 3). Altogether at least 20 cases (13 + 7) of CDH would come out of this population, which is about 1.5 per mille. Barlow (1962) mentions approximately the same figure (1.55 per mille). The corresponding figures from 1970–1974 are as follows: 189 verified cases of instability; $\frac{189}{8} \approx 23$ possible cases of CDH. Cases diagnosed after the neonatal period, three (from the non-treated group) (see Table 4) + 15 (referred from Paediatric Health Care Centres) (Table 3). Altogether about 41 cases in a population of 16,274 which is about 2.5 per mille.

The apparent difference between the calculated incidence 1.5 per mille versus 2.5 per mille is not a significant one. By using this type of calculation it is possible to bridge over the apparent differences in the figures of incidence given by Severin and those found nowadays. A calculated figure of about 2 per mille of CDH, if no treatment is instituted neonatally, seem relevant. This equals about 1.5 per cent as a reasonable figure for neonatal instability.

Treatment

The simple treatment with Frejka pillow and/or von Rosen splint has been successful in the majority of cases. Only a few cases needed plaster. Only one girl had to be operated upon. The treatment period in the von Rosen splint was generally 6 weeks and was followed by the Frejka pillow for the same length of time. The good results indicate that longer treatment in the splint is not needed (Emnéus & Undeland 1970) at least if followed by a Frejka pillow for the same time. Repeated examinations during the treatment period are necessary in order to check stability. In most cases the hip was stable at 2 weeks. Too firm a fixation with maximal abduction may be dangerous (Lancet Editorial, 1974) as illustrated by the case primarily fixed in plaster where some structural changes have been observed.

Of special interest is the handling of the cases with non-verified instability during the period 1970–1974. Out of a total of 314 cases, about one-half (161) were treated in Frejka pillows and the rest (143) were not treated. In the untreated group three subluxations were discovered later (Table 4). In the Frejka-treated group all became normal. It is possible that even those three subluxations could have been prevented if the treatment had comprised all cases. The existing "over treatment" would in that case have been more extensive. Consider-

ing the risk of "missed" cases and the simplicity of the treatment when started early, this might have been justified. A certain degree of over treatment cannot be avoided if the diagnostic criteria cannot be improved.

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