

Correlation of fetal posture and congenital dislocation of the hip

A statistical study was carried out on the incidence of CDH associated with mechanical factors in the uterus, including congenital genu recurvatum. There were 72 cases of CDH among 6559 infants (1.1 per cent). The incidence of CDH was 0.7 per cent in cephalic presentation, 2 per cent in footling presentation and 20 per cent in single-breech presentation. In another series, CDH was found in six of seven infants with congenital genu recurvatum. These findings suggest that a fetal posture with the hip flexed and the knee extended predisposes to the development of CDH.

**Shigeo Suzuki
Takao Yamamuro**

Department of Orthopedics,
Faculty of Medicine, Kyoto
University, 54 Kawara-cho,
Shogoin Sakyo-ku, Kyoto,
606 Japan

Fetal position and, possibly, sex hormones are known factors in the pathogenesis of congenital dislocation of the hip (CDH). The incidence of CDH is high in neonates born in breech presentation (Vogel 1905, Record & Edwards 1958, Artz et al. 1975, Palmén 1984), and Wilkinson (1963, 1972) reported that among various breech presentations, the single-breech presentation was the most deleterious; he demonstrated experimentally that sex hormones as well as fetal position were closely related to CDH.

Somerville (1953, 1962) noted that when the hip was extended from the fetal position, dislocation could develop, and Salter (1968) stated that a congenitally unstable or dislocated hip was made worse by extension and adduction. Ishida (1977) reported that applying a diaper and baby clothing without changing the naturally flexed leg reduced the incidence of congenital dislocation of the hip.

The purpose of this study was to analyze the occurrence of unstable hips in various types of deliveries and also to investigate the relationship between CDH and genu recurvatum.

Patients and methods

From January 1973 through April 1980, 6559 infants were born at the Matsue and the Otsu Red Cross Hospitals. They were all examined for hip instability during the first few days after birth (Barlow 1962). They were divided into five types of delivery (cephalic, double-breech, footling and single-breech presentation, and Cesarean section). Among 267 Cesarean babies, 207 could be divided into three

groups (cephalic, double-breech and single-breech presentation) based on the fetal roentgen examination or on the inspection at the time of Cesarean section. The occurrence of unstable hips, the duration of joint laxity and the affected side were studied for each presentation.

Seven infants had genu recurvatum. Three were born at the Kyoto University Hospital (3/3845 deliveries, 0.08 per cent, 1974–1979), and one at Otsu Red Cross Hospital (1/1197 deliveries, 0.08 per cent, 1978–1980). Three were born in other hospitals, but examined at the Kyoto University Hospital 1974–1979.

Statistical analysis was done by the Fisher exact probability test and the chi-square test, and the significance level $p < 0.05$ was accepted.

Results

Seventy-two infants (21 boys and 51 girls) had positive Barlow tests – an overall incidence of unstable hips of 1.1 per cent. The frequency was 0.7 per cent (42/6075) in cephalic presentation, 0 per cent in double-breech presentation (0/36), 2 per cent in footling presentation (1/46) and 20 per cent in single-breech presentation (22/111). In 24 cases the obstetrician had not recorded the presentation; one of these 24 babies had a positive Barlow test. The incidence of unstable hips in single-breech presentation was significantly higher than those in the other presentations ($p < 0.005$) (Figure 1).

There were 267 children delivered by Cesarean section: 185 were in cephalic presentation, two of whom had hip instability (1.1 per cent); 11 in single-breech presentation, two of

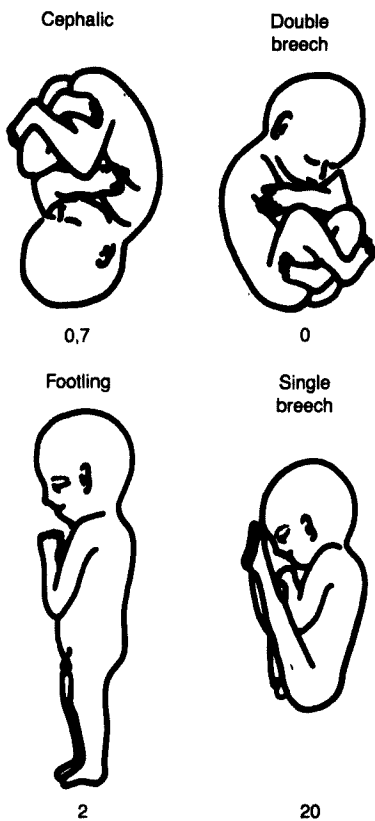


Figure 1. Per cent unstable hips in relation to birth presentation.

whom had hip instability; there were no CDH in double breech presentation. In the other 60 Cesarean babies the obstetrician had not re-

corded the type of presentation; two of these 60 cases had a positive Barlow test.

During a 2-year period from April 1978 to April 1980, babies with the click phenomenon (12 cases) were examined daily. The phenomenon disappeared on the day after birth in all three hip instability cases born by cephalic presentation, whereas six of nine CDH cases born by single-breech presentation were positive for the click test on the next day, and three cases were positive even 2 days after birth. In one case with severe instability, a von Rosen splint was applied.

Six of 42 babies born in cephalic presentation had bilateral hip instability, as compared with 10/22 infants in single-breech presentation ($p<0.01$, Figure 2). There were no bilateral

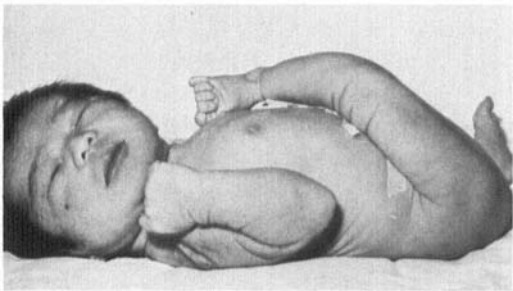


Figure 3. A female baby with right genu recurvatum was born by cephalic presentation. The click phenomenon was detected in the right hip joint soon after delivery. Genu recurvatum was reduced on the first day and the click phenomenon disappeared on the next day.

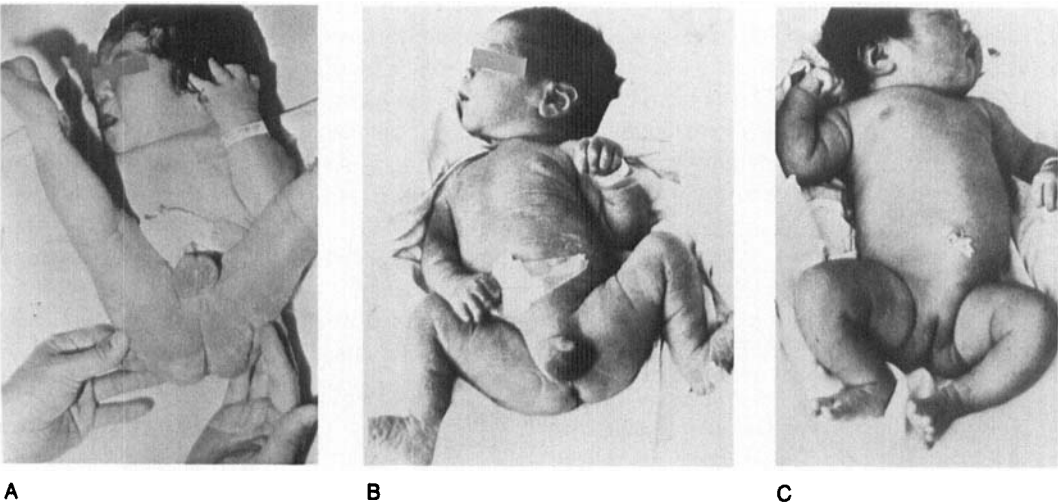


Figure 2. Single breech presentation. A. Immediately after delivery. B. Three days later. C. For comparison, newborn after cephalic presentation.

cases in footling or double-breech presentations. Two cases delivered by Cesarean section in single-breech presentation had bilateral instability.

Seven cases of congenital genu recurvatum (Figure 3) were all born by cephalic presentation. Four had bilateral and three unilateral genu recurvatum, in total 11 affected knees. Eight of 11 legs with genu recurvatum had CDH.

Discussion

The incidence of CDH was high (10–20 per cent) (Vogel 1905, Record & Edwards 1958, Artz et al. 1975, Palmén 1984) among the breech presentation children in the present study – 12 per cent. Our investigation, however, revealed the highest incidence of unstable hip (20 per cent) in single-breech presentation, one of three types of breech presentation. Furthermore, the incidence of bilateral instability in single-breech presentation was higher than in cephalic presentation, all in accord with Wilkinson (1963, 1972) and Dunn (1976), who noted the importance of single-breech presentation in CDH.

CDH is frequent in patients with congenital genu recurvatum (Niebauer & King 1960, Laurence 1967, Curtis & Fisher 1969, Katz et al. 1967). Eight of our 11 hips with congenital genu recurvatum were associated with CDH. Hyperextension of the knee joint in the uterus may provoke the hip instability.

Wilkinson (1963) showed that prolonged flexion of the hip and extension of the knee, combined with sex hormone administration, resulted in dislocation of the hip joint in young female rabbits. Michelsson & Langenskiöld (1972, 1974) demonstrated in young rabbits that immobilization of the knee joint in extension caused dislocation or subluxation of the hip joint. This did not occur if the hamstrings muscles were divided. Yamamuro et al. (1977) reported similar observations in rats. In addition, they showed that hip dislocation was accelerated by progesterone, but was prevented by estrogen. Experimental and clinical results led us to the hypothesis that an important prenatal causative factor for CDH might be an imbalance of skeletal muscle strength produced

by the fetal position in a prolonged flexion of the hip joint with an extension of the knee joint. Possibly the head of the femur is pulled down by the hamstrings and the capsule of the hip joint is stretched when the fetus takes a position of hip flexion and knee extension. Then the head of the femur may easily be pulled upwards by the iliopsoas when the hip is maintained in extension wrapped in a traditional diaper. This may explain why CDH occurs more frequently with extended knees.

A baby delivered by single-breech presentation spreads its legs more widely than a baby born by the other presentations, as shown in Figure 2. The mother may extend the spread legs when handling the baby. This may be the reason for the high incidence of late-diagnosed CDH cases in infants born in breech presentation (Palmén 1984).

We suggest that the main mechanical factor predisposing to hip instability may be the prolonged tension of the hamstrings due to knee extension in the intra-uterine period.

Acknowledgements

We thank Drs. S. Okamoto and A. Fujita for advice, and our colleagues at the Matsue and the Otsu Red Cross Hospitals for their cooperation in this study.

References

- Artz, T. D., Levine, D. B., Lim, W. N., Salvati, E. A. & Wilson, P. D. (1975) Neonatal diagnosis, treatment and related factors of congenital dislocation of the hip. *Clin. Orthop.* **110**, 112–136.
- Barlow, T. G. (1962) Early diagnosis and treatment of congenital dislocation of the hip. *J. Bone Joint Surg.* **44-B**, 292–301.
- Curtis, B. H. & Fisher, R. L. (1969) Congenital hyperextension with anterior subluxation of the knee. *J. Bone Joint Surg.* **51-A**, 255–269.
- Dunn, P. M. (1976) Perinatal observations on the etiology of congenital dislocation of the hip. *Clin. Orthop.* **119**, 11–22.
- Ishida, K. (1977) Prevention of the development of the typical dislocation of the hip. *Clin Orthop.* **126**, 167–169.
- Katz, M. P., Grogono, B. J. S. & Soper, K. C. (1967) The etiology and treatment of congenital dislocation of the knee. *J. Bone Joint Surg.* **49-B**, 112–120.

- Laurence, M. (1967) Genu recurvatum congenitum. *J. Bone Joint Surg.* **49-B**, 121–134.
- Michelsson, J.-E. & Langenskiöld, A. (1972) Dislocation or subluxation of the hip. *J. Bone Joint Surg.* **54-A**, 1177–1186.
- Michelsson, J.-E. & Langenskiöld, A. (1974) Coxa vara following immobilization of the knee in extension in young rabbits. *Acta Orthop Scand.* **45**, 399–411.
- Niebauer, J. J. & King, D. E. (1960) Congenital dislocation of the knee. *J. Bone Joint Surg.* **42-A**, 207–225.
- Palmén, K. (1984) Prevention of congenital dislocation of the hip. *Acta Orthop. Scand.* **55**, Suppl. 208.
- Record, R. G. & Edwards, J. H. (1958) Environmental influences related to the aetiology of congenital dislocation of the hip. *Br. J. Prog. Soc. Med.* **12**, 8–22.
- Salter, R. B. (1968) Etiology, pathogenesis and possible prevention of congenital dislocation of the hip. *Can. Med. Assoc. J.* **98**, 933–945.
- Somerville, E. W. (1953) Development of congenital dislocation of the hip. *J. Bone Joint Surg.* **35-B**, 568–577.
- Somerville, E. W. (1962) Some mechanical factors in the causation of congenital dislocation of the hip. *Develop. Med. Child. Neurol.* **4**, 147–153.
- Vogel, K. (1905) Zur Aetiologie und pathologischen Anatomie der Luxation Coxae Congenita. *Z. Orthop. Chir.* **14**, 132–159.
- Wilkinson, J. A. (1963) Prime factors in the etiology of congenital dislocation of the hip. *J. Bone Joint Surg.* **45-B**, 268–283.
- Wilkinson, J. A. (1972) A post-natal survey for congenital displacement of the hip. *J. Bone Joint Surg.* **54-B**, 40–49.
- Yamamuro, T., Hama, H., Takeda, T., Shikata, J. & Sanada, H. (1977) Biomechanical and hormonal factors in the etiology of congenital dislocation of the hip joint. *Int. Orthop.* **1**, 231–236.