# Ineffective hip rotation with Pavlik harness

## Prospective study of 35 infant dislocations

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**35 hips in 31 infants diagnosed as unstable were treated with a Pavlik harness and followed by weekly clinical and monthly ultrasound evaluation to determine eventual stability. 26 hips became stable within 3 months, and 9 dislocations required reduction with hip spica placement; 1 of these subsequently required open reduction. Of the 7 infants with 9 hips that failed, 2 children had a late onset of treatment, 2 children had problems with brace fit or family acceptance, and 3 other children had no problem with use of the orthosis. Internal rotation of a degree not possible with the Pavlik harness was required to reduce 4 of these 9 hips. The Pavlik harness is ineffective in some patients because of the need for internal rotation.**

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Stabilization of congenital hip dislocation and subluxation by Pavlik harness is not always possible (Mubarak et al. 1981, Dahlstrom and Friberg 1987). To discover the cause of failures in this orthosis, a prospective clinical and sonographic evaluation was undertaken.

## Patients and methods

This prospective study population was derived from infants up to 4 months of age, referred to our pediatric orthopedic service because of suspicion of an unstable hip by a positive Barlow or Ortolani sign noted by the pediatric or neonatal staff. After verification of clinical instability by the pediatric orthopedic staff, the children underwent dynamic ultrasound examination. After elimination of teratological and septic hips, the study population consisted of the 31 children with 35 hips (Table 1).

A Pavlik harness was applied before 1 month to 27 children with unstable hips. 4 others were applied at the ages of 1–4 months. The patients were seen weekly in the clinic for brace-check and examined monthly by ultrasound to evaluate hip stability. Ultrasound scanning was performed with the Pavlik harness in place, using the dynamic method of Harcke (Morin et al. 1985, Grissom et al. 1988, Harcke and Kumar 1991). When the hip was stable in all positions at ultrasound, the orthosis was used at night for 1 month and then discontinued. If the hip had not been reduced by the 8-week visit, closed reduction under general anesthesia with arthrographic verification was carried out. This was followed by immobilization in a hip spica in a position of stability identified by arthrography. The children then had follow-up physical examinations every 1–3 months. Hip radiographs were obtained at 9 months of age to verify the position of the ossified femoral epiphysis.

Children not responding to Pavlik treatment are continuing their follow-up care with visits every 3–6 months during early childhood. Radiographs documenting stability and deformity will be obtained up to at least 7 years of age. Our 7 children who did not respond to Pavlik are currently in their second year of follow-up.

## Results

At 1 month, 9 hips had become stable in all positions using ultrasonography (Cases 1–8). 16 children with unilateral hip instability (Cases 9–24) and 1 child with initial bilateral instability (Case 27R) had hip reductions at the second-month ultrasound examination and demonstrated stability in all hip positions at the third month (Figure 1). They were then weaned off the brace. All of these 26 hips remained stable

Table 1. Observations in 35 cases of infant hip dislocation

| A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|
| 1 | F | 0 | S | | | |
| 2 | F | 0 | S | | | |
| 3 | M | 0 | S | | | |
| 4 | M | 0 | S | | | |
| 5 | F | 0 | S | | | |
| 6 | F | 0 | S | | | |
| 7 | F | 0 | S | | | |
| 8 B | F | 0 | S | | | |
| 9 | F | 0 | U | S | | |
| 10 | F | 0 | U | S | | |
| 11 | M | 1 | U | S | | |
| 12 | M | 0 | U | S | | |
| 13 | F | 1 | U | S | | |
| 14 | M | 0 | U | S | | |
| 15 | M | 0 | U | S | | |
| 16 | F | 0 | U | S | | |
| 17 | F | 0 | U | S | | |
| 18 | F | 0 | U | S | | |
| 19 | M | 0 | U | S | | |
| 20 | M | 0 | U | S | | |
| 21 | F | 0 | U | S | | |
| 22 | F | 0 | U | S | | |
| 23 | M | 0 | U | S | | |
| 24 | F | 0 | U | S | | |
| 25 | M | 4 | U | U | S–I | |
| 26 | F | 2.5 | U | U | S–I | |
| 27 R | F | 0 | S | | | |
| L | | | U | U | S–I | |
| 28 B | F | 0 | U | U | S | |
| 29 B | F | 0 | U | U | S | |
| 30 | F | 0 | U | U | U | S–I |
| 31 | F | 0 | U | U | S | |

A Case
B Bilateral or L or R side if different results in bilateral cases
B Sex
C Age in months
*Ultrasound after*
D 1, and E 2 months of brace use
F Closed reduction under general anesthesia
G Open reduction
*D–G*
U Unstable
S Stable
S–I Stable only in internal rotation

with normal development at follow-up of 1 year or longer.

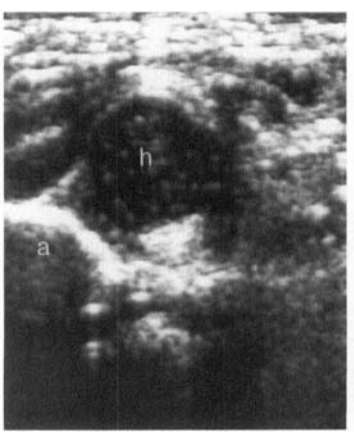
7 children (Cases 25–31) had 9 hips that had not been reduced after 2 months of brace use (Figure 1) and required reduction under anesthesia. Of the 7 children with failures, 2 (Cases 25 and 26) had late onset of treatment: at 3 and 4 months. 3 of these 7 children (Cases 27–29) had bilateral instability. 1 with bilateral instability had a family who found the brace impossible to use, despite nursing input (Case 29). 1 premature child had an unsatisfactory brace fit in the first few months of life (Case 30). The other 3 children with 5 hips had no basic problem with early and continuous brace-use in the 2-month trial period.

Closed reduction with arthrographic documentation in these 7 children was successful in 6 with 8 hips, 3 of which required internal rotation to reduce and hold stability (Cases 25–27). The other 5 hips could be stabilized in neutral or external rotation. 1 child (Case 30) with 1 unstable hip failed to respond to closed reduction and required open reduction with internal rotation to achieve stability. Thus, a total of 4 hips required internal rotation to achieve stability.

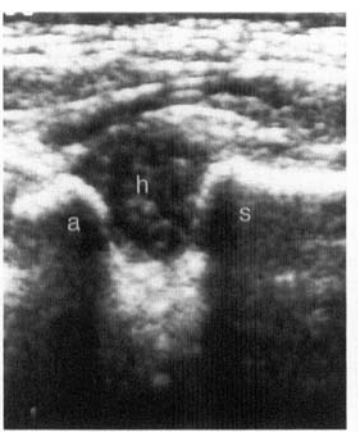
## Discussion

Ultrasonography is an excellent imaging tool to evaluate hip stability in the infant prior to ossification of the capital femoral epiphysis (Graf 1984, Tonnis et al. 1990). The dynamic stress method (Morin et al. 1985, Engesaeter et al. 1990, Polanuer et al. 1990, Harcke and Kumar 1991) allows the hip to be manipulated during direct ultrasound visualization of the

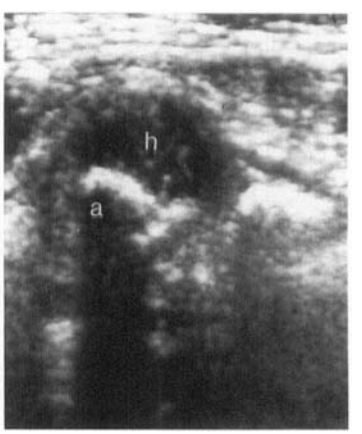
Figure 1. Case 27. Ultrasound of the hips. a Posterior acetabulum margin. h Cartilaginous femoral head. s Shaft of femur.




Transverse ultrasound of the *right hip* in neutral. Infant is wearing the Pavlik harness. Hip is dislocated.




*Right hip* in abduction, hip is located.




Persistently dislocated *left hip*. Infant is wearing the Pavlik harness.

unossified femoral head. The examination can be performed while the hip is in the Pavlik harness, and assessing the effectiveness of the harness in holding the hip in (or out) of reduction (Grissom et al. 1988, Terjesen 1992). The only potential disadvantage in its use is that it is highly operator-dependent, requiring a skilled and interested sonologist to complete a diagnostically useful examination. In this setting it is essential that the radiologist and pediatric orthopedist have a close working relationship.

Anteversion of the femur, with an accompanying lack of anterior coverage of the hip, may explain the inability of the Pavlik harness to reduce 4 of our 35 cases. In order to achieve stability, such hips would require internal rotation not provided by such an orthosis.

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