REDUCTION OF CDH BY THE PAVLIK HARNESS
SPONTANEOUS REDUCTION OBSERVED BY ULTRASOUND

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Ultrasound was used to observe the entire course of spontaneous reduction of CDH in the Pavlik harness in nine infants.

In six infants with Suzuki type-A dislocations, the femoral head settled slowly into the bottom of the acetabulum by gliding on its posterior wall. In type-B dislocations, passive abduction of the legs during sleep caused it to approach the entrance to the socket and then suddenly to slip in.

Reduction with the Pavlik harness is due to passive mechanical factors, and occurs only during muscle relaxation in deep sleep: no active movement is involved.

Ultrasound was harmeful and can be continued for long periods, with video-tape recording. Using this method spontaneous reduction could be recorded for the first time during treatment in the Pavlik harness.

PATIENTS AND METHODS

Reduction was recorded in nine infants (Table I). The dislocations were classified according to the relation of the unreduced head to the acetabulum (Suzuki 1993). In type A the femoral head is displaced posteriorly but lies within the socket having no contact with the anterior wall; in type B the head is in contact with the posterior margin of the acetabulum, with its centre at this level or anterior to it; and in type C the head is completely outside the socket, with its centre posterior to the posterior rim of the acetabulum. Type-C dislocations were not included in this study; spontaneous reduction was not recorded.

Each child had been in skin traction to eliminate adduction contracture before a Pavlik harness was applied with the hip in 100° flexion. The patient was placed supine in the Pavlik harness, with small pillows under the legs to prevent excessive abduction. The ultrasound transducer was then placed on the pubis to provide a cross-sectional view, being moved proximally until the image included both pubic and ischial bones at the acetabulum (Suzuki et al 1991). The transducer was either held by the examiner or had its position adjusted at intervals until reduction occurred (Fig. 1).

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* see text

An infant asleep in a Pavlik harness, with continuous ultrasound recording.
RESULTS

When the infant was awake, there was no active abduction of the hip in the Pavlik harness: no move to spontaneous reduction was seen. With the onset of sleep, the skeletal muscles relaxed and passive abduction of the hip was produced by the weight of the leg. When spontaneous reduction was about to occur, the infant commonly grimaced, sometimes cried, and by a jerk of hip adduction, prevented it, before dozing off again. This cycle of light sleep interrupted by sudden hip adduction was repeated several times during the first sleeping period in a Pavlik harness. Spontaneous reduction was usually seen to occur during the second, third or the fourth period of sleeping.

The changes in case 8, a five-month-old girl, are illustrated. The infant had type-B dislocation (Figs 2 and 3), and the ultrasound changes in the Pavlik harness are shown in Figure 4. The femoral head lay in the posterior part of the acetabulum when the harness was applied (Fig. 3a). During the first sleeping period, there were a number of episodes of abrupt hip adduction with grimacing and crying, but no reduction occurred. During the second sleeping period in the harness, the baby slept deeply and had no adduction jerks. As abduction increased, the femoral head approached the entrance to the socket (Fig. 4B) and then suddenly slipped in (Fig. 4C). After this the femoral head slowly moved to the centre of the acetabulum (Fig. 4D). Complete concentric reduction was evident 2.5 months later (Fig. 4E).

In all three type-B dislocations observed by ultrasound, reduction took place during deep sleep and no active movements were seen during these reductions. In the six type-A dislocations, the head settled slowly into the bottom of the socket, by gliding along the posterior acetabular surface during abduction. No episodes of adductor activity were seen during spontaneous reduction in this group.

Type-B dislocations which were not reduced in the harness tended to convert gradually to type C, in which the posterior wall of the acetabulum prevents the head from approaching the entrance to the socket.

DISCUSSION

Manual reduction uses force to reposition the femoral head. The Pavlik harness generates such a force from the weight of the legs. It prevents the infant from extending its hip so that the weight of the lower extremity causes abduction. This does not occur when the infant is awake, and it seems probable that there is slight or mild pain in the hip at the time of spontaneous reduction. Relaxation of the skeletal muscles during sleep seems to be essential.

Pavlik (1957) considered that active motion in his harness allowed the hip to become anatomically normal after the spontaneous reposition of subluxation or dislocation. I believe that the hip develops normally with the aid of active motion after reduction, but the spontaneous reduction is due to passive mechanical factors. These play the main role in bringing the head to the socket without any active movements of the legs, as suggested by Iwasaki (1983).

In type-A dislocations there is no significant obstruction to the movement of the head into the bottom of the socket. This takes place by abduction of the hip provided that the adductors are not too tight. Type-B dislocations may or may not be reduced in this way, but failure may be due to intra-articular obstructions or to tight adductors. Where reduction fails, the head has been seen to move out of the socket, and the dislocation converts to type C.
Type-C dislocations do not spontaneously reduce in the Pavlik harness because the posterior wall of the acetabulum blocks movement of the head to the mouth of the socket. Only manual reduction can produce such a reduction force. The Pavlik harness is therefore not indicated for type-C dislocation, or for some type-B dislocations.

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REFERENCES


