

Use of the Pavlik harness in nonoperative management of congenital dislocation of the hip¹

M A Smith MA FRCS

*Department of Orthopaedics, The Rayne Institute
St Thomas' Hospital, London SE1 7EH*

Summary: The Pavlik harness and its application are described. A series is reported of 25 patients with congenital dislocation of the hip, aged between one day and eight months, all of whom were successfully treated in the harness. Since the harness was found to be effective in treating older infants, it is suggested that treatment of the newborn could be delayed until the age of two or three months, thus avoiding unnecessary treatment of those hips which will reduce spontaneously.

Introduction

The first description of the Pavlik harness was by Pavlik (1957), in the German literature. He reported the results in 1912 children, treated in the harness up to the age of one year. There were no complications and no cases of avascular necrosis of the femoral head. Looking more closely at the 632 dislocated hips in this series, treated in the Pavlik harness, 84% were reduced successfully with no complications. Suzuki (1979) reported a similar success rate, but there were 9 hips with some deformity of the femoral head, 2 of which were significant. His follow up was incomplete. Previously, Suzuki & Sato (1968) had reported a series where the Pavlik harness alone was used in only the first of three treatment groups. There were 2 cases of avascular necrosis of the femoral head out of 90 hips treated; a persistent lateralization of the femoral head in 5 hips was also noted following treatment. Although the details in these series were incomplete, the majority of those hips with avascular complications appeared to be in children who were aged between four and twelve months when the harness was first applied. In the series from the DuPont Institute (O'Connor 1979), 323 hips were treated in the harness with a success rate of over 96%. Recently, Kalamchi & MacEwen (1980) have reported one case with a minor avascular insult to the capital femoral epiphysis following treatment in the Pavlik harness.

The Pavlik harness is a non-rigid structure made up of a body piece, held in position by two shoulder straps and two leg pieces with anterior and posterior restraining straps. It is by means of these leg straps that the legs can be correctly positioned. The anterior straps hold the hips in flexion, while the posterior straps are used to give the required limitation of adduction; both are easily adjustable. The degree of flexion of the hip is that amount required to point the capital femoral epiphysis at or just below the triradiate cartilage; the amount of flexion is also governed by the age of the patient. In the newborn, flexion of the hip to 95° is sufficient, but in the older child, flexion of the hip to 120° or more may be needed to achieve the desired alignment, which should be confirmed radiologically. This position is held by the anterior straps. The posterior straps are used to limit adduction. They are not abduction straps. In the newborn this restriction of adduction can be achieved immediately. In the older child the posterior straps should be left loose initially, and tightened gradually over a seven to ten day period. In this way with the hip flexed, and the femoral capital epiphysis pointing into the acetabulum, the hip is prevented from adducting and therefore redislocating; and the hip is not held at the extremes of abduction, thereby avoiding the potential and disastrous complication of avascular necrosis of the femoral head (Figure 1). Within these two extremes,

¹Paper read to Section of Orthopaedics, 3 March 1981. Accepted 28 April 1981



Figure 1. Diagrammatic representation of the correct position of the hips in the Pavlik harness. The dotted outlines of the right leg demonstrate the limitation of adduction and the avoidance of the extreme abduction

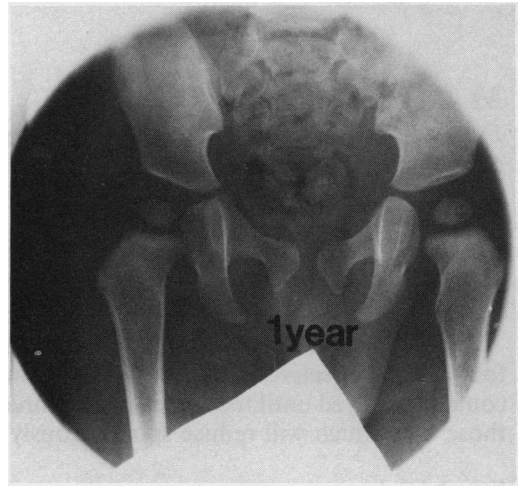


Figure 2. Radiograph to show follow up at one year, with normal hips

the harness has the added advantage of allowing a certain amount of hip movement. Finally, as no force is applied and because the harness is non-rigid, there are no pressure effects on the proximal femoral epiphysis.

Patients and methods

In this series 25 consecutive patients were treated in the Pavlik harness: 21 female and 4 male. There were 7 right, 10 left and 9 bilateral cases – a total of 34 hips treated. Nine patients were breech presentation at birth: 7 of these were delivered by caesarian section. Two patients had a family history of congenital dislocation of the hip.

There were two treatment groups, a newborn and an infant group. In the first, or newborn group, the Pavlik harness was applied within the first week of life; in the second, or infant group, the harness was applied for the first time to patients aged between three and eight months, none of whom had had previous treatment.

In the newborn group there were 14 patients with 19 hips requiring treatment; 9 hips were dislocated and 10 were unstable and dislocatable. The harness was applied within a week of birth. The required degree of flexion and limitation of adduction was achieved immediately. The hips were examined daily until the abnormal hip or hips were clinically stable and the harness stayed on for six weeks from that date. In this group it was not necessary to check the position of the hip radiologically during the course of treatment. At six weeks the harness was removed and a check radiograph taken. The patients were seen again at three, six and twelve months for clinical and radiographic examination (Figure 2).

In the infant group, the Pavlik harness was applied to children aged between three and eight months. There were 15 hips in 11 patients that were treated. Ten of the hips were dislocated and 5 were defined as dysplastic (Figure 3). All had a significant limitation of abduction. When applying the harness, the hips were flexed until the femoral capital epiphysis was pointing at or just below the triradiate cartilage; this often meant flexion of the hip to 120° or more. The correct positioning was confirmed radiologically (Figure 4). The posterior straps were left loose initially and, over the ensuing seven to ten days, were gradually tightened until the required limitation of adduction had been reached. Coincidentally, by the

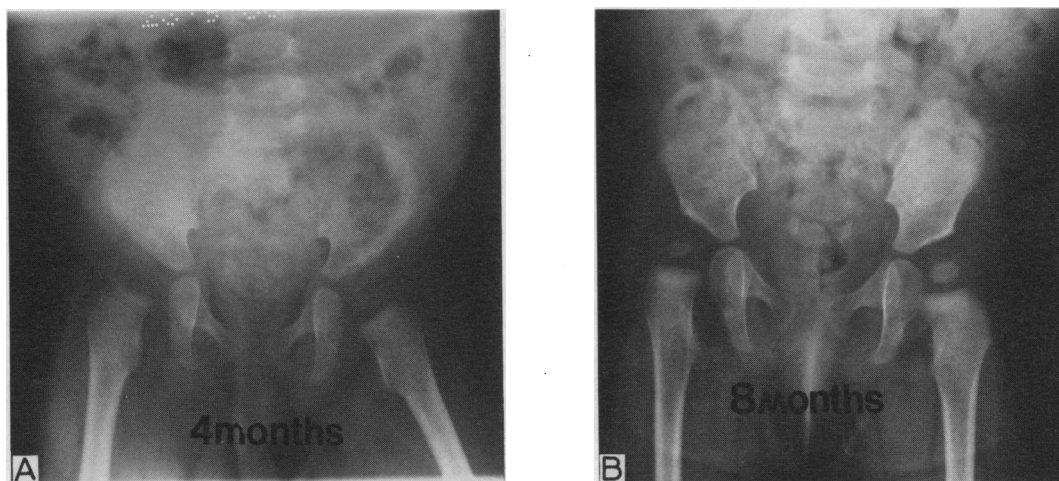


Figure 3. Radiographs showing (A) a dislocated right hip, and (B) a dysplastic right hip

tenth day all the hips had regained a full range of abduction. This meant that the hip had reduced, which could be confirmed by radiography (Figure 4B). At approximately three weeks the anterior straps were loosened until the hips were held just above 90° of flexion; the hyperflexion position that is needed in order to reduce the hip should not be held for longer than is absolutely necessary as this could cause anteroinferior capsular laxity. The harness remained on for a maximum of three months, after which time it was removed and a check radiograph taken to confirm the position of the hips. The patients were followed up at three-monthly and later six-monthly intervals to confirm the normal clinical and radiological development of the treated hips.

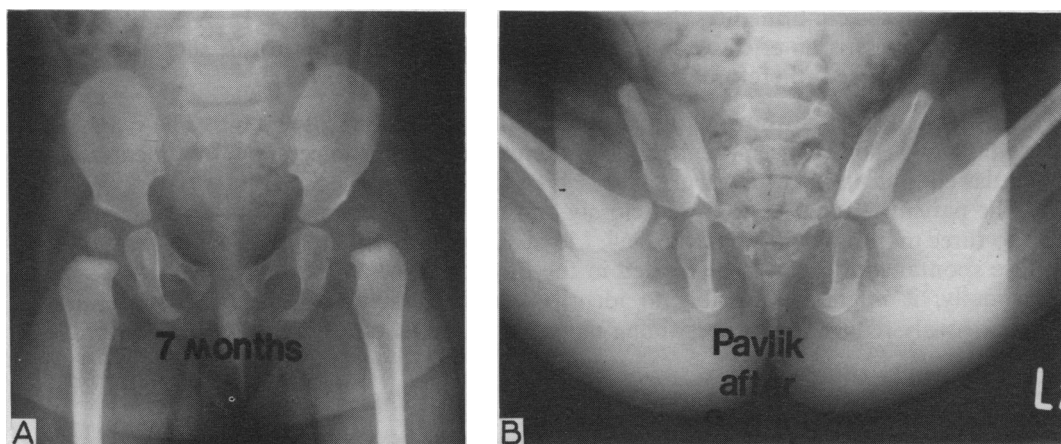


Figure 4. Radiographs showing (A) a dislocated left hip in a child aged seven months; and (B) the hips flexed in the Pavlik harness 9 days after application of the harness – the left hip is reduced

Results

There was a 100% follow up; the mean follow up was fourteen months. There were 19 hips in the newborn group and 15 hips in the infant group – a total of 34 hips. All the hips were reduced successfully. At review, both clinically and radiologically all the hips were located and developing normally and there were no complications (Figure 5).

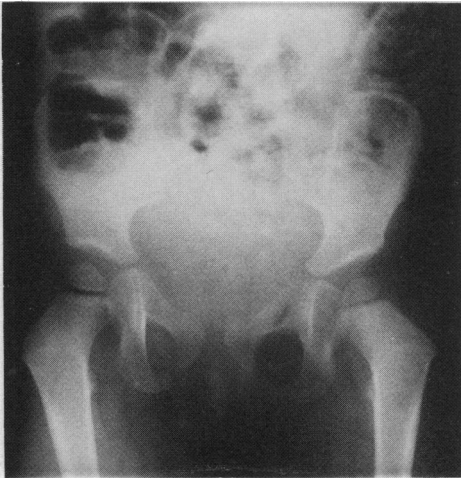


Figure 5. Anteroposterior radiograph showing normal hips bilaterally at follow up in a child who was treated at age 4 months on account of congenital dislocation of the left hip

Discussion

The Pavlik harness has been shown to be an effective means of treating congenital dislocation of the hip (Pavlik 1957, Suzuki & Sato 1968, O'Connor 1979). The purpose of this paper is to emphasize that it can be used not only in the newborn child, but also in the older child. It is not surprising that all the hips treated in the newborn group were successfully reduced, due mainly to the small number in the series and the fact that the majority would have reduced spontaneously anyway (Barlow 1962, Von Rosen 1962, Smaill 1968). Because a very high proportion of hips reduce spontaneously, Barlow (1962) took a group of 15 congenitally dislocated hips diagnosed at birth and left them untreated for a period of two months. At the end of this period, 13 had reduced and were normal. The problem then arose of treating a dislocated hip at a slightly older age, but the method used did not prove very satisfactory. However, with the confirmed results from the present series, it has now been established that the Pavlik harness is an effective means of treating hip dislocation in this slightly older age group. It is proposed, therefore, that the following trial be undertaken:

- (1) Do not treat the newborn child with congenital dislocation of the hip. The majority of these hips will then reduce spontaneously, thereby avoiding unnecessary treatment and the potential complications of avascular necrosis of the femoral head.
- (2) The patients should be followed closely and re-examined clinically and radiologically at two to three months (Stanisavljevic 1964, Lloyd-Roberts 1978). Only those hips that failed to reduce spontaneously would be treated in the Pavlik harness.
- (3) Finally, it might be possible to identify certain features of those hips that do not spontaneously reduce, thereby enabling us in the future to treat just those hips at birth.

References

- Barlow T G (1962) *Journal of Bone and Joint Surgery* **44B**, 292-301
 Kalamchi A & MacEwen G D (1980) *Journal of Bone and Joint Surgery* **62A**, 876-888
 Lloyd-Roberts G C (1978) *Hip Disorders in Children*. Butterworths, London; pp 39-49
 O'Connor J C B (1979) *Journal of Bone and Joint Surgery* **61B**, 236
 Pavlik A (1957) *Zeitschrift für Orthopädie und ihre Grenzgebiete* **83**, 341-353
 Smaill G B (1968) *Journal of Bone and Joint Surgery* **40B**, 524-536
 Stanisavljevic S (1964) *Diagnosis and Treatment of Congenital Hip Pathology in the Newborn*, Williams & Wilkins, Baltimore
 Suzuki R (1979) *International Orthopaedics (SICOT)* **3**, 77-79
 Suzuki R & Sato K (1968) *Fukushima Journal of Medical Science* **15**, 61-70
 Von Rosen S (1962) *Journal of Bone and Joint Surgery* **44B**, 284-288