Home Traction in the Management of Congenital Dislocation of the Hip

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Summary. A retrospective review of sixty children with seventy-eight congenitally dislocated hips who had pre-reduction traction at home was undertaken to assess the effectiveness of the traction and the incidence of severe complications, with specific reference to the incidence and severity of avascular necrosis. Thirty other children with forty-two congenitally dislocated hips who had pre-reduction traction while in the hospital were used as controls. Traction failed to radiologically improve the position of the head in relation to the acetabulum in two hips in each group. The incidence of avascular necrosis was 17.9 percent in hips treated at home and 23.8 percent in hips treated in the hospital. The hospital control group demonstrated higher incidences of the more severe types of necrosis. Traction at home was found to be an advantageous alternative to traction in the hospital, in that it is safe, effective, and less costly; however, it must be stressed that proper patient selection and careful monitoring of the program are required.

Zusammenfassung. Eine retrospektive Studie wurde an 60 Kindern mit einer congenitalen Hüftluxation an 78 Hüftgelenken durchgeführt, bei denen die Extensions-Einrenkungsbehandlung zu Hause durchgeführt wurde. Die Wirksamkeit der Extension und die Häufigkeit schwerer Komplikationen sollte ermittelt werden, insbesondere die Häufigkeit und die Ausdehnung avaskulärer Nekrosen. 30 andere Kinder mit 42 congenital luxierten Hüftgelenken, bei denen die Extensions-Einrenkungsbehandlung im Krankenhaus durchgeführt wurde, dienten als Kontrollgruppe. Bei jeweils 2 Hüftgelenken in jeder Gruppe gelang es mit der Extension nicht, die Stellung des Hüftkopfes gegenüber dem Acetabulum zu verbessern. Die Häufigkeit der avaskulären Nekrosen betrug bei den zu Hause behandelten Hüften 17,9% und bei den im Krankenhaus behandelten 23,8%. Bei der

Avaskuläre Nekrose bleibt das wichtigste post-reductionse, das in der Behandlung der congenitalen Hüftluxation auftritt, und dafür verantwortlich. In schweren Fällen kann nur partielle Korrektur erreicht werden, und die Schäden dauern das ganze Leben der Patienten an, was zu frühen Coxarthrosen (15). Traction prior to closed or open reduction, for which the patient is hospitalized, has considerably decreased the incidence and severity of avascular necrosis, and has gained general acceptance (1, 4-6, 9, 11, 12, 16, 17). However, prolonged hospitalization increases the cost of treatment, disrupts the family life, and may result in psychological problems (3).

Joseph et al. (7) described a program of skin traction which could be implemented in the home. This method was equally successful when compared with hospital traction in stretching the tissues around the hip and obtaining full reducibility prior to open or closed reduction.

The home traction program is an attractive alternative which is less expensive and more convenient for many families. In addition, it provides a healthier environment for the infant (13). It remained to be seen, however, how well the home program compared with hospital traction with respect to the incidence of avascular necrosis.

This report presents two groups of patients who were treated at the Alfred I. du Pont Institute for
congenital dislocation of the hip; the first group has been treated by home traction prior to reduction and the second by traction in the hospital. The primary purpose of this study was to compare the overall effectiveness of the two programs and the incidence and severity of avascular necrosis. While some of the patients in the home traction group are the same ones reported by Joseph et al. [7], the follow-up periods are considerably longer to allow for a more thorough evaluation of the results.

Materials and Methods

All patients included in this study have been followed for a minimum of fifteen months after reduction was obtained. All had frank dislocations initially, which were unassociated with other disorders and for which initial radiographs at the time of referral to our institution showed no evidence of avascular necrosis.

There were sixty patients in the home traction group (twelve male and forty-eight female), with seventy-eight dislocated hips (eighteen bilateral, twenty-two left-, and twenty right-sided), who were treated between 1974 and 1982.

The hospital traction group was randomly selected from the population of children who had congenital dislocation of the hip and who had traction in the hospital prior to reduction between 1967 and 1979. The group included thirty patients (twenty-five female and five male) with forty-two dislocated hips (twelve bilateral, three right-, and fifteen left-sided).

The average follow-up time in the home traction group was 3.1 years (range fifteen months to 8.4 years) and the average age at the time of follow-up was 4.2 years. The average follow-up time in the hospital traction group was 6.3 years (range 2.7 to fourteen years) and the average age at the time of follow-up was 7.5 years. Strict chronologic matching between the two groups was not possible, since, in recent years, few of our patients have been treated entirely in the hospital traction program.

The patients were referred to our hospital at ages ranging from two weeks to 3+9 years, as shown in Table 1. In the home traction group, twenty-seven patients (45 percent) had had unsuccessful treatment prior to referral, including nineteen who were treated by Pavlik harness, four who had been treated by other abduction devices, and four who had undergone failed closed reductions.

In the hospital traction group, twenty-three patients (77 percent) had had unsuccessful treatment prior to referral, including eleven patients treated by Pavlik harness, seven by other abduction devices, one by open reduction, one by open reduction and innominate osteotomy, and three by unsuccessful attempts at closed reduction.

The principles of the traction program, which consists primarily of longitudinal skin traction with the hips in slight flexion and abduction, have been described in detail in an earlier paper [7].

The duration of traction was 6.4 weeks (range two to seventeen weeks) in the home group and 5.9 (range three to twelve weeks) in the hospital group. With the exception of two cases of skeletal traction in the hospital traction group during the early years of this series, all patients were treated by skin traction. The amount of weight applied ranged from 1 to 5 kg, depending upon the patient's age and tolerance. The criteria set forth by Gage and Winter [5] were used to judge the effectiveness of treatment; that is, stations ranging from −1 to +2 according to the location of the medial metaphyseal corner with reference to Hilgenreiner's line (Table 2). Reducibility was also evaluated clinically by gentle manipulation of the hip.

Patients in both groups underwent a variety of post-traction treatment methods in order to achieve reduction (Table 3). Our guidelines for management included the use of gentle traction to bring the femoral head down to the level of the triradiate cartilage. Traction was followed by closed reduction and adductor tenotomy under general anesthesia, followed by casting in a position within the safe zone of hip flexion and abduction (Fig 1). When the cast was removed an abduction brace was applied in order to maintain hip abduction for a further period and to encourage acetabular development. This treatment was possible in 81 percent of the hips in the home traction group and 79 percent in the hospital traction group. Open reduction was performed when closed reduction failed; this was combined with femoral or innominate osteotomy if the reduction was unstable or there was marked acetabular dysplasia, increased femoral valgus, and/or avascular necrosis. Surgical treatment was employed initially in 19 percent of the home traction group and 21 percent of the hospital traction group. Six hips in the home group and three in the hospital group redislocated after the initial reduction and required a second open or closed reduction. Eighteen hips (23 percent) in the home traction group and fifteen hips (36 percent) in the hospital group eventually required second procedures to correct residual dysplasia and/or luxation.

Each patient's radiographs were evaluated for the presence of avascular necrosis, using the four criteria described by Salter et al. [11]. These include failure of the ossific nucleus to appear within one year after reduction; failure of the ossific nucleus to grow in diameter within one year after reduction; broadening of the femoral neck with increased density and fragmentation of the ossific nucleus; and residual deformity, such as an enlarged or flattened head, short and broad neck, etc.

The criteria of Gage and Winter [5] were also used to identify patients with partial necrosis of the femoral head. Special attention was given to the condition of the physis, in order to identify premature closure, and to the overall development of the acetabulum.

Several similar classifications of the pathology associated with avascular necrosis of the femoral head have been described [2, 9, 14]. We have followed the classification advocated by Kalamchi and MacEwen [9], in which Type I necrosis parallels the "temporary irregular ossification of the femoral head" described by Salter et al. [11]; and Types II through IV, which represent the more severe, residual avascular changes.

Specifically, Type I changes are those affecting the ossific nucleus. The problem is generally transient and allows for recovery with minimal, if any, residual deformity; however, occasionally a hip with Type I necrosis will later show changes characteristic of the more advanced types of necrosis. Type II

| Table 1. Age distribution at referral to our hospital |
|-----------------|--------------|--------------|
| Age [months]    | Home traction| Hospital traction|
| 0-6             | 19           | 5            |
| 7-12            | 15           | 7            |
| 13-24           | 20           | 13           |
| >24             | 6            | 5            |