ON CONGENITAL DISLOCATION OF THE HIP

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Studies of congenital dislocation of the hip have ranged in their conclusions from the words of Hey Groves (1928): "Congenital dislocation of the hips is a deformity which is mysterious in its origin, insidious in its course and relentless in its final crippling results," to those of Brewster (1945): "The etiology of the congenital dislocated hip is unknown. Many theories have been advanced, any one is just as good as another." Browne (1948) brought some order and simplicity out of chaos when he stated: "The hip is displaced during intra-uterine life by a thrust upon the knee by the uterine wall, which sends the head of the femur backwards out of the acetabulum." He made a valuable contribution in implying that the process was an accident, and in emphasising the necessity of movement in treatment, but one feels that, when the movements of the gravid uterus are considered, his conception of the etiology is unlikely. The body of the uterus is maintained in a state of tone as the foetus grows, but intermittent slow contractions of the whole uterus occur throughout pregnancy. Localised parts of the uterus can, of course, contract as a result of cold hands, brusque handling, or the active movements of the child, but this also is a slow hardening of the muscle rather than an active "thrust." It is hardly possible that either of these movements could give an active thrust to the foetal knee and dislocate the hip. Even if a part of the uterus were capable of taking a solid thrust at the foetal knee it would instantly be opposed by an equal and opposite force at the hip in accordance with Pascal's principle, which force would prevent dislocation. The frequency of bilateral dislocation is a further point against this hypothesis. Finally, a number of cases have been described in the literature in which congenitally dislocated hips were found in extra-uterine pregnancies. Heusner records a bilateral dislocation in a five months' foetus from an extra-uterine pregnancy, and a unilateral one in a foetus, ten inches long." (Tubby 1912.) The case reported by Lesk (1948) as "Extra-uterine Full Term Pregnancy" was delivered by laparotomy in March 1947. I was privileged to see the child at the Children's Hospital, Vancouver, in November 1948 when she was twenty months old. She had a congenital dislocation of the left hip.

As recorded by Tubby (1912), some writers have "gone so far as to say that in some cases the head had not occupied the acetabulum at all, and therefore dislocation is a misnomer. More recent investigations into the manner of development of the hip bone do not confirm this idea. The mesoblast, from which the cartilaginous models of the bones are developed, forms at first an unbroken mass in this region. The researches of Petersen (1893) and von Friedländer (1892) show that the shape of the articular surfaces is defined before the joint cleft is differentiated, and before rotation of the limb takes place."

A NEW CONCEPTION OF THE CAUSE OF DISLOCATION

As a new concept may I suggest, as a generalisation, that increasing deformity is the result of soft tissue contracture (or a relative shortening of normal muscle) upon which growth of bone is superimposed. This I believe to be the etiology of congenital dislocation of the hip. A familiar observation is the deformity of bone and joint in an extensively scarred child, which increases as the child grows but does not increase further when skeletal growth ceases. In an adult the deformity does not increase after the scar stops contracting. Also in poliomyelitis, for example, strong muscles inadequately opposed by paralysed muscles constitute the soft tissue contracture and as growth proceeds deformity increases. If an adult is stricken with
poliomyelitis and his peroneal muscles are paralysed, his tibial muscles will hold the foot in a position of strong inversion but, as there is no growth, bony deformity of the foot itself does not occur.

Growth of different tissues and of different parts of the body occurs in poorly understood sequence. The growth of any tissue occurs in waves, but the wave of one tissue is not synchronised with that of another in mathematical exactitude. Most cases of growing pains are probably the result of accelerated growth in a long bone with slower growth in the corresponding muscles.

It is suggested, then, that the primary cause of congenital dislocation of the hips is a relative lag in muscle growth. The adductor muscles, assisted by the flexors, provide the principal dislocating force and these constitute the "soft tissue contracture." A spurt of growth by the femur is the "superimposed growth." In the foetal position the femoral head is forced against, and over, the postero-inferior rim of the acetabulum, which at the time of dislocation is about the shape and size of a vest button, and too small for the femoral head. Only a slight discrepancy in growth between muscle and bone is therefore effectual, and "the deformity, lameness and shortening increase rapidly during the years of growth" (Tubby). The process is a simple accident to a normal foetus. If the hips are reduced, reduction maintained and a wide range of movement allowed, the result should be a normal hip.

The well known sex distribution—five, possibly ten, girls to one boy—of congenital dislocation of the hip is explained by Heusner's (1902) observations. He stated that "the joint capsule is sufficiently lax in the foetus, especially the female, to permit subluxation backward. If the thigh is flexed and pressed downward and backward, the head can be displaced half-way out of the acetabulum."

**TREATMENT**

To reduce the hip the child is placed on his back. The hip is flexed and adducted. Traction is applied to the femur, the greater trochanter is forced distally and flexion is continued. When the point of exit is reached, the dislocation is usually reduced with a distinct click. If this does not occur, the femoral head must have passed up over the acetabulum. This error is betrayed by four signs, none of which is present if the hip has reduced: 1) the thigh creases persist and are deepened; 2) there is apparent shortening of the femur; 3) movement is restricted; and 4) the greater trochanter describes a palpable arc of movement in an opposite direction to that of the shaft as the femur is moved to and fro. If the error does occur, the head must be replaced behind the acetabulum and the manoeuvre repeated. After reduction, both hips are abducted as widely as possible and a bilateral right-angle plaster spica applied. The spica is left on for four to six weeks in order to obtain adequate stretching of the adductor muscles. This period of immobilisation is indispensable; without it dislocation will recur. It allows the structures about the hip to heal and to become adapted to their new relations. The spica is then replaced with the mobile brace which allows the child considerable freedom of movement.

It is essential that in the unilateral case both hips be abducted. If a single spica be used the sound hip will assume a position of flexion and adduction. This position predisposes the sound hip to dislocation and a small acceleration in femoral growth will cause it to dislocate.

The principle of maintaining full abduction while allowing movement has been used by several individuals. Barnes's braces, Browne's splint and the pillow-splint of Frejika of Prague all conform to this principle. Strangely enough, apart from a brief abstract of Browne's Moynihan Lecture, none of these men has published anything on his work.

The mobile brace shown in Figures 1 and 2 has proved satisfactory. It maintains reduction and allows quite a good range of movement. It is of strong construction and effectively combats the extraordinary ability of an infant to escape from an orthopaedic restraint. The design of the brace is apparent in the figures. The back and abdominal plates
and the leg bands are made of strong aluminium alloy covered with waterproofed leather; they are attached to the connecting bar with four bolts passing through holes in the bar and held with lock-nuts and wing-nuts. There is a fair range of adjustment but two or three sizes are necessary for a child treated from infancy to the end of his first year.

The length of treatment is usually about one year. When the child is ready to walk, he will walk in the brace. If radiographs show satisfactory progress the brace may be removed as soon as full weight can be borne on the affected limb without discomfort.

**FIG. 1**
The mobile brace.

Open reduction—With infants reduction is usually easy. In the difficult cases in which open reduction is indicated a preliminary period of traction is helpful. If this is not enough, adductor tenotomies and section of the psoas tendon followed by two or three weeks in traction greatly simplify the open reduction. The exposure described by Gibson (1950) is simple and almost atraumatic and easily allows the conservative capsulotomy which is all that is necessary for reduction. The course described is then followed.

**THE IMPORTANCE OF EARLY DIAGNOSIS**

The child shown in Figures 2, 3 and 4 is the one referred to in the November 1950 issue of this Journal (Vol. 33-B, page 751). For some obscure reason the obstetrician suspected, before the birth of this child, that it had bilateral dislocation of the hips. He confirmed the diagnosis at birth and orthopaedic treatment was started on the third day. This ideal case brings up an important point. If orthopaedic surgeons were to make the obstetricians and paediatricians in their vicinity conscious of the possibility of congenital dislocation of the hips most of these cases would be recognised at birth. If these colleagues were instructed simply to look for loss of abduction in the infant’s flexed hip practically all of these cases would be diagnosed correctly at birth. They might even be persuaded to look for supporting evidence: 1) unusually deep or asymmetrical thigh creases; 2) broadening of the perineum; 3) the palpable head lying posteriorly in the buttock; 4) the movement of the trochanter (mentioned above) as the shaft is moved to and fro. If doubt remains a lateral radiograph

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Case 1—Bilateral congenital dislocation of the hips, in which the diagnosis was established immediately after birth. Figure 2—Aged five weeks, in mobile brace after reduction and preliminary period of immobilisation. Figure 3—Aged eighteen months. Hips clinically normal.

FIG. 4
Case 1—Radiographs of hips at the age of eighteen months.
should be obtained. The antero-posterior view alone is of little value as at this stage the head lies directly behind the socket.

Since the process is essentially a simple accident, normal hips should be the routine result if the patients are seen as infants. In older children whose hip development has been retarded for some years it does not seem possible that any other method of treatment could excel that of the pressure of the head in the acetabulum combined with the physiological stimulus of movement. If these conditions are met re-formation of the joint proceeds with such orderly rapidity that it is, I think, a conclusive argument against a primary developmental anomaly. In this connection Tubby wrote: "An undue proportion of the specimens describing this condition at birth have been obtained from foetuses rendered non-viable by other grave anomalies, so that it must not be too readily assumed that the hip condition is exactly similar to that which obtains in cases where no other developmental anomalies exist."

**SUMMARY**

A new concept of the etiology of congenital dislocation of the hip, which states that the process is simply an accident, is presented. It is observed that the diagnosis should be made at birth. The importance of obtaining movement of the hip, after the reduction has been stabilised, is stressed. Contact and function are mandatory for the natural production of a normal hip. A mobile brace is described which allows a wide range of movement while safely maintaining reduction. The success of this method of treatment supports the conception of the etiology on which it is based.

**REFERENCES**


