

INCREASED ANTEVERSION OF THE FEMORAL NECK AS SOLE SIGN OF DYSPLASIA COXAE

By

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The average, physiological angle of anteversion of the femoral neck in adults is ca 12° . It is well known that this is larger before birth and in children and that it decreases in the first years of life so that in the course of development it becomes about 12° . There are, however, great physiological variations and in the case of children there is no physiological norm for the size of the angle in the various age groups. *Kingsley* found that the anteversion angle in girls was 26° and in boys 23° . It is also dependent on the angle of inclination of the pelvis and with pelvic inclination at 65° and less the angle of anteversion is as a rule more than 20° , (*Elze*).

It is also well known that increased anteversion is a factor very often present in congenital hip joint dysplasia. As a rule this factor is combined with the other dysplastic components, but *Getz* has demonstrated that increased anteversion may be the only dysplastic finding. This article is restricted to include only those cases of hip joint dysplasia which have increased anteversion as the sole demonstrative defect in the hip joint. Manifestation and symptoms in increased anteversion are dependent on whether the hip joint is stable or unstable.

1. *Manifestation with stable hip joint*: a stable hip joint means in this connexion that the hip joint is in place and that the anterior part of the capsule is not overstretched. The whole of the lower extremity is then in a position of more or less inward rotation. The inward rotation increases, often up to 90° , and the outward rotation is correspondingly limited, often as low as 0° , but usually about $10-15^{\circ}$. The individual walks therefore with his legs turned in and with the feet pointed medially. The gait is rather stumbling and shaky and the child falls easily. To obtain the correct foot position while

walking, (i.e., walking with the feet pointed straight forward) the individual tries to rotate the lower extremity as far as possible outward. Whoever succeeds in rotating the whole of the lower extremity outward incurs a subluxation of the hip and it becomes unstable (see later). If the hip is kept stable the anterior part of the foot is pressed outward. This produces abduction of the anterior part of the foot which is one of the most important elements in the development of flat foot. Increased anteversion is therefore a not inconsiderable cause of flat foot development.

Some cases of increased anteversion are discovered when children (usually girls) grow sufficiently to take a pride in their appearance, and seek to overcome walking with an inward turn by pressing the leg into maximal outward rotation while walking. This attempt produces slight muscle pain in the hip owing to overstrain of the outward rotators, in the same way as any other static muscle exercise.

2. *Manifestation with unstable hip.* Whoever succeeds in compensating the increased anteversion by means of increased outward rotation, brings the caput into a subluxation position in the acetabulum and the anterior part of the joint capsule is overstretched. According to *Fick* the outward rotators are 3 times as strong as the inward rotators. The symptoms are then the same as in hip joint subluxation and vary with the degree of subluxation, exertion, development, etc. Anteversion is then no longer the sole pathologic finding and such cases are therefore to be regarded as common cases of dysplasia coxae. After a period secondary changes may occur in the acetabular roof and also elsewhere in the acetabulum and the condition may then be impossible to distinguish from an acetabular hip joint dysplasia with its original acetabular dysplastic components.

Both the stable and unstable forms of increased anteversion represent an articular malfunction, and like every other form of articular malfunction it causes arthrosis. It is also normal experience that during operations for so-called primary hip joint arthroses the caput femoris is often found in a position of subluxation forward, and it is an equally normal experience in these operations to find considerable anteversion of collum-caput femoris. Owing to the deforming changes it may often be very difficult, however, to estimate the degree of anteversion and it can be especially difficult to decide if a demonstrated anteversion is primary or secondary in relation to the deforming changes. Even with these reservations I think nevertheless that increased ante-

version is such a common finding in operations for coxarthrosis that one is justified in presuming that so-called *primary coxarthrosis is due in a large number of cases to increased anteversio colli femoris*.

Diagnosis:

Roentgenologically there are several different methods available for directly measuring the degree of anteversion. Common to the majority is that they are complicated, difficult to estimate and require special apparatus. It is possible to obtain quite a good estimate of the degree of anteversion for practical clinical use by taking two pelvic pictures of both hips, the first in O-position (i.e., lying on a flat support with the legs parallel and the patella pointing straight forward) and the second in the same pelvic position with maximum internal rotation of both lower extremities. The difference between the collum-femur angle projected on the X-ray in the two exposures then gives a good indication as to the degree of anteversion and at the same time good judgement of any possible subluxation position in the hip joint.

The diagnosis of increased anteversion is made, however, most simply and easily clinically with the aid of the rotation conditions in the hip joints. The degree of internal and external rotation in the hip joint is, however, somewhat variable and depends on age and joint position at examination. *Steindler* states that the maximum rotation is found in the flexed position, and is then 90° from maximum internal rotation to maximum external rotation. It is only 30° by examination in the O-position. *Lanz* and *Wachsmut* state the rotation as 100° in the middle flexed position, 60° internal rotation and 40° external rotation. In the O-position they give the rotation as 60°, 25° internal rotation and 35° external rotation.

In children I have found that the investigation of rotatory conditions is most easily undertaken in the O-position lying on the stomach with flexed knees. Then I discovered internal rotation to be considerably greater than that stated for the O-position of *Steindler* and *Lanz* and *Wachsmut*, although my investigation is not yet complete. In younger children I think that up to 60°–65° must be considered normal and can be attributed to the physiological increased anteversion of this age. In older children too internal rotation of 50°–60° must be regarded being within the normal. Children with evidently pathological increased anteversion possess, however, usually between 80°–90° internal rotation and occasionally considerably more. Because the joint capsule on the posterior part of the hip joint is short, tight and

yields little, increased internal rotation means that increased anteversion exists.

The most common *external rotation* in children is 35° – 50° , examined in the O-position. With increased anteversion and increased internal rotation the external rotation may be correspondingly restricted and is found with strongly increased anteversion as low as 0° . This is consequently the clinical indication that the joint is stable, meaning that the anterior part of the joint capsule is not overstretched. If normal or increased external rotation is found with increased anteversion this is a good indication clinically that the hip joint can be subluxated forward.

Treatment.

Children who walked turning the legs inward owing to increased anteversion were previously sent for active physiotherapy to learn to walk correctly: that is, to press the foot outward. This may result in abduction of the anterior part of the foot (flat foot development) or in anterior subluxation of the hip joint and ought not to be done.

The treatment consists of subtrochanteric rotation osteotomy in the same way as when the increased anteversion is a component in general hip joint dysplasia. In small children with a stable hip joint one can wait for a possible spontaneous decrease of the anteversion. After 7 years of age this spontaneous diminishment is rarely experienced. In children under 7 years the rotation osteotomy ought to be performed so radically that the lower extremity after operation can only be rotated inwardly some few degrees; in older children and adults there ought to be a reasonable internal rotation again after operation, up to 20° – 25° in the O-position.

At Sophies Minde Orthopaedic Hospital, in the course of the last 6 years, 29 patients have been operated on, aged 4 to 18 years, for increased anteversio colli femoris with a stable hip joint in which the anteversion was the sole demonstrable pathological defect and the sole demonstrable factor in the hip joint dysplasia which is probably responsible for the condition. Patients with both increased anteversion and unstable hip joint, subluxation, are not included here, but in the normal series for congenital hip joint dysplasia.

SUMMARY

Increased anteversio colli femoris is found occasionally as the only demonstrable pathological, clinical and roentgenological sign of hip dysplasia. The diagnosis is made roentgenologically or clinically by the demonstration of increased internal rotation and limited external rotation of the hip joint. Increased internal rotation and at the same time normal or increased external rotation show that subluxation changes also exist as with the common forms of dysplasia coxae. Individuals with increased anteversion and stable hip joint (without subluxation or other pathological changes) walk with the legs turned inwards and stumble easily. The anterior part of the foot is pressed into abduction and the increased anteversion is therefore an important cause of flat foot development. It can also provoke muscle pain in the hip muscles owing to increased static muscle exercise. The increased anteversion is presumed to be the cause of many of the so-called primary hip joint arthroses. The treatment is subtrochanteric rotation osteotomy.

RESUME

Une antéversion accrue du col fémoral est parfois le seul signe pathologique clinique et radiologique de la dysplasie de la hanche. Le diagnostic est posé radiographiquement ou cliniquement par la présence d'une rotation interne accrue et d'une rotation externe restreinte de l'articulation de la hanche. Une rotation interne accrue simultanément avec une rotation externe normale ou accrue montre qu'il y a aussi des modifications de subluxation comme dans les formes courantes de dysplasie de la hanche. L'antéversion accrue avec une articulation de la hanche stable (sans subluxation ou modifications pathologiques) se manifeste à la marche, le sujet s'appuie sur la partie intérieure de la jambe et a tendance à trébucher. La plante du pied est pressée en position d'abduction et c'est pourquoi l'antéversion accrue est une des principales raisons du développement du pied plat. Elle peut aussi provoquer des douleurs musculaires dans la musculature de la hanche par suite de l'accroissement du travail musculaire statique. On considère que l'antéversion accrue est la cause de beaucoup des arthroses de l'articulation de la hanche dites primaires. Traitement: ostéotomie de rotation subtrochantérienne.

ZUSAMMENFASSUNG

Vermehrte anteversio colli femoris findet man hier und da als das einzige pathologische klinische und röntgenologische Zeichen eine Dysplasie der Hüfte. Die Diagnose wird röntgenologisch oder auch klinisch mittels des Nachweises einer vermehrten Innenrotation und einer eingeschränkten Aussenrotation gestellt. Vermehrte Innenrotation und gleichzeitig normale oder vermehrte Aussenrotation weisen darauf hin, dass auch Subluxationsveränderungen wie bei den gewöhnlichen Formen der dysplasia coxæ vorliegen. Die vermehrte Anteversion bei stabilem Hüftgelenk (ohne Subluxation oder andere pathologische Veränderungen) äussert sich dadurch, dass das Individuum mit nach einwärts gedrehten Füßen geht und daher leicht strauchelt. Der Vorfuss wird in Abduktionsstellung gedrückt und die vermehrte Anteversion ist deshalb eine wichtige Ursache der Plattfussentstehung. Sie kann auch Muskelschmerzen in der Hüftgelenksmuskulatur wegen gesteigerter Muskularbeit hervorrufen. Es besteht die Auffassung, dass die Anteversion die Ursache für viele der sogenannten primären Hüftgelenksarthrosen ist. Die Behandlung ist die subtrochantäre Osteomie.

LITERATURE

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