Ultrasound examination of neonatal hip: correlation of twin pregnancy and congenital dysplasia

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Twin pregnancy is considered to be a risk factor for congenital dysplasia of the hip. From 1987 until 1996, the hips of 4476 (2260 male, 2216 female) newborn babies were examined by ultrasound according to Graf's technique and classification in our hospital. In this study, we compare the results of twins and singletons for this risk factor. Of the newborns, 97 (2.2%) were twins (40 male, 57 female); 39 pairs of twins (10 male/male, 19 female/female, 10 male/female) and 19 individual twins (6 male, 13 female) were investigated. Hips of type Ia, Ib and IIa ($\alpha \geq 55°$) are not pathologic; hips of type IIa ($\alpha < 55°$) need an early control examination; and hips of type IIc, D, IIIa, IIIb and IV require therapy. Types Ia, Ib, and IIa ($\alpha \geq 55°$) were found in 4207 (94.0%) of all newborns, in 4112 (93.9%) of the singletons, and in 95 (97.9%) of the twins. Early control examination and/or therapy (indicated for types IIa ($\alpha < 55°$), IIc, D, IIIa, IIIb, and IV) were necessary in 269 (6.0%) of all cases, in 267 (6.1%) of singletons and two (2.1%) of twins. Twins with additional factors such as breech position birth, hip dysplasia in the family or premature birth did not show the types of hip IIa ($\alpha < 55°$), IIc, D, IIIa, IIIb, IV. We did find these hips in two (3.5%) of the female twins, but not at all in the male twins. Statistically, twins with or without other risk factors that are known before birth did not show significantly more of type hip IIa ($\alpha < 55°$), IIc, D, IIIa, IIIb, IV ($P > 0.05$). Twin Research (2000) **3**, 7–11.

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Introduction

The risk of developing hip dysplasia or luxation has been discussed in the literature in connection with various risk factors. A fundamental point raised by several authors is that ultrasound screening of the hips of newborn babies should only be carried out if risk factors are involved and that, in general, screening of all babies is considered unnecessary.[1–3] Due to the frequent familiar occurrence of dysplasia, much of the work presented in the literature shows the genetically determined component to be an essential risk factor.[2–12] Breech-position births[2–6,8,10–16] and the presence of deformities at birth such as foot deformities, muscular wryneck, newborn scoliosis etc[3,7,11] have been thought by many to be closely connected with simultaneously existing hip dysplasia. Of the postulated clinical signs such as leg length discrepancies, abduction impediment and asymmetry, duplication asymmetry and Ortolani phenomena, only the latter can be recognised as justified and this only with decentred hips. The other clinical signs indicate a large number of incorrect positive and negative results, particularly regarding dysplasia with centred hips.[6,17–20] With reference to prematurely born babies, there is a higher rate of undeveloped hip joints without any increased sonographical pathology, indicating that the general statements of some authors do not necessarily apply to a specific risk group.[6,13,18]

With twin pregnancies there is a high probability of breech presentation and an increased intrauterine pressure, suggesting that twins have a greater risk of hip dysplasia formation.[6]

Most of the articles on the subject do not cover in detail the correlation between twin pregnancy and hip dysplasia. In this study, the results of an instituted sonographic hip screening programme including a twin cohort, are presented, with special regard to the following questions. Do twins have a higher rate of hip congenital dysplasia than singletons? Is there an effect among twins due to prematurity, breech delivery and cases of dysplasia in their families?

Materials and methods

We examined the hips of newborn babies of the department of gynaecology and obstetrics at Hannover Medical School.

Table 1 Ultrasound examination. Definition of types of hip according to Graf's technique and classification. Consequences for the particular types of hip

Type of hip	Definition	Consequence
Ia, Ib	normal joint	no control investigation
IIa +	physiologically immature hip, appropriate for age	type IIa, alpha $\geq$ 55°: control investigation after 6 weeks
IIa −	maturation deficiency exceeds tolerable degree	type IIa, alpha < 55°: control investigation within 4 weeks
IIc	minimum degree of maturation at birth not reached	abduction orthosis
D	beginning partial dislocation (subluxation)	Pavlik harness accompanying physiotherapy
IIIa, IIIb	partial dislocation (subluxation)	Pavlik harness accompanying physiotherapy
IV	dislocation (luxation)	Pavlik harness or extension accompanying physiotherapy

Between July 1987 and March 1996, 13 864 babies were born; 4476 of them (2260 male, 2216 female) underwent an ultrasound examination of the hips performed by 19 different physicians of the orthopaedic department. All available newborns except those already discharged or those absent due to treatment in intensive care, for example, were examined as an unselected group. The investigations took place every second day, with 95% of the newborns being examined within 5 days of birth. No special inclusion or exclusion criteria were determined.

Ninety-seven (2.2%) of the newborns (40 male, 57 female) were twins. Thirty-nine pairs (10 male/male, 19 female/female, 10 male/female) of twins and 19 individual twin members (6 male, 13 female) were examined. The relation between identical and non-identical twins was not considered.

The ultrasound examinations and diagnosis into hip type were performed according to Graf's technique and classification,[21] using a 5.0 MHz (Siemens SL-1; Siemens AG, Erlangen, Germany) or 7.5 MHz (Picker LSC 7500; Picker International GmbH, Hofheim-Wallan, Germany) linear transducer.

Available and complete documentation, including data of the newborn, anamnesis, clinical and sonographic findings, consecutive therapy and procedure, was analysed retrospectively and statistically evaluated using the χ^2 test.

To reduce variation in assessment and to improve inter-observer agreement, all sonograms and forms were additionally checked immediately after the investigation by an experienced ultrasound examiner and, if necessary, corrected. According to Graf, types Ia, Ib and IIa ($\alpha \geq$ 55°) are not pathologic, type IIa ($\alpha <$ 55°) needs an early control examination, and types IIc, D, IIIa, IIIb, IV require therapy. These classifications of ultrasound examination of

Table 2 Comparison of results of all newborns, singletons and twins, statistical analysis (χ^2 test)

Type of hip	All newborns n = 4476	Singletons n = 4379	Twins n = 97
Ia, Ib, IIa ($\geq$ 55°)	4207 (94.0%)	4112 (93.9%)	95 (97.9%)
IIa (< 55°), IIc, D, IIIa/b, IV	269 (6.0%)	267 (6.1%)	2 (2.2%)
statistical analysis	type of hip IIa (alpha < 55°) to IV: not significantly more often in twins (P > 0.05)		

the hip and the related consequences are summarised in Table 1.

Results

We found types Ia, Ib, IIa ($\alpha \geq$ 55°) in 4207 (94.0%) of all newborns, in 4112 (93.9%) of the singletons, and in 95 (97.9%) of the twins. Early control examinations and/or therapy (type IIa ($\alpha <$ 55°), IIc, D, IIIa, IIIb, IV) were necessary in 269 (6.0%) cases overall, specifically in 267 (6.1%) singletons and two (2.1%) twins (Table 2).

Hips of type IIa ($\alpha <$ 55°), IIc, D, IIIa, IIIb, IV were not found in twins with the following risk factors that are known before birth: breech position birth, family history of CDH, and premature birth (before the 37th week of gestation). Two (3.5%) female twins and no male twins showed these hips (Tables 3–6).

Twins with or without additional risk factors known before birth did not show significantly more often the types IIa ($\alpha <$ 55°), IIc, D, IIIa, IIIb, IV (P > 0.05) than did singletons.

Table 3 Comparison of results of female and male newborns of the entire group and the twins (χ^2 test)

Type of hip	Boys n = 2260	Girls n = 2216	Male twins n = 40	Female twins n = 57
Ia, Ib, IIa ($\geq$ 55°)	2185 (96.7%)	2022 (91.2%)	40 (100%)	55 (96.5%)
IIa (< 55°), IIc, D, IIIa/b, IV	75 (3.3%)	194 (8.8%)	0	2 (3.5%)
statistical analysis	type of hip IIa (alpha < 55°) to IV: significantly more often in girls (P < 0.05)			

Table 4 Comparison of results of all newborns, singletons, twins, and breech presentation at birth, statistical analysis (χ^2 test)

Type of hip	All newborns n = 165	Singletons n = 157	Twins n = 8
Ia, Ib, IIa ($\geq 55°$)	137 (83.0%)	129 (82.2%)	8 (100%)
IIa ($< 55°$), IIc, D, IIIa/b, IV	28 (17.0%)	28 (17.8%)	0
statistical analysis	type of hip IIa (alpha $< 55°$) to IV: not significantly more often in twins with breech presentation (P > 0.05)		

Table 5 Comparison of results of all newborns, singletons, twins, and cases of dysplasia in their families, statistical analysis (χ^2 test)

Type of hip	All newborns n = 372	Singletons n = 357	Twins n = 15
Ia, Ib, IIa ($\geq 55°$)	332 (89.3%)	317 (88.8%)	15 (100%)
IIa ($< 55°$), IIc, D, IIIa/b, IV	40 (10.7%)	40 (11.2%)	0
statistical analysis	type of hip IIa (alpha $< 55°$) to IV: not significantly more often in twins with dysplasia in the family (P > 0.05)		

Table 6 Comparison of results of all newborns, singletons, twins, and premature birth, statistical analysis (χ^2 test)

Type of hip	All newborns n = 240	Singletons n = 204	Twins n = 36
Ia, Ib, IIa ($\geq 55°$)	222 (92.5%)	186 (91.2%)	36 (100%)
IIa ($< 55°$), IIc, D, IIIa/b, IV	18 (7.5%)	18 (8.8%)	0
statistical analysis	type of hip IIa (alpha $< 55°$) to IV: not significantly more often in twins with premature birth (P > 0.05)		

Discussion

Incomplete development of the hips leading to dysplasia did not occur more frequently in twins than in non-twins, despite a high number of breech presentations (8.3%) in twins.

With twin pregnancies there is increased intra-uterine pressure and frequency of breech presentation. The connection between hip luxation and breech position has been acknowledged for some time, with reports of 12.3% to 25.0% of the number of children with congenital hip luxation born in breech position.[7,14] The majority of authors have deduced from their sonographical investigations that hip dysplasia is more frequent in children born in breech position.[2–6,8,10,13–15] Morgan[22] stated in 1964 that 5.8% of all births in breech position were twins; Roth[23] found in 1961 that 21% of all twins are born in breech position. Our team found that 8.3% of the twins were born in breech position.

The assumption that twins born in breech position demonstrate a higher likelihood of dysplasia and
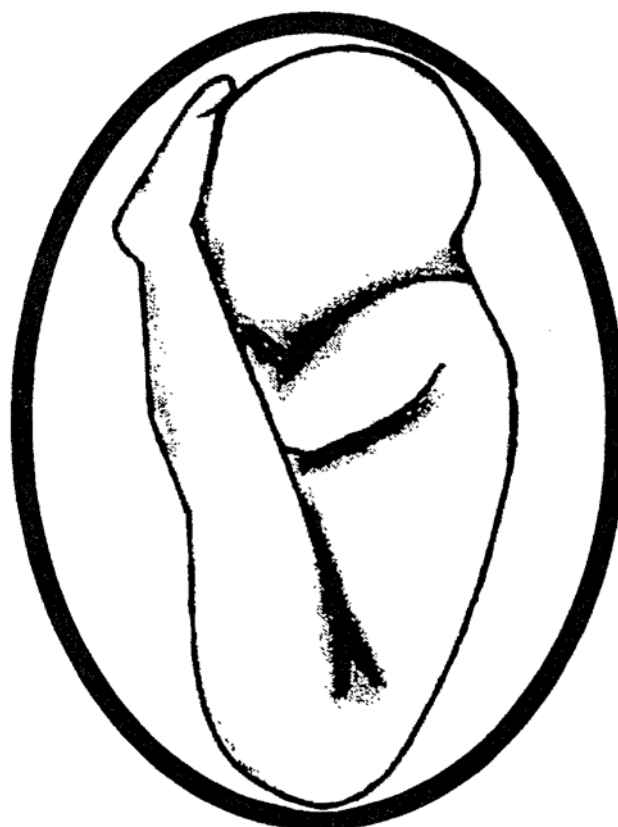

Figure 1 Straightforward breech presentation: the legs extended at the knee are stretched upwards to the side of the child's abdomen; predominant breech position in non-twins

luxation was refuted by Fettweiss[7] in 1992. He suggested that breech presentations of twins are different from those of non-twins. Breech births in singletons are usually straightforward breech presentations, ie the legs extended at the knee are stretched upwards to the side of the child's abdomen (Figure 1). The breech position with flexed hips and fully extended knees represents a special high-risk group for congenital dysplasia of the hip, because the prolonged tension of the ischiocrural musculature mechanically exerts a pressure on the posterior and superior acetabular rim.[7,8,15,16,24] Depending on the form of the spatial narrowing and length of time in this position, hip dysplasia and/or dislocation can occur. Breech position is usually occupied by singletons long before birth takes place, since in most cases spontaneous turning of the foetus (up to the 32nd week of gestation) does not take place from the breech position into the physiological vertex presentation.

Fettweiss[7] suggests that for twins, the footling presentation usually prevails with folded legs and parallel positioned feet (Figure 2), ie legs positioned as for a vertex presentation. This statement refers to the work of Wilkinson[16] from 1972, who investigated
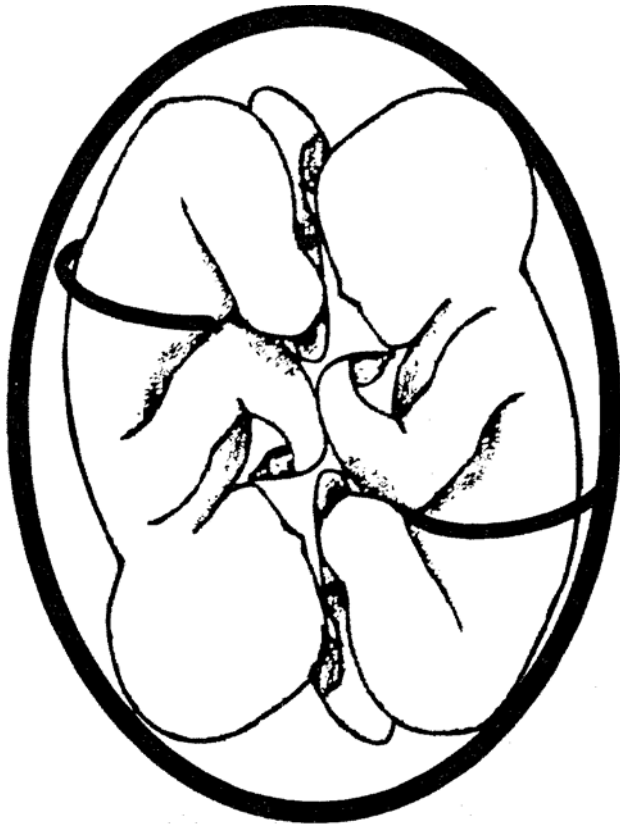
Figure 2 Footling presentation with folded legs and parallel positioned feet, ie a leg position as for vertex presentation: predominant breech position in twins

the configuration of newborn babies immediately following birth.

According to Fettweiss,[7] one can also conclude indirectly from the work of Isigkeit[25] in 1931 and Idelberger[9] in 1951 that breech presentation alone is not the sole cause of hip dysplasia for twins. Both stated that there was no increase in the occurrence of muscular wrynecks in twins which is closely associated with breech presentations. Also, in the case of twins as opposed to non-twins, the breech position is usually taken on during or just before birth, resulting in a shorter duration of mechanical strain for the hip. Our group demonstrated that there was a higher percentage of twins born before the 37th week of gestation period (37.1%), as opposed to singletons (4.6%) but no increased rate of hip dysplasia was demonstrated in the twins. Dorn[6] found in 1990 that there was no indication that premature babies presented a higher risk of hip dysplasia. On the other hand, he suggests that the final months of pregnancy result in an impediment of movement with increased intrauterine narrowing and relatively less amniotic fluid. Pauer[13] and Pfeil[18] also did not find any increased sonographic pathology in the investigated hips of premature babies. We also did not find

the types IIa ($\alpha < 55°$), and worse, more often in twins with additional risk factors (family history of CDH, premature birth).

Information is lacking in the literature regarding the occurrence of dysplasia in monovular vs dissimilar twins. In our group the worse types of hip were found in dissimilar twins.

Rosendahl[26] determined inter- and intra-observer variability in assessing hip morphology by ultrasound. She found a high degree of agreement for morphological classification based on repeated readings of recorded scans by the same observer, whilst the degree of agreement between observers was moderate. The author concluded that a high degree of inter- and intra-observer agreement in classifying hip morphology in general may be achieved in the reading of ultrasound scans. Inter- and intra-observer variability in producing the scans is poorer than for reading. Dorn[6] also found that correct assessment of recorded scans depends on the experience of the observer. To obtain a high degree of inter-observer agreement, it is necessary to have substantial training, attention to detail in the technique, and meticulous evaluation of results. To reduce variation in assessment and to improve inter-observer agreement, all our scans and documentation forms were additionally checked after the investigation by an experienced ultrasound examiner and, if necessary, corrected. Each examiner had participated in several instruction courses, with at least the first 50 recordings of scans performed under guidance.

The most important factor for avoiding bias in using Graf's technique is the identification of the anatomic structures and the proper selection of the standard plane, including correct anatomic representation of os ileum and labrum acetabulare. The description of morphology is followed by angular measurement.

In conclusion, twins with or without additional risk factors that are known before birth did not show a significant higher rate of hip dysplasia manifested as types IIa ($\alpha < 55°$) and worse according to Graf's classification.

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