

# Abnormal Development of the Femoral Head Epiphysis in an Infant with no Developmental Dysplasia of the Hip Apparent on Ultrasonography

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## What to Learn from this Article?

Importance of radiographic evaluation in infants at risk of DDH

## Abstract

**Introduction:** In the investigation of hip development in newborns and infants, ultrasonography and radiography are widely used, but their optimal roles in this setting remain controversial.

**Case Report:** Here we describe an 8.5-month-old infant who had undergone hip radiography at a primary care facility and was referred to our hospital to be evaluated for developmental dysplasia of the hip. Ultrasonography showed no developmental dysplasia of the hip according to standard criteria, but developmental retardation of the femoral head was apparent on the radiograph.

**Conclusion:** This patient's findings demonstrate that abnormalities in femoral head epiphysis development can go undetected during routine ultrasonographic evaluations for developmental dysplasia of the hip.

**Keywords:** Hip Dislocation; congenital; femur head; radiography; ultrasonography.

## Introduction

In the investigation of hip development in newborns and infants, two widely used imaging methods are ultrasonography and radiography; however, their optimal roles in the management of diseases such as developmental dysplasia of the hip (DDH) remain controversial [1,2]. Advantages of ultrasonography include its freedom from ionizing radiation and its capacity to show cartilaginous structures in newborns [3], while an advantage of radiography is its capacity to show the bony structure of the hip and the related developmental abnormalities in older children [3]. In our country, hip ultrasonography is not doing routinely in all hospitals [4]. At our institution, we use

routinely hip ultrasonography by Graf method, if the patient's age (Up to 10 months) is suitable for assessment, as primary investigation in all patients over radiograph. Also, we are using hip ultrasonography for screening DDH in infants.

Here we describe an 8.5-month-old infant who had undergone hip radiography at a primary care facility and was referred to our center for evaluation for DDH, and was then found to have normal hip development according to standard ultrasonographic criteria despite the presence of developmental retardation of the femoral head that was apparent on the radiograph.

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## Author's Photo Gallery



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**Figure 1:** An 8.5-month-old girl. On the anterior-posterior radiograph, ossification in the right femoral head epiphysis appeared to be markedly less than in the left.



**Figure 2:** An 8.5-month-old girl. Right hip ultrasonography image (Graf type 1/mature hip). Ultrasonography of the hip was performed according to the Graf method. The ultrasonography device had a 7.5-MHz linear transducer (Toshiba Sonolayer SSA-270A, Japan).



**Figure 3:** Left hip ultrasonography image (Graf type 1/mature hip). Ultrasonography of the hip was performed according to the Graf method. The ultrasonography device had a 7.5-MHz linear transducer (Toshiba Sonolayer SSA-270A, Japan).

## Case Report

An 8.5-month-old girl was referred to our hospital to be evaluated for DDH. Her parents noticed asymmetric skin folds and had taken her to a primary care center to have this investigated. Hip radiography was performed there, and the patient was referred to our hospital. Her mother said that she had used no medications during pregnancy, and that the birth had been a full term normal vaginal delivery with no complications. The parents reported that the child had experienced no falls or other trauma, and they were unaware of any family members who had hip dysplasia or genetic disorders.

Physical examination findings were normal except for skin fold asymmetry. There was no limitation of abduction in either hip. Ortolani and Barlow maneuvers gave findings consistent with normal hip development bilaterally. On the hip radiograph that the family had brought with them, the right femoral head was noticeably less ossified than the left (Fig. 1). In our hospital, hip ultrasonography by Graf method is used routinely for all the infants, who are suitable for screening easily due to their age. Then, hip ultrasonography was performed and images were consistent with normal hip development bilaterally (Graf type 1, Figs. 2 and 3). Thyroid hormone evaluation gave normal results. Other biochemical evaluations and magnetic resonance imaging were suggested to the parents, but were declined. There are many theories about what causes avascular necrosis. In this patient we wanted to rule out sickle cell anemia, Gaucher's disease, hyperlipidemia, polycythemia, hemophilia, coagulation abnormalities, metabolic diseases. Especially, calcium, phosphorus, alkaline phosphatase and vitamin D deficiencies are important parameters that could help to detect rickets. However, the patient's parents refused to do further investigations.

## Discussion

For the evaluation of DDH in infants, ultrasonographic methods include the morphologic approach described by Graf [5], dynamic techniques in which the hip is moved during ultrasonography [6], and techniques which take into account the extent to which the femoral head is covered by the acetabulum [7]. Our patient was evaluated according to the morphologic criteria described by Graf. In this method, three principal measurement lines are used to defined hip maturity:

the acetabular roof line, drawn from the iliac tip along the bony echo of the acetabular roof; the base line, drawn along the bony echo of the iliac wing; and the cartilaginous roof line, drawn from the tip of the labrum to the inferolateral extremity of the bony rim [8]. The morphology of the femoral head epiphysis itself, however, is not taken into account, and for this reason abnormalities in its development can go undetected during routine ultrasonographic evaluations for DDH. In fact, the presence of the femoral capital centre is of no consequence for ultrasound diagnosis in the hip, but has some significance as a sign of maturity of the hip. Since the position and contour of the femoral ossification centre is not known a priori, the plane of insonation does not in any way meet the ossification centre at a reproducible position. Thus an assessment of the size of the femoral ossification centre cannot be carried out in a reproducible fashion sonographically [8].

In our patient, the femoral head epiphysis abnormality was noticed incidentally, and its etiology was not apparent. However, for infants who are at risk for abnormalities of the femoral head epiphysis, such as those who have received abduction splint therapy for DDH or those with a family history of disease affecting epiphyseal development, radiographs of the hip should be considered.

## Conclusion

This patient's findings demonstrate that in the setting of hip development in infants, the ruling out of DDH by ultrasonography with Graf method does not rule out the presence of an abnormality in the development of the femoral head.

## Clinical Message

Abnormalities in femoral head epiphysis development can go undetected during routine ultrasonographic evaluations for developmental dysplasia of the hip. Therefore, for infants who are at risk for abnormalities of the femoral head epiphysis, radiographs of the hip should be done.

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