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DEVELOPMENTAL DYSPLASIA OF THE HIP – CURRENT TRENDS APLLIED IN ARAD

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Abstract. Developmental dysplasia of the hip (DDH) is the most common musculoskeletal disorder in infancy and varies in severity, ranging from neonatal hip instability with or without associated acetabular dysplasia to irreducible dislocation. Although the disease is described by Hippocrates, there is no standard protocol for diagnosis and treatment unanimously accepted. There are still unsolved issues across the etiology, diagnosis method, the time of imaging screening and initiation of treatment. Considering the severity of the malformation, the current trend is to diagnose and treat early DDH.
In our country, infants are referred to the orthopaedic pediatric service for DDH diagnosis by family physicians or pediatricians, late enough, after 4 months age.

Keywords: Developmental dysplasia of the hip (DDH), newborns, early diagnosis, ultrasound hip.

INTRODUCTION

Developmental dysplasia of the hip (DDH), comprises a spectrum of abnormalities that include abnormal acetabular shape (dysplasia) and malposition of the femoral head, ranging from dislocatable hip and mild subluxation to fixed dislocation (American Academy of Pediatrics, 2000; Dezateux et al., 2007).

Other authors define DDH as a condition that encompasses a wide spectrum of pathology ranging from a complete fixed dislocation at birth to asymptomatic acetabular dysplasia in the adult (Shipman et al., 2006).

If this disease is not treated properly it gives long term morbidity such as gait abnormalities, chronic pain and degenerative arthritis.

It is difficult to assess the true incidence of DDH, as the definition varies and there is no gold-standard test. Incidence varies from 1.5 to 20 in 1,000 births (Shipman et al., 2006).

The incidence of DDH in infants is influenced by a number of factors, including diagnostic criteria, gender, genetic and racial factors, and age of the population in question (Patel et al., 2001).

The reported incidence has increased significantly since the advent of clinical and sonographic screening, suggesting possible overdiagnosis (Bialik et al., 1999).

In addition to a higher prevalence of DDH in females, reported risk factors for the development of DDH include a family history of DDH, breech intrauterine positioning, and additional in utero postural deformities (Omeroglu et al., 2001). The majority of cases of DDH have no identifiable risk factors.

There is no consensus on the best screening method for DDH (Mahan et al., 2009).

As clinical examinations are specific but not sensitive, they may only detect neonates with dislocatable or dislocated hips and not those with stable acetabular dysplasia (Jones,1998).

The goals of a screening program are early detection in all patients who have DDH, when therapy is most effective and noninvasive, and identification of patients without DDH, for whom unnecessary treatment could be costly and harmful.

Radiographs are available and relatively low in cost. The main limitations are radiation exposure and radiography's inability to demonstrate the cartilaginous femoral head. Radiographs are of limited value during an first 3- 4 months of infants life, when the femoral heads are composed entirely of cartilage, but they become more reliable for use in infants 4–6 months of age, with the appearance of femoral head ossification (American Academy of Pediatrics, 2000; Dezateux et al., 2007).

Delayed diagnosis increases the risk of complications, and infants diagnosed after 6 months of age often require surgical correction(Mahan et al., 2009).

Using ultrasound hip in infants and newborns has the following advantages: non-invasive, no side effects, identify coxo-femoral joint entirely, including the osseous nucleus in the femoral head, and the dysplasia type. The treatment for hip dysplasia depends on the age of the patient and on the type of the hip disorder according to the Graf method. Abduction brace, Pavlik harness, close reduction and

open reduction if necessary are used in treatment of DDH.

In our country, few doctors know about hip ultrasound and its applicability in newborns and infants. The most of the family physicians or pediatricians advises patients to DDH screening after 4 months age. In pediatric orthopedics service, frequently we encounted patients who have more than 1 year old, who were not examined by specialist for DDH.

MATERIALS AND METHODS

Based on current data from the literature and the current status related to the diagnosis of DDH, we began to implement in Arad current notions about DDH and perform clinical examination and early ultrasound screening of the hips in newborns and infants.

The data presented in this study are only a part of the clinical and ultrasound research of DDH, where the patients were younger than 3 months.

Required data of this study were obtained by clinical examination and ultrasound of the hips systematically to all infants who were born in Arad, at Laser System Medical Center, and other neonates or young infants under the three age months who were brought by parents to consult, during the 18 calendar months, the final number of cases reaching 457.

The ultrasound examinations were performed with high-performance ultrasound with 7.5 MHz linear transducers Siemens Acuson Antares, Siemens Acuson X300 and Philips HD3.

Examinations were recorded on heat-sensitive paper printer, enabling controls subsequent in dynamic and critical assessment about exam performed.

Working methods were:

- Clinical examination of the hip - Ortolani and Barlow tests were performed on all babies at the time of initial presentation,
- Ultrasound examination of the hip - Graf static method.

Protocol ultrasound examination of the hip, Graf method, was:

- Use clear and precise terminology of the principles and definitions of Prof. R. Graf;
- Ultrasound evaluation was performed in coronal neutral incidence;
- Based on bone components of joint cartilage, angles alpha and beta, we defined the type of hip using Graf classification, which is particularly important in therapeutic and later clinical follow;
- In cases with DDH was established early orthopedic treatment with abduction devices (abduction brace, Becker harnnes, Pavlik harnnes) and its efficiency was monitored clinically and by ultrasound every two months;
- Each examination was accompanied by adequate documentation;
- Archiving of examination protocols carefully, can be made at any time to endorsed checks, certifying the quality of the examination.

We used ultrasound Graf classification system for infant hips:

- type I : alpha angle > 60 degrees (normal)
  - type Ia : beta angle < 55 degrees
  - type Ib : beta angle > 55 degrees
- type II
  - type IIa : alpha angle 50 - 59 degrees
  - type IIb : alpha angle 50 - 59 degrees
  - type IIc
    - alpha angle 43 - 49 degrees
    - beta angle < 77 degrees
- type D ("about to decenter")
  - alpha angle 43 - 49 degrees
  - beta angle > 77 degrees
- type III : alpha angle < 43 degrees
  - type IIIa and IIIb distinguished on the grounds of structural alteration of the cartilaginous roof
- type IV
  - alpha angle < 43 degrees
  - dislocated with labrum interposed between femoral head and acetabulum

As a general rule, the alpha angle determines the type and in some instances the beta angle is used to determine subtype.

Results

On the study group, 23 cases with DDH had associated risk factors:

- Girls - 6 cases (60%);
- Family history of DDH - 2 cases (20%);
- Indicated caesarean section for pelvic presentations - 2 cases (20%);
- Caesarean section because of other indications: maternal hypertension, intrauterine growth retardation, maternal uterine abnormalities - 6 cases (60%);
- High birth weight G> 4000g - 1 case (10%);
- Twins - 1 case (10%);
- DDH associations with other congenital malformation - 5 cases (50%), which were congenital clubfoot 4 cases (40%), torticollis 1 case (10%).

Risk factors	Cases no.	%
Girls	6	60%
Family history of DDH	2	20%
Cesarean section for pelvic presentations	2	20%
Caesarean section because of other indications	6	60%

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High birth weight	1	10%
Twins	1	10%
Congenital malformations associated	5	50%

Tabel1. - Distribution of cases based on the risk factors associated

Routine clinical examination was followed by the detection of the abduction limit of affected hip and the hip instability detection by Ortolani maneuvers, Barlow, Palmen and the joint hyperlaxity.

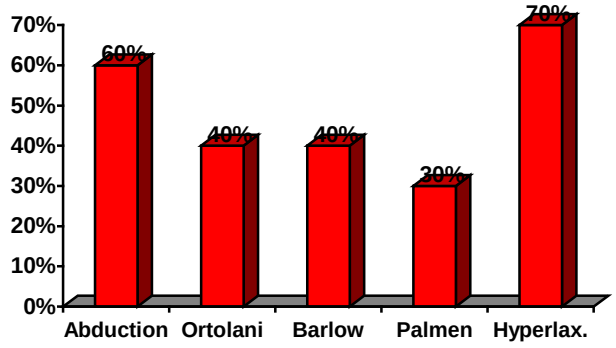


Fig. 1 - Distribution of DDH cases with a positive clinical signs

On the study group of 457 newborns and infants under the age of three months, we viewed pathological changes in 10 cases (2.19%), 2 cases were bilateral disease, so a total of 12 dysplastic hips, the following distribution by Graf classification:
Type II A + 8 hips (66.67%)
Type II A-: two hips (16.66%)
Type II C: two hips (16.67%)

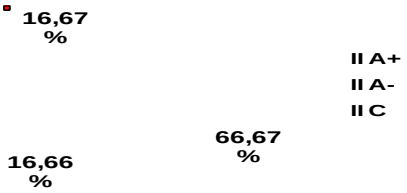


Fig. 2 - *Distribution of the patients with DDH according to Graf method*

For all patients diagnosed with DDH, we have established orthopedic treatment individualized to the ultrasound type:

- To patients with type II A + (8 hips) I have recommended orthopedic abduction brace for two months followed by clinical and ultrasound control.
- To patients with type II (2 hips) and type II C (2 hips) (two cases with bilateral involvement, both having type II C at left hip and to right hip type II A-) I have recommended Pavlik harness for two months followed by clinical and ultrasound control.

Normalization hips happened at intervals of 2 and 6 months of immobilization in abduction orthotic device, according to the type of dysplasia and the precocity of diagnosis: as quiqly the diagnosis was determinated at earlier age, the normalization of the hip was faster and duration of treatment was shorter.

The decision to stop the treatment was made when the hips has become Type I A.

There was no need cast immobilisation, traction or corrective surgery because the treatment was established early.

DISCUSSIONS

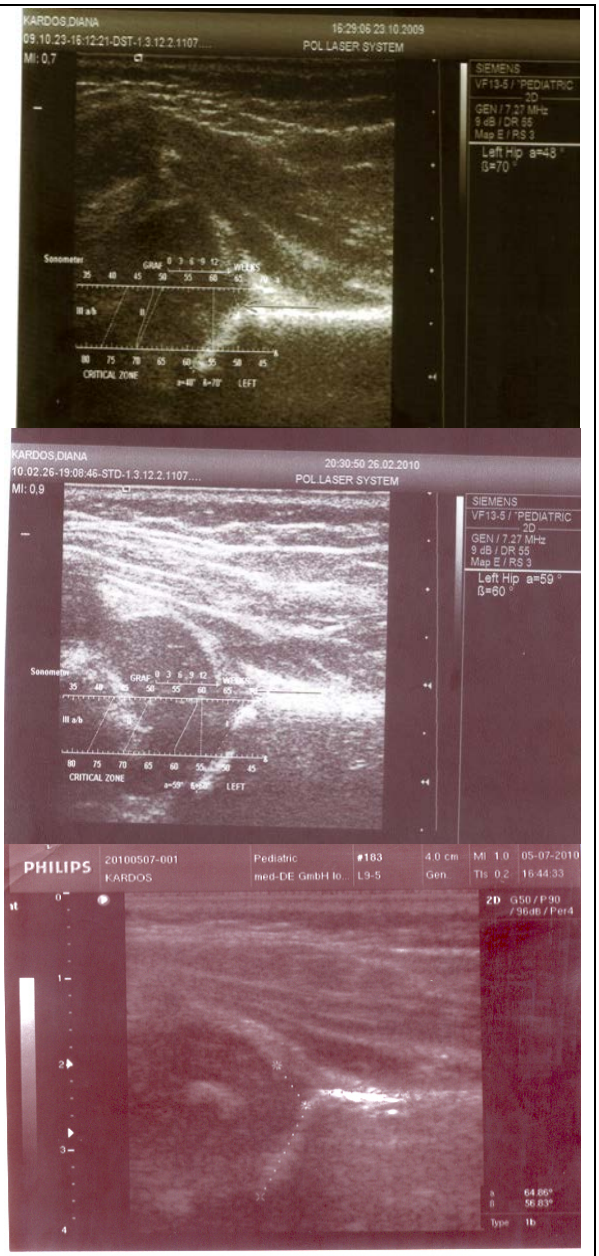
Many authors reported their results in diagnosis of DDH with ultrasonography.

Rosendahl et al. report that in the Norwegian new-born population approximately 85% of the infants have morphologically normal hips (based on the alpha angle) while 12% have immature and 3% dysplastic hips.

It is a sensitive method for visualisation of the hip in infants up to 3 months of age, especially before appearing the osseous nucleus in the femoral head. It can detect minimal abnormalities of the hip which are not diagnosed with clinical examinations (Gelfer et al., 2008).

Ultrasound screening of the hips in newborns and infants is important for early diagnosis of DDH (Zgoda et al.,2009).

Patients with dysplasia or subluxation of the hips are treated with braces and harnesses. The braces and harnesses, are used for holding the hip in an abducted and flexed position, which allows best orientation between the femoral head and the acetabulum, allowing the hip joint to remodel and develop normally (Zgoda et al., 2009).



Picture1- Illustration of early ultrasound diagnosis of left hip dysplastic, type II C, (newborn - 3 weeks) and ultrasounds control after 2 and 6 month of orthopedic treatment – final result - hip type IA

CONCLUSIONS

Ultrasound screening of the hips in newborns and infants is important for early diagnosis of DDH.

Ultrasound is known to be a safe and effective screening tool for hip dysplasia in infants, especially before the appearance of the femoral head osseous nucleus, and has been advocated to decrease the incidence of late detected hip dysplasia.

Ultrasound can detect DDH in infants up to three months of age with normal physical examination.

Analysis of the results of ultrasound screening of the hips in our study showed that there was a significant number of dysplastic hips in newborns and infants up three month.

Ultrasound screening is necessary for adequate treatments.

Treatment of dysplastic hips depends on age of the patients.

The numerous advantages of the technique requires as a screening method in newborns and infants.

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