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Problems encountered in screening study with ultrasound for early diagnosis of developmental dysplasia of hip in eastern region of Turkey

Mehmet Fethi Ceylan[1*], Savas Güner[2], Mehmet Ata Gökalp[2], Zehra Kurdoğlu[3], Abdurrahim Gözen[4], Mehmet Fatih Korkmaz[1], Tülin Türközü[2], Hüseyin Akdeniz[5], Oğuz Tuncer[6]

[1] *Orthopedics and Traumatology, Medicine School of Inönü University, Malatya, Turkey*
[2] *Orthopedics and Traumatology, Medicine School of Van Yüzüncü Yıl University, Van, Turkey*
[3] *Gynecology and Obstetrics, Ankara Training and Research Hospital, Ankara, Turkey*
[4] *Orthopedics and Traumatology, Private Tatvan Can Hospital, Bitlis, Turkey*
[5] *Radiology, Private Lokman Hekim Hospital, Van, Turkey*
[6] *Pediatric Neonatology, Department of Pediatrics, Medicine School of YYU, Van, Turkey*

ABSTRACT

The aim of this study is to evaluate results of the screening program of the developmental dysplasia of the hip (DDH) examined in newborn period. The problems encountered in the applicability of the early screening program were evaluated. By interviewing with the family of 1680 newborns born in our institution or referred, the information was given about the DDH and its risk factors, obtained results were recorded. The families were told to bring their babies for examination and hip ultrasound at the 3rd or 4th week of birth. In addition, all the parents were called by telephone the day prior to their appointments.

Five hundred and thirty-six babies (31.3%) were brought to the first appointment. Forty-two hips (3.9%) of the 30 infants (5.6%) were detected as dislocated (Type 2c, D, 3). The 8 of these 30 patients (26.7%) whom the treatment was started were brought for the second control. Asymmetry of thigh folds was positive in the highest rate as the finding of the examination in the infants brought to the appointment. The rate of swaddling at the first appointment was found to be 74.2%.

Surprisingly, less than one third of children were brought to ultrasound examination at first control. Similarly, about 3/4 of the parents continued to use swaddling for their babies. For the success of national DDH screening program, additional precautions must be taken to ensure the participation of the families and release of the swaddling.

Key Words: Screening program, early diagnosis, newborn, hip ultrasound.

Introduction

Developmental dysplasia of hip (DDH) is a disease that can well be healed if diagnosed and treated properly in the newborn period. The reported incidence rate of DDH around the world varies widely between 0‰ and 188.5‰ (1). Twenty years ago, it was seen as 5 - 15 per 1000 live births (2). In recent years, while the rate of DDH has decreased in the western parts of Turkey, it still remains high in eastern regions (3,4). To diagnose and decrease the rate of DDH, evaluation of the hips of newborn with the ultrasound (US) beside the clinical examination is essential (5,6,7). Moreover, the eastern region of Turkey has negative socioeconomic, geographical and cultural differences compared to other regions (8). Unfortunately, the national early screening programme associated with DDH could not be performed in the eastern part of Turkey. It is necessary to conduct a pioneering study to determine problems while planning national screening program for this region.

The aim of this study is to evaluate the applicability of the newborn DDH screening performed with the clinical examination and US in the eastern region of Turkey.

Material and Methods

This prospective study was held after obtaining the approval of the our university ethics

***Corresponding Author:** Mehmet Fethi CEYLAN, MD, Inönü Universitesi Tıp Fakültesi, Ortopedi ve Travmatoloji Anabilim Dalı Kampüs 44200 Malatya, Turkey, GSM: +90(535) 952 44 40, Fax: +90(422) 341 07 28, E-mail: mfethiceylan@hotmail.com
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committee (Acceptance no: 2010/18) between March 2010 and September 2012. In addition, informed consent forms were obtained from all families.

1680 of newborns who were born in our institution or referred within first one month were accepted to this study. Infants with genetic, syndromic and neuromuscular diseases were excluded.

The families of the infants were informed about the DDH on the first day of birth in the clinic of gynecology by the same physician (AG). Five-page leaflet including the informations about the importance of DDH, risk factors, prevention methods, diagnosis and treatment was prepared for given to parents. In addition, it was explained in detail in this form that swaddling is a harmful application for the hip development of their babies. Moreover, the parents who cannot speak Turkish were informed in the local language through an interpreter. Risk factors of DDH (gender, swaddling, breech delivery, and skeletal deformities) were determined and noted in all of newborn.

We examined all the hips clinically using the Barlow, Ortolani, limitation of abduction, asymmetry of thigh folds and Allis tests. Then, we advised their families to come to the Orthopedia Department for an examination and US when the infant was 3-4 weeks old.

US device with 5-7.5 MHz linear probe (LOGIQ C2; GE Healthcare, Beijing, China) was used in this study. Ultrasonographic assessment of the hips were performed by the same physicians (MFC, HA). We examined all the hips ultrasonographically with Graf's (9) static morphological methods (Tablo 1). The infants whose clinical examination was normal in the 3rd week and ultrasonographically type 1 hip were excluded from the follow-up. Type 2a hips were examined with the US by calling 6th week and were treated if they were evaluated to be type 2a - (α angle: 50-54). In the 3rd month of type 2a + of the hips controls, the treatment was started those measured to be type 2b. The treatment was absolutely started in the infants with type of the hip IIc, D, III and IV in the first assessment of US. The treatment was continued until the pathologic hip was type 1 in monthly controls of US.

Pavlik harness (10) was primarily preferred in the treatment of all patients. Despite that, the pelvipedal cast was done after hip arthrography in cases where Pavlik harness was not appropriately performed and the parents were incompatible. No compulsory maneuver was applied to any patient's hips to prevent the development of avascular necrosis. It was decided whether the conservative treatment would be continued according to the results of US. According to the results of clinical examination and US in all infants, the decision for treatment was given by the same orthopedic surgeon (MFC).

In order to increase the participation of the families in the study, they were not asked to come to their appointments with official referral documents. In addition, the families who did not come to their appointments were called on the phone. Moreover, US examination was made on the same day even for babies brought without an appointment.

Results

According to the result of US in the first control, dislocation was detected in the 42 hips (3.9%) of the 30 infants (5.6%) (12 bilateral, 10 right, 8 left). The 112 hips (10.4%) of the 90 infants (16.8%) were assessed as type 2a (22 bilateral, 24 right and 44 left). 14 of the 30 DDH patients we started to treat were the type 2c, 10 were the type D, six were the type 3, respectively.

The distribution of the identified risk factors was shown in Table 2. The clinical findings we found in the US positive infants in the first control have been shown in Table 3. The results of ultrasonographic examination and the parents participation rates in our study are shown in Table 4.

We treated with pelvipedal cast in 8 of 30 patients. Six (75%) of these patients were brought to second control. Interestingly, only half of these patients were brought to third controls six weeks later. Two (9.1%) of the 22 patients in whom we started treatment with Pavlik harness were brought to the second control. Avascular necrosis was not detected in any of these patients.

An open reduction with the medial approach was performed to two patients whom the conservative treatment was not enough.

Due to the low participation in our study, a specific statistical test was not applied to the data since the true results could not be obtained.

Discussion

DDH is a very common disease of the hip joint that causes disability if left untreated. The importance of early diagnosis of DDH by clinical examination is well known. US helps to detect especially clinically silent cases (11,12).

Table 1. Ultrasonographic classification Graf proposed.

Type	Explanation	angle α	angle β
1	Normal hip	≥60	Ia: <55 Ib: ≥55
2a	Physiological delay in the development of hip (age ≤ 3 months)	50-59	55-77
2b	Pathological delay in the development of hip (age> 3 months)	50-59	55-77
2c	Risky or critical hip	43-49	≤77
D	The hip in the dislocation point (dicentric)	43-49	>77
3	Dislocated hip	<43	>77
3a	No deterioration in the structure of the cartilage acetabular roof		
3b	Deterioration in the structure of the cartilage acetabular roof		
4	High dislocated hip	<43	>77

Table 2. The distribution of the risk factors.

Patient	famele	swaddle habit	family story	breech delivery	oligo hydramnios	foot deformity	consanguineous marriage
total N=1680	842 (50.1%)	1246 (74.2%)	160 (9.5%)	124 (7.4%)	83 (4.9%)	59 (3.5%)	383 (22.8%)
pathological n=30	26 (86.7%)	26 (86.7%)	12 (40%)	3 (10%)	2 (6.7%)	2 (6.7%)	13 (43.3%)

Table 3. The clinical findings detected in the first control.

Type	Ortolani	Barlow	limitation abduction	pillar asymmetry	Allis
2a n=90	-	-	2	4	1
2c,D,3 n=30	4	5	6	8	4
Total n=120	4	5	8	12	5

Table 4. Participation rates of parents.

Type	1. Control (3-4 week)	2. Control (6 week)	3. Control (12 week)
1	416 (77.6%)	-	-
2a	90 (16.8%)	18 (20%) n=90	4 (22.2%) n=18
2c,D,3	30 (5.6%)	8 (26.7%) n=30	4 (50%) n=8
Total	536 (31.3%) n=1680	26 (21.7%) n=120	8 (30.8%) n=26

It must be kept in mind that, only by examination, the rate of the detection of DDH may increase up to 50-60% (5,13). Similarly, in this study, less than half of the patients with pathologic hip detected by ultrasound were clinically diagnosed. The most common clinical finding in our patients was observed as the asymmetry of thigh folds. In addition, the use of swaddling has been identified as the most common risk factor.

The Pavlik harness is widely used as an effective, lowcost, simple to manage and safe procedure of treatment in infants younger than 26 weeks of age (14,15,16). It is the only apparatus easily available which promotes automatically reduction by the activity of the babies (17). We preferred the proposed Pavlik harness in the treatment of patients with DDH, but the participation rate of these patients was low. Interestingly, the use of the pelvipedal cast instead of Pavlik harness increased the rate to come to the second control (75%). The use of pelvipedal cast as a primer in the treatment of patients may be a solution to the lack of participation in screening, which is the most important problem we have identified in this study.

Although several studies support the use of hip ultrasonography as the most effective method for

the early diagnosis of DDH (18,19,20), there is still some controversy regarding the use of ultrasonography as a screening method from the viewpoint of especially overdiagnosis and overtreatment (12,21,22). There was no over-diagnosed patient due to false ultrasonography in this study.

The parents are usually uneducated about the DDH risk factors and no early screening program exists in Eastren Turkey (4). For this reasons, so far, many DDH patients were noticed in fairly later periods and treated surgically (23). Therefore, disabilities and medical expenses were at the high rate in this region. In this study, only two patients required surgical treatment.

The use of the swaddle is one of the most important risk factors for DDH. There is a parallelism between the frequency of the use of swaddle in newborns and the incidences of DDH in cold regions such as eastern region of Turkey (4). As the swaddle has not been used in hot regions like Africa, the infants are traditionally carried in the correct position and the rate of DDH is quite low (24). The most common risk factor detected in this study was swaddling (74.2%). It was surprisingly found that parents continued to use the swaddle, although they were informed and alerted in detail during the first interview.

In studies conducted in Turkey it was emphasized that the participation of the families was low (25,26). Similarly in our study less than 1/3 of the infants was brought for the first control. To increase participation in this study, an appointment was not required and a phone reminder was made. In addition, even though we solved the language problem and provided the education about DDH for parents, about ¼ of the patients with the DDH were brought for the second control.

Avoiding compulsive reduction of the hips is recommended to reduce avascular necrosis in DDH treatment (10). The absence of avascular necrosis in our treated patients was associated with non-forced maneuvering of the hips.

The limitation of this study is the fact that more than one doctor has performed the hip examination and US. Another limitation is that patients from other cities are included in the study. Accordingly, families may have continued to treat their children with orthopedic specialists in the city where they live. In addition, patients' participation in the study was low. There is a need for further study involving more babies with control groups.

In conclusion, parents' awareness of DDH during this study was inadequate. The low participation of families and insistence on making swaddle despite warnings are the most important problems identified in this study. Studies should be undertaken to resolve these problems that we have identified before the planned national hip screening program in the eastern region of Turkey. For example, the effective means such as media, schools and non-governmental organizations should effectively used in order to convince or inform of parents to solve these problems.

Conflict of interest

No conflicts declared.

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