



Newborn hip screening experience in Türkiye

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Abstract

In this review article, newborn hip screening experience in Türkiye was summarized. The nationwide newborn hip screening program was officially initiated in 2013. The program currently includes the ultrasonographic examination of the hips of almost all newborns within the first two months of life. The rate of minor surgical interventions (closed/open reduction and casting) was 0.47 per 1,000 live births in 2015 and was 0.89 per 1,000 live births in 2020. Thus, an increase of 89% in the rate of minor surgical interventions was observed. The rate of major surgical interventions (pelvic/femoral osteotomies) was 0.74 per 1,000 live births in 2015 and was 0.21 per 1,000 live births in 2020. Thus, a decrease of 72% in the rate of major surgical interventions was observed between 2015 and 2020. While minor surgical interventions constituted about 39% of the overall surgical interventions in 2015, this ratio raised to 81% in 2020. Based on the experiences in Türkiye universal newborn ultrasonography (US) hip screening is advocated to lessen the rate of extensive surgeries in developmental dysplasia of the hip (DDH) during childhood and adulthood and to have as many as possible functional hips in the long-term follow-up of patients with DDH.

Keywords

Developmental dysplasia of the hip, hip ultrasonography, newborn hip screening

Introduction

The exact incidence of developmental dysplasia of the hip (DDH) in Türkiye is still unknown. The nationwide incidence of DDH was estimated to be between 0.5% and 1.5% in the late 1990s [1]. The prevalence of dislocation/subluxation in children between 6 months and 14 years of age was found to be 5.9 per 1,000 in an article published in 2011 [2]. DDH is the etiological factor for hip degenerative arthritis in one-third of the patients who have undergone total hip arthroplasty, in Türkiye [3].



The occurrence rate of DDH ranged from 0.5% to 9% in the local institutional studies between 1969 and 1996. The numbers obtained from these studies were dependent on clinical and radiographic examinations [1]. The number of physicians who used hip ultrasonography (US) as the primary diagnostic tool for DDH in newborns was very limited till 1990s in Türkiye. Pilot studies about the diagnosis of DDH by sound waves were performed in the late 1980s [4]. Clinical and radiographic examinations were used as the definitive diagnostic methods for DDH in infants.

This review aims to summarize the development and results of the newborn hip screening program in Türkiye.

Short history of the development of nationwide newborn hip screening program in Türkiye

Up to the late 1990s, most of the DDH cases were either missed or neglected; usually operated on after the age of 1.5–2 years and many pediatric patients underwent extensive hip surgeries. Turkish orthopaedic surgeons used to contribute to the field of pediatric orthopaedics by defining new surgical procedures in the treatment of missed or neglected cases in DDH. The “radical reduction operation” initially defined by Chakirgil [5] and including release of all contracted muscles around the hip joint, open reduction of the hip joint, subtrochanteric femoral shortening, derotation and varization osteotomy and transiliac acetabuloplasty through a single incision was perhaps the most common surgical procedure performed in the treatment of older children with DDH in Türkiye in 1970s and 1980s. Korkusuz [6] was the very first surgeon who used ligamentum teres as a stabilizer and repositioned it to the center of the acetabulum with the aid of a button placed on the medial wall of the acetabulum in the late diagnosed patients treated by combined open reduction and pelvic and femoral osteotomies.

The founder of the Turkish Society of Children’s Orthopaedics Professor Yücel Tümer started to emphasize the necessity of the prevention of DDH in the early 1990s and looked for solutions concerning the early diagnosis of DDH particularly the extensive use of infantile hip US in the country [7]. Finally, the society communicated with Professor Reinhard Graf. Everything changed when a group of Turkish orthopaedic surgeons attended a one-week long hands-on infantile hip US course conducted by Graf in Stolzalpe in December 1996. The mentioned visit of 15 Turkish orthopaedic surgeons who were primarily interested in the field of pediatric orthopaedics to Stolzalpe can be considered the starting point of the newborn hip screening program in Türkiye [7]. Graf’s saying “my residents see only a couple of DDH operations after nationwide newborn hip screening program has been initiated” as well as the very first results of the Austrian nationwide newborn hip screening program [8] impressed the visiting Turkish orthopaedic surgeons. Graf proposed these surgeons organize courses for teaching hip US to their colleagues in Türkiye.

Therefore, the core group of surgeons trained in hip US started to use hip US as the primary early diagnostic tool in DDH at their institutions. Turkish Society of Children’s Orthopaedics started to organize “hands-on infantile hip US by the Graf method courses” in different regions of the country and the core group of surgeons worked as trainers and contributed to the organization of infantile hip US training courses. Besides, Graf visited Türkiye several times to attend the hands-on infantile hip US courses as a trainer. Increased experience of the physicians with the use of hip US in infants led to the initiation of local institutional newborn hip screening programs in several regions of the country and the preliminary results of these programs were published.

Turkish Society of Children’s Orthopaedics consistently worked on the development of the project “nationwide newborn hip screening program in Türkiye” and finally presented the project to the Turkish Ministry of Health in December 2004. Then, the Turkish Ministry of Health and the Turkish Society of Children’s orthopaedics worked together, improved the project, and then developed a road map. A “training of the trainers course” was organized by the Turkish Ministry of Health in October 2010 and the course was scientifically endorsed by the Turkish Society of Children’s Orthopaedics. The course included basic

knowledge about the etiology and prevention of DDH and diagnosis in newborns with DDH. Then, these trained trainers from each city of the country trained pediatricians, family health physicians, orthopaedic surgeons, obstetricians, nurses and midwives in all regions of the country between 2010 and 2012. Nationwide standardized information about the Graf method was given to the orthopaedic surgeons and radiologists. Finally, the official circular initiating the nationwide hip screening program was published in July 2013. A selective hip screening program was initially conducted as the number of trained and experienced health staff in infantile hip US was not so high. However, the spontaneous development of universal hip screening occurred over the years due to an increased number of physician training programs related to the early diagnosis of DDH and hip US, the increased awareness of the parents and particularly the pediatricians and family health physicians about the importance and efficiency of the running newborn hip screening program [9]. The program currently includes the US examination of the hips of almost all newborns within the first two months of life. The examination and treatment costs of newborns in this program have been covered by the social security system since the beginning.

Local institutional newborn hip screening results

Before the implementation of the nationwide newborn hip screening program in Türkiye, several studies from local institutions were published and the encouraging results of such studies stimulated the efforts that were made for the development of the nationwide newborn hip screening program.

Omeroğlu and Koparal [10] emphasized the importance of US hip screening particularly in the diagnosis of dysplastic hips which had a higher risk of missed diagnosis by clinical examination alone. Karapinar et al. [11] reported a treatment rate of 5.8% in the screened newborns having risk factors for DDH and about one-quarter of the treated infants had normal clinical findings. Sahin et al. [12] reported the results of an institutional newborn hip screening experience in 5,798 infants and found the rate of DDH as 1.7 per 1,000. Senaran et al. [13] considered a unilateral limitation of hip abduction as a sensitive and predictive clinical finding for DDH in the screened newborns, however, proposed hip US as the gold early diagnostic tool. Tuncay et al. [14] analyzed the results of 1,592 screened newborns and proposed to ultrasonographically classify the hips according to the chronological age alone in both term and pre-term newborns. Köse et al. [15] reported the occurrence rate of Graf type IIc and worse hips as 1.2% in the newborns screened by hip US within the first 3–4 weeks of life. Pavlik harness treatment failed in only one of 22 Graf type IIc and worse hips which had been diagnosed within the first month of life. Dogruel et al. [16] evaluated the results of 3,541 screened infants and concluded that clinical examination alone could not reliably detect all the ultrasonographically defined hip pathologies. Koşar et al. [17] found a DDH incidence of 1.4% in male newborns as well as a possible missed DDH diagnosis of 28% in male newborns if a selective hip screening had been performed. Omeroğlu et al. [18] analyzed the results of 312 screened newborns with Graf type IIa hips and concluded that Graf type IIa hip was more common and had a lower rate of spontaneous normalization and higher rate of treatment in newborn girls than in boys.

Following the initiation of the nationwide newborn hip screening program several institutional studies were published. Çekiç et al. [19] reported a DDH incidence of 1.36% in 1,136 screened newborns and considered hip US a useful tool for both early diagnosis of DDH and detection of a possible deterioration in hip dysplasia. Güler et al. [20] reported the results of 4,782 newborns who were screened by hip US at a single institution; found the occurrence rate of Graf IIc and worse hips as 2.5 per 1,000 and female gender and first-born were considered as the most significant risk factors for DDH. Kural et al. [21] evaluated the results of 9,758 screened newborns; found the rate of abnormal US findings 5.8 per 1,000 and considered breech presentation, female gender, torticollis, and multiple pregnancies as significant risk factors for DDH. According to Ömeroğlu et al. [22], family history, breech presentation, postnatal swaddling, and oligohydramnios were the four most significant risk factors associated with abnormal hip US findings in an institutional newborn hip screening program. Bozkurt et al. [23] recently reported the impressive local institutional results comparing the data before and after the implementation of the nationwide newborn hip screening program in a geographical area where DDH incidence was higher. The authors stated that

while major surgical interventions including pelvic and femoral osteotomies constituted 77% of all DDH operations in 2012, the rate of such operations dropped to 48% in 2019 in their institution. Besides, while the newborn hip screening rate was 3.8% in 2013, it increased up to 93% in 2019 in this geographical area [23].

Nationwide newborn hip screening results

In a recent article, the very first nationwide results of the US newborn hip screening program in Türkiye between 2015 and 2020 were reported [9]. In this retrospective study, an analysis of the data obtained from the national registry system about surgical interventions in children with DDH as well as of the records of the screened newborns was carried out. It was found that while the newborn hip screening rate was 51% in 2015, almost all newborns were screened in 2019 and 2020. The rate of minor surgical interventions (closed/open reduction and casting) was 0.47 per 1,000 live births in 2015 and was 0.89 per 1,000 live births in 2020. Thus, an increase of 89% in the rate of minor surgical interventions was observed. The rate of major surgical interventions (pelvic/femoral osteotomies) was 0.74 per 1,000 live births in 2015 and was 0.21 per 1,000 live births in 2020. Thus, a decrease of 72% in the rate of major surgical interventions was observed between 2015 and 2020. While minor surgical interventions constituted about 39% of the overall surgical interventions in 2015, this ratio rose to 81% in 2020 [9]. The exact number of the DDH patients treated by abduction bracing was not available in the national registry system, therefore the changes in this variable could not be analysed [9]. However, daily clinical experiences of many surgeons show that the number of infants treated by abduction bracing due to DDH has significantly raised after the initiation of the nationwide newborn hip screening program. According to Kapicioğlu et al. [9] the key point for maintaining and improving the success of the running prevention program was the close collaboration between the government and the national children's orthopaedics society and this was followed by the contribution of other related specialty societies to the nationwide newborn hip screening program.

Besides, the results of a recent nationwide survey among the Turkish orthopaedic surgeons concerning the management of DDH before walking age revealed that hip US was the most preferred definitive diagnosis method for DDH under the age of 6 months [24].

Conclusions

The first 10-year experience with the nationwide newborn US hip screening program in Türkiye revealed promising results. The rate of pelvic/femoral osteotomies significantly dropped while the rates of abduction bracing and closed/open reduction significantly raised. The considerable changes in these variables show how effectively the program is running and how early diagnosis and effective treatment are available by the use of hip US in the infants with DDH. It is our pleasure to say that “our residents can only see a few numbers of missed or neglected DDH cases and no longer have advanced level of surgical skills about the pelvic osteotomies in childhood”. Based on our experiences in Türkiye, we advocate universal newborn US hip screening to lessen the rate of extensive surgeries in DDH during childhood and adulthood and to have as many as possible functional hips in the long-term follow-up of patients with DDH. We repeat the saying of professor Graf: “let others perform hip surgery, do sonographic hip screening” [8]. Long-term follow-up studies assessing the hip function and rate of degenerative hip arthritis in patients diagnosed and treated at very young ages will show the precise benefits of this newborn US hip screening program.

Abbreviations

DDH: developmental dysplasia of the hip

US: ultrasonography

Declarations

Author contributions

HÖ, MİSK, and FK: Conceptualization, Investigation, Writing—original draft. All authors read and approved the submitted version.

Conflict of interest

The authors declare that they have no conflicts of interest.

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