The Role of Fetal Sonography in the Management of Patients with Osteogenesis Imperfecta: A Case Report¶

OSTEOGENESIS IMPERFECTA TANISI ALAN GEBELERDE ULTRASONOGRAFİNİN ROLÜ: OLGU SUNUMU

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Abstract

Our objective was to discuss the importance of prenatal diagnosis and differentiate types of Osteogenesis imperfecta (OI). We presented a patient with OI type I who admitted to our clinic at 36th weeks of gestation. Fetal assessment with ultrasonography showed a male fetus of 33 weeks gestation who have slightly shortened and significantly bowed femurs with generalized hypomineralization of long bones. A cesarean section was performed when cardiotocography revealed tachycardia. The baby was also diagnosed as type I OI with the clinical findings at birth and during follow-up. The severity of OI in the fetus cannot be predicted by the phenotype of mother. Thus, the diagnosis of the type of the disease and the route of delivery should be based upon the findings on ultrasonography and obstetric considerations.

Key Words: Osteogenesis imperfecta, ultrasonography, operative delivery

Özet

Amacımız osteogenesis imperfecta (OI)'nın prenatal tanısı ve tip tayininin önemini tartışmaktı. Otuz altıncı gebelik haftasında kliniğimize başvuran OI tip I tanısı konulan olgu sunuldu. Ultrasonografiye göre 33. gebelik haftası ile uyumlu erkek bebekte uzun kemiklerde yaygın hipomineralizasyonun yanı sıra femurların kısa ve belirgin biçimde eğri olduğu saptandı. Kardiotokografide fetal taşikardi görülerek hasta sezaryenle doğurtuldu. Yenidoğan servisinde de klinik bulgulara ve takipteki gelişmelere göre OI tip I tanısı konuldu. Sonuç olarak, annenin fenotipiyle fetal hastalığın şiddeti belirlenemeyeceği için hastalığın tip tayininin yapılarak ultrasonografi ve obstetrik nedenlere göre doğum şekli belirlenmelidir.

Anahtar Kelimeler: Osteogenesis imperfecta, ultrasonografi, operatif doğum

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Osteogenesis imperfecta (OI) is a generalized connective tissue disorder characterized mainly by bone fragility, blue sclerae and to a lesser extend joint hypermobility, kyphoscoliosis, hearing disorders, hernias and easily bruised skin.[1] The incidence in pregnancy is about 1/25,000 to 1/30,000 and type I OI is the most prevalent whereas type II is the lethal form.[2] We present a case with sonografic diagnosis of a nonlethal form of OI from a woman who have type I disease to stress the need to avoid diagnostic delay and minimize adverse operative impact.

Case Report

A 27 years old, gravida 1, para 0 woman at 36 weeks of pregnancy was admitted to our clinic with premature labor. She had not visited any health care service until that time, but told she had an uneventful pregnancy course. She had a short stature, with short extremities, kyphosis and blue sclerae. In her medical history, she had suffered from multiple fractures without pelvic bone involvement in her childhood to puberty, decreasing thereafter. She had a moderate hearing loss. Since she was from a low income status, she had not

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been followed properly by a specialist (i.e., orthopedist) for her skeletal disease until then. All routine blood and urine laboratory investigations (hemoglobin, hematocrit, platelet, urea, creatinine, liver tests) revealed normal results and also the coagulation profile was normal. On ear-nose and throat consultation the hearing loss was diagnosed as a moderate form, caused by a conductive defect. All these findings, especially recurrent multiple fractures made us to conclude that the woman has type I OI.

Fetal assessment with ultrasonography showed a male fetus of 33 weeks of gestation with generalized hypomineralization of the long bones, the bones in the hands and feet and the skull (Figure 1). The BPD measurement was compatible with 33.3 weeks (83 mm), head circumference with 31.6 weeks (289 mm), abdominal circumference with 32.1 weeks (281 mm) and femur length with 30.1 weeks' (57.5 mm) of gestation. However, the ribs were all in normal appearance and the amniotic fluid index was in normal limits. We did not observe any bone fractures, but femurs were slightly shortened (< 5. persentile) and bowed. The umbilical and middle cerebral artery Doppler flow velocities were in the normal limits. The presentation of the fetus was vertex, and she had contractions with cervical dilatation on digital examination. Repeated Non-stress tests (NST) revealed contractions with tachycardia. We performed a cesarean section and delivered a male infant weighing 2300 gr. with 1- and 5-minute Apgar scores of 5 and 7, respectively. We did not find any cause of fetal tachycardia such as chorioamnionitis, abruptio placenta or uterine rupture during the cesarean section. The infant was taken to the neonatal intensive care unit (NICU) immediately after birth for observation. On physical examination he had soft skull, blue sclerae with pectus carinatus and pes equinovalgus deformities with a lack of fracture on long bones. Radiography confirmed the antenatal sonographic findings of the bowed femurs and also hypomineralization in the long bones, bones in the hands, feet and skull (Figure 2). The baby was also diagnosed as type I disease as his mother by the clinical approach. The baby stayed in the NICU for 10 days with a diagnosis of respiratory distress syndrome and received antibiotics and oxygen therapy. On the third day in NICU, a left femur fracture occurred while changing his diaper. Cast-brace immobilization in proper alignment was applied to the fractured bone. Thereafter, he was discharged home from the neonatal unit in good condition on the thirteenth day and followed up as outpatients. He was physically and neurologically normal at 18 months follow-up with normally appearing sclerae and no evidence of any fractures.

Discussion

Although fetal skeletal dysplasias are rare, they are still a challenging issue for the obstetrician. Skeletal dysplasias consists of a heterogeneous group of disorders which affect the shape and the size of the skeleton, osteogenesis imperfecta the third most abundant form. The basic pathology in OI is defective maturation of type I collagen produced by mutations in either the COL 1A1 or the COL 1A2 genes.[3] The classification of OI has been made by Sillence[4]based upon the clinical phenotype and inheritance which divides the disease into 4 main groups. Type II and III are the severe and the lethal forms, whereas type I and type IV are milder ones.[5] The incidence of all types is about 1/10,000 to 1/12,000, but the incidence of each specific type varies between 1/28,500 and 1/60,000.[6] As in our patient, Type I patients have typically bluish coloration of sclerae, mild osteopenia with recurrent fracture (deformity is uncommon or mild) and conductive or sensorineural deafness. Type II disease is often fatal within the first few days of life by respiratory complications and is most commonly diagnosed in-utero by using the typical triad of diffuse hypomineralization of bones, multiple fractures and shortening of long bones.[7] Severe shortening of long bones (≤4 SD), femur length/abdominal circumference <0.16, hypoplasia of the thorax identified by torax circumference under 50. percentile, thorax circumference / cardiac circumference ≤60%, thorax circumference / abdominal circumference <0.77 and multiple fractures of the long bones are the findings which can be determined by sonography.[8,9] We identified our

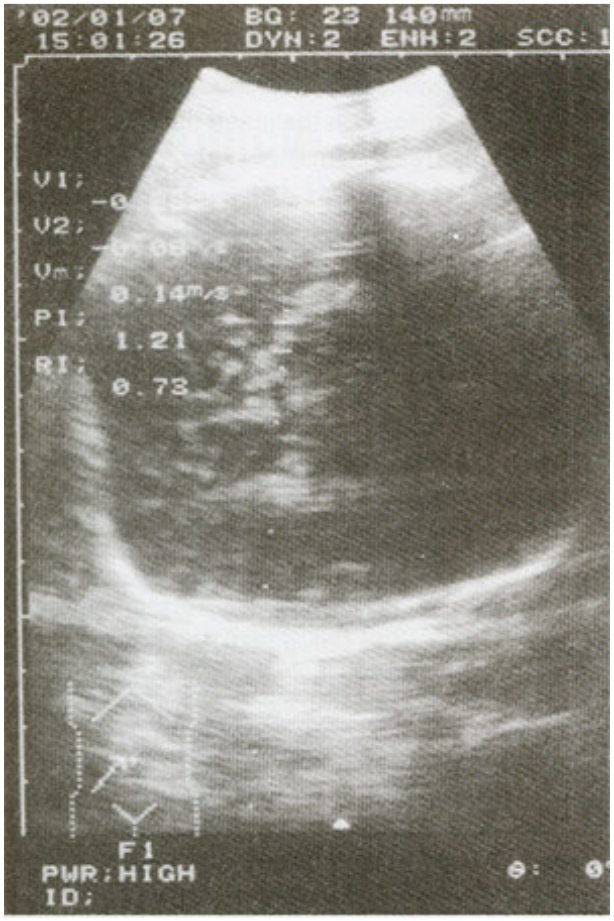

Figure 1. Hypomineralization of the skull.

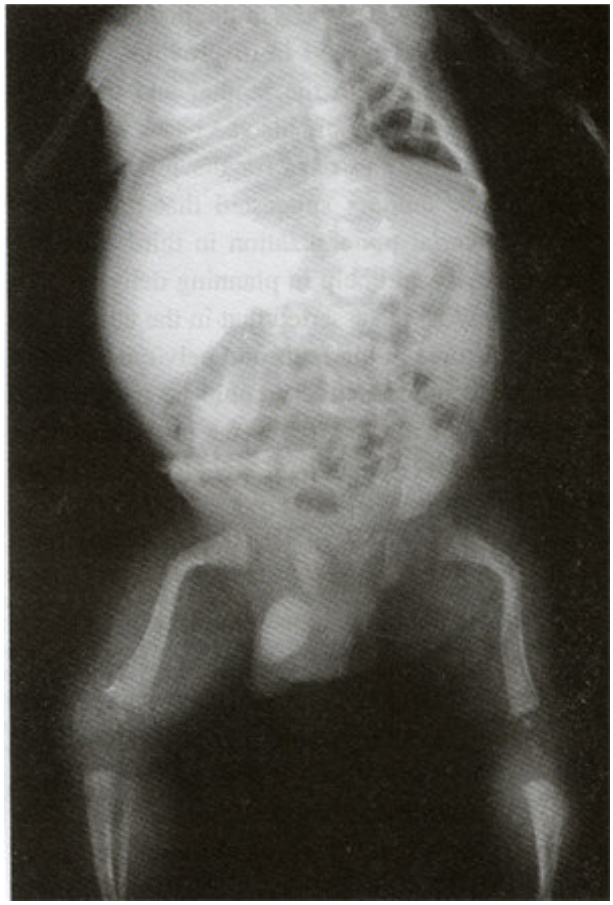

Figure 2. Note the bowed femurs and hypomineralization in the long bones, bones in the hands and feet.

case from type II disease by the absence of generalized fractures, rib fractures and small thorax cavity on sonography. Type III is characterized by progressive skeletal deformity from recurrent fractures commonly with dental manifestations and short stature. Moreover, osteoporosis and macrocephaly also exist. The pelvis can have a triradiate shaped appearance and this can help to define type III disease.[4] Type IV and type I can be diagnosed in the late second and third trimester of pregnancy based both on mild femoral bowing and slightly shortening of femurs. However, sonographic appearance could not differentiate type I or type IV disease from another.[10] For a definite differentiation of type I and type IV, a genetic counseling is obligatory. In OI type I there was a substitution for residue other than glycine in the triple helix of α1 (I) type I procollagen, but in type IV disease point mutations occur in the α2 (I) or rarely in the α1 (I) chain.[3] Type IV patients generally have normally appearing sclerae, whereas blue sclerae exists in type I disease, such as in our patient and the newborn. In the differential diagnosis of OI, congenital hypophosphatasia must also be considered which exhibits moderate micromelia and diffuse hypomineralization; the degree of which the tubular bones are delicate or may even be absent.

Type I OI is inherited in an autosomal dominant manner, but about one-third of cases occur with new mutations.[3] Although the newborn in our case was diagnosed as OI type I as in his mother, the severity of the disease in the infant can not be predicted by the phenotypic presentation of the mother.[6] Thus, a sonographic evaluation of the

fetus is mandatory. The goal in the management of OI in the prenatal period is to provide an atraumatic delivery for both the mother and the fetus. Method of delivery should also be based on obstetric considerations and risks for the infant and the mother. Some authors suggested that the assessment of calvarial mineralization in third trimester of pregnancy would help in planning delivery.[11] In a recent study it was asserted that in the absence of in utero fractures in the fetus and pelvic fracture in the mother, vaginal delivery could be performed.[6] If vaginal delivery is chosen, instrumentation probably should be minimized to avoid intracranial trauma. We have performed a cesarean section because of the presence of fetal tachycardia. Cesarean section can also be chosen based on the hypotheses that cesarean is more controlled and less traumatic for the fetus then vaginal delivery, impresses survival and decreases morbidity. Moreover, a case of spontaneous uterine rupture in a woman with OI have been described in the literature.[12] Thus, the performance of cesarean section as soon as the patient had contractions and cervical dilatation might prevent the occurrence of such a complication during labor. Since patients with OI usually have potential anesthetic problems like hard endotracheal intubation, sinus tachycardia and malign hyperprexia, delivery in a tertiary center is recommended. Also, during cesarean section one should prefer to use permanent suture materials in the closure of the rectus sheath in order to prevent hernia which might be a common complication because of defective collagen synthesis.[2] Besides, a tendency of uterine atony and bleeding problems must be mentioned and managed accordingly.

In conclusion, osteogenesis imperfecta is an inherited condition with different types of severity. Sonographic evaluation is essential to the diagnosis of the type of disease in the infant in order to differentiate primarily the lethal and non-lethal forms of the disease. The route of delivery should be based upon the form of OI and obstetric considerations.

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