Scientific Research Publishing

Open Journal of Obstetrics and Gynecology, 2024, 14, 996-1002
https://www.scirp.org/journal/ojog
ISSN Online: 2160-8806
ISSN Print: 2160-8792

Case Report and Clinical Management of a Case of Osteogenesis Imperfecta Detected in the Prenatal Period

Amina Chaieb[1,2], Oumayma Ben Rejeb[1,2*], Samar Knaz[1,2], Yasmine Ben Ali[1,2], Syrine Chelly[1,2], Safia Ernez[1,2], Mouna Derouiche[1,2]

[1]Department of Gynecology and Obstetrics, Farhat Hached University Hospital, Sousse, Tunisia
[2]Faculty of Medicine Ibn Al Jazzar, University of Sousse, Sousse, Tunisia
Email: *oumaymabr93@gmail.com

How to cite this paper: Chaieb, A., Ben Rejeb, O., Knaz, S., Ben Ali, Y., Chelly, S., Ernez, S. and Derouiche, M. (2024) Case Report and Clinical Management of a Case of Osteogenesis Imperfecta Detected in the Prenatal Period. *Open Journal of Obstetrics and Gynecology*, **14**, 996-1002.
https://doi.org/10.4236/ojog.2024.147079

Received: May 21, 2024
Accepted: July 7, 2024
Published: July 10, 2024

Abstract

Osteogenesis imperfecta is a hereditary disease characterized by bone fragility due to a defect in type I collagen synthesis. The diagnosis is typically suspected based on suggestive ultrasound findings and confirmed through genetic studies. We present a case of osteogenesis imperfecta suspected during obstetrical ultrasound at 19 weeks' gestation, which was later confirmed radiographically through computed tomography. Due to the severity of the condition, therapeutic termination of pregnancy was indicated.

Keywords

Osteogenesis Imperfecta, Ultrasound Screening, Antenatal Diagnosis

1. Introduction

Osteogenesis imperfecta is an inherited congenital osteoporosis and a rare disease [1] characterized by highly variable skeletal and extraskeletal involvement. The majority of patients have a mutation in one of the two genes encoding the type I collagen alpha chains [2]. Among the new approaches to prenatal diagnosis, molecular biology techniques that identify specific genetic mutations are invaluable. However, ultrasound remains the method of choice for early diagnosis, particularly for detecting severe forms of the disease [3].

We report a case of osteogenesis imperfecta diagnosed prenatally by ultrasound, with additional confirmation through tomography. Postnatally, the diagnosis was confirmed by an anatomopathological study.

2. Observation

A 32-year-old primiparous woman with no past medical history is currently in her second trimester of pregnancy. She previously delivered a healthy term infant. The current pregnancy was unremarkable until a fetal ultrasound at 19 weeks' gestation.

The ultrasound revealed an intrauterine monofetal pregnancy with a live fetus with multiple anomalies:

Skull: Depressed with little ossification (Figure 1).

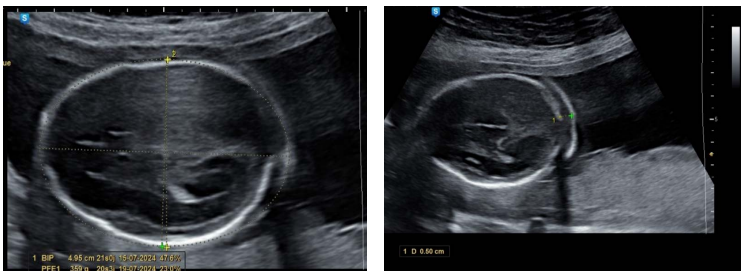

Figure 1. Prenatal ultrasound scan: depressible skull with little ossification.

Thorax: Small and narrow.

Limbs: Upper and lower limbs are short and bowed (Figure 2).

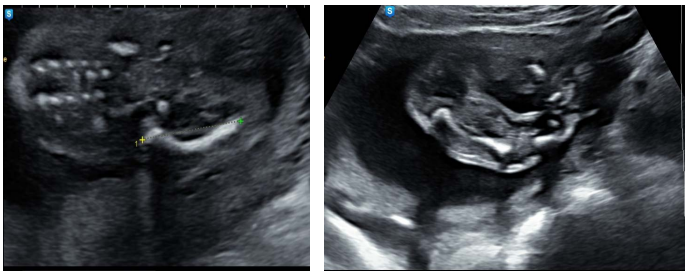

Figure 2. Appearance of the upper and lower limbs: short and curved and narrow chest.

Ectrodactyly: Present with varus feet and a split between the third and fourth toes (Figure 3).

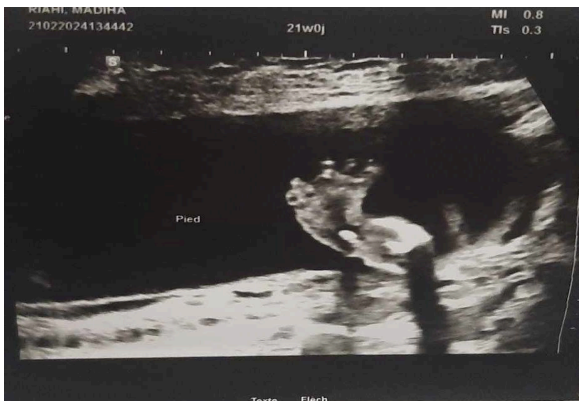

Figure 3. Ectrodactyly.

Genitalia: Short penis observed (Figure 4).

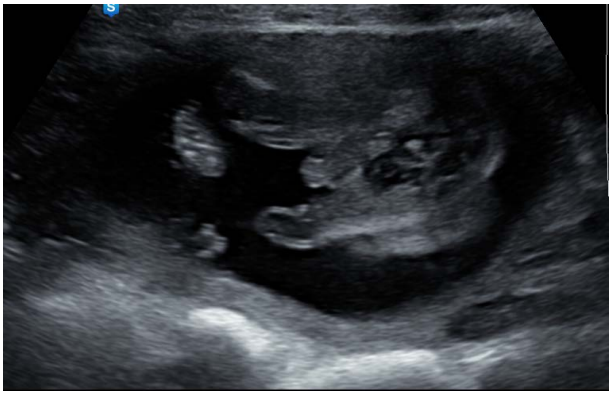

Figure 4. Short penis.

A CT scan of the uterus confirmed the presence of an osteoporotic fetus with fractured short ribs, deformed bones, and flattened vertebral bodies, leading to the overall diagnosis of lethal osteogenesis imperfecta (OI). Given the severity of the findings, a therapeutic abortion was performed, resulting in the delivery of a 360 g macerated stillborn female.

On post-delivery examination, the fetus presented with a soft skull, low-set ears, microretrognathism (Figure 5), short and irregular limbs with ectrodactyly of both feet (Figure 6), and a permeable anus. A skeletal radiograph (Figure 7) revealed a transparent appearance throughout the skeleton, a non-ossified skull, wavy, bamboo-like ribs, and short, curved, and irregular limb bones. Pathology confirmed the diagnosis of osteogenesis imperfecta.

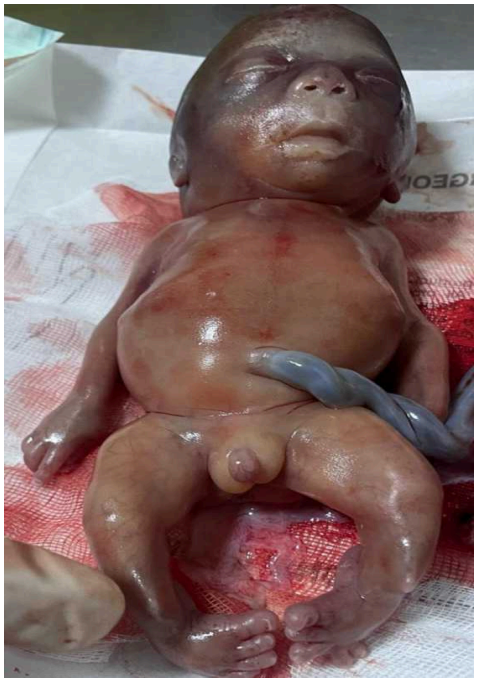

Figure 5. Post natal appearance of the fetus.

Figure 6. Ectrodactyly.

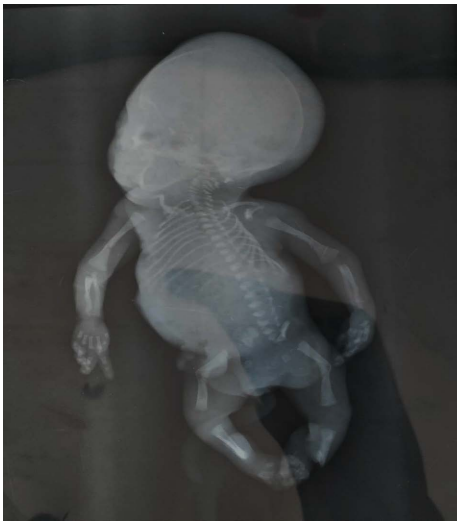

Figure 7. Fetal skeleton x-ray: multiple fractures of the long bones with flattened vertebral bodies.

3. Discussion

Osteogenesis imperfecta (OI), also known as "glass bone disease," is a rare genetic condition with an estimated prevalence of 1 in 10,000 to 20,000 people [3]. The disease affects both sexes equally and shows no ethnic or racial predominance. It is characterized by low bone mass and increased bone fragility, manifesting in a combination of skeletal and extra-skeletal signs of varying severity.

In the majority of osteogenesis imperfecta (OI) cases, around 90%, the condition manifests as autosomal dominant, primarily resulting from single mutations

in genes like COL1A1, COL1A2, or IFITM5. Conversely, the remaining 10% of cases are largely characterized by autosomal recessive inheritance, driven by dual mutations in genes crucial for the synthesis, maturation, or posttranslational modification of type I collagen, notably COL1A1 and COL1A2. Fourteen distinct genes are implicated in this process, including P3H1, CRTAP, PPIB, FKBP10, SERPINH1, SP7, SERPINF1, BMP1, TMEM38B, WNT1, CREB3L1, TAPT1, PLOD2, and SPARC. X-linked recessive forms, although exceptionally rare, involve genes like PLS3 and MBTPS2 [2] [4] [5].

The types of osteogenesis imperfecta vary widely, from mild forms with few fractures, no bone deformities, and normal stature, to forms that are fatal in the perinatal period. The classification by Sillence *et al.*, updated in 2004 by Rauch and Glorieux, is the most widely used and distinguishes seven forms of OI. Except for the most severe forms, it can be challenging to classify a patient at the initial detection of the pathology, especially in the first years of life. Therefore, using a classification based on the age of onset may be useful [1].

Ultrasound is a key test in the diagnosis of Osteogenesis Imperfecta (OI), particularly for detecting severe and fatal forms during the second trimester. However, while severe and fatal forms can be identified at this stage, benign forms may not be visible on ultrasound [6]. Abnormal ultrasound findings indicative of severe OI include long bone shortening (especially of the femur), curvature, and multiple fractures. Additionally, fatal forms show severe demineralization with thin, easily compressible calvaria and no posterior acoustic shadowing of the long bones [7] [8]. A femur length to abdominal circumference ratio of less than 0.16, fetal lung volume less than the fifth percentile for gestational age (as measured by ultrasound or MRI), and hydramnios are associated with a fatal outcome.

Prenatal diagnosis of lethal type II osteogenesis imperfecta (OI) is possible and is suggested by the pathognomonic association of severe micromelia of all four limbs with angulated diaphyses indicative of multiple fractures and calluses. The skull vault is poorly ossified and easily depressed by probe pressure, making cerebral structures overly visible [7].

Type II OI has three subtypes (A, B, and C) distinguished by radiologic features:

- **Type IIA OI:** Wide ribs with multiple fractures, a continuous rosary appearance of the ribs, and severe femoral modeling defects.
- **Type IIB OI:** Normal or slender ribs, few fractures, a discontinuous rosary appearance of the ribs, and mild femoral modeling defects.
- **Type IIC OI:** Ribs of variable thickness with a discontinuous rib rosary appearance, malformed scapula and ischium, and thin, twisted long bones. Type IIC is extremely rare, and its existence has been questioned [5] [7].

Ultrasound findings alone do not allow for an accurate differential diagnosis with other skeletal dysplasias. Three-dimensional helical CT provides more detailed data on skeletal anomalies. In difficult cases, the benefit of combining ultrasound with CT has been demonstrated [9] [10].

X-rays show excessive transparency of the entire skeleton, poor ossification of the cranial vault, very short and deformed long bones, and a string of ribs appearance [1].

The outlook for individuals with osteogenesis imperfecta (OI) varies depending on the extent of the condition and its management. Incorporating bisphosphonates along with physical therapy and surgical interventions has notably enhanced the independence of individuals with severe OI. Prognosis is intricately linked to the severity of respiratory and spinal abnormalities. Typically, individuals with type I or IV OI can expect a regular lifespan, whereas those with more severe types, like type II or III, might face a considerably shortened lifespan due to complications associated with their condition [3].

In cases where lethal OI is suspected based on radiologic signs, therapeutic abortion followed by anatomopathologic analysis is often necessary for diagnostic certainty. This approach is particularly important to confirm the diagnosis and clarify the prognosis [6].

Genetic analysis is also crucial in this context. Advances in genetic research have made it possible to identify specific mutations and transmission patterns, which are essential for genetic counseling and management. This information helps in understanding the inheritance pattern, assessing recurrence risks, and planning future pregnancies [5].

4. Conclusion

Osteogenesis imperfecta is a rare and potentially severe genetic disorder characterized by a wide spectrum of phenotypes, varying from mild to life-threatening forms. Ultrasound surveillance during pregnancies is crucial for individuals with a family history of the condition or those personally affected. The management of osteogenesis imperfecta requires a comprehensive, multidisciplinary approach.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Hsayaoui, N., Mbarki, C., Melliti, S., Elkadhi, Y., Douik, F., Mezghanni, S., *et al.* (2015) L'ostéogenèse imparfaite: à propos d'un cas. *Pan African Medical Journal*, **21**, Article 83. https://doi.org/10.11604/pamj.2015.21.83.6416

[2] Amberger, J.S., Bocchini, C.A., Schiettecatte, F., Scott, A.F. and Hamosh, A. (2014) Omim.org: Online Mendelian Inheritance in Man (OMIM®), an Online Catalog of Human Genes and Genetic Disorders. *Nucleic Acids Research*, **43**, D789-D798. https://doi.org/10.1093/nar/gku1205

[3] Dinulescu, A., Păsărică, A., Carp, M., Duşcă, A., Dijmărescu, I., Pavelescu, M.L., *et al.* (2024) New Perspectives of Therapies in Osteogenesis Imperfecta—A Literature Review. *Journal of Clinical Medicine*, **13**, Article 1065. https://doi.org/10.3390/jcm13041065

[4] Andersson, K., Dahllöf, G., Lindahl, K., Kindmark, A., Grigelioniene, G., Åström,

E., *et al.* (2017) Mutations in COL1A1 and COL1A2 and Dental Aberrations in Children and Adolescents with Osteogenesis Imperfecta—A Retrospective Cohort Study. *PLOS ONE*, **12**, e0176466. https://doi.org/10.1371/journal.pone.0176466

[5] Panzaru, M., Florea, A., Caba, L. and Gorduza, E.V. (2023) Classification of Osteogenesis Imperfecta: Importance for Prophylaxis and Genetic Counseling. *World Journal of Clinical Cases*, **11**, 2604-2620. https://doi.org/10.12998/wjcc.v11.i12.2604

[6] Chamunyonga, F., Masendeke, K.L. and Mateveke, B. (2019) Osteogenesis Imperfecta and Pregnancy: A Case Report. *Journal of Medical Case Reports*, **13**, Article No. 363. https://doi.org/10.1186/s13256-019-2296-0

[7] Deguchi, M., Tsuji, S., Katsura, D., Kasahara, K., Kimura, F. and Murakami, T. (2021) Current Overview of Osteogenesis Imperfecta. *Medicina*, **57**, Article 464. https://doi.org/10.3390/medicina57050464

[8] Milks, K.S., Hill, L.M. and Hosseinzadeh, K. (2016) Evaluating Skeletal Dysplasias on Prenatal Ultrasound: An Emphasis on Predicting Lethality. *Pediatric Radiology*, **47**, 134-145. https://doi.org/10.1007/s00247-016-3725-5

[9] Gilligan, L.A., Calvo-Garcia, M.A., Weaver, K.N. and Kline-Fath, B.M. (2019) Fetal Magnetic Resonance Imaging of Skeletal Dysplasias. *Pediatric Radiology*, **50**, 224-233. https://doi.org/10.1007/s00247-019-04537-8

[10] Ulla, M., Aiello, H., Cobos, M.P., Orioli, I., García-Mónaco, R., Etchegaray, A., *et al.* (2011) Prenatal Diagnosis of Skeletal Dysplasias: Contribution of Three-Dimensional Computed Tomography. *Fetal Diagnosis and Therapy*, **29**, 238-247. https://doi.org/10.1159/000322212