

## A 1-month-old baby with Osteogenesis Imperfecta : A Case Report

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### Abstract :

Osteogenesis imperfecta (OI) is a connective tissue formation disorder that is generally characterized by bone fragility, osteopenia, blue sclera, dentinogenesis imperfecta (DI), and hearing loss. This disease occurs due to changes in collagen type 1 that forms the basis of bone formation, so that bones tend to be thinner and smaller. The bones become weak and easily cracked. OI has been classified by type according to the system based on the mode of inheritance, clinical features, and information from the X - ray. There is a four types of osteogenesis imperfecta, namely Type I, Type II, Type III and Type IV. Health problems often seen in children and adults who have OI include: short stature, weak tissues, fragile skin, muscle weakness, and loose joints, bleeding, easy bruising, frequent nosebleeds , and tiny amounts of the heavy bleeding from the wound,impaired loss of hearing can begin in childhood and affects approximately 50 % of adults, breathing problems, a higher incidence of asthma plus risk for other lung problems, spinal curvature.

### Introduction

Osteogenesis imperfecta (OI) is a genetic disorder that is characterized by recurrent fractures, low bone mass, blue sclera and dentinogenetic imperfecta (DI). It is a rare disorder with an overall incidence of 1 in 10,000-20,000 births. <sup>1</sup>The etiology remains unclear however, it is estimated that ~90% of cases are associated with mutations in the collagen type I,  $\alpha 1$  (COL1A1) or COL1A2 genes and the remaining 10% of cases are associated with other genes.<sup>2</sup>

OI is a heterogeneous disease and type I is the most common and mild form. The clinical classification by Silence et al., is the most helpful in prognosis and genetic counseling and it groups OI into four types: Type I OI is mild, type II is perinatal lethal, type III is progressive deforming and type IV is moderately severe. It is characterized by multiple and recurrent fractures, which are intrauterine or perinatal or post-natal. Other features include blue sclera, otosclerosis

with hearing loss, high arched palate, hyperlaxity of ligaments and skin, "dentinogenetic imperfecta" (defective dentition), scoliosis and growth retardation. Wormian bones could also be seen on skull X-ray. Intelligence is not affected. Diagnosis can be made clinically. Radiographic support and confirmation by collagen analysis of skin fibroblast culture or blood deoxyribonucleic acid analysis may be necessary in some cases. This is important for genetic counseling and cases of suspected child abuse. Prenatal diagnosis for at risk pregnancies by fetal ultrasonography in the early 2nd trimester is possible and enables care. There's no cure for OI. Management is multidisciplinary involving mainly surgery, physiotherapy and rehabilitation. However, medical treatment, especially with bisphosphonate, has shown good prospects.

### Case Illustration

A baby girl aged 1 month 24 days comes with complaints of bowing feet since birth (**Figure 1**). As the patient was 1 month old, the bowing legs became more prominent and the patient's mother admitted that she cried more often when she was carried. Referred to an orthopedic specialist and based on x-ray results the diagnosis is Osteogenesis Imperfecta. The patient's mother also admitted that at 29 weeks of gestation based on prenatal ultrasound there was a skeletal dysplasia in the fetus. Based on the nutritional status and anthropometry of the baby, the results showed normal weight according to age, normal stature, good nutritional status,

normocephalic. On physical examination found blue sclera on both eyes (**Figure 2**) and bowing in femur bilateral and tibial region (femur and tibia sinistra appear more dominant) (**Figure 3**). In this case, the baby deformities in the extremity that occurred without prior trauma and there was a gray-blue sclera, all the abnormality was present from birth. On X-ray examination, bowing of the femur, tibia and fibula are shown bilaterally. The bones appear to have diffuse osteopenia with a thinning cortex (**Figure 4**). Also, on x-ray examination of bilateral manus, showing results epiphyseal plate has not closed (according to age), suspicious contracture in bilateral human bones and bone density decreased with coarse trabeculation (**Figure 5**).



**Figure 1.** Patient's Clinical Appearance at Birth. Bowing of the femur, tibia and fibula bilaterally.



**Figure 2.** Blue sclera in osteogenesis imperfecta.



**Figure 3.** Patient's clinical appearance at 1 month. Bowing of the femur, tibia and fibula bilaterally (the femur Sinistra and Tibia Sinistra appear more prominent).



**Figure 4.** X-Ray - Lower Extremity Bilateral AP, Lateral View. Findings bowing Os of the femur, tibia and fibula were shown bilaterally and the bones appear Diffuse osteopenia with thinning cortex.



**Figure 5.** X-Ray Manus Bilateral AP, Oblique View. Findings epiphyseal plate has not closed. Suspect bilateral contracture of the human bones and bone density decreases with coarse trabeculation.

## Discussion

Osteogenesis imperfecta is caused by a genetic disorder characterized by bones that break easily, that affects the body's production of collagen. One of the genes that has function for the body to make a specific protein (type I collagen) is defective in person with osteogenesis imperfecta. Type I collagen is a major component of the connective tissues in bones, ligaments, teeth and sclerae. A person with osteogenesis imperfecta may have associated features, including short stature/dwarfism, macrocephaly, blue sclerae, dentinogenetic imperfecta, hearing loss and neurological and pulmonary complications. Most cases of osteogenesis imperfecta are caused by genetic effect. If one parent has osteogenesis imperfecta, the child has 50 percent chance of being born with osteogenesis imperfecta.

Type II of OI is the severe form of osteogenesis imperfecta. The collagen is improperly formed. Bones may break even while the fetus is in the uterine, and many infants are still-born or die after birth. In addition to complete medical history and physical examination, diagnostic procedures for oogenesis imperfecta may include a skin biopsy to evaluate the amount and structure of collagen. However, this test is complicated and not many quality laboratories are available to perform the procedure.

The diagnostic approach involves all aspects including family history of the same disease, pregnancy history, and physical examination. In general, the diagnosis can be made clinically. Only in some situations special examinations are required such as collagen and DNA examinations, namely if after clinical examination in the form of anamnesis, physical examination, and radiological examination, the diagnosis of OI cannot be confirmed or is still in doubt.

The main questions that should be asked of the family history are regarding the height of the family members, the color of the sclera, history of fractures and the presence of deafness in the family members. In this case, there is no family history of blue

sclera, skeletal abnormalities or deafness, and the possibility of gene damage that occurs is from a spontaneous mutation. The sign of OI is the presence of brittle bones accompanied by fractures either without, or accompanied by trauma of a mild or moderate nature. In general, the earlier the fracture occurs, the more severe the degree of OI you suffer. The lower extremity is the area most commonly affected. Fracture The femoral is the most common type of fracture of the long bone, with its general location in the convex, transverse, and minimally displaced part of the bone. In this case, the patient had multiple deformities in the extremities that occurred without prior trauma and the abnormality was present at birth from ultrasonography prenatal.

Until now, there is no known treatment option that will cure osteogenesis imperfecta. Early-termination is preferable. The goal of treatment is to prevent deformities and fractures and allow the child to function as independently as possible. Management of osteogenesis imperfecta can be either non-surgical or surgical. Non-surgical interventions may include one or more of the following;

- Physical therapy
  - Positioning aids (to help sit, lie or stand)
  - Braces and splints (to prevent deformity and promote support or protection)
  - Medications-bisphosphonates, growth hormone
  - Psychological counseling
  - Gene therapy
- Surgical interventions may be considered to manage the following conditions
- Fractures
  - Bowing of bone
  - Scoliosis
  - Dental procedures
  - Heart problem

Research into other treatment methods is continuing. Several clinical trials are focused on the use of medications to improve bone strength and decrease fracture rates.

Pamidronate (a bisphosphonate) has been found to inhibit bone resorption. As a result, chronic bone pain lessens, bone density increases, fewer fractures occur and mobility improves. Administration of bisphosphonates at an early age leads to less incurving of bone, thus allowing minimally invasive rod insertion surgery, even in the patient with more severe OI. Major complications of surgical included external migration, absence of elongation with fracture, internal migration with fracture, injury of the physis, bent rod, rod displacement into the joint, backing out of the proximal femoral rod, and severe external rotation. Minor complications included internal migration without fracture, absence of elongation, detachment of the T-piece, and superficial infection.

In this case, the therapy carried out was conservative by giving 400 IU drops of vitamin D supplementation and coming back to the doctor for re-control after 2 weeks. In addition, education is carried out to parents because the baby is still in the stage of development and growth. In the future when they start walking they must wear special shoes. Parents must also be pay attention with their spine, because it can break and experience paralysis in their children. It is necessary to pay attention to their weight too, try to still be in the ideal weight,

because if the child is obese it can cause additional weight on the bones which are already had brittle quality, which can worsen the condition of the bone deformity and can fracture the bones. For future planning, if both parents want to have more children, it is advisable to do genetic consultation to estimate what percentage can be affected by the child, which is then done for future planning so that the next child does not happen like this and the last one in this baby should not be carried carelessly, it must be the person who already trained because of the risk of fracture. Finally, patients with osteogenesis imperfecta who are at risk of vitamin D deficiency are advised to bask at 10-15 minutes of sun exposure every morning because the benefits of vitamin D to maintain bone strength.

### **Conclusion**

OI is a rare inherited disorder Osteogenesis imperfecta is a progressive condition that needs life-long management to prevent deformity and The prognosis of an individual with osteogenesis imperfecta varies greatly depending on the number and severity of symptoms. The interdisciplinary healthcare team helps the family to improve the functional outcomes and to provide support.

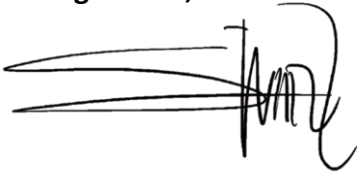


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Signature ,

A handwritten signature in black ink, consisting of several horizontal strokes followed by a vertical line and a cursive flourish.

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