Adams-Oliver syndrome. About a case

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Introduction

Adams-Oliver syndrome (AOS) is a rare congenital disorder characterized by congenital cutaneous aplasia of the scalp and terminal transverse limb anomalies (1). The lesions of congenital cutaneous aplasia are generally located on the midline of the parietal or occipital regions, where they may be associated with a parietal bone defect, but may also appear on the abdomen or limbs(1–3). First described by Adams and Oliver in 1945, this syndrome also presents severe forms of expression, including central nervous system anomalies, cardiovascular disease, and gastrointestinal malformations (1,4–6). Several modes of transmission have been described: autosomal dominant, autosomal recessive, and sporadic mutations (7–9). Six genes responsible for Adams-Oliver syndrome have been identified, including ARHGAP31, RBPJ, NOTCH1, DLL4, DOCK6, and EOGT (5,10,11). We report the case of a term newborn with severe intrauterine growth retardation (IUGR) presenting with typical signs of Adams-Oliver syndrome without associated visceral complications. This syndrome remains rare and poorly described in the scientific literature in Burundi.

Clinical case

A male newborn was born by vaginal delivery at 40 weeks in the maternity ward of the district hospital (MURAMVYA), with severe intrauterine growth restriction in a polymalformative setting, then transferred the following day to the neonatology unit of the Kamenge University Hospital (CHUK) for better management. The multiparous woman was 34 years old, and denied any toxic exposures or any illness during pregnancy and family history of the syndrome. The father is 41 years old and a farmer. The parents denied any prior family hereditary anomalies. She had attended two prenatal consultations; all the biological tests carried out releaved no particularities. Two obstetrical ultrasounds had been performed, but no antenatal anomalies were detected. The newborn was the 5th of 5 apparently healthy siblings. They all come from a non-consanguineous couple. On initial assessment in the delivery room, the newborn had a good Apgar and was respiratory and hemodynamically stable. On admission to the CHUK neonatal unit, evaluation of anthropometric parameters revealed a low weight of 1500 grams (< -3DS), a short stature of 37 cm (< -3DS) and microcephaly with a head circumference of 28 cm (< -3DS). Physical examination of the head revealed normotensive, pulsatile fontanelles and a 5x5 cm of aplasia cutis congenital in the left parietal region, associated with superficial dilatation of the scalp veins (fig. Ia). Hyperthelorism and dysmorphia facial were noted. Examination of the limbs revealed brachydactyly associated with hypoplasia of all fingers except the thumb and index finger of the right hand (fig. IIa); the thumb and small finger of the left hand (fig. IIb). In the right foot, amniotic amputation of the large toe with nail agenesis was also observed (fig. IIc). In the left foot, we observed nail agenesis, syndactyly amputation of the large and 3rd toes with clinodactyly of the 2nd toe and small finger with brachydactyly of the median with index and middle fingers with brachydactyly of the ring finger (fig. IId).

Cardiovascular, pulmonary, and neurological examinations were within normal limits. Paraclinical examinations were carried out, including transfontanellar and abdominal ultrasound, with no abnormalities noted, and X-rays of the limbs, which confirmed the above-mentioned abnormalities (Figs. IIIa, b, c, d). Medication with antibiotics and nutrition with maternel milk had been started, and local care of the aplasia cutis congenital with isotonic saline (NaCl 0.9%) was applied; as for the limb abnormalities, no treatment was initiated. After 4 weeks of hospitalization in neonatology, we observed that the scalp ulceration was healing and that he was gaining weight (2500g). He was discharged with follow-up appointments at 3, 6, 9, and 12 months of age, to assess his weight-for-height and the healing of the aplasia cutis congenital.

Evolution

At 4 months of age, the evolution was marked by a staturo-ponderal gain, respectively 57 cm and 5 kg (P/T -1.0 DS), microcephaly with a head circumference of 38 cm (< - 2 DS) and good skin healing on the left parietal level, leaving a circumscribed area of alopecia exposed (fig. Ib). His psychomotor progress was good. Ultrasound examination of the area of alopecia revealed a bone defect on the left parietal bone measuring 4.66 cm in diameter (fig. Ic). At 10 months of age, there was still no staturo-weight gain (weight 6.5 kg, height 65 cm with P/T -1.5 and -1 DS, microcephaly with a head circumference at 42 cm (-3, -2 DS). Psychomotor development was good, and an appointment was scheduled with the neurosurgeon for possible skin expansion and cranioplasty.

Discussion

The first description of Adams-Oliver syndrome, in 1945, was attributed to Forrest Adams and Peter Oliver who gave it their names; described 8 members of one family (1). It's a rare congenital disorder characterized by a polymalformative syndrome. Its incidence is estimated at 0.44 per 100,000 live births (8). It appears to be more common in women (1,4,5). Adam-Oliver syndrome combines congenital skin aplasia (aplasia cutis congenital) with distal limb anomalies. This syndrome corresponds to type 2 of Frieden's classification (Appendix 1) (12). Limb malformations are the important anomalies in ODS, with an estimated prevalence of 85%(13). The most frequently described anomalies are nail hypoplasia or anonychia, brachydactyly, polydactyly, syndactyly, and sometimes pseudo-amputation, with the absence of fingers or toes, or even complete absence of hand or foot in extreme forms(2). Cutaneous aplasia is the second most frequent anomaly, observed in 75 to 85% of cases(2,12). It most often affects the vertex in the parietal region, and more rarely the abdomen and limbs. In 64% of patients with vertex involvement, a bony defect of the underlying skull is found (4,10,14). The specific etiologies of congenital skin aplasia are not elucidated, but chromosomal abnormalities, particularly BMS1, intrauterine infections, and teratogenic agents during pregnancy are possible causes(4). Our case presented major criteria for ODS, namely skin aplasia at the vertex with bone defect and distal limb anomalies. Prenatal complications such as intrauterine growth retardation, oligohydramnios, or hydramnios are reported in less than 10% of cases(7,10,15). In our case, severe intrauterine growth restriction was noted. In the absence of other obvious etiologies, such as placental or chromosomal, it was thought to be of vascular origin. Cutis marmorata telangiectasia congenital (CMTC) is described in 20-25% of reported cases of SAO(2,15). It is characterized by dilation of the veins and capillaries of the cutaneous and subcutaneous tissue, anastomosing into networks giving a reticulated (or marbled) appearance. Bluish venous vessels may be visible through transparency, and skin ulcerations and atrophied areas may be noted in places. CMTC may be diffuse over the whole body, including the scalp, or limited to one area. Lesions may remain stable or regress over time(2,12,14).It was absent in our case. Cardiac malformations occur at a frequency of 23% and can account for the full severity of the disease (15). The anomalies observed are left-sided obstructive heart disease, interventricular or interatrial communications, pulmonary arterial hypertension, and pulmonary venous stenosis (4,16). In our case, no congenital heart disease was identified on cardiac ultrasound. Central nervous system malformations occur with a frequency of 30% and can also determine prognosis. A wide variety of anomalies have been described, including polymicrogyria, microcephaly, cortical dysplasia, hydrocephalus with subthalamic and periventricular calcifications, cerebellar hypoplasia, and agenesis of the corpus callosum(4,17–19). Other less frequent anomalies have also been described, such as genitourinary, ophthalmic, and intestinal anomalies

(4,15). Our patient had no central nervous system anomalies, as no abnormalities were detected either on neurological examination or on the transfontanellar ultrasound performed. Several genes (ARHGAP31, DOCK6, EOGT, RBPJ, NOTCH1, and DLL4) have been identified as linked to this syndrome, but without genotype-phenotype correlation(5,10,11). The pathophysiological mechanism is not well elucidated. Because of the various abnormalities observed, the vascular origin remains the most likely hypothesis, with the main mechanism being an in-utero thrombotic event causing early interruption of blood perfusion to the various affected areas(2). In the absence of a molecular biology and genetics department at the CHUK, no gene was identified in our patient. Autosomal dominant (20) and recessive (8,21) modes of inheritance have been reported, as have sporadic cases (7,9). In the absence of family history and molecular studies, the mode of transmission cannot be determined in our case. Management is multidisciplinary (13) ; there is no univocal management in the initial phase, as it depends on the type of congenital cutaneous aplasia (CCA). In particular, the presence of any associated abnormalities, such as a cardiac anomaly, must be taken into account, as these will affect the prognosis. In the case of ACC of the epidermis vertex with bone aplasia, surgical management is deferred(12). Constriction grooves are treated surgically with Z-plastics; multiple amniotic syndactylies, which are responsible for major functional limitations, require early treatment before any skeletal deformity occurs. The use of skin grafts, in addition to local skin plasty, is decided on a case-by-case basis. Amniotic amputations require few corrective procedures. Functional prostheses are of little use(22).Scarring alopecia of the vertex had not been corrected, awaiting the neurosurgeon's assessment, let alone the orthopedic burden.

Conclusion

Adams-Oliver syndrome remains a complex, rare congenital disorder, with very little documented in the scientific literature. It is essentially autosomal dominant, but recessive and sporadic modes have also been reported. This multisystem pathology, requiring regular follow-up, affects the quality of life and can be fatal if internal organs are affected. This syndrome requires a continuous and comprehensive multidisciplinary approach, from birth until the best medical, social, and psychological conditions are obtained.

Authors' contributions

John Mambo Itongwa : Writing original draft.

Moise Mbaluku Colombe : Writing original draft.

Helene Bukuru : Writing, review and editing.

Deogratias Niyongeko : Writing, editing and editing.

Cédric Irenge Matabaro : Writing original draft.

Fernand Manga Opondjo : Writing, editing and editing.

Viviane Feza Bianga : Writing, editing and editing.

Ndayishimye Alice : Supervision.

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Conflicts of interest

The authors declare any conflicts of interest.

Consent

Written consent was obtained from the parents.

References

1. Adams FH, Oliver CP. Hereditary deformities in man due to arrested development. J Hered. 1945;36:3–7.

2. Kojmane W, Hmami F, Atmani S. Adams-Oliver syndrome and cutis marmorata telangiectatica congenita. Ann Dermatol Venereol. 2019;146(3):223–5.

3. Lehman A, Wuyts W, Patel MS. Adams-Oliver Syndrome Summary Genetic counseling Diagnosis Suggestive Findings. In: Adam MP, Mirzaa GM, Pagon RA, et al [Internet]. GeneReview. University of Washington, Seattle; 2023. p. 1–27. Available from: https://www.ncbi.nlm.nih.gov/books/

4. Baroudi Ihsan, Ola Alakhras, Thaer Douri NA. Adams – Oliver syndrome , intestinal obstruction and heart defects : a case series of aplasia cutis congenita [Internet]. Vol. 1, Oxford Med Case Reports. 2022. p. 20–3. Available from: https://doi.org/10.1093/omcr/omab141

5. Suarez, E., Bertoli, M.J., Eloy, J.D, Shah SP. Case report and review of literature of a rare congenital disorder: Adams-Oliver syndrome. *BMC Anesthesiol* **21** , 117 (2021). https://doi.org/10.1186/s12871-021-01339-0

6. Seo J, Kang J, Lee H, Lee D, Sung H, Hwang S. CASE REPORT A Case of Adams-Oliver Syndrome. Ann Dermatol. 2010;22(1):96–8.

7. Yeo S, Perrot P, Bellier-Waast F, David A, Duteille F. Adams- Oliver Syndrome. About a case. Chir Main. 2010;29(4):274–6.

8. Temtamy SA, Aglan MS, Ashour AM ZM. Adams-Oliver Syndrome: Further Evidence of an Autosomal Recessive Variant. Clin Dysmorphol. 2007;16:141–9.

9. Narang T, Kanwar AJ DS. Adams-Oliver syndrome: a sporadic occurrence with minimal disease expression. Pediatr Dermatol. 2008;25:115–6.

10. Kim M. Wehrens, Frank De Jongh, MP Ter Laak, EM Cornips, RRWJ Van der Hulst. Treatment of a Large Skull Defect and Brain Herniation in a Newborn With Adams- Oliver Syndrome. Cureus. 2020; 12(2):e704-7. doi: 10.7759/cureus.7047.

11. Stittrich, A. B., Lehman A, Bodian DL, Justin A, Zong Z, Hong L et al. Mutations in NOTCH1 cause Adams-Oliver syndrome. Am J Hum Genet. 2014;95(3):275–84. doi: 10.1016/j.ajhg.2014.07.011.

12. Belkhou A, Francois C, Bennis Y, Martinot VD, Guerreschi P. Aplasia cutis congenita : update and management. Ann Chir Plast Esthet. 2016;61(5):450-461. doi: 10.1016/j.anplas.2016.07.003.

13. Messerer M, Diabira S, Belliard H, Hamlat A. Adams-Oliver Syndrome: About a case of minimal expression. Arch Pediatr. 2010;17(10):1460–4. Available from: http://dx.doi.org/10.1016/j.arcped.2010.07.009

14. Browning JC. Aplasia cutis congenita: approach to evaluation and management. Dermatol Ther. 2013;26(6):439–44. doi: 10.1111/dth.12106.

15. Lehman A, Wuyts W PM. Adams-Oliver syndrome. In: Pagon RA, Adam MP, Ardinger HH, Wallace SE, Amemiya A, Bean LJ, et al, editors GeneReviews1, Seattle (WA) Seattle: University of Washington; 2016.

16. Zapata HH, Sletten LJ, Pierpont ME. Congenital cardiac malformations in Adams- Oliver syndrome. Clin Genet. 1995;47(2):80-4. doi: 10.1111/j.1399-0004.1995.tb03928.x.

17. Amor DJ, Leventer RJ, Hayllar S, Bankier A. Polymicrogyria associated with scalp and limb defects: variant of Adams-Oliver syndrome. Am J Med Genet. 2000;93(4):328–34. doi: 10.1002/1096-8628(20000814)93:4<328::aid-ajmg13>3.0.co;2-0.

18. Orstavik KH, Stromme P, Spetalen S, Flage T, Westvik J, Vesterhus P, Skjeldal O. Aplasia cutis congenita associated with limb, eye, and brain anomalies in sibs: a variant of the Adams-Oliver syndrome?

Am J Med Genet. 1995; 59(1):92-5. doi: 10.1002/ajmg.1320590118.

19. Meester JAN, Sukalo M, Schroder KC, Schanze D, Baynam G, Borck G, et al. Elucidating the genetic architecture of Adams–Oliver syndrome in a large European cohort. Hum Mutat. 2018;39(9):1246–61.

20. Whitley CB, Gorlin RJ. Adams-Oliver syndrome revisited. Am J Med Genet. 1991; 40(3):319-26. doi: 10.1002/ajmg.1320400315.

21. Meester JA, Southgate L, Stittrich AB, Venselaar H, Beekmans SJ, Hollander ND et al. loss-of-function heterozygous mutations cause Adams-Oliver syndrome. Clin Genet. 2015; 97(3):475-82. doi: 10.1016/j.ajhg.2015.07.015.

22. Poeuf B, Samson P, Magalon G. Amniotic bridle syndrome, Chirurgie de la main. 2008;27(1):136–47. Doi : 10.1016/j.main.2008.07.016

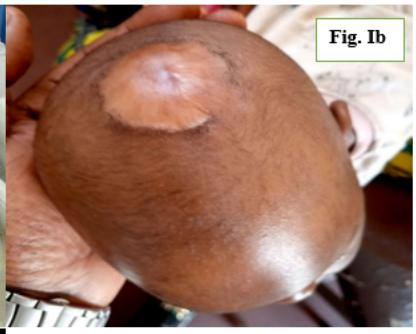


Figure I a, b, c :

Fig. Ia : Left parietal aplasia cutis congenital

Fig. Ib : Complete healing of the parietal aplasia cutis congenital

Fig. Ic : Left parietal bone defect through which cerebral contents herniate

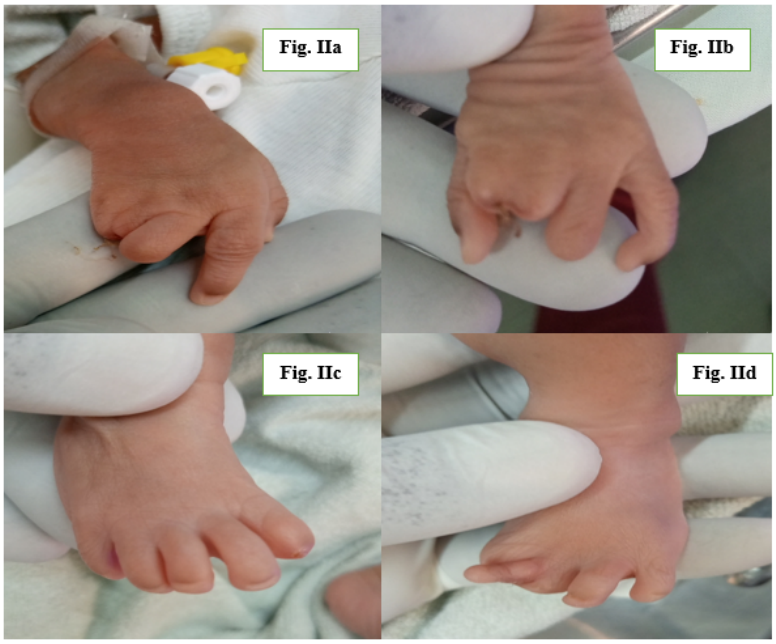


Fig. IIa : Amniotic amputation of the ring finger and small finger with brachydactyly of the middle finger

Fig. IIb : amniotic amputation of the index and middle fingers with brachydactyly of the ring finger

Fig. IIc : Total nail agenesis and short big toe

Fig. IId : Amniotic amputation-syndactyly of the big toe and 3rd toe with clinodactyly of the 2nd toe associated with nail agenesis.

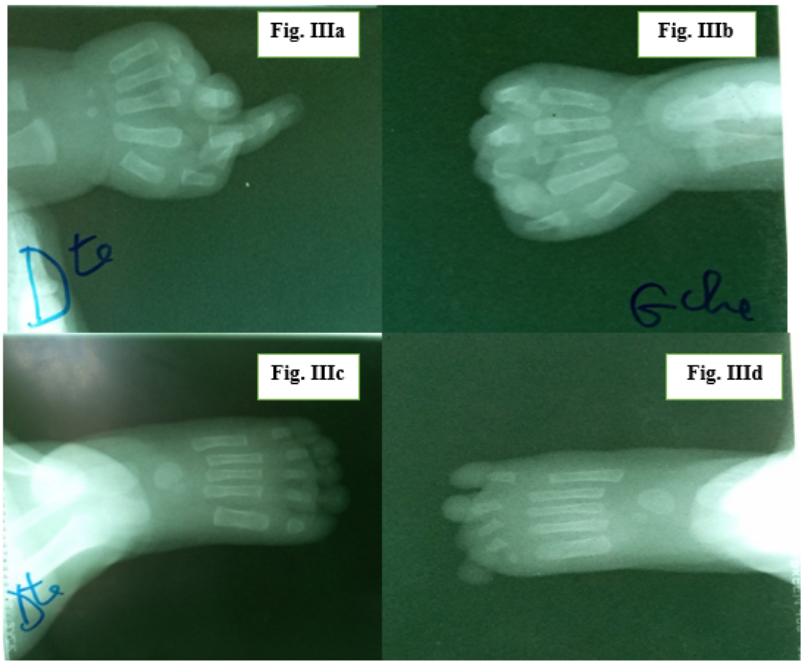


Fig. IIIa : **Right hand:** Complete agenesis of the middle and distal phalanges of the middle finger, proximal brachyphalangia with complete agenesis of the middle and distal phalanges of the ring and little fingers.

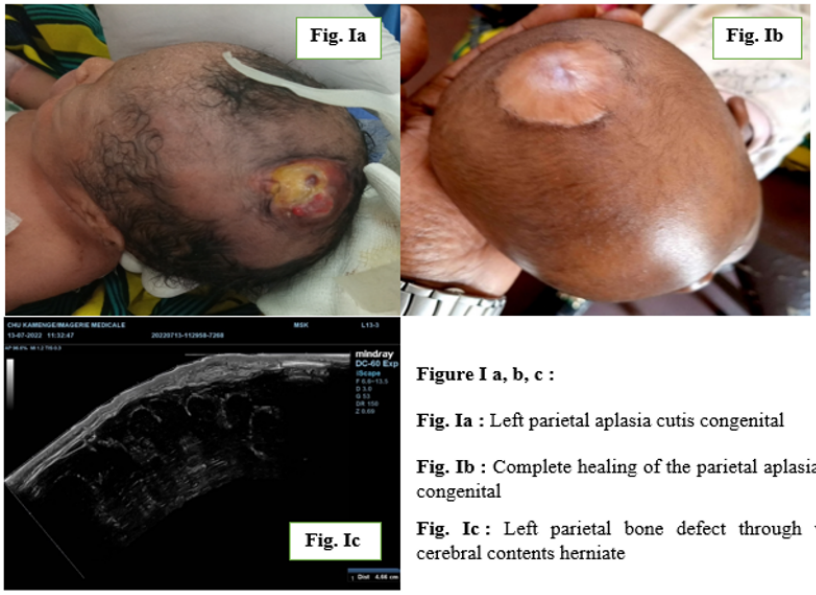
Fig. IIIb : **Left hand:** Complete agenesis of the middle and distal phalanges of the index and middle fingers, complete agenesis of the middle and distal phalanges of the ring finger.

Fig. IIIc : Right foot: Brachy-basophalangea and complete agenesis of the distal phalanx of the great toe, agenesis of the middle and distal phalanges of the other toes.

Fig. IIId : **Left foot:** proximal brachyphalangia with complete agenesis of the distal phalanx of the big toe, proximal brachy-clinophalangia with complete agenesis of the middle and distal phalanges of all toes.

Frieden Classification

Group	Characteristics
Group 1	Scalp ACC without multiple anomalies
Group 2	Scalp ACC associated with limb abnormalities
Group 3	Scalp ACC associated with epidermal or sebaceous nevi
Group 4	ACC overlying an embryologic malformation
Group 5	ACC associated with fetus papyraceus or placental infarct
Group 6	ACC associated with epidermolysis bullosa
Group 7	ACC localized to the extremities without epidermolysis bullosa
Group 8	ACC due to teratogens
Group 9	ACC associated with syndromes of malformation



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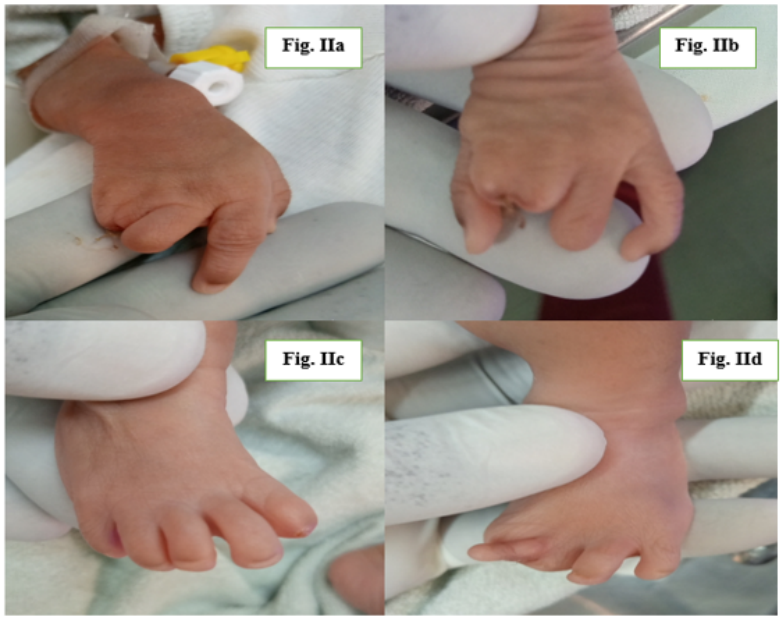

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Fig. IIb : amniotic amputation of the index and middle fingers with brachydactyly of the ring finger

Fig. IIc : Total nail agenesis and short big toe

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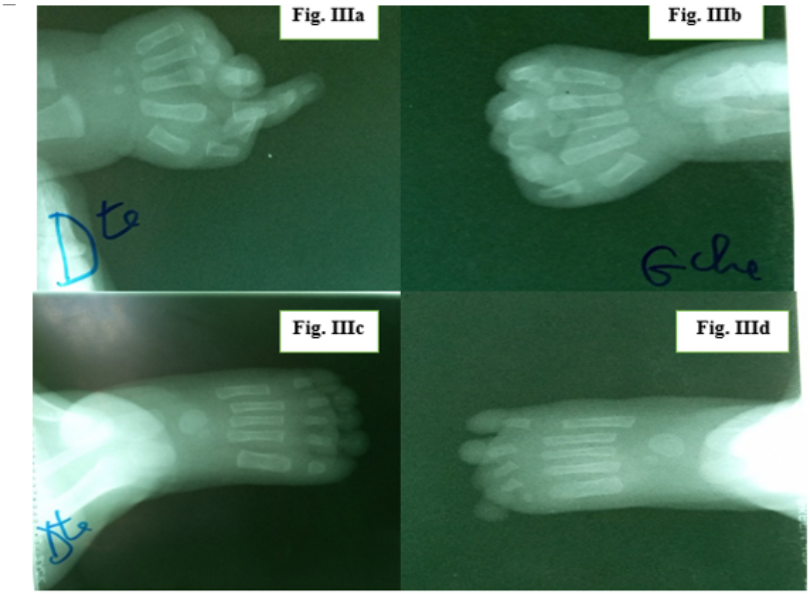

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