

Asymmetrical tetraphocomelia with radiohumeral synostosis

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Amelia is the complete absence of a limb, which may occur in isolation or as part of multiple congenital malformations.¹⁻³ The condition is uncommon and very little is known with certainty about the etiology. Whatever the cause, however, it results from an event which must have occurred between the fourth and eighth week of embryogenesis.^{1,3} The causal factors that have been proposed include amniotic band disruption,⁴ maternal diabetes,⁵ autosomal recessive mutation⁶ and drugs such as thalidomide,⁷ alcohol⁸ and cocaine.⁹ We report a case of a female baby with a complex combination of two rare limb abnormalities: left-sided humero-radial synostosis and amelia of the other limbs.

Case

A six-week-old female Mosotho child was born via normal spontaneous vaginal delivery, without complications, to a 24-year-old gravida 3 para 2+0 woman. There was no history of consanguinity in the parents and no history of malformation in either parent or their extended families. The mother did not consume alcohol, or any other known teratogenic drugs or native therapies during pregnancy. She was not diabetic and had no prenatal diagnostic procedures.

The baby was delivered with an absence of both lower and right upper limbs and a deformed left upper limb. This abnormal appearance was the reason for referral from Barea District Hospital to the Queen Elizabeth II Hospital, Maseru, Kingdom of Lesotho.

Clinical examination revealed an otherwise healthy-looking neonate with tetraphocomelia. The baby was pink in room air, weighed 4.8 kg and the rectal temperature was 37.2°C. She had a rather small chin, but no cleft lip or palate. The chest was clear to auscultation with a respiratory rate of 24 breaths per minute. Cardiovascular examination revealed no abnormality; the heart rate was 130 beats per minute. Similarly, examination of the abdomen revealed no abnormality; the external genitalia were normal female. The occipito-frontal circumference was 38.5 cm (75th centile).

Both lower limbs were represented merely by a tubercle. The right upper limb was a rudimentary 3.25 cm long, rounded stump. The left upper limb was 8.20 cm in length with a three-digit hand, a normal thumb and two fused fingers. It was fixed in extension at a dimple, which represented the 'elbow' (Figures 1 and 2).

The complete blood count, serum electrolytes, urea and creatinine were normal. Abdominopelvic ultrasound and a brain CT scan were normal. Chromosomal analysis revealed a normal 46,XX female karyotype. A babygraph revealed amelia of both lower and right upper limbs. There was aplasia of the left ulna and a short left radius fused to a very short humerus.

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Figure 1.

General view of the baby with asymmetrical tetraphocomelia (left).

**Figure 2.** Close up view of same patient; note the tubercles representing the amelic lower limbs, phocomelia of the left upper limb with oligodactyly and "elbow" fixed in extension (right).

The parents left the hospital with the child, against medical advice on the fifth day of admission because we had no immediate plan for any form of surgical treatment or provision of prosthetic device.

Discussion

The spectrum of congenital limb abnormalities is wide and ranges from such common conditions as syndactyly and polydactyly to other less common ones like amelia and phocomelia. The patient presented here exhibited a complex combination of two different categories of congenital anomalies as described by Swanson et al.¹⁰ These are failure of formation of parts (amelia of three limbs) and failure of differentiation of parts (left ulnar aplasia with humero-radial synostosis). Amelia is an uncommon congenital malformation, with an incidence of 1.5 per 100 000 live births and 7.9 per 10 000 still births.¹¹

Congenital fusion of long bone occurs "in parallel" or "in series" and involves the upper limbs more commonly than the lower limbs.¹² The more common "in series" fusion involves bones in serial segments of the limb, while the "in parallel" fusion involves bones in a block.¹² Humero-radial synostosis, an "in-series" fusion, is frequently associated with aplasia or hypoplasia of the ulnar.^{13,14} It tends, however, to be unilateral with the elbow being nonfunctional, and the shoulder or proximal humerus often being hypoplastic. Hunter et al¹⁵ highlighted the importance of oligodactyly in the classification of congenital limb anomalies. Patients with humero-radial synostosis and oligodactyly have associated congenital anomalies,

including lower limb deficiencies more commonly than those without oligodactyly.⁹

Some syndromes have been described in association with congenital limb anomalies. In Roberts syndrome, there is severe almost symmetrical tetraphocomelia in association with cleft lip and palate,^{16,17} while in the femur-fibula-ulna (FFU) syndrome there is absence of the proximal part of the femur associated with fibular ray defects and ulnar ray abnormalities.² The FFU syndrome is commonly asymmetrical and often manifests with unilateral upper limb involvement.^{2,18} Anomalies associated with ulnar deficiencies are usually limited to the musculoskeletal system in contrast to those associated with radial deficiencies.¹⁶ The thrombocytopenia-absent radius (TAR) syndrome is associated with thrombocytopenia while the Holt-Oram syndrome is associated with cardiac anomalies, which is most frequently an atrial septal defect.¹⁶ Our patient had a form of tetraphocomelia that did not fit into a specific syndrome though some components of Roberts and FFU syndromes were present. Similar cases that had been reported were considered as possible variant examples of Roberts syndrome.¹⁹

Several predisposing factors have been associated with limb anomalies. These include amniotic band disruption,⁴ maternal diabetes,⁵ and ingestion of drugs such as thalidomide,⁷ alcohol⁸ and cocaine⁹ during pregnancy. Although the precise mechanism of association of these factors is still a subject of investigation, it is believed that their effects must be consequent on events occurring between the fourth and eighth week of embryogenesis.^{1,3} Furthermore, reports of selective limb malformations, even in only one of monozygotic twins, have strengthened the possibility of environmental or stochastic influences on development as a cause of these defects.^{12,20}

No definite inheritance pattern has been described for phocomelia.¹⁶ Autosomal recessive mu-

tation has however been reported in some cases of phocomelia.⁶ There was consanguinity reported in an Arab family in which tetra-amelia was demonstrated in seven male infants, suggesting an autosomal recessive inheritance pattern.²¹ In Roberts syndrome premature centromere separation was a typi-

cal finding.^{22,23} Humeroradial synostosis in patients with normal hands is probably due to autosomal recessive inheritance.¹⁵ This case is of interest because there were no other associated malformations and there was no discernable cause, suggesting that its occurrence was probably sporadic.

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