

Phocomelia: Case report and differential diagnosis

Captain Rasto Osadsky, MD

While rarely seen in the present-day Western world, phocomelia is not uncommon in underdeveloped countries. Phocomelia is an abnormality in which the limbs are not fully formed. It may be inherited as an autosomal recessive or dominant disorder. This case concerns a 12-year-old Afghan boy with multiple skeletal anomalies, most prominently of his right arm, including aplasia of the entire proximal humerus, hypoplasia of the clavicle and scapula, and absence of the radial ray and thumb. A hypoplastic left thumb was also present. Other anomalies included thoracic scoliosis, upper thoracic hemivertebrae, and mild cardiomegaly. The differential diagnosis and likely diagnosis are discussed.

Case report

While commissioned as the battalion surgeon for an Army infantry unit, I was deployed to the northeastern region of Afghanistan. During this deployment, a 12-year-old Afghan boy presented to our Army infantry unit aid station; his chief complaint was that he had fallen from a tree that was approximately 20 feet high. At the time of his accident, the patient was in the tree chopping wood with his one functional hand for a stove in order to prepare a meal for himself and his family.

Physical examination showed prominent dyplasia of the right arm, an absent right thumb, and a hypoplastic left thumb (Fig. 1). Further questioning revealed that these abnormalities had been present since birth. No reliable family history was available, since the patient's parents had abandoned him at a young age. Specifically, it could not be determined whether his mother had taken any medications during the pregnancy, or whether there was any degree of consanguinity between his mother and father. Our patient has had apparent cardiomegaly in the past, but no murmur was heard on physical exam.



Figure 1. 12-year-old Afghan national male with a hypoplastic thumb on the left hand.

Portable radiographs (Fig. 2) and FAST (Focused Assessment with Sonography for Trauma) were ordered for further evaluation but did not show any evidence of fracture.

Radiographs revealed multiple skeletal anomalies of the right arm, including aplasia of the entire proximal humerus, hypoplasia of the clavicle and scapula, and absence of the radial ray, carpal bones, and thumb. Only three fully developed fingers were present on the right hand (Fig. 3).

Other anomalies included thoracic scoliosis, upper thoracic hemivertebrae, failure of segmentation anomalies of the right upper ribs, and mild cardiomegaly (Fig. 4).

Citation: Osadsky R. Phocomelia: Case report and differential diagnosis. *Radiology Case Reports*. (Online) 2011;6:561.

Copyright: © 2011 The Author. This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs 2.5 License, which permits reproduction and distribution, provided the original work is properly cited. Commercial use and derivative works are not permitted.

Dr. Osadsky is in the US Army. Contact him at osadsky@gmail.com.

Competing Interests: The author has declared that no competing interests exist.

DOI: 10.2484/rcr.v6i4.561

Phocomelia: Case report and differential diagnosis



Figure 2. 12-year-old Afghan national male with phocomelia undergoing portable radiography at a military aid station in Afghanistan.

Discussion

In phocomelia, the upper limbs are not fully formed; frequently, parts of the arms and hands are missing, along with underdeveloped or absent thumbs (1).

The differential diagnosis includes sporadic phocomelia, Holt-Oram syndrome, thrombocytopenia-absent radius syndrome (TAR syndrome), Roberts syndrome, and thalidomide-induced phocomelia.



Figure 3. 12-year-old Afghan national male with phocomelia. Anteroposterior radiograph of the right arm. Marked dysplasia of the entire arm is noted, with aplasia of the entire proximal humerus, hypoplasia of the clavicle and scapula, absence of the carpal bones, and only three fingers, with absence of the radial ray and thumb. Thoracic scoliosis, upper thoracic hemivertebrae, and failure of segmentation anomalies involving the right second and third ribs are partially visualized on this image.

Sporadic phocomelia is a very rare genetic disorder inherited as autosomal recessive trait or as the result of spontaneous mutations (2). In such cases, there is 25% chance for a child to be affected, provided both parents are carriers. Thus, there is significantly increased risk for phocomelia when parents have consanguinity. However, without the ability to obtain a reliable family history, the presence of hereditary phocomelia cannot be determined.

Thrombocytopenia-absent radius syndrome (TAR) is characterized by a low platelet count, an absent radius, a hypoplastic thumb, and cardiac abnormalities (3). Our military aid station has no CBC capabilities, making it impossible to document thrombocytic abnormalities. However, our patient denied easy bruising or prolonged bleeding from small injuries. No hemarthrosis was observed on physical exam. Considering this information, TAR syndrome is an unlikely diagnosis.



Figure 4. 12-year-old Afghan national male with phocomelia. Anteroposterior radiograph of the chest. Dysplastic right clavicle, scapula, and humerus are noted, as well as thoracic scoliosis, upper thoracic hemivertebrae, and failure of segmentation anomalies involving the right second and third ribs and mild cardiomegaly.

Roberts syndrome is an extremely rare disorder that has been described in only 150 individuals around the world; it is characterized by malformation of the bones in the face, skull, arms, and legs (4). Our patient does not have any facial deformities, such as cleft lip or palate, micrognathia, or hypertelorism, which frequently accompany the phocomelia seen in Roberts syndrome. Therefore, Roberts syndrome can be considered a nonplausible diagnosis.

Holt-Oram syndrome may be seen both as an autosomal dominant disorder and as the result of spontaneous genetic mutations. This syndrome is characterized by abnormal limb development that affects mostly the forearm and the carpal bones of the wrists. Characteristic features

Phocomelia: Case report and differential diagnosis

include a hypoplastic thumb or a thumb that looks like a finger. Frequently, the radius is missing and the humerus is underdeveloped. The clavicle and scapula may be affected. Three-quarters of the patients with Holt–Oram syndrome have cardiac problems that may include atrial septal defects or ventricular septal defects (5). Our patient conforms to the profile of those afflicted by Holt–Oram syndrome, and the aggregate findings render this a very plausible diagnosis.

Thalidomide-induced phocomelia: Unfortunately, the same symptoms seen in our patient may also be caused by the teratogenic drug thalidomide, when used during the first trimester of pregnancy. This drug was first introduced in 1957 in West Germany for anxiety, insomnia, and gastritis. Later, this medication was used for nausea and morning sickness in the early stages of pregnancy. The drug became over-the-counter in 1960, and shortly thereafter, 5,000 to 7,000 infants were born with signs of phocomelia. Other abnormalities included eye deformities, blindness, deafness, and abnormalities of the cardiac, gastrointestinal, genitourinary, and nervous systems. The drug was withdrawn from western markets in 1962. After 1965, the drug was re-marketed in several countries for the treatment of erythema nodosum leprosum (ENL) (6).

It is unclear if this medication could be in circulation in Afghanistan. The health care system in the country is poorly controlled, and medications are imported by patients from neighboring countries. The Teratogen Information Service (TIS) Porto Alegre recorded three new cases of thalidomide embryopathy born in Brazil since 2005 (7). Another paper suggests that thalidomide is a current teratogen in South America, and it is reasonable to assume that at present this situation may also affect births in other underdeveloped countries (8). No similar study has been done in Afghanistan. However, based on the literature, it is reasonable to believe that thalidomide could be in use in Afghanistan despite its teratogenic effects.

In the USA, thalidomide is approved only under a special Food and Drug Administration restricted distribution program called System for Thalidomide Education and Prescribing Safety (S.T.E.P.S.). Only prescribers and pharmacists registered with this program are allowed to prescribe and dispense the drug for multiple myeloma, ENL, and nerve damage associated with leprosy.

The final diagnosis in this patient remains unknown, due primarily to the lack of a reliable family history and the inability to do sophisticated genetic testing--both of which are common consequences of life in a developing nation. Among the differential considerations described above, the most plausible diagnostic considerations are Holt–Oram syndrome and possible maternal use of thalidomide in early pregnancy.

References

1. Mildenstein F, Von Massenbach, Ruether K. Abnormally shortened extremities 1950-1962. Results of a survey. *Geburtshilfe Frauenheilkd.* 1964 Jan;24:1-27. Review. German. [PubMed]
2. Lenz W. Genetics and limb deficiencies. *Clin Orthop Relat Res.* 1980 May;(148): 9-17. [PubMed]
3. Toriello HV, Pagon RA, Bird TD, Dolan CR, Stephens K. Thrombocytopenia Absent Radius syndrome. In: *GeneReviews* [Internet] Seattle (WA): University of Washington, Seattle; 1993-2009 Dec 08. [PubMed]
4. Gordillo M, Vega H, Jabs EW, Pagon RA, Bird TD, Dolan CR, Stephens K. Roberts Syndrome. In: *GeneReviews* [Internet]. Seattle (WA): University of Washington, Seattle; 1993-2009 Dec 08 [PubMed]
5. Aviña-Fierro JA, Colonnelli-Barba G. Holt-Oram syndrome associated with facial anomalies. A case report. *Rev Med Inst Mex Seguro Soc.* 2010 Nov-Dec;48(6): 657-9. Spanish. [PubMed]
6. Lenz W. A short history of thalidomide embryopathy. *Teratology.* 1988 Sep;38(3): 203-15. [PubMed]
7. Schuler-Faccini L, Soares RC, de Sousa AC, Maximino C, Luna E, Schwartz IV, Waldman C, Castilla EE. New cases of thalidomide embryopathy in Brazil. *Birth Defects Res A Clin Mol Teratol.* 2007 Sep; 79(9):671-2. [PubMed]
8. Vianna FS, Lopez-Camelo JS, Leite JC, Sanseverino MT, da Graça Dutra M, Castilla EE, Schüler-Faccini L. Epidemiological surveillance of birth defects compatible with thalidomide embryopathy in Brazil. *PLoS One* 2011;6(7):e21735. Epub 2011 Jul 6. [PubMed]