Arthrogryposis multiplex congenital (AMC) in a three year old boy: differential diagnosis with distal arthrogryposis: a case report

Zoran S Gucev*, Nada Pop-Jordanova, Gordana Dumalovska, Orhideja Stomnaroska, Gorgji Zafirovski and Velibor B Tasic

Address: Medical Faculty Skopje, 50 Divizija BB, 1000 Skopje, Former Yugoslav Republic of Macedonia

Email: Zoran S Gucev* - gucevz@gmail.com; Nada Pop-Jordanova - jpi@manu.edu.mk; Gordana Dumalovska - gordanadumalovska@yahoo.com; Orhideja Stomnaroska - ostomnaroska@yahoo.com; Gorgji Zafirovski - zgeorge.zafirovski@gmail.com; Velibor B Tasic - vtasic2003@gmail.com

* Corresponding author

Abstract

Introduction: Arthrogryposis multiplex congenital (AMC) is characterized by contractions of multiple joints present at birth. The involved muscles are partially or totally replaced by fat or fibrous tissue. Talipes equinovarus and scoliosis are also frequently reported.

Case presentation: This 2 year was born after uneventful pregnancy, with normal birth weight and length. The parents are unrelated, young and healthy. No malformations or mental retardation have been reported in the family. Since his birth a specific posture was noted: internal rotation at the shoulders, extension at the elbows, and flexion at the wrists. In addition, the child has a severe equinovarus deformity of the feet. Syndactily between II and III finger was also noted. His face is round with a frontal midline capillary hemangioma, while his jaw appears to be small. Mental development is normal. The karyotype is: 46, XY.

Conclusions: About 150 syndromes have arthrogryposis as a presenting sign. AMC is a distinct entity and distinction with the distal forms of arthrogryposis can be difficult, since there is a considerable clinical and genetic heterogeneity. A comprehensive musculoskeletal evaluation and genetic consultation is necessary.
Case Presentation
This 2 year old boy was diagnosed with AMC at the age of 10 months. He was born after uneventful pregnancy, with normal birth weight and length. The parents are unrelated, young and healthy, and the family does not have a history of malformations or mental retardation. A peculiar body posture is evident: internal rotation at the shoulders, extension at the elbows, and flexion at the wrists. A severe equinovarus deformity of the feet and syndactyly between II and III finger are also present. A frontal facial midline capillary hemangioma, and a small jaw are also present. His mental development is normal retarded. Ultrasound of the kidneys is uneventful. Creatinin kinase concentrations in serum were normal. Karyotype is normal male: 46, XY. Radiography revealed scoliosis and talipes equinovarus.

Discussion
Since the first descriptions [1] AMC was described as limited flexion of joints of the arms and neck and with absent flexion creases of the fingers. In addition, talipes equinovarus and scoliosis were also reported. In a review article, Hall et al. (1983) [2] found congenital contracture syndrome in 135 of 350 patients. An early observation included a specific positioning present at birth with internal rotation at the shoulders, extension at the elbows, and flexion at the wrists. Severe equinovarus deformity of the feet is frequently present [3]. A frontal midline capillary hemangioma, small jaw, round face and normal intelligence are also found to be typical. Twins have been described, but the condition is mainly sporadic. Our patient has all the features belonging to the AMC. In addition, since no other family member has joint contractures or a malformation our child is a sporadic case of AMC.

Besides the classic AMC, other distinct types of X-linked arthrogryposis have been described. DA1 is a distal form of AMC characterized by autosomal dominant inheritance, intrafamilial variability and involvement primarily of the hands and feet. The position of the hands is specific: the fingers are medially overlapping and ulnarly deviated, the fists are clenched. No associated visceral anomalies have been reported, while the intelligence is normal [3,4].

Distal arthrogryposis type 2B is a clinically and genetically heterogeneous disorder characterized by clenched fist, overlapping fingers, camptodactyly, ulnar deviation, and positional foot deformities from birth. This type of distal arthrogryposis can be caused by mutations in TNN3 gene which encodes tropinin T and I.

DA2A which includes in its phenotype ptosis, dwarfism, small contracted mouth, and proximal and distal joint contractures was found to have MYH3 gene mutations. On the other hand, Toydemir et al. (2006) found a mutation in the MYH3 gene in 26 of 28 FSS cases [13]. Another form of DA, DA2E, characterized by small mouth and jaw with limited jaw movement, with horizontal depression above the chin, microcephaly and severe flexion contractures of the hands and feet [3,12].

Congenital contractual arachnodactyly (CCA) is a rare, autosomal dominant disorder characterized by contractures, arachnodactyly, scoliosis, and crumpled ears with overlapping features with Marfan syndrome. Wang et al. (1995) identified point mutations in the FBN2 gene in cases of CCA [14]. Bamshad et al. (1996) referred to this disorder as distal arthrogryposis type 9 (DA9) [9].

Arthrogryposis multiplex congenita can also have neurogenic origin. This form of arthrogryposis is also genetically heterogeneous. It includes a subgroup which is allelic to spinal muscular atrophy type I, or Werdnig-Hoffmann disease (SMA1).

Some AMC forms are mild [15] and limited to the lower extremities, others (DA 10) have only short tendo calcaneus [16,17]. DA5 is arthrogryposis with oculomotor limitation and electroretinal abnormalities [18]. DA4 (DAIID) is a form with severe scoliosis [3]. AMC can also be of neurogenic type, resulting from GLE1 gene mutations [19], or can have a specific whistling face (Illum syndrome) [20].

Conclusions
AMC is a distinct entity that needs to be delineated from the other arthrogryposis types (~10 types so far) and
other syndromes in which stiff joints are a part of the phenotype (~150 syndromes). In particular, the distinction with the distal forms of arthrogryposis can be challenging. A considerable clinical and genetic heterogeneity is noted in almost all arthrogryposis types. Therefore, a comprehensive musculoskeletal evaluation and genetic consultation is necessary.

Consent
Written informed consent was obtained from the father of the patient for publication of this case report.

Competing interests
The authors declare that they have no competing interests.

Authors’ contributions
All of the authors were involved in the clinico-radiographic assessment and finalizing the paper. All authors have red and approved the final version of the paper.

References
1. Lacassie Y, Sack GH Jr, McKusick VA: An autosomal dominant form of arthrogryposis multiplex congenita (AMC) with unusual dermatoglyphics. (Abstract). Birth Defects Orig Art Ser 1977, XIII(3B):246-247.
2. Hall JG, Reed SD, Driscoll EP: Part I. Amyoplasia: a common, sporadic condition with congenital contractures. Am J Med Genet 1983, 15:571-590.
3. Hall JG, Reed SD, Greene G: The distal arthrogryposes: delineation of new entities—review and nosologic discussion. Am J Med Genet 1982, 11:185-239.
4. Daentl DL, Berg BO, Layzer RB, Epstein CJ: A new familial arthrogryposis without weakness. Neurology 1974, 24:55-60.
5. Krakowiak PA, O’Quinn JR, Bohnsack JF, Watkins WS, Carey JC, Jorde LB, Bamshad M: A variant of Freeman-Sheldon syndrome maps to 11p15.5-pter. Am J Hum Genet 1997, 60:426-432.
6. Shrimpton AE, Hoo JJ: A TNNI2 mutation in a family with distal arthrogryposis type 2B. Europ J Med Genet 2006, 49:201-206.
7. Griffiths E, Tajbareh H, Kroksmark A-K, Oldfors A, Tulinius M: A mutation in the fast skeletal muscle troponin I gene causes myopathy and distal arthrogryposis. Neurology 2006, 67:597-601.
8. Friedman BD, Heidenreich RA: Distal arthrogryposis type IIB: further clinical delineation and 54-year follow-up of an index case. Am J Med Genet 1995, 58:125-127.
9. Bamshad M, Jorde LB, Carey JC: A revised and extended classification of the distal arthrogryposes. Am J Med Genet 1996, 65:277-281.
10. Sung SS, Brasington A-ME, Grannatz K, Rutherford A, Whitby FG, Krakowiak PA, Jorde LB, Carey JC, Bamshad M: Mutations in TNNI2 cause multiple congenital contractures: a second locus for distal arthrogryposis type 2B. (Letter). Am J Hum Genet 2003, 73:212-214.
11. Hall JG, Truong WE, Plowma DL: A new arthrogryposis syndrome with facial and limb anomalies. Am J Dis Child 1975, 129:120-122.
12. Toyedmir RM, Rutherford A, Whitby FG, Jorde LB, Carey JC, Bamshad MJ: Mutations in embryonic myosin heavy chain (MYH3) cause Freeman-Sheldon syndrome and Sheldon-Hall syndrome. Nature Genet 2006, 38:561-565.
13. Wang M, Tsipouras P, Godfrey M: Fibrillin-2 (FBN2) mutation in congenital contractual arachnodactyly. (Abstract). Am J Hum Genet 1995, 57:A231.
14. Zori RT, Gardner JL, Zhang J, Mullan MJ, Shah R, Osborn AR, Houlden H, Wallace MR, Roberts S, Yang TP: Newly described form of X-linked arthrogryposis maps to the long arm of the human X chromosome. Am J Med Genet 1998, 78:450-454.
15. Levine MS: Congenital short tendo calcaneus. Am J Dis Child 1973, 125:858-859.
16. Stevenson DA, Swoboda KJ, Sanders RK, Bamshad M: A new distal arthrogryposis syndrome characterized by plantar flexion contractures. Am J Med Genet 2006, 140A:2797-2801.
17. Fibrillin-2 (FBN2) mutation in a family with distal arthrogryposis type 5: a dominant syndrome of peripheral contractures and ophthalmoplegia. Am J Med Genet 2004, 131:67-70.
18. Nousiainen HO, Kestila M, Pakkasjarvi N, Honkala H, Kuure S, Talila J, Vuopala K, Ignatiu J, Herva R, Peltonen L: Mutations in mRNA export mediator GLE1 result in a fetal motoneuron disease. Nature Genet 2008, 40:153-157.
19. Illum N, Reske-Nielsen E, Skovby F, Askjaer SA, Bernsen A: Lethal autosomal recessive arthrogryposis multiplex congenita with whistling face and calcifications of the nervous system. Neuropediatrics 1988, 19:186-192.