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Cognitive Impairment, Scoliosis and Renal Parenchymal Disease with Isolated Rhombencephalosynapsis: A Case Report

İzole Rombensefalosinapsis ile Birlikte Kognitif Bozukluk, Skolyoz ve Renal Parankimal Hastalık: Bir Olgu Sunumu

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ABSTRACT

Rhombencephalosynapsis (RS) is an uncommon cerebellar malformation defined by vermian agenesis with fusion of the hemispheres and of the dentate nuclei. Very few cases have been reported in the literature. While the literature suggests that RS is often associated with behavioral and/or intellectual impairment, very few previous reports have described neuropsychological functioning. We report a 12-year-old male who was diagnosed with RS. The neurological examination revealed general hypotonia, brisk deep tendon reflexes, ataxic gait and dysarthria while neuropsychological evaluation revealed low verbal learning, attention and working memory subtest scores. He also had scoliosis and renal parenchymal disease, both conditions being reported very rarely in association with this anomaly. Our findings suggest that RS is associated with cognitive impairment and often accompanied by other abnormalities.

Key Words: Cerebellar abnormality, Intellectual disability, Kidney disease, Scoliosis

ÖZET

Rombensefalosinapsis serebeller hemisferlerler ve dentat nukleusların füzyonu ile serebeller vermisinagenezisi veya hipogenezisi ile karakterize, nadir görülenbir serebellar anomalidir. Literatürde davranış ve/veya entelektüel bozuklukla ilişkili olduğundan bahsedilmiş ancak nöropsikolojik fonksiyonları bildiren az sayıda olgu bildirilmiştir. Rombensefalosinapsisli 12 yaşında bir erkek olgu bildirilmiştir. Nörolojik muayenesinde genel hipotoni, derin tendon refleksleri canlı, ataksik duruş ve dizartrisi vardı ve nöropsiklojik değerlendirmesinde sözel öğrenme, dikkat ve çalışma becerisi alt testlerinde düşük puan almıştı. Skolyoz ve renal parankimal hastalık gibi bu anomali ile birlikteliği çok nadir olan buguları da mevcuttu. Bu bulgular rombensefalosinapsisin bilişsel bozukluk ve diğer anomalilerlerle birlikteliğini vurgulamaktadır.

Anahtar Sözcükler: Serebellar anomali, Bilişsel bozukluk, Böbrek hastalığı, Skolyoz

INTRODUCTION

Rhombencephalosynapsis is an uncommon cerebellar malformation characterised by vermian agenesis with fusion of the hemispheres and of the dentate nuclei. Embryologic and genetic mechanisms are still unknown. Clinical presentation is variable and primarily determined by the presence of systemic malformations. A number of pediatric and adult cases (less than 80) have been previously reported in the literature (1,2). Associated anomalies within and outside the central nerbous system have been reported in some cases.

It is well known that the cerebellum is essential for the control and integration of movement and that cerebellar disorders often are associated with a motor syndrome that can include ataxia, dysmetria, disordered eye movements, dysarthria, dysphagia and tremor (3). In recent years it has been hypothesized that there is also a strong cerebellar contribution to cognition and mood.

This is one of the very few published reports of RS presenting with cognitive impairment, and rare anomalies outside the central nervous system.

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CASE REPORT

A 12 years old boy was referred to our department with developmental delay and mental retardation. He was born at term following a normal pregnancy and delivery. He showed a consistent delay in acquisition of psychomotor skills (head control at 6 months, sitting alone at 12 months, walking at 3 years of age, speaking at 3.5 yeras of age). He experienced two simple febrile seizures when he was three years old. He had an operation for scoliosis at the age 3.5 years. He had recurrent urinary tract infections during infancy. Subsequent ultrasound study of the urinary tract revealed renal paranchimal disease with a mildly irregular renal contour. Further dimercaptosuccinic acid study revealed scarring of the left side of the single kidney. He has developed chronic renal insufficiency. In the ensuing years, he was found to have global developmental delay and cerebellar ataxia.

At admission, physical examination disclosed normal head circumference and cranio-facial dysmorphism: microcephaly (head circumference <3p), low set ears, hypertelorism, prominent forehead, protruding tongue and midface hypoplasia. On neurological examination, general hypotonia, brisk deep tendon reflexes in all four limbs, ataxic gait and dysarthria were noted. His social relations and behavioural capabilities were largely impaired, and he has developed no independence. The patient's Wechsler Intelligence Scale-revised showed full scale IQ fell within the moderately low range (WISC-R FSIQ = 40). The estimated verbal (VIQ = 38) and performance (PIQ = 42) IQ s fell within the moderately low average range. Verbal learning, attention and working memory subtest scores asseses by Stanford Binet test were in low range. Cranial magnetic resonance imaging showed agenesis of the cerebellar vermis with the fusion of the cerebellar hemispheres (Figure 1). Fusion of the middle cerebellar hemispheres and probable fusion of the dentate nuclei along the midline were also present (Figure 2). He was referred to a special child care centre, where he received intensive training. There was a steady improvement and satisfactory progress in his development.

DISCUSSION

Cerebellar disorders often are associated with disturbances of movement. Many individuals with RS have motor impairments, albeit of varying range and severity (4). In recent years it has been hypothesized that there is also a strong cerebellar contribution to cognition and mood. Schmahmann suggested that cerebellar lesions can manifest as a "cerebellar cognitive affective syndrome" consisting of disturbances in executive functioning, spatial cognition, linguistic abilities and personality (5). The association areas that are connected to the cerebellum include regions of the prefrontal cortices, posterior parietal lobes, superior temporal lobe, and parahippocampus.

RS is a rare cerebellar malformation and it is characterized by the absence or hypogenesis of the vermis and the midline fusion of the cerebellar hemispheres into a single mass. The pathogenesis is related to a disturbed development of the

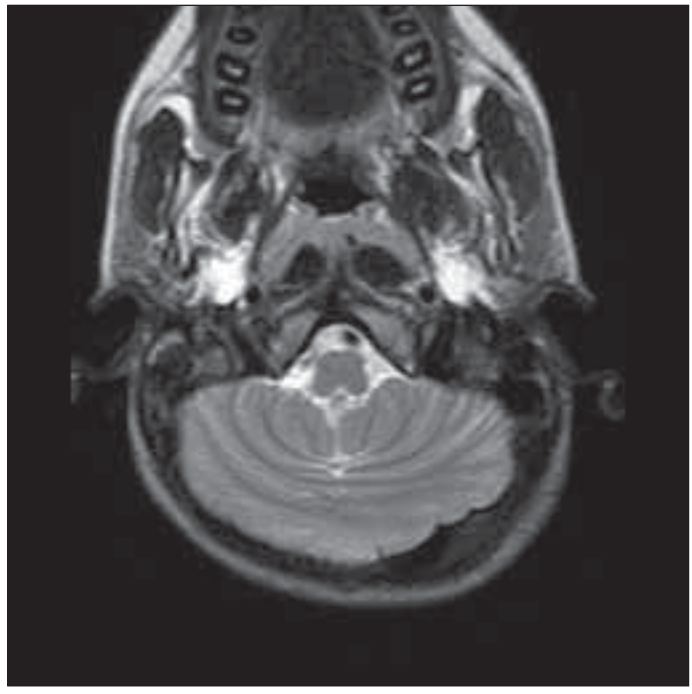

Figure 1: Axial T2-weighted magnetic resonance image showing absence of the cerebellar vermis with the fusion of the cerebellar hemispheres.

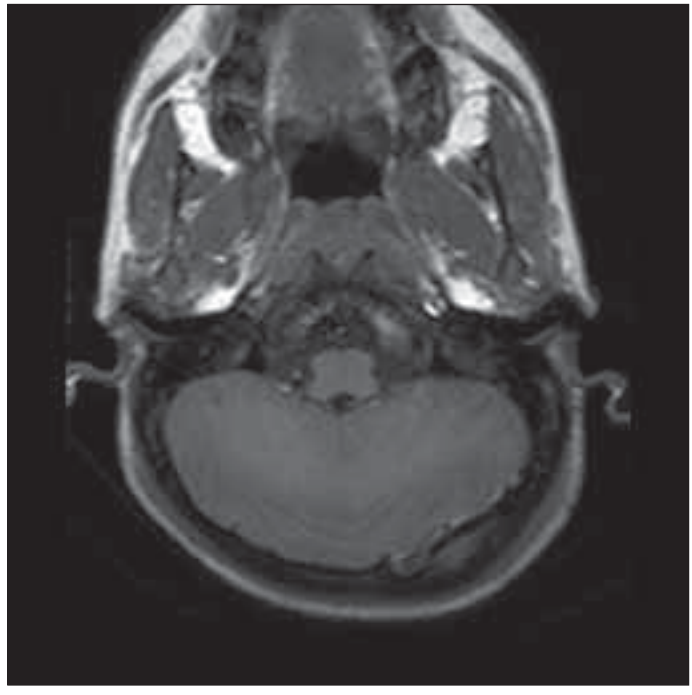

Figure 2: Axial T1-weighted magnetic resonance image showing the fusion of the dentate nucleus, agenesis of the vermis and cerebellar fusion.

cerebellum between 28 and 41 days of gestation However, to this date, true causative factors remain controversial (6). There is no specific syndrome associated with this condition, so clinical findings may vary. Our patient had mild motor abnormalities and verbal learning, attention and working memory subtest scores were in low range. This deficit appears consistent with the patient's report of motor disturbance with the cerebellar malformation. The cognitive and mood problems present in this case and others with RS conceivably could be considered consistent with the cerebellar cognitive affective syndrome.

Extraneural associated anomalies have been rarely reported and concerned mainly pediatric and adult cases. Analyzing the clinical traits of these patients we found that the musculoskelteal system, respiratory, urinary system and skeletal abnormalities may be present in patients with RES. The vast majority of extraneural anomalies cited in the literature concern skeletal abnormalities, and consist of segmentations and fusions of the spine, as well as of radial ray defects and anomalies of upper extremities. The latter include polydactyly, syndactyly, phalangeal hypoplasia, and duplication of the thumbs (7,8). As in of our case, associated scoliosis have rarely been reported previously. Regarding the existence of craniofacial dysmorphism, low set ears hypertelorism, and midface hypoplasia have been reported (9). We have described a similar dismorphism in our patient with microcephaly, low set ears, prominent fore head, hypertelorism and protruding tongue. Although not specific, this pattern, in particular midface and ear anomalies should alert clinicians to search for RS.

Associated, perhaps syndromic but with no definite diagnosis, visceral malformations have also been reported as in our case. In our review, we have found no published cases with renal paranchimal disesase and end stage renal disease. Elliott et all reported a patient with autosomal dominant polycystic renal disease associated with RES (10). They concluded the reqirement of genetic analysis to determine the underlying pathogenetic connection between those two disorders.

In conclusion, RS occurs most of the time as a complex condition associated with a Aavariety of intra- and/or extraneural malformations, as seen in our patient. We postulate a link between the cognitive disturbance of this patient and his cerebellar malformation, suggesting that this case may represent another example of the role of cerebellum in cognitive functioning.

REFERENCES

1. Isaac M, Best P. Two cases of agenesis of the vermis of cerebellum, with fusion of the dentate nuclei and cerebellar hemispheres. Acta Neuropathol 1987;74:278-80.
2. Sener RN. Unusual MRI Wndings in rhombencephalosynapsis. Comput Med Imaging Graph 2000;24:277-82.
3. Schmahmann JD. An emerging concept: The cerebellar contribution to higher function. Arch Neurol 1991;48:1178-87.
4. Toelle SP, Yalcinkaya C, Kocer N, Deonna T, Overweg-Plandsoen WC, Bast T, et al. Rombencephalosynapsis: Clinical findings and neuroimaging in 9 children. Neuropediatrics 2002;33:209-14.
5. Schmahmann JD. Disorders of the cerebellum: Ataxia, dysmetria of thought, and the cerebellar cognitive affective syndrome. J Neuropsychiatry Clin Neurosci 2004;16:367-78.
6. Truwit CL, Barkovich AJ, Shanahan R, Maroldo TV. MR Imaging of Rhombencephalosynapsis: Report of three cases and review of the literature. AJNR Am J Neuroradiol 1991;12:957-65.
7. Aydingoz U, Cila A, Aktan G. Rhombencephalosynapsis associated with hand anomalies. Br J Radiol 1997;70:764-6.
8. Pavone P, Incorpora G, Ruggieri M. A complex brain malformationsyndrome with rhombencephalosynapsis, preaxial hexadactyly plus facial and skull anomalies. Neuropediatrics 2005;36:279-83.
9. Cox PM, Gibson RA, Morgan N, Brueton LA. VACTERL with hydrocephalus in twins due to Fanconi anemia (FA): Mutation in the FAC gene. Am J Med Genet 1997;68:86-90.
10. Elliott R, Harter DH. Rhombencephalosynapsis associated with autosomal dominant polycystic kidney disease Type 1. J Neurosurg Pediatr 2008;2:435-7.