

# Atypical Presentations of Type 1 Chiari Malformation; Hemiatrophic Extremities, and Hypothalamic Hypogonadism: A Case Report

Ramazan Sari\*

İbrahim Şahin\*\*

İrem Pembegül\*\*

Elmas Uzer\*\*

Soner Şenel\*\*

\* Akdeniz University, Endocrinology, Ankara, Turkey

\*\* İnönü University, Internal Medicine, Malatya, Turkey

Type I Chiari malformations consist of herniation of the cerebellar tonsils through the foremen magnum and present with a variety of symptoms and signs described previously but hemiatrophy of extremities and hypothalamic hypogonadism are not characteristic findings. Hemiatrophy of extremities has been reported in just one case, and to our knowledge hypothalamic hypogonadism has not been reported previously in literature. In this paper, we reported a unique patient with hemiatrophic upper and lower extremity, short stature and hypothalamic hypogonadism in a patient with type I Chiari malformation

**Key words:** Chiari malformations, hypogonadism, hemiatrophy of extremities.

## Introduction

The type I Chiari malformation consists of caudal displacement of the cerebellar tonsils into the upper cervical spinal canal. The brainstem is infrequently involved in the herniation, and the most common associated findings are cervical syringohydromyelia and, on occasion, hydrocephalus (1). Syringohydromyelia occurs commonly with type I Chiari malformations and can be seen in 50 to 70% of patients (1-4).

Patients with the type I Chiari malformation may present with a variety of symptoms and signs ranging from a slight headache to severe myelopathy and brainstem compromised. Common symptoms included nonradicular pain in the shoulder, back, and limbs; motor (40 to 74%) and sensory (50%) changes in the extremities; clumsiness (15%); and dysphagia (10%). Progressive scoliosis is a relatively common manifestation (30%) of type I Chiari malformation when there is coexistent syringohydromyelia (5). Clinical and radiographic signs that raise the suspicion of an underlying neurological defect in a patient with scoliosis include a convexity to the left, a single curve, leg, or foot asymmetry, vertebral anomalies or other congenital anomalies (2-4). A case of Chiari malformations

plus syringomyelic syndrome with hypertrophy of upper left and lower right limbs is reported (6).

The patient with isolated partial growth hormone deficient short stature with syringomyelia and Chiari malformations has been reported (7,8). Albero Gambo et al. (9) reported type I multiple endocrine adenomatosis associated with basilar impression and Chiari deformity. We did not encounter any reports in the literature about hypogonadism in Chiari Malformation.

Serum gonadotropin and sex steroid determinations are performed if puberty and growth are delayed. When hypogonadism develops before the age of puberty, the manifestations are those of impaired puberty: Small testes, scant pubic and axillary hair, disproportionately long arms and legs, reduced male musculature, and gynecomastia (10,11).

In this paper, we report a patient who had hemiatrophic left upper and lower extremity, hypothalamic hypogonadism, and type I Chiari malformation.

## Case Report

A 17-year-old male was referred to our department for scoliosis, short stature and hemiatrophic lower, and upper extremities. Hemiatrophic lower and upper extremities were noticed 9 years ago. Type I Chiari malformation had been diagnosed and

### Correspondence address:

Ramazan Sari

Tel : +90 242 227 43 43

Fax : +90 242 227 44 901

E-mail : rsari@akdeniz.edu.tr

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cranial operation had been performed 13 months ago. His body weight and height were 39 kg and 1.46 meter, respectively. Physical examination revealed that he was not face hair development, axillary and pubic hair development (Stage G1, according to Marshall and Tanner Staging) (11). His left eye was cross-eyed. On genitourinary examination; penis height was 3 cm (in passive extension), left and right testis size was 1 x 0.5 x 1.5 and 1 x 1 x 1.5 cm, respectively. His left lower and upper extremities were hemiatrophic (Table 1 and Figure 1). Motor deficit was not detected and electromyographic evaluation of upper and lower extremities was within normal limits.



Figure 1.

Table 1.

	Height (cm)	Upper circumference (cm)	Lower circumference (cm)
Right arm	67	21.5	16.5
Left arm	59	19.5	13.5
Right leg	86	38	20.5
Left leg	82	34	19

His body height was more than 2.5 standard deviation below the mean for chronologic age, growth rate was below the third percentile for chronologic age, and height was more than 2 standard deviation below the mean for chronologic age when corrected for midparental height. Skeletal (bone) age was 15 years. With these results, he was accepted as pathologic short stature.

On hormonal examination, plasma testosterone [89.7 ng/dL (normal: 212-1511)], Follicle-stimulating hormone (FSH) [1.5 mIU/mL (1.5-14)] and Luteinizing Hormone (LH) levels were low [0.51 mIU/mL (1.4-7.7)]. Plasma Growth Hormone (GH) [0.17 ng/mL (0.06-5.0)], Thyroid-stimulating

Hormone (TSH) [1.14 mIU/mL (0.4-4.0)], prolactin [3.95 ng/mL (2.5-17)], and cortisol levels were normal [8.79 ug/dL (5-25)]. Other laboratory examination; hemoglobin (13.6 g/dL), plasma glucose (95 mg/dL), sodium (139 mmol/L), potassium (3.9 mmol/L), creatinine (0.6 mg/dL), calcium (9.2 mg/dL), alanine transaminase (15 U/L), aspartate transaminase (17 U/l) were within normal limits.

After hospitalization; we evaluated GH reserve, pituitary-adrenal, and pituitary-gonadal systems. Normal GH response to insulin hypoglycemia testing and during sleeping were detected (GH level was increased from 0.4 to 14.2 ng/mL during sleeping and from 0.36 to 10.6 ng/mL during the insulin hypoglycemia testing). These results indicate that normal response for GH in our patient.

Pituitary-adrenal axis was evaluated by insulin-hypoglycemia test and cortisol level was increased from 8.7 to 22 ug/dL during the test. This response was accepted in normal limits.

Clomiphene citrate stimulation test was performed for the evaluation of hypothalamo-pituitary-gonadal system. FSH, LH, and testosterone was not increased after the test. Normal LH, FSH response was detected to Gonadotropin-releasing hormone test (Table 2). Testosterone levels was increased from 38 to 289 ng/dL during the Chorionic Gonadotropin stimulation test. This response for testosterone was normal.

Ultrasonographic examination of testes, right and left testes sizes were calculated 2.1 x 1.4 x 0.6 and 2.1 x 1.7 x 0.7 cm, respectively. Dilated third and lateral ventricles, tonsillar herniation and syringomyelia were detected by cranial and spinal magnetic resonance (MR) imaging (Figures 2a, 2b). Pituitary MR imaging was normal.



Figure 2a

**Table 2.**

	Baseline	30 minutes	60 minutes	90 minutes	120 minutes	180 minutes
LH (Normal: 1.4-7.7 mIU/mL)	1.02	14.6	8.7	7.4	4.9	3.54
FSH (Normal: 1.5-14 mIU/mL)	3.23	9.3	9.9	8.9	8.3	7.34
Testosterone (Normal: 212-1511 ng/dL)	<50	<50	<50	<50	50.1	<50



**Figure 2b.**

With these symptoms, signs and laboratory results, a case was finally diagnosed as pathologic short stature, hypothalamic hypogonadism, type I Chiari malformation. We planned chorionic gonadotropin therapy.

## Discussion

Our patient, who is consistent with the majority of patients with type I Chiari malformation in the literature, is demonstrated caudal displacement of the cerebellar tonsils into the upper cervical spinal canal, syringohydromyelia, and progressive scoliosis. Patients with the Chiari malformation may present with a variety of symptoms and signs. Neurological signs can be divided into three types of presentation: a brainstem syndrome, a spinal cord syndrome, and a cerebellar syndrome, which

in one adult series was seen to occur in 22%, 65%, and 11% of cases, respectively. Presenting signs include motor and sensory losses (30 to 92%), hyporeflexia (38%), hyperreflexia (40 to 52%), clonus (18%), Babinski response (28%), ataxia (20 to 40%), respiratory irregularities (10%) (1-4). We did not encounter any neurological deficit, respiratory problems in our patient.

Clinical and radiographic signs that raise the suspicion of an underlying neurological defect in a patient with scoliosis include a convexity to the left, a single curve, leg, or foot asymmetry, vertebral anomalies or other congenital anomalies. Recent reports have reported motor (40 to 74%) and sensory (50%) changes in the extremities (2-4). A case of Chiari malformations plus syringomyelic syndrome with hypertrophy of upper left and lower right limbs is reported (6). Lapresle et al. (6) discussed that hypertrophy of limbs due to muscular hypertrophy. We also detected manifesting leg and foot asymmetry. However, we did not detect any neurological and motor deficiency. In addition, both limbs circumference and bone thickness was difference in our patients. Therefore, we think that this asymmetry in patients with Chiari malformations may probably due to widespread syringomyelia.

Cerebral midline anomalies and type I Chiari malformation had been observed in 20% of the children presenting with growth hormone deficiency. On the other hand, isolated partial growth hormone deficient and short stature has been reported in patients with Chiari malformations (7,8). We detected pathologic short stature in our patient, and then the reserve of growth hormone was tested by provocative pharmacologic stimuli as insulin and physiologic stimuli as a sleep. Adequate rise of serum GH was determined after insulin hypoglycemia test and after the sleep, and then GH deficiency was eliminated in our patient.

Gonadal sex steroids exert an important influence on the pubertal growth spurt, while absence of

these factors is not of major importance in prepubertal growth. The pubertal rise in gonadal steroids exerts direct and indirect effects upon insulin-like growth factor-1 from cartilage. They also increase growth hormone secretion, which stimulates insulin-like growth factor-1 production indirectly. Both actions appear to be important in the pubertal growth spurt. Serum gonadotropin and sex steroid determinations are performed if puberty and growth are delayed (10,11). Our patient had a short stature and hypogonadism, then we tested hypothalamus-pituitary-gonadal system by the dynamic stimulation tests. Inadequate FSH, LH, and testosterone rise for Clomiphene Citrate; normal LH, FSH response for Gonadotropin-releasing hormone test; normal testosterone response for gonadotropin-releasing hormone were detected. With these symptoms, sign and laboratory results, a case was finally diagnosed as pathological short stature due to hypothalamic hypogonadism.

There are a few reports about endocrinological manifestation in patients with Chiari malformations in the literature (7-9). Albero Gamboa et al. (9) reported type I multiple endocrine adenomatosis associated with basilar impression and Chiari deformity. In addition, hypopituitarism has been reported in patients with type 1 Arnold-Chiari malformation. Hypopituitarism can be associated with syringomyelia and/or small pituitary gland and/or basilar impression (12). The etiological mechanism between hypothalamic hypogonadism and type 1 Arnold-Chiari malformation was not known. We concluded that hypogonadotropic hypogonadism could be associated with syringomyelia.

In this paper, we reported short stature, manifesting hemiatrophic upper and lower extremity and hypothalamic hypogonadism in a patient with type I Chiari malformation which is not reported previously.

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