Anti-Müllerian Hormone: a marker of premature ovarian insufficiency in girls with Turner syndrome

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Background:

Patients with Turner syndrome (TS) typically exhibit short stature and gonadal dysgenesis with pubertal delay and infertility. Up to 30% of these girls will have spontaneous pubertal development, however only 2% achieve a spontaneous pregnancy. Biochemical markers reflecting ovarian reserve in girls and adolescents with TS are therefore needed.

Objective:



Assessment of ovarian reserve in girls and adolescents with TS using serum anti-Müllerian hormone (AMH) and comparing this value with other markers, including serum follicle-stimulating hormone (FSH), number of ovarian follicles (OF) on ultrasound and karyotype.

Methods and results:

METHODS:

Prospective study

TS girls followed at the Pediatric Endocrinology Unit of a Portuguese General Hospital.

Period of study

RESULTS:

Number (<i>n</i>)	20
Karyotype	
45,X	8 (40%)
45,X/46,XX	3 (15%)
Other	9 (45%)
Age at testing (y)	
Mean	9.94
Median/SD	8.82 ± 3.8
Minimum	3.45
Maximum	15.22
Spontaneous puberty, <i>n</i> (of 11) ^a	
8-13y	1 (9.1%)
>13y	4 (36.4%)
Spontaneous menarche, <i>n</i> (of 11) ^a	1 (9.1%)
Measurable AMH, <i>n</i>	13 (65%)
AMH level if measurable, ng/mL (mean/SD)	0.83 ± 1.1

Table 3. Relationship between FSH and AMH values (*n*)

	FSH ↑	Normal FSH	P
AMH ↓	13	0	<0,001
Normal AMH	0	7	

Table 4. Relationship between serum AMH and OF (n)				
	Absence of OF	Presence of OF	Ρ	
AMH ↓	9	4		

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Data analyzed*

Clinical data: age, Tanner stage, spontaneous menarche

Karyotype

Hormone measurements: serum

AMH, FSH

Transabdominal gynecologic

ultrasound: number of ovarian

follicles.

*Girls with previous or ongoing hormonal replacement therapy were excluded.

Statistical analysis

Statistical significance was tested with χ2

Table 2. Age, karyotype and pubertal development

Age	n	karyotype		Spontaneou	Spontaneo	
group		Monosomy	Mosaicism, SAs	s puberty	us menarche	
< 8 y	9	2	7	-	-	
8-13 y	5	2	3	1	0	
> 13 y	6	4	2	4	1	
SAs: struc	ctural ab	normalities in one of t	he X chromosomes.			
Tabla		Agylegye of				

Table 6. Markers of ovarian reserve grouped by ageand karyotype

			=0,057
Normal AMH	1	6	

OF in 86% of girls with normal AMH, absence of OF in 69% of girls with low AMH level.

Table 5. Relationship between karyotype and OF (n)

	Absence of OF	Presence of OF	Р
Monosomy	6	2	=0,158
Mosaicism, SAs	4	8	

Ovarian follicles were detectable in only 25% of girls with karyotype 45,X and in 67% with karyotype 45,X/46,XX or other cytogenetic abnormalities.



test. A *p*-value <0.05 was considered

statistically significant.

Age	n	Normal serum AMH		Norma FS	l serum SH	Presence of OF	
		Monos.	Mosaic, SAs	Monos.	Mosaic, SAs	Monos.	Mosaic, SAs
< 8 y	9	0/2	3/7	0/2	3/7	0/2	5/7
8-13 y	5	0/2	1/3	0/2	1/3	0/2	1/3
> 13 y	6	1/4	2/2	1/4	2/2	2/4	2/2

<8 y 8-13 y > 13 y

2

0

Serum AMH/FSH (*n*)



Discussion:

Serum AMH correlated well with serum FSH and appears to be a useful marker of the follicle pool. Nevertheless,

complementary imaging study is still needed. Karyotype is a good predictive marker of premature ovarian insufficiency when considered together with other parameters.

REFERENCES: 1. Sybert VP, McCauley E. Turner's syndrome. N Engl J Med. 2004;351:1227-38. 2. Lie Fong S, Visser JA, Welt CK, et al. Serum anti-Müllerian hormone levels in healthy females: a nomogram ranging from infancy to adulthood. J Clin Endocrinol Metab. 2012;97(12):4650-5. 3. La Marca A, Sighinolfi G, Radi D, et al. Anti-Müllerian hormone (AMH) as a predictive marker in assisted reproductive technology (ART). Hum Reprod Update. 2010;16:113–130. 4. Purushothaman R, Lazareva O, Oktay K, Ten S. Markers of ovarian reserve in young girls with Turner's syndrome. Fertil Steril. 2010;94(4):1557-9. 5. Visser JA, Hokken-Koelega AC, Zandwijken GR, Limacher A, Ranke MB, Flück CE. Anti-Müllerian hormone levels in girls and adolescents with Turner syndrome are related to karyotype, pubertal development and growth hormone treatment. Hum Reprod. 2013;28(7):1899-907. 6. Borgström B, Hreinsson J, Rasmussen C, et al. Fertility preservation in girls with turner syndrome: prognostic signs of the presence of ovarian follicles. J Clin Endocrinol Metab. 2009;94(1):74-80.