The aim of this study was to establish a standard ultrasound echogenicity of the testicular stroma in prepubertal sheep correlating with testicular biometry. Eight Santa Inês rams aging 6 months were evaluated. It was used an Aquila Vet ultrasound with 6 MHz linear transducer using acoustic gel on the previously shaved scrotal region. Sagittal, frontal and transverse images of right and left testicles were recorded to evaluate the image echogenicity (gray scale) on selected predetermined areas of the testicular stroma. The biometric evaluations were performed according to the standard method. The testicular stroma was homogeneous, with echogenicity $53.95 \pm 6.5\%$, $55.70 \pm 6.4\%$ and $55.68 \pm 6.4\%$ for the right, left and the testis mean, respectively. There was also a high correlation between echogenicity and scrotal circumference ($P = 0.0027$, $r= 0.80$, $r^2 = 0.75$). The study showed a contribution to andrological findings, showing accurately and practical the echogenicity of the testicular parenchyma of prepubertal ram, optimizing the early breeding evaluation.

**KEYWORDS**: SHEEP, ANDROLOGY, TESTICULAR PARENCHYMA, ULTRASOUND.

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O objetivo deste estudo foi estabelecer um padrão ultrasonográfico da ecogenicidade do estroma testicular em ovinos pré-púberes correlacionando com a biometria testicular. Foram avaliados 8 carneiros de 6 meses de idade e raça Santa Inês. Foi utilizado um aparelho Áquila Vet, ligado ao transdutor linear 6 MHz, utilizando gel acústico sobre a bolsa testicular previamente tricotomizada nas regiões de aferição. Foram feitas imagens em planos sagitais, transversais e frontais nos testículos direito e esquerdo. Com a função de aferição de ecogenicidade da imagem (escala de cinza), no próprio aparelho foram selecionadas áreas predeterminadas do estroma testicular. As avaliações biométricas foram realizadas de acordo com o método padrão. O estroma testicular apresentou-se, de uma forma geral, homogêneo, com ecogenicidade $53.95 \pm 6.5\%$, $55.70 \pm 6.4\%$ e $55.68 \pm 6.4\%$ para o testículo direito, esquerdo e a média dos testículos, respectivamente. Também se verificou uma correlação entre a ecogenicidade e a circunferência escrotal ($P= 0.0027$, $r= 0.80$, $r^2 = 0.75$).

**RESUMO**
INTRODUCTION

The sheep industry has grown up in the country and the world (Fonseca, 2005). In this context, breeders are fundamentally important in the final production system. Both, in natural mating and in artificial insemination programs or other biotechnologies of reproduction, males are primarily responsible for the breeding herd, subject to greater selection pressure (Simplicio et al., 2007). Thus, choosing a breeder must be based on their production, evaluating the progeny test, and also by conducting a thorough clinical andrological examination (Martins, 2006).

The use of tested breeding and with high fertilizing capacity is very important to ensure good reproductive efficiency and production of lambs. Thus, the search for indicators of reproductive fertility has been the subject of several studies in last years. Smith et al. (1989) indicate that the animal reproductive potential can not be expressed by only one analysis window, which must be estimated by combining several parameters.

The reproductive capacity of breeding is accurately measured by andrological examination (Unanian, 2000). But, the evolution of diagnostic techniques, especially ultrasound, was important for the evaluation of the anatomy of the sex glands and the testicular stroma (Sanches and Afonso, 2000). It is possible to diagnose asymptomatic andrological changes by conventional ultrasound exams (Joey et al. 2009).

Cardilli et al. (2009) studying cattle and Teixeira et al. (2011) studying sheep established an analysis method of testicular stromal echogenicity through its gray scale and correlated with testicular morphometry and seminal evaluations, also verifying findings of earlier changes in sperm quality. For prepubertal animals there is no standard data yet.

The aim of this study was to establish a standard ultrasound echogenicity of the testicular stroma in prepubertal sheep correlated with testis size.

MATERIAL AND METHODS

Animals

Eight Santa Ines rams, aging 6 months, average weight of 15.6 ±2.5, created in the city of Jaboticabal, (latitude 21 ° 15’17” south and longitude 48 ° 19’20” west, with an altitude of 605 meters and a CFa climate predominance according to Köppen) were evaluated. The evaluation was conducted in February, a long days and higher temperatures period.

Equipment and experimental design

We used Aquila Vet Ultrasound equipment, connected to 6 MHz linear transducer. Acoustic gel was used on the previously shaved scrotum, according to Teixeira et al (2011). Images of the right and left testicles were made in sagittal, frontal and transverse view. For measuring image echogenicity (gray scale), were selected on the ultrasound image, predetermined areas of the testicular stroma as described by Teixeira et al. (2011).

The biometric evaluations were performed according to standard method, performing the clinical examination of the external structures of the reproductive system (symmetry and shape of...
the testis and epididymis and plexus structures). With a caliper rule and a measuring tape were obtained scrotal circumference, length, width and thickness of the testicles. The testicular shape (shape of the left testis - SLT, shape of the right testis - SRT) was calculated by the ratio between the width and the length (WIDTH / LENGTH ratio) in the range of 1 to 0.5, where 1 means WIDTH = LENGTH and 0.5, WIDTH = 1/2 LENGTH. According to this ratio, were established the following ways: ratio I ≤ 0.5 = long; ratio II = 0.51 to 0.625 = long / moderate; ratio III = 0.626 to 0.750 = long / oval; ratio IV = 0.751 to 0.875 = oval / spherical; and ratio V > 0.875 = spherical (Bailey et al., 1996).

The testicular volume was measured by comparing two mathematical equations, the first using the mathematical model suggested by Fields et al. (1979) and Unanian et al. (2000) with the mathematical equation of the cylinder volume: 
\[
CVol = 2 \times \frac{(WIDTH / 2)^2 \times \pi \times (LENGTH)}{3}
\]
and the second suggested by Bailey et al. (1998), the equation of prolate spheroid: 
\[
PVol = 2 \times \frac{4}{3} \times \pi \times (WIDTH / 2)^2 \times (LENGTH / 2)
\]
volume expressed as cm³.

The testicular stroma was homogeneous, with 53.95 ± 6.5%, 55.70 ± 6.4 and 55.68 ± 6.4% of echogenicity for the right, left and mean of the testes, respectively, with no significant statistical variation in each measurement (p> 0.05). There was also a high correlation between echogenicity with scrotal circumference (P = 0.0027, r = 0.80, r² = 0.75).

Table 1. Morphometric parameters, shape and testicular volume according to Fields et al. (1979), Bailey et al. (1996) CBRA (1998) and Unanian et al. (2000).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scrotal circumference (SC)</td>
<td>23,13 ± 3,7</td>
</tr>
<tr>
<td>RWidth</td>
<td>7,12 ± 1,0</td>
</tr>
<tr>
<td>LWidth</td>
<td>7,18 ± 1,1</td>
</tr>
<tr>
<td>RLength</td>
<td>4,81 ± 0,9</td>
</tr>
<tr>
<td>LLength</td>
<td>4,68 ± 0,9</td>
</tr>
<tr>
<td>SRT</td>
<td>0,590 ± 0,21</td>
</tr>
<tr>
<td>SLT</td>
<td>0,649 ± 0,05</td>
</tr>
<tr>
<td>CrVol</td>
<td>278,5 ± 118,7</td>
</tr>
<tr>
<td>ClVol</td>
<td>267,9 ± 123,3</td>
</tr>
<tr>
<td>PrVol</td>
<td>185,7 ± 79,12</td>
</tr>
<tr>
<td>PlVol</td>
<td>178,6 ± 82,20</td>
</tr>
</tbody>
</table>

Parameters of testis size in cm and cm³.

**DISCUSSION**

The testes showed long / moderate to long / oval form, as observed by Louvandini et al. (2008) in adult sheeps. The CVol was statistically equal to PVol (P> 0.05), as found by Teixeira et al., (2011). Regard to testicular stroma, the echogenicity was similar to that found by Dickie et al (2009) and Teixeira et al. (2011) in adult sheep during the breeding season, observing the expected homogeneity of the testicular stroma in all measured planes (p> 0.05).

Cardilli et al. (2011) described by the evaluation of testicular stroma of calf, the pathological presence of multiple hyperechoic spots that did not produce acoustic shadowing,
as microlithiasis, which can bring andrologic changes for these breeding cattle.

The correlation between the scrotal circumference and echogenicity can be explained by its increase during the reproductive development of the animals. The same was described by Cardilli et al. (2010), evaluating the development of testicular Nelore cattle. The stromal testicular echogenicity increased directly proportional to the age of the animals (scrotal circumference). The mean value of echogenicity found by Teixeira et al. (2011), 37.91 ± 5.2% was lower than that found in prepubertal animals in this study. The hypothesis explains that adult animals were weekly semen collected and animals in this study had a mean age of 6 months, with possibly considerable sperm production, the reason for the increased echogenicity.

The clinical knowledge importance of differences, between the testicular stroma echogenicity in prepubescent and adult human, has been reported since tumors and inflammatory processes are characteristically hypoechoic compared to the male gonad stroma. It is difficult to visualize the contrast to the low echogenicity of children testes, what reinforces the knowledge importance about the normal sonographic echogenicity pattern of this organ according to the age of the animals, especially young animals, the focus of this study (Hamm and Fobbe, 1994; Cardilli et al., 2010).

The study had a great contribution to the andrological findings, showing accurately and in a practical way the stromal echogenicity of prepubertal ram testicles as a valuable tool to andrologic evaluation.

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REFERENCES


