Radiographic and ultrasonic study of pelvic bones in awassi ewes and local she goat and relationship with age of sexual maturity

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Abstract

The goal of this study is to find out the age of sexual maturity in Awassi sheep and native black she goats by examining pelvic bone development which is obtained from measuring the transverse and vertical diameters of the pelvic bone in the two species using portable X-ray machines American origin. In addition, the length and width of the ovaries were measured with an ultrasound rectal probe. To achieve the goal of this study, six Awassi sheep and the same number of local goats were used. Radiographs were taken of each animal in the ventro-dorsal position, then the mean and standard error of each measurement in the two species were extracted. The rectal probe of the ultrasound machine was also used by inserting it into the rectum, taking vertical and transverse ovarian measurements, and then extracting the mean of each measurement along with the standard error. The mean transverse and vertical diameter measurements at the first instances of sexual maturity in Awassi sheep were 7.70±0.09 cm and 10.61±0.03 cm, respectively, and the mean ovarian length and width were 1.20±0.08, 0.80±0.06 cm respectively. While the average distance to the transverse pelvic inlet and the pelvic inlet vertically in local black goats at age of sexual maturity were 7.15±0.06 cm and 10.55±0.10 cm, respectively, and the average length and width of the ovary was 1.66±0.03, 1.24±0.02 cm respectively. The results in both species showed that the age of sexual maturity is earlier in Awassi sheep than in local black goats.

Introduction

V2.2 Veterinary Ultrasound CD66V Digital radiography, this proposal in the field of veterinary anatomy and embryology may be a step on the way to developing other disciplinary areas in the veterinary profession (1). A pelvic scale was used to evaluate the size of the pelvic canal and compare it with the size of the fetus, and there are several types of measurement methods, the most important of which is radiography, which is the most common method (2-4). When using radiography to measure the size and diameter of the pelvic bone in a number of sheep breeds in South Africa, and through the study, the cross-sectional diameter and the associated diameter of the entrance to the pelvis were calculated. Radiometric measurements of the pelvic bone in ewes were taken and compared with measuring the size of the pelvis after slaughtering. The results of the measurements for both methods were accurate (r>0.87), regardless of the breed. Thus, it is possible to rely on measuring the dimensions of the pelvis in ewes through radiography (5) study of a technique for radiographic pelvimetry in the ewe, where the radiography was done in the ventral-dorsal position and the lateral position, and the distance between the animal and the x-ray device was target- film distance 1.83 meters in order to reduce inflation in the diameters of the tub to less than 8 times in most cases Kodak high-speed tapes were used. Wool was cut from the ewes used for measurement. They were also prevented from eating for 18
hours before radiography to decrease the risk of regurgitation during anesthesia, and the use of the anesthetic sodium Pentobarbitone by slow injection into the jugular vein, and ventral-dorsal and lateral snapshots were taken for each animal. The iliac bone, the space between the Lateral Ischial Tuberosities (LIT), and the measurement of the posterior promontories of the ischium (PPI). The results for a number of ewes were as follows, the mean transverse diameter was 89.6 millimeters, the average vertical diameter was 101.2 millimeters, and the average vertical diameter was 101.2 millimeters. The LIT was 138.7 millimeters and the average PPI was 66.0 millimeters (6). The trans rectal ultrasound is considered to be a crucial tests-criteria for observing the growing of different ovarian follicles besides the growth of fetus at initial stages of gestation (7,8). With the transrectum probe of an ultrasound machine for adult ewes and female goats, so that the ovaries take an ellipsoidal in shape, with major and minor axes of 15 and 10 mm, respectively, be contingent on the period. Ovarian structures determination be determined by the skill and familiarity of technical person. The comparative accurateness between two approaches may be vary by more than 20% (9). The examining embraced 28 heads of female goats by using ultrasound imaging, that the accurateness of ultrasound investigation in the fields of teaching anatomy at the international level, we have adhered modern methods that is used internationally for this purpose, such as X-ray to point the sexual maturity as well as ovulation in the goats is 100%. This aims to determine the necessity as well as the accurateness of ultrasound inspection for goats to guesstimate the ovulation and the sexual maturity (10).

Materials and methods

In this study used 6 Awassi ewes and 6 female goat lambs with information of date of birth which was recorded in special records, and followed up the animals until they reached the age of 12 weeks, where began to measure them by radiography. The x-rays were performed in the ventral-dorsal position, and the distance between the animal and the X-ray machine was a target-film distance of 1.83 meters to reduce inflation in the pelvic diameters to less than 8 times in most cases (6). High speed kodak tapes were used, we performed x-rays using the American original portable x-ray machine. We converted the measurement unit that appears on the computer of the portable x-ray device from the unit of measure mm to the unit of measure cm.

The pelvic bone measurements

This is achieved by measuring the transverse pelvis inlet (TPI) from the mid of the pelvic bone. Measure of the vertical pelvis inlet (VPI) between the base of the sacrum and pubic tubercle. X-rays were performed every 15 days until the first signs of maturity appeared.

The usage of ultrasound instrument

The purpose of this method was to: scan ovaries; inspected by use of rectal probe; reviewed weekly; and detect the changes on the surface of ovaries to decide the approximate age of sexual maturity. Ultrasound method was performed through rectal route while the animal in the stand-up position and the probe was rubbed with liquid vaseline to simplify the penetration into rectum, after that, the probe was rotated about 45-90 degree with an anticlockwise and in reverse direction till it directly contact with mucus membrane of rectum to point the locality of right and left ovaries (11). Veterinary ultrasound instrument CD66V (Figure 1) which was fitted out with a full electrometric caliper, where the measurements of the most structures like ovaries and other organs could be measured. The sensor was covered by a rubber tube as shown in figure 2 to have a better control of the inside of the rectum (12). Animals put into a dimmed-light place devoid from direct sunshine in order to enhance the images (13).

Figure 1: Veterinary Ultrasound CD66V ultrasound V2.2.

Figure 2: before and after applying the rubber tube to the probe.
Results

Radiographic of TPI and VPI measurements in ewe lamb from age 12 week to the sexual maturity

The mean of measurements to the sexual maturity, recorded the lowest average measurement of the TPI and VPI measurements in the first measure was 5.28±0.04, 8.36±0.04 cm, respectively, and the ultimate measurement is reached at the age of sexual maturity 7.70±0.09, 10.61±0.03, accordingly (Table 1, Figure 3 and 4).

Radiology of TPI and VPI measurement in she goat lamb from age 12 weak to the sexual maturity

The mean of the measurements to the sexual maturity, recorded the lowest average of the TPI and VPI measurement in the first measure is 4.61±0.04, 7.55±0.03 cm, respectively, while the supreme is reached at the period of sexual maturity; 7.15±0.06, 10.55±0.10 respectively (Table 2, Fig. 5 and 6).

Measurements of length and width of the ovary by sonograph

As shown figure 7 shows, the recording of the dimensions of the ovaries at the first appearance by using the straight sensor of the ultrasound, where weekly measurements were made to the age of sexual maturity, during which 78 the ovaries increased in size as the numbers and counts of the X’s increased noticeably as we approached the first sexual maturity. our study on ewe lambs shown in table 3 showed that the lowest average length and width of the ovary was at the first measurement with an average measurement of 1.20±0.08, 0.80±0.06 cm, respectively, while the maximum measurement was at the age of sexual maturity with an average of 1.66±0.03, 1.24±0.02 cm respectively. while in she goat lamb the results of our study shown in table 3 showed that the lowest average length and width of the ovary is at the first measurement with an average measurement of 1.14±0.08, 0.77±0.04 cm, respectively, while the maximum measurement was at the age of sexual maturity with an average of 1.53±0.04, 1.18±0.07 cm respectively.

Table 1: Measure the TPI and VPI measurement in ewe lamb from 12 week to the sexual maturity (mean±SE)

<table>
<thead>
<tr>
<th>Measurements</th>
<th>TPI</th>
<th>VPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Measurement</td>
<td>5.28±0.04</td>
<td>8.36±0.04</td>
</tr>
<tr>
<td>Second Measurement</td>
<td>5.28±0.03</td>
<td>8.67±0.04</td>
</tr>
<tr>
<td>Third Measurement</td>
<td>5.89±0.03</td>
<td>8.90±0.04</td>
</tr>
<tr>
<td>Fourth Measurement</td>
<td>6.36±0.04</td>
<td>9.16±0.05</td>
</tr>
<tr>
<td>Fifth Measurement</td>
<td>6.75±0.06</td>
<td>9.41±0.04</td>
</tr>
<tr>
<td>Sixth Measurement</td>
<td>7.15±0.09</td>
<td>9.73±0.03</td>
</tr>
<tr>
<td>Age of sexual maturity</td>
<td>7.70±0.09</td>
<td>10.61±0.03</td>
</tr>
</tbody>
</table>

Figure 3: Radiographic photo that represented of TPI and VPI in ewe lambs, VPI= 83.10 mm, TPI=52.21 mm, N0. of animal 02275, R: right side of animal.

Figure 4: Radiographic photo that represented of TPI and VPI in ewe lambs in appear primary singes of sexual maturity, VPI= 106.0 mm, TPI=69.8 mm, N0. of animal: 02300, R: right side of animal.
Table 2: The TPI and VPI Measurements in she goat lamb from age 12 week to the sexual maturity (Mean±SE)

<table>
<thead>
<tr>
<th>Measurements</th>
<th>Variables</th>
<th>TPI (Mean±SE)</th>
<th>VPI (Mean±SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Measurement</td>
<td></td>
<td>4.61±0.04</td>
<td>7.55±0.03</td>
</tr>
<tr>
<td>Second Measurement</td>
<td></td>
<td>4.90±0.03</td>
<td>7.95±0.05</td>
</tr>
<tr>
<td>Third Measurement</td>
<td></td>
<td>5.25±0.04</td>
<td>8.40±0.04</td>
</tr>
<tr>
<td>Fourth Measurement</td>
<td></td>
<td>5.55±0.03</td>
<td>8.67±0.09</td>
</tr>
<tr>
<td>Fifth Measurement</td>
<td></td>
<td>5.75±0.06</td>
<td>8.97±0.07</td>
</tr>
<tr>
<td>Sixth Measurement</td>
<td></td>
<td>5.93±0.02</td>
<td>9.36±0.03</td>
</tr>
<tr>
<td>Seventh Measurement</td>
<td></td>
<td>6.29±0.05</td>
<td>9.60±0.05</td>
</tr>
<tr>
<td>Eighth Measurement</td>
<td></td>
<td>6.67±0.04</td>
<td>10.17±0.07</td>
</tr>
<tr>
<td>Age of sexual maturity</td>
<td></td>
<td>7.15±0.06</td>
<td>10.55±0.10</td>
</tr>
</tbody>
</table>

Figure 5: Radiographic photo that represented of TPI and VPI measurement in she goat lambs, VPI= 75.61 mm, TPI=46.61 mm. No. of animal 02283, R: right side of animal.

Figure 6: Radiographic photo that represented of TPI and VPI measurement in she goat lambs, VPI= 79.08 mm, TPI=49.00 mm, No. of animal 02271, R: right side of animal.

Figure 7: A; represent the length and width of ovary, B; represent the boundaries of the ovary.

Table 3: dimensions of ovaries from the first sonar appearance to the age of sexual maturity in ewe lambs and she goat lambs

<table>
<thead>
<tr>
<th>Variables</th>
<th>Ewe lambs</th>
<th>She goat lambs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>length of the ovary</td>
<td>width of the ovary</td>
</tr>
<tr>
<td>First Measure</td>
<td>1.20±0.08</td>
<td>0.80±0.06</td>
</tr>
<tr>
<td>Second Measure</td>
<td>1.24±0.03</td>
<td>0.84±0.03</td>
</tr>
<tr>
<td>Third Measure</td>
<td>1.28±0.02</td>
<td>0.90±0.02</td>
</tr>
<tr>
<td>Fourth Measure</td>
<td>1.32±0.04</td>
<td>0.94±0.04</td>
</tr>
<tr>
<td>Fifth Measure</td>
<td>1.37±0.03</td>
<td>1.01±0.03</td>
</tr>
<tr>
<td>Sixth Measure</td>
<td>1.42±0.02</td>
<td>1.10±0.03</td>
</tr>
<tr>
<td>Seventh Measure</td>
<td>1.50±0.02</td>
<td>1.19±0.02</td>
</tr>
<tr>
<td>Eighth Measure</td>
<td>1.66±0.03</td>
<td>1.24±0.02</td>
</tr>
<tr>
<td>Ninth Measure</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Eighth measure in ewe lambs represents age of sexual maturity, ninth measure in she goat lambs represents age of sexual maturity.
Discussion

In the last decade, researchers study the measurements of the pelvic bones using x-rays in different strains of adult female sheep of less than 4 years of age, including the Marino, Dormer and African Marino, and the results for the VPI of the Marino sheep breed were 11.76 cm, and the TPI was 8.88 cm, while the VPI of the Dormer sheep breed was 11.66 cm, the TPI is 10.60 cm, and the VPI of the African Marino sheep breed was 12.51 cm, and the TPI was 10.71. Also, Haughey et al. (14) described the average of TPI and VPI of ewes from the adult Dorset breed was 9.3 and 10.0 cm, respectively, while the average of TPI and VPI of ewes from the adult Marino breeds were 8.4 and 11.3 cm, respectively. The results in this study differed with the researchers mentioned above in the average transverse pelvic inlet TPI and the vertical pelvis inlet VPI was some similar to the results of the current study. The reasons for the difference are due to the difference in the breeds of ewes and domestic goats with the other mentioned breeds, as well as the difference in age. The method of taking radiography of the pelvic bone in sheep is similar to Haughey et al. (14), where the animal was placed in a dorsal ventral position inside a special room used for radiography, and the measurement was taken using an electronic scale connected to a special computer used to take bone measurements. That transrectal ultrasound technology is one of the most important examinations that aim to monitor the growth of ovarian follicles and measure their diameter (15,16). What happens in the ovary every week until the appearance of the follicles, whose first appearance is considered to be the first estrous cycle of weaning, where we recorded the age of sexual maturity for weaning sheep and goats, so the results of this research match those of the researchers. The researcher Islam et al. (17) indicated that the length of the ovary in goats is approximately 1.1 cm and its width is 0.7 cm, and this differs from what the results in this study showed, where the length of the ovary in weaning sheep was approximately 0.04±1.53 cm for the first estrous cycle, and its width was 1.18±0.07 cm (18).

Conclusion

The true distance to the vertical and transverse pelvic entrance increases by radiography as the animal approaches the age of sexual maturity. Upon reaching the age of first sexual maturity, the length and width of the ovaries increase in ewes and goats.

Acknowledgment

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Conflict of interest

The authors declare that conflict of interest exists.

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دراسة شعاعية و فوق الصوتية لعظام الحوض في النعاج العواسية و اناث الماعز الاسود المحلي و علاقتها مع عمر البلوغ الجنسي

أحمد أنمار الحنوش و عدنان علي حسو
فرع التشريح، كلية الطب البيطري، جامعة الموصل، الموصل، العراق

الخلاصة
هدف الدراسة معرفة عمر البلوغ الجنسي في النعاج العواسية و اناث الماعز الاسود المحلي من خلال دراسة تطور عظام الحوض في كلا الحيوانين. تم استخدام جهاز الأشعة السينية و مسبار المستقيم لقياس المسافة وطول وعرض المبيض في كلا الحيوان في سن البلوغ الجنسي الأول. ظهرت نتائجنا أن عمر البلوغ الجنسي في النعاج العواسية كان متقدماً على عمر البلوغ الجنسي في الماعز الاسود المحلي، مما يعكس تطوراً في عظام الحوض قبل البلوغ الجنسي.

المبادئ. استخدمت الدراسة 26 حيواناً من فئات النعاج العواسية ونفس العدد من فئات الماعز المحلي. أخذت لكلا الحيواناً تقسيمًا公务员يًا تحت ضغط نبتي ظهري بعد ذلك تم استخراج معدل البصوات وكذلك الخطاء القياسي لكل قياس في كلا الحيوانين، وكذلك استخدام مساحة القياسي لجهاز الموجات فوق الصوتية. قياسات الخصائص الميكانيكية للمستقرة وقدمت قياسات الوزن عند كل قياس وكذلك الخطاء القياسي.

كان متوسط قياس القطر المستعرض والمتبقي مع أول حالات البلوغ الجنسي في فئات النعاج العواسية 7.70 ± 0.09 سم، 10.61 ± 0.03 سم على التوالي وعرض المبيض 7.70 ± 0.20 سم على التوالي. بينما كان متوسط المسافة لمدخل الحوض المستعرض والمتبقي مع أول حالات البلوغ الجنسي في فئات الماعز الاسود المحلي 7.15 ± 0.06 سم، 10.55 ± 0.1 سم على التوالي وعرض المبيض 7.15 ± 0.24 سم على التوالي. أظهرت النتائج على كلا الحيوان أن عمر البلوغ الجنسي في النعاج العواسية كان متقدماً على عمر البلوغ الجنسي في الماعز الاسود المحلي.