

## Evaluation the effect of laparoscopic unilateral ovariectomy in young Iraqi black goat on the histomorphometric of the remaining ovary at adult stage

K. I. Al-Khazraji<sup>1</sup>; M. J. Eesa<sup>2</sup> and S. M. Merhesh<sup>3</sup>

<sup>1,2</sup>Department of Surgery and Obstetrics, <sup>3</sup>Department of Anatomy and Histology, College of Veterinary Medicine, <sup>1</sup>Diyala University, <sup>2,3</sup>Baghdad University, Iraq.

E-mail: [mohammed.jawad1956@gmail.com](mailto:mohammed.jawad1956@gmail.com)

Accepted: 2/9/2015

### Summary

The ovarian histomorphometric in adult normal and unilateral ovariectomized Iraqi black goats (Age 7 months) was studied to evaluate the effect of laparoscopic unilateral ovariectomy of young goat (age 2-3 months) on other remaining ovary histologically. Ten young female Iraqi black goats were used in the study. The goats were divided randomly into two equal groups; young goats were left normal (group A) and young goats underwent to right laparoscopic unilateral ovariectomy (group B). All animals in both groups were left to reach adult stage at 7 months age, in which they underwent to removal their ovaries laparoscopically by using the harmonic scalpel. Operations were performed under general anesthesia by using of a mixture of xylazine and ketamine intramuscularly. The ovarian histomorphometric included; height of germinal epithelium and thickness of tunica albuginea, cortex and medulla were measured at adult stage for both groups. The study revealed a significant elevation ( $P < 0.05$ ) in thickness value of tunica albuginea, cortex and medulla in the right ovary compared with the left one in normal adult goat (group A). The left ovary in group (B) showed significant increase in the thickness value of tunica albuginea, cortex and medulla compared with those in similar (left) ovary in group (A) which indicated that the remaining ovary in group (B) showed compensatory action in increasing their histological structures measurements. The short operative time, no intraoperative and less postoperative complications referred to that the laparoscopic ovariectomy in goats could be performed successfully with this technique and by using of harmonic scalpel.

**Keywords:** Laparoscopic ovariectomy, Ovary, Histomorphometric, Goats.

### Introduction

The goat is an important animal reared to produce milk, meat, hair and leather over much of the world especially in Asia and Africa (1). Also the goat is used as a better model for study and biomedical research (2). Goats characterized by its small size, do not require the employment of much money to set up projects to be reared and easily handled, as well as the reproductive efficiency of reaching the puberty, low duration of pregnancy and multiple births, in addition to the fact that nutrition does not require special foodstuffs. Also, it is adapt to seasonal and geographical changes (3 and 4). Reproduction and management play an important role in increasing the production of the goat, thus, the reproductive performance was one of the most essential economic traits due to its effect on the number of kids produced per year (5 and 6). The ovary is an essential organ in female genital system, it produces the ovum and performs a critical role as an endocrine organ, serving as the principle source of sex steroid

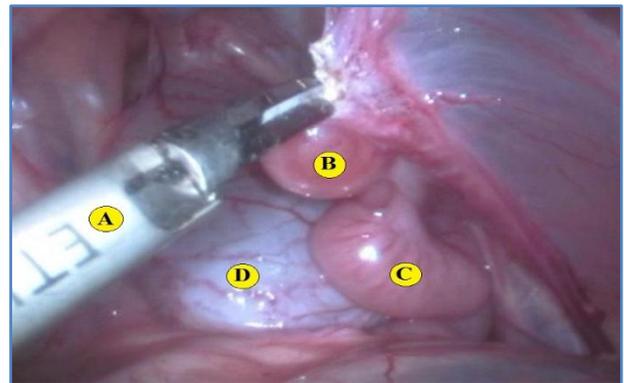
hormones in the female, so the function and maintenance of the genital tract, mammary gland and behavior of female all are depending on the normal function of the ovary (7 and 8). Various genital system disorders can lead to economic losses and interrupted animal production. One of these disorders that may affect the ovary in goats is ovarian tumors that require the removal of the entire ovary (9). Ovariectomy is a surgical procedure done either to remove an abnormal ovary or for experimental uses. In last decades, the laparoscopic devices were used in this procedure because this technique provides several benefits more than the open surgery such as less surgical trauma, shorter time, safe, less complications and less the pain and stress to animals (10 and 11). Because of no accessible studies regarding the effect of unilateral ovariectomy in young Iraqi black goats, therefore the aim of this study was to evaluate the effect of laparoscopic unilateral ovariectomy in young Iraqi black goats on the

histomorphometric structure of the remaining ovary.

### Materials and Methods

Ten healthy young female Iraqi black goats aged between 2 to 3 months (mean  $2.5 \pm 0.18$  months), and their weight between 5 and 7.2 kg (mean  $6.3 \pm 0.37$  kg) were used. The animals were divided randomly into two equal groups; A and B. The young goats in group (A) left normal while the animals in group (B) were subjected to right laparoscopic unilateral ovariectomy. All animals in both groups left to reach adult stage at 7 months age in which the animals underwent to removal their ovaries in order to determination of the histological structure. The procedure of ovariectomy performed using a three portal technique by laparoscope (Karl Storz Company, Germany) and harmonic scalpel device (Ultracision Harmonic Scalpel, Ethicon Endo-Surgery, Inc. Cincinnati, OH, USA.). The goats fasted for 24 hours of food and 12 hours of water prior to surgery. Under aseptic technique, the ventral abdominal area prepared surgically. A combination of xylazine hydrochloride 2% at dose of 0.05 mg/kg B.W. and ketamine hydrochloride 10% at dose of 3mg/kg B.W. was administered intramuscularly to provide general anesthesia (12), and the goat placed in dorsal recumbency. The three operating portals, one for telescope and two for instruments were introduced in the abdominal area and the pneumoperitoneum with CO<sub>2</sub> (5 mm Hg and 8 mm Hg) for goat was performed. The right ovary in young goats of group (B) was manipulated by the two grasper forceps until the ovarian pedicle (mesovarium) was easily accessible. The harmonic scalpel blade was then placed across the cranial aspect of the mesovarium for hemostasis and transected (Fig. 1) and then repeated the cycle of hemostasis and transection until complete resection of mesovarium and the proper ligament of the ovary using the harmonic scalpel blade. When the entire mesovarium and proper ligament were complete transected, the right ovary was free and removed from the abdominal cavity together with their holding grasper and cannula. The ovarian pedicle was observed for identify adequate hemostasis before the laparoscopic completion. After that the instruments was removed and abdominal

wall was closed routinely. At the adult age, the both ovaries in group (A) and the left ovary in goat of group (B) were removed in similar technique that used for removing of the right ovary in young goats. The time of operations were measured in minutes for determine the mean time consumed for laparoscopic unilateral and bilateral ovariectomy in goats. Penicillin- Streptomycin in dose of (20.000 I.U./kg B.W. and 20 mg/ kg B.W) respectively was administered intramuscularly for five days post-operatively. Skin sutures were removed ten days post-surgery.



**Figure, 1:** Laparoscopic view shows the hemostasis and transection the cranial aspect of mesovarium by the harmonic scalpel for ovariectomy. The harmonic scalpel (A), right ovary (B), right uterine horn (C), urinary bladder (D).

For histological examination, specimens were taken from the both ovaries of group (A) and from the remaining (left) ovary of group (B), and were fixed in 10% neutral buffered formalin, then routinely processed and embedded in paraffin which were cut at 5 microns and stained by hematoxyline and eosin stain and PAS stain (13 and 14) and they were examined under light microscope. Histomorphometrical determination was taken by multiple measurements of each section using ocular stage micrometer (15). Results underwent statistical analysis using analysis of variance (ANOVA). Least significant difference (L.S.D) was also used for the purpose of differentiating between the means of parameters in each group by using SPSS statistical program.

### Results and Discussion

The ovaries in both groups of goats were removed successfully through a three port laparoscopic technique with harmonic scalpel

device. Access and visualization of ovary was excellent in laparoscopy. This result was consistent with (16) who referred to the pneumoperitoneum and the magnification of field facilitate of the laparoscopic operations. The harmonic scalpel device was relatively easy to use and achieved complete hemostasis and transection of the ovaries. The current study showed similarly to others studies reported that the harmonic scalpel was represented a safe and alternative to other methods of laparoscopic ovariectomy in mare (17 and 18). In present study, the mean surgical time was (11.4 ±1.02 min.) and (17.2 ±1.24 min.) for laparoscopic unilateral and bilateral ovariectomy respectively. The time of operation showed significant differences (P<0.05) among the two surgical operations. The mean time of laparoscopic bilateral ovariectomy using harmonic scalpel in the current study was comparable to mean time 15 minutes that reported by (10) in goats subjected to laparoscopic-assisted ovariectomy In sheep, the average time that required for removal of ovaries by using of laparoscope and electro-cautery device was 19 minutes (19). The differences in the duration of operative time in the study could be related to the types of operations, while the difference

with other studies could be due to vessels sealing device differences, body weight, position of the animal, as well as the surgeon experiences. There were no intraoperative complications and no major postoperative complications were reported in the current study. The findings of the study appear to be similar to observations in previous report by (20).

The results of histological examination showed that the ovary of studied animals of groups (A) and (B) was divided into an outer zone (the cortex), and an inner zone (the medulla). The cortex was covered by a simple squamous (germinal epithelium) which continuous with the visceral peritoneum, beneath this layer was a dense connective tissue called the tunica albuginea. The cortex was containing various stages of ovarian follicles. The medulla of ovary made up of loose connective tissue with smooth muscle fiber, blood and lymphatic vessels, and present of rete ovarii which was channels like lined with cuboidal epithelium (Fig. 2 and 3). Histomorphometric measurements of the ovarian structures that included germinal epithelium, tunica albuginea, cortex and medulla of ovaries in goats of present work were explained in (Table, 1).

**Table, 1: Histomorphometric value of the height and thickness of ovarian structures in the two groups of goats. (M± S.E.) in micrometers.**

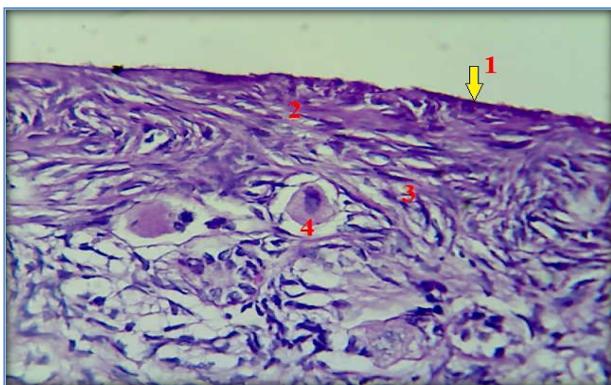
Groups	Ovary	Germinal epithelium	Tunica albuginea	Cortex	Medulla
Group (A) Normal	Left	9.6 ±1.122 A	47.0 ±2.144 B	704.0 ±10.295 C	250.0 ±5.477 C
	Right	10.8 ±1.201 A	67.6 ±3.472 A	930 ±7.071 A	360.0 ±2.449 A
Group (B) Unilateral ovariectomy	Left	10.2 ±1.529 A	62.0 ±2.756 A	892.0 ±6.633 B	322.0 ±3.741 B

Different capital letters in same column denote significant differences (P<0.05).

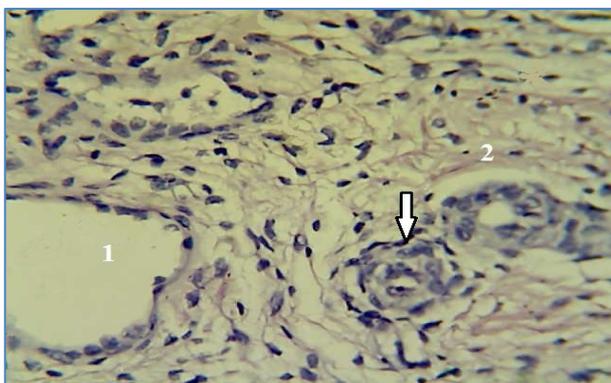
The height of germinal epithelium in the ovaries showed no significant differences (P<0.05) between the two groups (Table, 1). The thickness of tunica albuginea, cortex and medulla in group (A) revealed significant elevated (P<0.05) in the right ovary compared with the left one (Table, 1). No significant differences (P<0.05) in thickness of tunica albuginea between the right ovary in group (A) and left ovary of group (B) was detected, but the thickness of cortex and medulla in group (B) showed significant decrease compared with those observed in right ovary of group

(A) (Table, 1). The left ovary in group (B) revealed significant increase (P<0.05) in the thickness of tunica albuginea, the cortex and medulla compared with those recorded in ipsilateral (left) ovary in group (A). The ovaries in goats of group (A) were recorded mean value for thickness of cortex and medulla higher than those reported by (21) in Indian goats. The results of present work demonstrated that the left ovaries in group (B) showed significantly increased in thickness of tunica albuginea, cortex and medulla after unilateral ovariectomy compared with similar

(left) ovary in group (A). These observations were agreed with studies on other mammals reported previously by other researchers (22 and 23) in rats, (24) in rabbits and (25) in gilts. The variation in measurements of ovarian structures between the two groups could be related to the ovarian steroid hormones levels, while the differences in measurements with other studies could be related to breed and species differences. The present work indicated that the laparoscopic ovariectomy using harmonic scalpel were novel in the goats, submitted safe and reliable technique with minimal invasiveness, shorter surgical time, no intraoperative and less postoperative complications. The histomorphometric for ovarian structures showed that the thickness of tunica albuginea, cortex and medulla were highest in the right ovary than the left one in normal goat. Also the remaining ovary in unilateral ovariectomized goats was shows compensatory action in increasing their histological structures compared with ipsilateral ovary in normal goats.



Figure, 2: Histological section in ovary of one animal in group (B) shows simple squamous germinal epithelium (1) over tunica albuginea (2), and the cortex (3) that contain primordial follicle (4) (H and E stain 100X) .



Figure, 3: The medulla of the ovary in goat of group (A) showing tubules of rete ovarii (arrow), large blood vessel (1), smooth muscle fiber. (PAS stain 400X).

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### تقييم تأثير استئصال المبيض منظارياً من جانب واحد في الماعز العراقي الأسود اليافع على القياس النسجي للمبيض الآخر الباقي عند مرحلة البلوغ

خالد ابراهيم الخزرجي<sup>1</sup> و محمد جواد عيسى<sup>2</sup> و شاكور محمود مرهش<sup>3</sup>

<sup>1,2</sup> فرع الجراحة والتوليد، <sup>3</sup> فرع التشريح والانسجة، كلية الطب البيطري، جامعة ديالى، <sup>2,3</sup> جامعة بغداد، العراق.

E-mail: [mohammed.jawad1956@gmail.com](mailto:mohammed.jawad1956@gmail.com)

#### الخلاصة

درست القياسات النسجية للمبايض في الماعز العراقي الاسود البالغ الطبيعي والمستأصل المبيض منظارياً من جانب واحد (في عمر 7 اشهر) لتقييم تأثير استئصال أحد المبايض في الماعز اليافع (عمر 2-3 اشهر) على القياس النسجي للمبيض الآخر الباقي عند مرحلة البلوغ. استعملت في الدراسة 10 من أنثى الماعز اليافعة، والتي قسمت عشوائياً على مجموعتين متساويتين، تركت الحيوانات اليافعة في المجموعة الأولى طبيعية، أما المجموعة الثانية فأجريت لها عملية استئصال المبيض الأيمن منظارياً. تركت جميع الحيوانات في كلتا المجموعتين للوصول إلى مرحلة البلوغ في عمر 7 اشهر، وبعدها خضعت لعملية استئصال المبايض منظارياً باستعمال المشروط التوافقي. أجريت جميع العمليات الجراحية تحت التخدير العام باستعمال خليط من الزايلازين والكيتامين حقناً بالعضل. تم إجراء القياسات النسجية للمبايض لجميع الحيوانات في مرحلة البلوغ وللمجموعتين والتي تضمنت قياس ارتفاع الظهارة الجرثومية، وسمك الغلالة البيضاء، والقشرة والنخاع. أظهرت نتائج الدراسة وجود ارتفاع معنوي في سمك الغلالة البيضاء والقشرة والنخاع في المبيض الأيمن مقارنة مع المبيض الأيسر في الماعز البالغ الطبيعي في المجموعة A. أظهر المبيض الأيسر في المجموعة B زيادة معنوية في سمك الغلالة البيضاء والقشرة والنخاع مقارنة مع تلك الموجودة في المبيض الأيسر المماثل في المجموعة A، والتي أعطت مؤشراً على أن المبيض الأيسر المتبقي في المجموعة B قد أظهر عملاً تعويضياً في زيادة قياسات التراكيب النسجية للمبيض. أشار قلة وقت العملية الجراحية، وعدم وجود مضاعفات أثناء العملية وقلة المضاعفات بعد العملية الجراحية إلى أن عملية استئصال المبايض في الماعز جيدة باستعمال المنظار والمشروط التوافقي.

الكلمات المفتاحية: استئصال المبايض منظارياً، المبيض، القياس النسجي، الماعز.