FACULTY OF VETERINARY MEDICINE
USMANU DANFODIYO UNIVERSITY
P.M.B. 2346, SOKOTO. NIGERIA

Sokoto Journal of Veterinary Sciences

ISSN 1595-093X

Awasum *et al.* /*Sokoto Journal of Veterinary Sciences* (2008). **7**(2): 7-9.

Neovascularisation of the ovary post ligation of ovarian vessels in bitches

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Abstract

A total of 6 adult bitches that had cycled at least three times and whelped at least twice were conditioned for 3 weeks prior to surgery and maintained for eight and a half months post surgery. Under general anaesthesia, a laparatomy was performed. Ligatures were placed proximal and distal to each ovarian vessel to completely occlude the vascular supplies to the ovaries.

Thirty two weeks later, the ovaries were harvested for gross and laboratory evaluations.

Pre, intra and post-surgical temperatures and haematological parameters (taken twice weekly) were within normal range, for all 6 bitches. Grossly, all harvested ovaries were insignificantly regressed except the ovary of bitch 1 and 4 which showed significant regression and degeneration. Histopathologically, there were diffused necrosis, dense fibrosis of the ovarian cortex and medulla, degeneration of primary and graafian follicles in the ovarian stroma as well as atretic follicles and degenerated corpus lutea for bitch 1 and 4. Bitches 2, 3, 5 and 6 had numerous normal primary and graafian follicles with congested blood vessels, fully developed ova in the ovarian stroma and developed corpus lutea indicative of vascular invasion of the ovarian stroma. The viable ovarian tissues noticed on histology were evidence of revascularization suggestive of newer invasion of blood vessels from the ovarian attachment from the retroperitoneal tissues and likely from the subcutaneous supplies. Consequently, it is not advisable to neuter a bitch by ligation of the ovarian vessels

Keywords: Neovascularisation, Ligation, Ovarian vessels, Bitches

Introduction

Various reasons have been advanced for neutering bitches just like instituting contraceptives in humans. In bitches, mismating, over population, prevention of metastatic tumors are the common reasons advanced for neutering or spaying bitches (Volpe *et al.*, 2001). Neutering or contraception could be as old as life history of man (Himes, 1963). Neutering has been considered as an elective sterilization meant for the treatment of ovarian and uterine diseases, prevention of recurrent vaginal hyperplasia as well as to prevent hormonal changes that may interfere with administered medication (Stone *et al.*, 1998).

Neutering dates back in ancient history, but the search for modern techniques of preventing, avoiding and terminating pregnancies is still the desire of theriogenologic or gynaecologic surgeons. Conservative methods used to induce contraception have left untold medical complications (Bertram, 1998). Similarly, the existing standards for surgically induced contraception is burdensome, over laden with whole organ loss, urinary incontinence, severe haemorrhage, complications of homeostasis and the complexity of the surgical procedure (Stone *et al.*, 1998; Ettinger and Edward, 2000). The canine ovaries are oval, flattened and about 1.5cm in length in adult dogs (Evans and Christensen, 1979) and located close to the caudoabdominal wall, the caudal poles of the Kidneys, and concealed within a peritoneal pouch. Attached by the mesovarium linking the suspensory ligament cranially and the mesometrium caudally in which the ovarian blood vessels course. The ovarian artery branch of the abdominal aortic trunk branches further to supply the ovary (Nickel, 1973). The right ovarian vein drains into the caudal vena cava. The left ovarian vein enters the left renal vein (Evans and Christensen, 1979). If these vessels are ligated, what will happen to the ovarian tissues?

The objective of the study was to investigate whether there will be revascularization post ligation of the ovarian vessels.

Materials and Methods

Six adult local breed bitches of various body weights (12, 10 and 11 kilograms respectively) that have gone through at least 3 reproductive cycles and whelped at least twice were conditioned for 3 weeks and judged clinically fit by their mean presurgical temperatures and haemograms. They were free from endo- and ecto-parasites post

treatment with Avermectin (MSD Mectizan® USA) and praziquantel.

The bitches were kept nil per os three hours prior to surgery. Under standard and aseptic pre-surgical conditions, a laparotomy was conducted under general anaesthesia with Atropine-SO_4 (0.5mg/kg) and Chlorpromazine (4mg/kg) as preanaesthetic medications and thiopental sodium (10mg/kg) as the final anaesthetic agent in continuous infusion, all at standard doses. At dorsal recumbency, an 8 cm mid-ventral incision was made 7cm cranial and 1cm caudal to the umbilicus to access the ovaries. The abdominal viscerals were packed using abdominal packs to adequately expose the left ovaries. The left ovarian arteries and veins were identified, isolated, and ligated by 3 forceps clamp, with 2-0 chromic Catguts. The abdominal viscerals were neatly arranged and the omental sheath spread over. Abdominal closure was in two layers with 2-0 chromic catguts and 2-0 nylon. The bitches were maintained at the hospitalization unit of the Ahmadu Bello University Veterinary Teaching Hospital (ABUVTH) for eight and a half months under observation and routine post operative care. A second series of operation was performed to harvest the ligated ovaries.

The harvested ovaries were examined grossly before they were fixed in 10% buffered formalin. Standard laboratory procedures were undertaken to produce histopathological slides. The slides were viewed under the microscope and photomicrographs were taken with DIALUX 20 microscope with camera attachment at x40 objective.

Results

Presurgical mean temperatures and haematological values showed minimum data base within normal limit.

Gross observation of the ovaries: Bitch 1 & 4: Mildly turgid ovary on palpation and fatty. Crushed and ligated vascular areas appeared degenerated with blackish discolorations. Histopathology results revealed normal numerous primary and Graafian follicles in the stroma of the ovary. Well formed corpus lutea, degenerated primary and Graafian follicles, atretic follicles and degenerated corpus lutea. There was diffused necrosis with dense fibrosis of ovarian stroma, in the cortex and medulla. There was infiltration of mononuclear cells (Macrophages, neutrophils and lymphocytes) in the connective tissues. There were haemosiderosis and congestion of ovarian stroma (Fig. 1).

Bitch 2, 3 and 5: Flabby and soft ovary on palpation with severe necrosis at crushed and ligated portions of the ovarian blood vessels. The entire ovaries were mildly regressed and it was pale. Histopathology results revealed well formed corpus lutea, normal numerous primary and Graafian follicles in the stroma of the ovary with congested blood vessels (Fig. 2)

Bitch 6: Flabby, regressed and soft ovary on palpation. Histopathology results revealed congested blood vessels (Fig. 3) and numerous primary and Graafian follicles with fully developed ova in the ovarian stroma (Fig. 4), well developed corpus lutea.

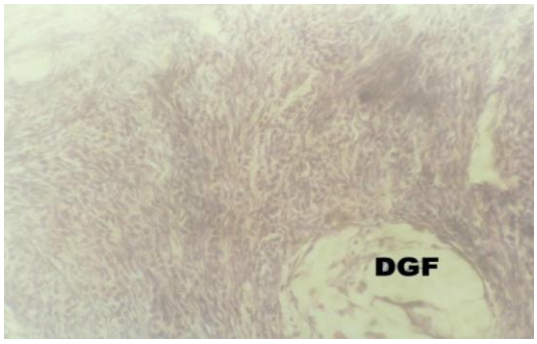

Plate 1: Photomicrograph shows degenerated Graafian and numerous primary follicles and corpus lutea of the ovary

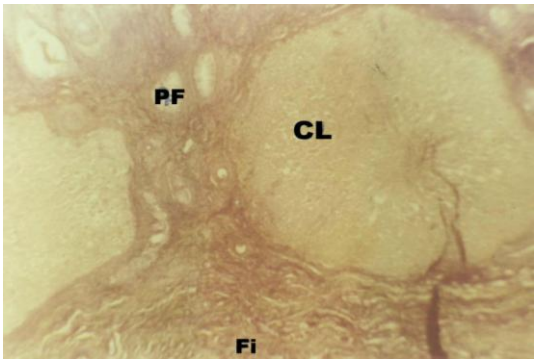

Plate 2: Photomicrograph of well formed corpus lutea and numerous Graafian and primary follicles of the ovary

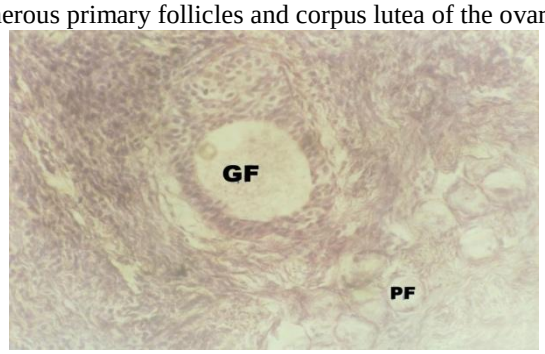

Plate 3: Photomicrograph of fully developed ova in the ovarian stroma with numerous Graafian follicles of the ovary

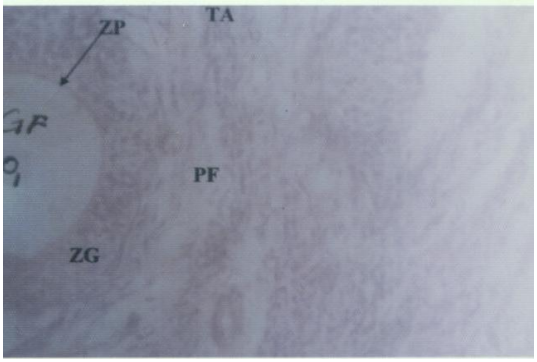

Plate 4: Photomicrograph shows numerous primary and Graafian Follicles with fully developed ova in the ovarian stroma of the ovary

Discussion and Conclusion

Cautious attempts to maintain asepsis were observed; therefore it is not unusual to have a normal vital parameter curve post surgery. The 40°C temperature peak with bitch one was attributed to the individual's endowment response to physiologic change, due to traumatic injury of the surgery. The observed changes at gross examination are in consonance with organs or tissues under ischaemic degeneration. According to Gresham (1979) , arterial and venous blockages results in ischaemic degeneration suggestive of loss of tissue viability at cellular level with necrosis and discoloration due to local anaemic effect (Runnells *et al.*, 1967) and shrinkage. The apparently viable tissues had microcapillarity invasion as collateral supplies. Since ischaemic necrosis of tissues and organs degeneration occur best within four days, it therefore implies that as a result of revascularization, the degenerative effect which ensued at the early days of ovarian vessel ligation were resolved when the ovary was later invaded by small collateral capillary vascular tree giving some viability to the organ. Possible origin of neovascularization is from the omental, parietal, mesometrial and mesovarian tissues. The possibility of new blood vessels originating from the ovarian ligament are not clear (Runnells *et al.*, 1967).

Certainly mild degenerative changes occurred at the ovaries with ovarian vessel ligation, but due to the high compensatory mechanism of revascularization, the organ regained viability. It is likely that if the organs were left for a little longer, total viability may have been regained.

There was evidence of neovascularisation in ovaries despite ligation of the ovarian vessels. Viable tissues were suggestive of newer invasion of blood vessels from the ovarian attachment to the retroperitoneal tissues and likely from the subcutaneous supplies.

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