Cairo University
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A Potential Use of Doppler Ultrasound as a Tool for Reproductive Studies in Cows

A thesis submitted by

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Abstract

The present study aimed to use color and spectral Doppler ultrasound to study both follicular, luteal blood flow vascularization areas and ovarian and uterine arteries Doppler indices after single and multiple ovulations and after induction of ovulation using either Ovsynch or CIDR evaluated. Nitric oxide and ovarian hormones were estimated in blood serum. Results of the non-induced ovulation showed that both days and phases of the oestrus cycle influenced (*P*=0.0001) the follicular dynamic, the luteal dynamic, the ovarian and uterine hemodynamic. The ovulatory wave and the mid-luteal non-ovulatory wave had expanding numbers and the diameters of small, medium and large follicles. Though area, antral area, vascularization area of the (ovulatory folcile) OF ascended from day -4 to the day of ovulation (day 0), but the percent of the vascularization area and the granulose layer increased till day -3. The CL diameter and luteal vascularization area increased till day 13, and 15, but luteal % of vascularization area ascended (*P*=0.0001) from days 1 to 4 and declined from days 9 to 13. Both (resistance index)RI and(pulstility index) PI of the ipsilateral ovarian artery were lower than the contralateral one, but both obtained high values during the follicular phase. A linear increase (*P*=0.0001) of uterine horns vascularization area, both ovarian and uterine arteries diameters, (peak systolic velocity)PSV and (end diastolic velocity) EDV from follicular to late luteal phases was accompanied by a linear decrease of their PI and RI. Ovsynch ipsi-lateral Ov.A and Ut.A blood flows were lower (P<0.05) than the spontaneous ones as expressed by lower diameters, PSV, EDV, BFV and S/D accompanied higher PI and RI. The ovsynch contra-lateral Ov.A had higher (P<0.01) PI but lower TAMV during follicular and early luteal phases. The ovsynch contralateral Ut.A had lower (P<0.05) PSV and EDV during follicular and late-luteal phases. Ovsynch ovulation had low E_2, NO and high glucose but the late luteal had high (P<0.001) P4 and glucose but low E2 compared to the spontaneous ovulations. The right ovarian artery had higher blood flow parameters and Doppler indices after ovulation and the parameters of the right uterine artery increased after CIDR insertion reaching a maximum value on day of prostaglandin injection then descended reaching low values on day 2, while the parameters of the left uterine artery decreased sharply from day -7 and reached minimum level on day 18. Estradiol increased but progesterone decreased from day -7 till day of ovulation. P_4 reached maximum values on day 12 and decreased after that till day 18.Nitric oxide metabolites showed one peak on day -1 and another on day 6 and 8. The results of superovulation revealed that the ovulatory wave (days -5 to 0), and the non ovulatory wave (days 4 to 9) after ovulation were associated with increased numbers and diameters of small (≤0.5cm), medium (>0.5-≤0.1cm), and large (>1.0cm) follicles and from ≥13 follicles, five follicles ovulated from both ovaries. The PSV of uterine arteries decreased while that of ovarian arteries increased from day -4 to Day 0. Both ovarian arteries diameter, RI, PSV, EDV and S/D positively correlated (P<0.0001), but their PI negatively correlated (P<0.0001). The uterine arteries PI, RI, PSV, EDV, TAMV and S/D negatively correlated (P<0.0001) but their diameters positively correlated. Estradiol increased but progesterone decreased from day -5 till Day 0. After ovulation, P_4 reached maximum values on day 9 and started to decrease till day 19.Nitric oxide showed one peak on day -3 and another one from day 3 to day 9. In conclusion, the ovarian and uterine blood flows vary according to the estrous day, estrous phase, the ovulating ovary, ovulatory follicle growth and corpus luteum developmental stage. In addition to, the decrease of the follicle blood flow may decrease the follicle quality and the decrease of the luteal vascularization and their association with lowered uterine blood flow may disturb the maintenance of the embryo when the animals undergo timed insemination following the ovsynch protocol. As well as there was the same pattern of blood flow in both ovarian arteries and different pattern of blood flow in both uterine arteries and depended on pre- or post-ovulation. Finally, in superovulation, the blood flow of ovarian arteries is different from uterine arteries vascular perfusion.

Keywords: Doppler, ovarian artery, uterine artery, cows, eCG, ovsynch, CIDR

Dedication

I dedicate this study to ***my parents*** *and* ***my brothers*** *for their, understanding, support and help to succeed. Thank you for every unconditional love and guidance.*

I dedicate this study to ***my husband*** *who inspired me to be strong despite many obstacles in life .Thank you for everything.*

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