Indian Journal of Animal Sciences **88** (11): 1262–1265, November 2018/Article

Ultrasonography and laparoscopy as a diagnostic tool for evaluation of genitalia in cows

K A SOFI[1] and M M SINGH[2]

CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur, Himachal Pradesh 1760 62 India

Received: 28 May 2018; Accepted: 2 July 2018

ABSTRACT

The present study was conducted for evaluating genitalia of cows (17) through transrectal ultrasonography (TRUS) and transabdominal laparoscopy (TAL) as a diagnostic tool. Genital tract of cows was initially examined by rectal palpation followed by TRUS and a day later TAL was conducted through flank approach.The study revealed: 35.3, 41.2 and 88.2% ovarian abnormalities; 5.8, 35.3 and 70.6% oviduct and adnexal abnormalities; and 23.6, 47.1 and 52.9% uterine abnormalities, by rectal palpation, TRUS and TAL, respectively. However, cervical abnormalities diagnosed were 35.3 and 52.9% by rectal palpation and TRUS respectively. TAL enabled to evaluate ovarian and oviduct and adnexal abnormalities accurately followed by TRUS than rectal palpation but ultrasound enabled to differentiate abnormalities like cystic ovaries, hydrosalpinx, pyosalpinx based on echogenicity compared to laparoscopy. However, TRUS proved to be very useful in diagnosing and differentiating uterine and cervical abnormalities compared to TAL and rectal palpation. It was concluded that both ultrasonography and laparoscopy are better diagnostic tools for evaluation of genitalia of bovines compared to rectal palpation and both these tools provided supplementary evidence in diagnosing and differentiating different genital abnormalities.

Key words: Abnormalities, Bovines, Cows, Evaluation, Genitalia, Laparoscopy, Ultrasonography

Transrectal ultrasonography (TRUS) is the most common approach to ultrasonic examination of the reproductive tract in bovines. Interest in ultrasonography among both veterinarians and animal scientists began to grow in the early eighties, following reports (Chaffaux *et al.* 1982, Pierson and Ginther 1984) on the usefulness of technique in studying the reproductive organs of the cow. It has now become an important diagnostic tool for evaluating the female reproductive system and to diagnose and differentiate various reproductive pathologies (Kumar and Purohit 2009, Akhter *et al.* 2013, Sunia 2015). However, perusal of literature revealed that use of ultrasonography in delineating different pathological conditions of the bovine genital tract continues to be a less frequently described especially oviduct and adnexal abnormalities.

Laparoscopy appears to be the gold standard method for different gynaecologic procedures in humans (Daniilidis *et al.* 2011). Roberts (1968) first reported endoscopic examination of reproductive organs in sheep followed by Witherspoon and Talbot (1970) and Wilson (1983) in the mare. Although use of laparoscopy as a diagnostic tool for infertility evaluation is presently frequent in equines (Allen *et al.* 2006, Arnold and Love 2013), its use in bovines for infertility assessment is very meagre. Further, comparative diagnostic assessment of these diagnostic tools with respect to various genital abnormalities in bovines is not documented elsewhere. So, the present study was conducted to record and evaluate the diagnostic potential of TRUS and TAL in comparison to traditional rectal palpation for different genital abnormalities in cows.

Present address: [1]Assistant Professor (drsofi.vet54321@gmail.com), Division of Veterinary Clinical Complex, Faculty of Veterinary Science and Animal Husbandry, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Jammu and Kashmir. [2]Professor (madhumeet2004@rediffmail.com), Department of Veterinary Gynaecology and Obstetrics.

MATERIALS AND METHODS

The present study comprised evaluation of genitalia in cows (17) through transrectal ultrasonography (TRUS) and transabdominal laparoscopy (TAL). Cows housed in university dairy farm of the University and also from few surrounding Goshalas constituted the study group. These cows were examined by rectal palpation, followed by TRUS, and a day later TAL was conducted for evaluation of genital tract.

Transrectal ultrasonography (TRUS): The genital tract of cows was examined using Color Doppler Ultrasound Machine (Mindray; Model DC-3) with multifrequency linear rectal probe of 5, 6.5 and 8 MHz. Initially, cows were examined by rectal palpation and observations were recorded followed by TRUS of the whole genital tract. Generally B-mode Ultrasonography was used but color

Doppler was used where it was found desirable to potentiate the diagnosis. Ultrasonographic morphometry was done with inbuilt caliper to study size characteristics of genital pathologies. All the significant findings and images were recorded and saved for further analyses.

Transabdominal laparoscopy (TAL): Feed, but not water was withheld for at least 24 h and animal was given meloxicam (Melonex^{R}; Intas Pharmaceuticals Ltd. India) @ 0.3 mg/kg BW (im) and strepto-penicillin (Dicrysticin-S; Zydus Animal Health Limited) @ 2.5 gm (im) as a pre-operative treatment. The animal was restrained in standing crush designed for laparoscopy and sedated with xylazine (xylaxin; Indian Immunological Ltd) @ 0.03 mg/kg BW (im). Portable laparoscope of Karl Storz (Gmbh and Co. KG, Tuttlingen/Germany) was used and all the laparoscopic instruments were sterilized by chemical method using glutaraldehyde 2% solution w/v (Glutarex^{TM} 28; 3M India Ltd, Pune) as per manufacturing instructions.

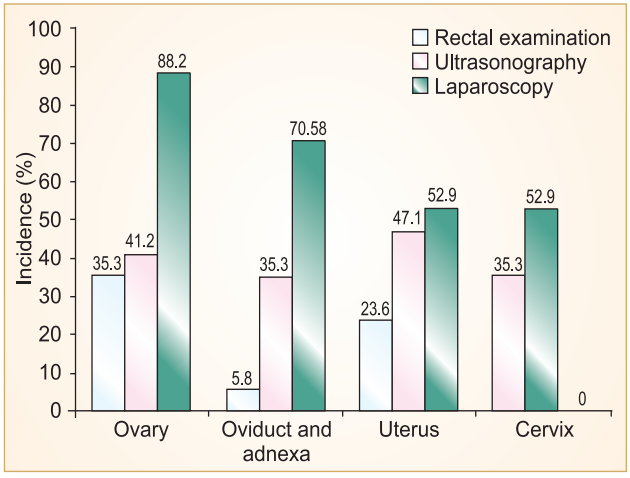
Laparoscopic procedure: Paralumbar fossa was clipped, shaved and aseptically prepared for laparoscopy. The procedure was done under local anaesthesia in which subcutaneous and muscular tissue of the portal sites was infiltrated with 10 ml of 2% lignocaine. Laparoscopic port was made at about 6–8 cm ventral to the horizontal line drawn from tuber coxae at the junction of middle and caudal third flank. Similarly, one or two instrument ports were made at 12 and 18 cm ventral to the tuber coxae using 6 mm or 11 mm cannula. After optimum pneumoperitoneum (6–8 mm Hg), a 0° viewing angle rigid laparoscope (10 mm, 57 cm) was inserted through the cannula and the tract was searched and visualized on the monitor. Palpation probe and claw forceps were used to manipulate the genital tract for complete examination. The ovary, oviduct and uterus including cervix was examined and all significant observations were noted and recorded including video recording for further analysis.After complete examination, incision sites were sutured and standard post-operative care was done. The sutures were removed after 10–12 days of laparoscopic procedure.

Statistical analysis: The data were analyzed by using statistical software SPSS version-16.

RESULTS AND DISCUSSION

In the present study, genitalia of 17 cows were examined by rectal palpation, ultrasonographic and laparoscopic examination to evaluate the proficiency and feasibility of these diagnostic tools for diagnosis of various infertility problems. Further, as ultrasonography was followed by laparoscopy, any abnormality confirmed on laparoscopy but missed by ultrasound examination was further studied sonographically to record their ultrasound characteristics (Figs 1–9). This was especially done in pathologies like parovarian cysts, oviductal and adnexal pathologies, tubo-ovarian abscess as ultrasonographic studies of these abnormalities are meagre or absent in bovines. Our results revealed ovarian abnormalities as 6 (35.3%), 7 (41.2%) and 15 (88.2%), oviduct and adnexal abnormalities as 1 (5.8%), 6 (35.3%) and 12 (70.6%) and uterine abnormalities as 4 (23.6%), 8 (47.1%) and 9 (52.9%) by rectal palpation, ultrasonography and laparoscopic examination. However, cervical abnormalities diagnosed were 6 (35.3%) and 9 (52.9%) by rectal palpation and ultrasonography.

Ovarian abnormalities diagnosed by rectal palpation, ultrasonography and laparoscopic examination were true anestrus (3; 17.6%, 2; 11.7% and 2; 11.7%), ovarobursal adhesion (2; 11.7%, 4; 23.6% and 10; 58.9%) and luteal cyst (1; 5.8%, 1; 5.8% and 1; 5.8%), respectively. However, perioophoritis and ovarian abscess was diagnosed in 1 (5.8%) animal each by laparoscopy and both conditions were missed by rectal palpation as well as ultrasonography. Among oviduct and adnexal abnormalities, a single case of parovarian cyst was diagnosed by rectal palpation but ultrasonography and laparoscopy revealed hydrosalpinx (2; 11.7% and 4; 23.6%), parovarian cyst (1; 5.8% and 2; 11.7%) and tubo-ovarian abscess (1; 5.8% and 1; 5.8%), respectively. Further, oviductal adhesion cases (5; 29.4%) were diagnosed by laparoscopy only but ultrasound enabled to differentiate two cases of hydrosalpinx (11.7%) diagnosed with laparoscopy as pyosalpinx based on echogenicity of the fluid seen during ultrasound scanning. The uterine abnormalities diagnosed were endometritis (3; 17.6%, 4; 23.6%) by rectal palpation and ultrasonography and uterine adhesion (1; 5.8%, 3; 17.6% and 4; 23.6%) by rectal palpation, ultrasonography and laparoscopic examination. However, mucometra was diagnosed by ultrasound examination in 1 (5.8%) animal which could not be diagnosed by rectal palpation and laparoscopy. Similarly, laparoscopic examination revealed abnormal color of uterus with nodules in 4 (23.5%) and uterine cyst in 1 (5.9%) animal, respectively, which was not possible by rectal palpation and ultrasonography. The cervical abnormalities included cervical fibrosis (3; 17.6%, 5; 29.4%), cervical kink in 2 (11.7%) and cervical adhesion in 1 (5.8%) animal each by rectal palpation and ultrasonography. Further, cervicitis was diagnosed in 1 (5.8%) animal by ultrasound examination.



Comparison of reproductive abnormalities diagnosed by rectal palpation, ultrasonography and trans-abdominal laparoscopy in abandoned cows (n=17)

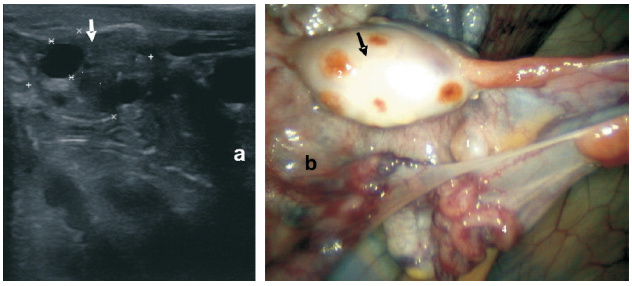


Fig. 1. Inactive ovary (arrow). (a) Ultrasound image (b) Laparoscopic image.

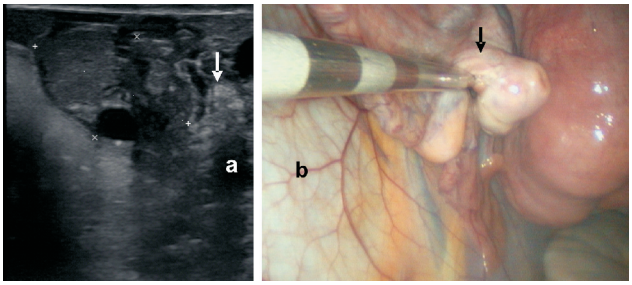


Fig. 2. Ovarobursal adhesion (arrow). (a) Ultrasound image (b) Laparoscopic image.

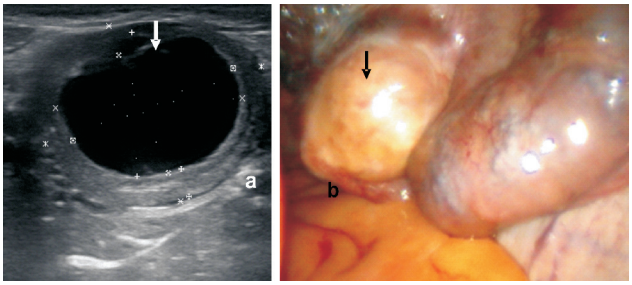


Fig. 3. Luteal cyst (arrow). (a) Ultrasound image (b) Laparoscopic image.

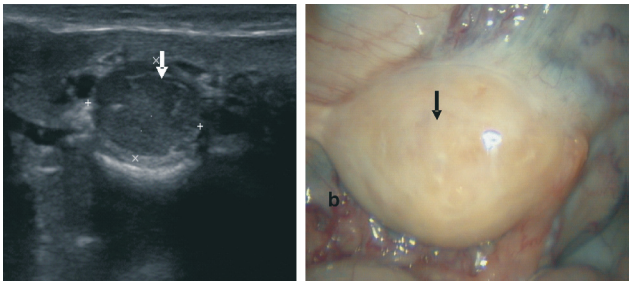


Fig. 4. Perioophoritis (arrow). (a) Ultrasound image (b) Laparoscopic image.

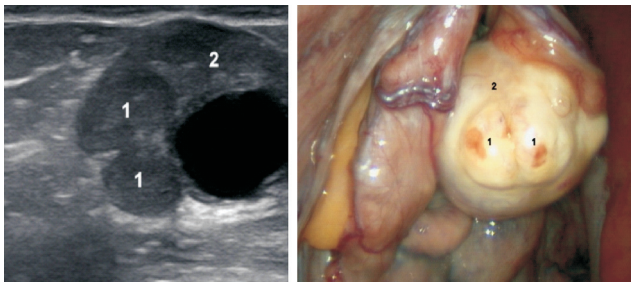


Fig. 5. Ovarian abscess on ovary. (a) Ultrasound image (b) Laparoscopic image.

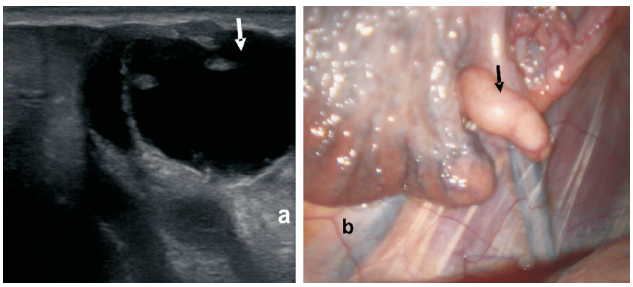


Fig. 6. Hydrosalpinx (arrow). (a) Ultrasound image (b) Laparoscopic image.

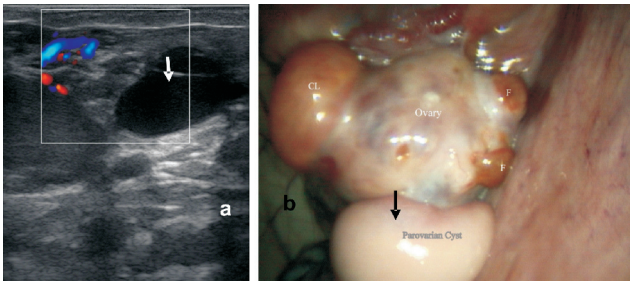


Fig. 7. Parovarian cyst besides ovary (arrow). (a) Ultrasound image (b) Laparoscopic image.

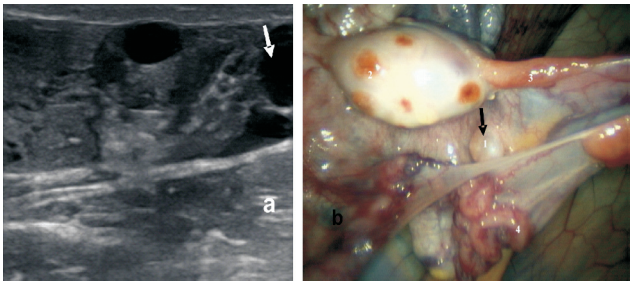


Fig. 8. Parovarian cyst in adnexa (arrow). (a) Ultrasound image (b) Laparoscopic image.

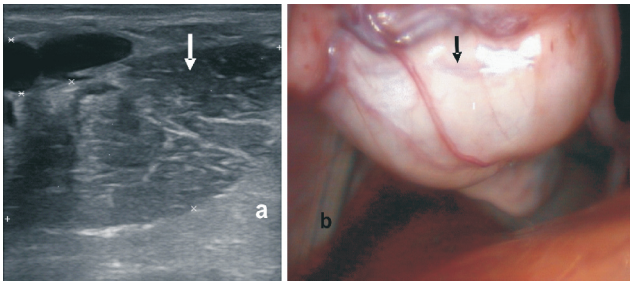


Fig. 9. Tubo-ovarian abscess (arrow). (a) Ultrasound image (b) Laparoscopic image.

This study comprised ultrasonographic and laparoscopic examination along with rectal palpation of genitalia of cows to evaluate the competence and feasibility of these tools for diagnosis of various infertility problems. The study revealed that TRUS and TAL allowed diagnosing ovarian abnormalities in a better way compared to rectal palpation. It was found that animals routinely diagnosed as true anestrus per rectally have active ovaries as appeared by presence of functional structures (follicles and CL)by ultrasound examination and laparoscopy. However, TRUS

proved more useful in diagnosing cystic ovarian condition as it allowed estimating size of cyst, its wall thickness and posting treatment response. Similarly, ovarobursal adhesion was diagnosed accurately by laparoscopy and ultrasonography than rectal palpation but laparoscopy provided the confirmatory diagnosis and cases like perioophoritis were not diagnosed by even ultrasonography. Thus, our study revealed that compared to rectal palpation, ultrasonography appeared as a very reliable method for diagnosis of pathological ovarian conditions as also observed by Grygar *et al.* (1992), Honparkhe *et al.* (2007) and Kumar and Purohit (2009). Similarly, laparoscopy was more accurate to identify CL and follicles than rectal palpation (Guay and Bedoya 1981). It was observed that oviductal abnormalities were difficult to be diagnosed by rectal palpation and ultrasound examination alone. However, laparoscopy due to its ability to directly visualize the structures, not only proved very helpful in diagnosis but also provided confirmation to oviduct and adnexal abnormalities. Laparoscopic diagnosis permitted clear visualization and identification of the reproductive abnormalities in free-ranging rhesus macaques (Kumar and Raj 2012). However, using B-mode and color Doppler ultrasonography, hydrosalpinx and pyosalpinx including parovarian cysts were correctly diagnosed and differentiated which are difficult to be diagnosed manually.

Ultrasonography appeared to be comparatively more useful to diagnose uterine pathologies and to identify abnormalities of cervix compared to rectal palpation but laparoscopy was not useful for diagnosis of such conditions as it allows direct visualization of the external surface not the internal anatomy like ultrasonography. Thus, compared to rectal palpation and laparoscopy, ultrasonography proved to be better diagnostic tool for evaluating uterine and cervical abnormalities. It enabled to assess presence along with echogenicity of fluid and thickness and echogenicity of uterus and cervix. It can be suggested that ultrasound examination is the method of choice in diagnosing the pathological conditions of the uterus in cattle as also reported earlier (Honparkhe *et al.* 2007, Kumar and Purohit 2009, Sunia 2015). Similar observation as ultrasound examination being the method of choice in diagnosing the pathological conditions of the uterus was reported by Ali and Razek (2002) while investigating correlation between transrectal palpation and ultrasound findings in cattle, and by Sharma *et al.* (2012) during ultrasonographic, surgical and histopathological findings of uterine leiomyoma in a cow.

Based on present findings, it was concluded that both TRUS and TAL are better diagnostic tools for evaluation of genitalia of bovines compared to rectal palpation, and both these tools provide supplementary evidence in diagnosing genital abnormalities. Laparoscopy provided confirmation to many conditions suspected by ultrasonography especially oviductal and adnexal abnormalities.

REFERENCES

Akhter M, Hoque M N, Shamsuddin M I, Alam M G S and Bari F Y. 2013. Ultrasonography for the management of reproductive disorders in dairy cows. *IOSR Journal of Agriculture and Veterinary Science* **5**(5): 61–66.

Ali A and Razek A K A. 2002. Ultrasonography in detecting uterine pathology in cattle and sheep. 14th congress of ESARF. pp 1–10.

Allen W R, Wilsher S, Morris L, Crowhurst J S, Hillyer M H and Neal H N. 2006. Re-establishment of oviductal patency and fertility in infertile mares. *Animal Reproduction Science* **94**: 242–43.

Arnold C E and Love C C. 2013. Laparoscopic evaluation of oviductal patency in standing mare. *Theriogenology* **79**: 905–10.

Chaffaux S, Valon F and Martinez J. 1982. Evoluation de l'image echographique du produit de conception chez la vache. *Bull Academy of Veterinarian France* **55**: 213–21.

Guay P and Bedoya M. 1981. A study of the equivalence between rectal palpation, laparoscopy, laparotomy and ovarian dissection for evaluation of the ovarian response of PMSG superovulated cows. *Canadian Veterinary Journal* **22**: 353–55.

Grygar I, Vanatka F, Vinkler A and Kudlac E. 1992. Comparison of the accuracy of diagnostics of physiological and pathological conditions in bovine ovaries by means of rectal palpation and ultrasonography. *Acta Veterinaria Brno* **61**: 219–30.

Honparkhe M, Gandotra V K and Nanda A S. 2007. Ultrasonographic size and characteristics of reproductive organs of repeat breeder buffaloes (*Bubalus bubalis*). *Indian Journal of Animal Sciences* **77**: 821–24.

Kumar V and Purohit G N. 2009. Ultrasonographic diagnosis of the bovine genital tract disorders. *Online Veterinary Journal* (*Vet Scan)* **4**(2): 1–10.

Kumar V and Raj A. 2012. Laparoscopic diagnosis of gross reproductive abnormalities in free-ranging female rhesus macaques (*Macaca mulatta*). *Veterinary Science Development* **2**: 59–62.

Pierson R A and Ginther O J. 1984. Ultrasonography of the bovine ovary. *Theriogenology* **21**: 495–504.

Roberts E M. 1968. Endoscopy of the reproductive tract of the ewe. *Proceedings of the Australian Society of Animal Production* **7**: 192.

Sharma A, Kumar A, Imran S, Sood P and Asrani R K. 2012**.** Ultrasonographic, surgical, and histopathological findings of a uterine leiomyoma in a cow. *Veterinary Medicine.* Article ID # 536204.

Sunia P K. 2015. 'Vaginoscopic, ultrasonographic and haematological studies in dairy cows with endometritis and studies on the efficacy of different treatments.' M.V.Sc Thesis, Department of Veterinary Gynaecology and Obstetrics, RAJUVAS, Bikaner. Pp 73.

Wilson G L. 1983. Laparoscopic examination of mares. *Veterinary Medicine And Small Animal Clinician* **78**(10): 1629–33.

Witherspoon D M and Talbot R B. 1970. Nocturnal ovulation in the equine animal. *Veterinary Record* **87**(11): 302–04.