

LAPAROSCOPIC CHOLECYSTECTOMY BY SUBSEROVAL LAYER DISSECTION TECHNIQUE IN CANINES: A REPORT OF EIGHT CASES

JOG MUGDHA, GAURI FISKE*, S.B. AKHARE, B.K. BHADANE, V.S. UPADHYE, A.P. GAWANDE,
M.S. PATIL and JITENDRA HAZARE

Department of Veterinary Surgery and Radiology, Nagpur Veterinary College,
Nagpur Maharashtra Animal & Fishery Sciences University, Nagpur-440001, Maharashtra, India

Received: 01.06.2025; Accepted: 28.08.2025

SUMMARY

A total of eight laparoscopic cholecystectomy procedures were carried out on patients with varied clinical signs suggestive of hepatobiliary disorder during a period of January 2024 to December 2024. All the patients were subjected to ultrasonographic examination. The patients primarily suffering from biliary conditions like choleliths, chronic cholecystitis and gallbladder mucocele were selected for the procedure. Laparoscopic cholecystectomy was carried out by subserosal dissection, starting at the fundus. The gall bladder was dissected by separating the inner serosa from the outer serosa; keeping the outer serosa attached to the hepatic parenchyma. Endoclips as well as ligatures were used for sealing of the biliary duct. The study indicated that laparoscopic cholecystectomy by Subserosal Layer Dissection Technique served as an ideal and minimally invasive technique for management of affected gallbladder in canines.

Keywords: Cholecystectomy, Gallbladder, Laparoscopy

How to cite: Mugdha, J., Fiske, G., Akhare, S.B., Bhadane, B.K., Upadhye, V.S., Gawande, A.P., Patil, M.S. and Hazare, J. (2026). Laparoscopic cholecystectomy by subserosal layer dissection technique in canines: A report of eight cases. *Haryana Veterinarian*. 65(1): 102-106.

Minimally invasive surgery is a comparatively recent advancement in veterinary practice with laparoscopy having numerous advantages over conventional laparotomy. Cholecystectomy is indicated in case of any pathogenic conditions like cholecystitis, cholelithiasis, gallbladder mucocele, gallbladder sludge, gallbladder polyps or neoplasia, gallbladder rupture or any other inflammatory conditions of the hepatobiliary tract causing obstruction (Kanai *et al.*, 2022; Chae *et al.*, 2023).

Ultrasonography is extensively employed to visualize the liver and gallbladder in dogs and cats to diagnose such conditions. It is currently the gold standard diagnostic tool for biliary affections (Kumar *et al.*, 2012). Certain cases of hepatobiliary affections can be managed conservatively while most require surgical intervention. Cholecystectomy is the treatment of choice in acute cholecystitis and gallstone disease. Laparoscopic cholecystectomy is preferred over open cholecystectomy due to better operative safety (Mayhew *et al.*, 2008). Laparoscopic cholecystectomy can be performed in a variety of ways. The subserosal layer dissection method has been shown to be safer than the Fundus First Technique, with a lower conversion rate to open cholecystectomy, fewer cases of bile duct damage, and fewer post-operative complications, even though retrograde laparoscopic cholecystectomy is the accepted practice protocol for dogs. The technique involves antegrade blunt dissection of the gallbladder after incising the outer subserosal layer (Kondo *et al.*, 2023).

Pre-operative abdomino-pelvic sonography was

performed on every patient. The required areas were clipped and shaved for effective scanning and visualization of abdo-pelvic organs. Scans were carried out in ventro-dorsal, left lateral and right lateral positions to detect abnormalities in the abdomino-pelvic region related to intra-abdominal conditions.

Patients exhibiting signs of anorexia, vomiting, nausea, lethargy, diarrhoea, weight loss, pyrexia, abdominal pain etc. were taken into consideration. Those patients which could not be managed conservatively underwent laparoscopic procedures. Preoperative CBC and biochemical parameters like Serum alkaline phosphatase (IU/L), serum alanine aminotransferase (IU/L), serum aspartate aminotransferase (IU/L), serum total protein (gm/dL), serum albumin (gm/dL) and serum globulin (gm/dL), serum total bilirubin (mg/dL), serum direct bilirubin (mg/dL), serum indirect bilirubin (mg/dL), serum gamma-glutamyl transferase (mg/dL), serum cholesterol (mg/dL), serum creatinine (mg/dL) and serum blood urea nitrogen (mg/dL) were conducted.

Patients exhibiting signs of anorexia, vomiting, nausea, lethargy, diarrhea, weight loss, pyrexia, abdominal pain etc. were taken into consideration. Those patients which could not be managed conservatively underwent laparoscopic procedures. Preoperative CBC and biochemical parameters like Serum alkaline phosphatase (IU/L), serum alanine aminotransferase (IU/L), serum aspartate aminotransferase (IU/L), serum total protein (gm/dL), serum albumin (gm/dL) and serum globulin (gm/dL),

*Corresponding author: drgaaurifiske@gmail.com

serum total bilirubin (mg/dL), serum direct bilirubin (mg/dL), serum indirect bilirubin (mg/dL), serum gamma-glutamyl transferase (mg/dL), serum cholesterol (mg/dL), serum creatinine (mg/dL) and serum blood urea nitrogen (mg/dL) were conducted. A total of eight dogs diagnosed with hepatobiliary conditions like gall bladder sludge, cholecystitis, cholecystolithiasis and gall bladder mucocele were included in the study.

A total of eight dogs diagnosed with hepatobiliary conditions like gall bladder sludge, cholecystitis, cholecystolithiasis and gall bladder mucocele were included in the study.

Preoperative hematological parameters in all eight cases remained within the normal range. Specific biochemical indicators of biliary affection remained elevated in all the cases. Serum ALP (494.92 ± 250.08 IU/L), serum total bilirubin (0.91 ± 0.28 mg/dl) and serum GGT (9.73 ± 3.93 IU/L) were found to be elevated in all the cases. Hypoalbuminemia was found in all canines, attributed to inappetence and gastric symptoms. Laparoscopic cholecystectomy was performed within 7 days after diagnosis by ultrasonography. Post sedation and anaesthetic induction of the patient, endotracheal intubation as well as urinary catheterization was performed. The patient was placed in Trendelenburg position with the head facing the laparoscopic monitors as indicated by Kirpekar *et al.* (2023). Four port method was employed for the surgical procedure. The first port or the umbilical port was placed about 10mm caudal to the umbilicus. The operator's right-hand port was positioned at the left subcostal margin of the patient, approximately one-third of the distance laterally from the midline. Similarly, the operator's left-hand port was placed at the right subcostal margin, about two-thirds of the distance laterally from the midline. Additionally, an assistant port was located on the outer caudal side of the operator's left-hand port, to the right side of the patient (Fig. 1).

A small 5 mm skin incision was taken caudal to the umbilicus using a 11 Bard Parker blade through which the first port was placed after establishment of pneumoperitoneum. Veress needle was inserted through the incision. The hanging drop technique was used to ensure entry into the abdomen. CO₂ insufflation was performed via the Veress needle, successfully creating pneumoperitoneum in all dogs. The CO₂ insufflation parameters were set to maintain intra-abdominal pressure between 7 and 13 mmHg, with a flow rate of 1.5 to 6.6 L/hr. Subsequent ports were inserted under telescopic guidance by making small skin incisions and using a trocar with a cannula to pass through the muscle and peritoneum layers.

Subserosal dissection was carried out as described by Kondo *et al.* (2023) with the exception that initial dissection was carried out using a KARL STORZ SE & Co. KG Autocon 200 laparoscopic cautery instead of a laparoscopic scissor. The hepatobiliary system was identified and gallbladder carefully visualized, and grasped with atraumatic forceps. The gall bladder was retracted and manipulated so that the subserosal layer was visible (Fig. 2). Dissection of the gall bladder was initiated from the fundus in all the cases. Dissection was done so that the outer subserosal layer remained adherent to the hepatic parenchyma while the inner subserosal layer remained adherent to the gallbladder (Fig. 3). Along the downward dissection, the cystic duct was located and isolated (Fig. 4). Either metallic endoclips alone (Fig. 5) or a combination of endoclips and sutures were used for ligating the cystic duct right below the neck of the gallbladder before its transection (Fig. 6). The gallbladder was retrieved through one of the ports. Haemorrhage or any spillage was checked after removal of the gall bladder. In case of spillage, the abdominal cavity was lavaged using Normal Saline and the contents suctioned out. The abdomen was completely deflated. The muscle layer was sutured using polyglactin 910 No. 1 or 0, depending on the size of the dog, and the skin incision was closed with polypropylene No. 2-0. The operative time for all of the eight surgeries was between 120 and 180 minutes. A steep learning curve was associated with the process. The operative time improved significantly in the later surgeries; reducing by as much as 60 minutes.

Ultrasonographic examinations prior to the procedure revealed cholecystitis in all the eight cases to a varying severity. In one case of Mongrel suffering from severe cholecystitis and acute abdominal pain, the gallbladder wall was found to be thickened to the extent of 7.7 mm (Fig. 7). Tamborini *et al.* (2016) stated that the gallbladder wall was considered thickened or inflamed if the thickness is greater than 3 mm.

In cases of gallbladder wall edema, Kumar *et al.* (2012) observed a similar double rim effect of the gallbladder. In a different instance, a Spitz with less severe symptoms than others had a double wall appearance (Fig. 8). Cholecystoliths were found in four cases. Multiple gallstones of varied sizes along with gallbladder sludge were found in all the cases (Fig. 9). According to Kumar *et al.* (2012), on ultrasound imaging, cholecystoliths appeared as bright, echogenic structures within the gallbladder lumen; they vary in size and number and often demonstrated acoustic shadowing, characterized by a shadow extending behind the stones caused by the blockage of the ultrasound



Fig. 1. Image showing placement of ports

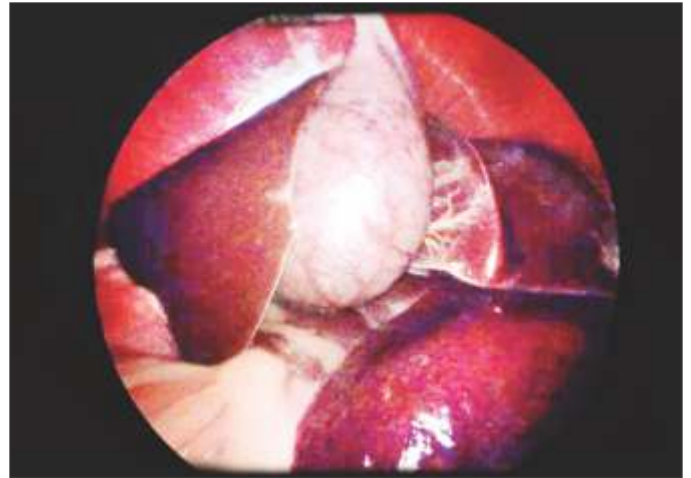


Fig. 2. Image showing retraction of the gallbladder



Fig. 3. Image showing dissection of the subserosal layer.



Fig. 4. Image showing isolation of the cystic duct.



Fig. 5. Image showing Use of endoclips alone.

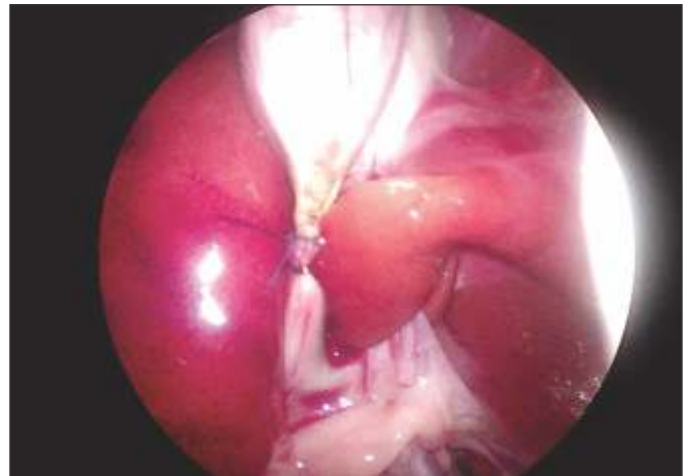


Fig. 6. Image showing Sealing of the cystic duct using a combination of endoclips and ligature.

beam. Onultrasonography, sludge is visualized as low-intensity echoes within the gallbladder lumen, often forming layers or shifting position in response to gravity. In the present study, immobile and gravity independent sludge was found in two cases (Fig. 10).

Only one case of gallbladder mucocele was

diagnosed and consequently operated (Fig. 11). Physical examination of the patient revealed acute abdominal pain on palpation with yellowish mucous membranes indicating onset of jaundice. Upon further biochemical investigation, SAP and GGT values were found to be severely elevated. The patient was diagnosed to be



Fig. 7. Ultrasonographic image showing thickened gall bladder wall (0.77cm) indicating cholecystitis.



Fig. 8. Ultrasonogram showing double wall appearance indicating oedema of gall bladder wall.



Fig. 9. Ultrasonographic image showing cholecystitis and 2 cholelithic calculi.



Fig. 10. Ultrasonographic image showing severe distension of gall bladder due to sludge.



Fig. 11. Ultrasonographic image showing gall bladder mucocoele.

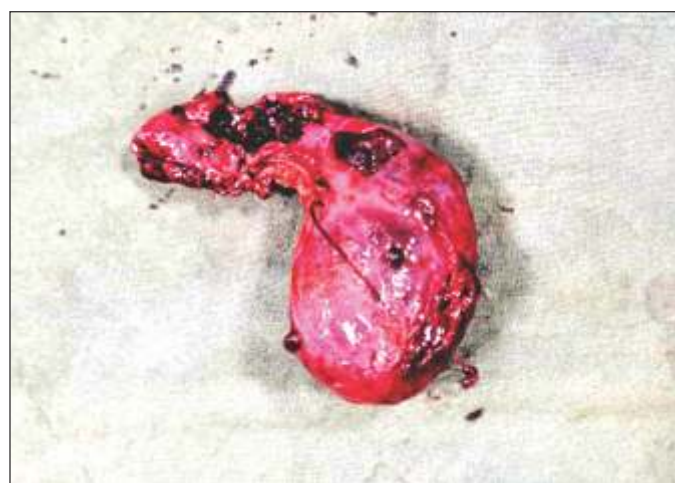


Fig. 12. Retrieved gall bladder showing extensive necrosis of the gall bladder wall.

suffering from biliary obstruction and deemed to be in an advanced stage of hepatobiliary disease.

Abdominal pain on palpation with yellowish mucous membranes indicating onset of jaundice. Upon further biochemical investigation, SAP and GGT values

were found to be severely elevated. The patient was diagnosed to be suffering from biliary obstruction and deemed to be in an advanced stage of hepatobiliary disease. Ultrasonographically, gall bladder mucocoeles were presented with diverse appearances. The classic

pattern resembled a “kiwi fruit”, characterized by hyperechoic striations radiating from a central point. Other variations included irregular or striated, non-gravity-dependent contents, or a stellate pattern with a distinct hypoechoic rim, which is thought to result from mucin accumulation between the gallbladder wall and the organized structure (Rademacher, 2011).

Laparoscopic cholecystectomy was performed within 7 days after diagnosis by ultrasonography. The patients were premedicated using Inj. Atropine Sulphate at a dosage of 0.04 mg/kg BW, Inj. Ranitidine at 0.2 mg/kg BW, and Inj. Meloxicam at 0.2 mg/kg BW. Inj. Amoxicillin was administered intraoperatively at 15 mg/kg BW. The patients were sedated using Inj. Xylazine HCl at 1.1 mg/kg BW. Induction of anaesthesia was done using a combination of Inj. Diazepam at 0.5 mg/kg BW and Inj. Ketamine at 5 mg/kg BW intravenously through Normal saline. Anaesthesia was maintained using 1-3% Isoflurane. After induction, endotracheal intubation was performed with the assistance of a laryngoscope. The patient was placed in Trendelenburg position with the head facing the laparoscopic monitors. Foley’s catheter or an infant feeding tube was placed and secured to evacuate the bladder.

Subserosal dissection was successfully performed in seven out of eight cases. In the eighth case, separation of the outer serosa from the inner serosa was not possible due to extensive cholecystitis and necrosis of the gallbladder wall which could have led to a gallbladder rupture (Fig. 12). In this case, the fundus first approach was followed where the entire gallbladder was dissected out from its bed starting from the fundus to the hepatic fossa. This inclusion criterion was set as directed by Kondo *et al.* (2023) who discouraged the selection of complicated cases for subserosal dissection. The infundibulum of the gallbladder was separated from the hepatic fossa in all the cases. In two cases, endoclips were applied to prevent leakage while in the remaining four cases, a combination of endoclips as well as ligature using polyglactin 910 vicryl no. 2-0 was employed. The deciding factor for the use of endoclips or ligatures was the thickness and the size of the infundibulum. In cases where the gallbladder was severely distended or inflamed, a combination was used to ensure that no leakage occurs. Only endoclips were used in cases where the thickness of the infundibulum was small enough to prevent leakage from the use of endoclips alone.

No major complications were encountered during any of the procedures. Minor hemorrhage was observed in

one case during dissection of the gallbladder which was managed effectively without requiring the need for conversion. Kondo *et al.* (2023) advocated the use of the subserosal layer dissection technique for lesser intraoperative and consequently, post operative complications. Kanai *et al.* (2018) switched from dissection from the hepatic fossa, which is the conventional dissection technique for laparoscopic cholecystectomy to the subserosal layer dissection technique with notable decline in complication rates. The author concluded that while retrograde dissection is an ideal technique in humans, dogs have a lesser working space in the abdomen which makes the antegrade dissection technique favourable. Furthermore, this technique was suitable for uncomplicated cases where the general condition of the patient was relatively good.

REFERENCES

- Chae, H.K., Jeong, J.Y., Lee, S.Y., Hwang, H.M., Shin, K.I., Park, J.H. and Hong, Y.J. (2023). Clinical outcomes in dogs undergoing cholecystectomy via a transverse incision: A meta-analysis of 121 animals treated between 2011 and 2021. *Vet. Sci.* **10**(6): 395.
- Kanai, H., Hagiwara, K., Nukaya, A., Kondo, M. and Aso, T. (2018). Short-term outcome of laparoscopic cholecystectomy for benign gall bladder diseases in 76 dogs. *J. Vet. Med. Sci.* **80**(11): 1747-1753.
- Kanai, H., Minamoto, T., Nukaya, A., Kondo, M., Aso, T., Fujii, A. and Hagiwara, K. (2022). Intraoperative cholangiography and bile duct flushing in 47 dogs receiving laparoscopic cholecystectomy for benign gall bladder disease: A retrospective analysis. *Vet. Surg.* **51**: O150-O159.
- Kirpekar, K., Fiske, G.A., Akhare, S.B., Dhoot, V.M., Raghuwanshi, D.S. and Fani, F. (2023). Comparison of intraabdominal lesions using ultrasonography and laparoscopy-A clinical study. *Haryana Vet.* **62**(2): 154-156.
- Kondo, M., Hagiwara, K., Nukaya, A., Aso, T. and Kanai, H. (2023). Laparoscopic cholecystectomy using the subserosal layer dissection technique in dogs: 34 cases (2015-2021). *J. Small Anim. Pract.* **64**(4): 288-295.
- Kumar, V., Kumar, A., Varshney, A.C., Tyagi, S.P., Kanwar, M.S. and Sharma, S.K. (2012). Diagnostic imaging of canine hepatobiliary affections: A review. *Vet. Med. Int.* doi: 10.1155/2021/672107.
- Mayhew, P.D., Mehler S.J. and Radhakrishnan, A. (2008). Laparoscopic cholecystectomy for management of uncomplicated gall bladder mucocele in six dogs. *Vet. Surg.* **37**(7): 625-630.
- Rademacher, N. (2011). BSAVA Manual of Canine and Feline Ultrasonography. Frances B. and Lorrie G. (Edts.) BSAVA Woodrow House, Gloucester, England. pp. 85-99.
- Tamborini, A., Jahns, H., McAllister, H., Kent, A., Harris, B., Procoli, F., Allenspach, K., Hall, E.J., Day, M.J., Watson P.J. and O'Neill E.J. (2016). Bacterial Cholangitis, Cholecystitis or both in Dogs. *J. Vet. Intern. Med.* **30**(4): 1046-1055.