Management of Urolithiasis by Cystotomy in a German Shepherd Dog – *A Case Report*

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Abstract

Urolithiasis is an ailment resulting from the presence of calculi, crystals, or an excess of sediment in the urinary tract. Swift and accurate diagnosis of canine urolithiasis is crucial, enabling the prompt application of tailored interventions, including both surgical and non-surgical approaches, to effectively address this common urinary tract ailment. This report discusses the surgical treatment of urolithiasis in a four-year old male German Shepherd dog with clinical signs of dysuria and protruded penis. The patient exhibited lethargy, caudal abdominal pain and bladder distention during the physical examination. Radiological findings revealed several stones in the urinary bladder with clear margins and radiopaque-like appearance. The dog was given pre-medication with xylazine at a dose of 3 mg/kg. Anesthesia was initiated and sustained with the combination of ketamine (5mg/kg body weight) and diazepam (0.5 mg/kg body weight). After ensuring the aseptic patient preparation, the peritoneal cavity was reached through a caudal ventral midline incision. The bladder was cut open, and the uroliths were extracted through a cystotomy incision. The bladder wall was closed with 3-0 polyglactin (Vicryl) suture in a cushing pattern. Vicryl was employed in a simple continuous pattern to close the peritoneum, subcutaneous tissues and muscles. The skin was sutured with silk in a simple interrupted pattern. The animal made a complete recovery 14 days after surgery.

Keywords: Dog, Cystotomy, Urinary bladder

Chapter 1: Introduction

Urolithiasis is a condition of the urinary tract caused by calculi, which can cause blockage and injury to the urinary bladder, kidneys, ureters or urinary tract (Men and Arjentina, 2018). This condition most commonly occurred in the urinary bladder and urethra. One of the most common causes of urinary tract infections is high levels of dissolved salts in the urine. These dissolved salts then precipitate out into calculi. These calculi formation is characterized by a number of etiological factors and the composition of these substances are also different from one from to another (Sharun et al., 2021). In uroliths, four types of mineral deposits are most common: urate, cystine, struvite and calcium (Dvorska et al., 2015).

There are no signs of disease in some dogs that have been affected. Signs are mainly dependent on the position, size and number of stones. Stranguria, dysuria and hematuria may be triggered by the presence of calculi in the urinary tract (Men and Arjentina, 2018). When diagnosing urocystoliths in dogs, a comprehensive approach involves physical examinations such as abdominal palpation and assessing resistance during urethral catheter insertion can be indicative (Herdrickson,2007). Confirmation of canine urolithiasis often relies on imaging modalities. During palpation, dogs with urinary tract obstruction may exhibit signs of vomiting, weakness, abdominal discomfort and pain. Early confirmation should be used for definitive treatment of urolithiasis and the effective interventions, including surgical treatment, medication after surgery and urine p^H modulation combined with diet modification (Koehler et al., 2008).

Urolithiasis treatment can take either a surgical or a nonsurgical route. The non-surgical approach, known as conservative management, aims to dissolve calculi through appropriate solutions or diet adjustments based on the urolith's composition (Siener, 2021). Cystotomy is a common surgical procedure in small animal veterinary practice that involves making an incision into the urinary bladder to remove cystic calculi. During cystotomy procedure, the abdomen is first opened on the ventral side, and then the bladder is opened and subsequently closed once again (Sardjana and Kusumawati. 2011). It is the most popular method for removing vesical calculi from small animals (Doria et al., 2007). This procedure is often performed to address issues such as bladder stones or tumors. The surgeon carefully opens the bladder, removes the problematic elements, and then closes the incision.

During my clinical placement of internship, I was exposed to a German Shepherd dog (GSD) suffering with urolithiasis. Urolith from the urinary bladder of the dog was successfully removed by performing cystotomy. The objective of this clinical case report is to describe the surgical treatment of urolithiasis case in a GSD with cystotomy.

Chapter 2: Case Presentation

A 4 year German Shepherd dog weighing 30 kg was brought to the Teaching and Training Pet Hospital & Research Center (TTPHRC), CVASU with one-month history of dysuria and protruded penis. The dog had comprehensive vaccination records, lived indoors and was nourished with a combination of home-cooked and commercial food. The patient had a good appetite, no vomiting and no diarrhea. Clinical examination of the animal exhibited normal temperature, respiration and pulse rate. Physical examination showed pain, and distention of the bladder was confirmed on palpation of the caudal abdomen. Radiographic examination revealed dense, opaque several structures within the bladder (**Figure 2.1**). Then it was decided to perform a cystotomy to expel out the stones.

2.1. Pre-operative preparations and anesthesia

The animal went without food for 12 hours and was refrained from drinking water for six hours prior to surgery. The dog was prepared with aseptic measures and placed in a dorsal recumbent position. It received a pre-anesthetic xylazine injection intramuscularly at the dose rate of 3 mg/kg body weight, followed by intravenous administration of ketamine hydrochloride (5mg/kg body weight) and diazepam (0.5 mg/kg body weight) combo for anesthesia induction. A catheter was used to extract urine from the urinary bladder (**Figure 1.2**). The intended incision site was clipped, shaved, washed with clean water and then treated with 70% ethyle alcohol once dry (**Figure 1.3**). Following that, the site soaked with povidone iodine, after which the iodine was subsequently removed using 70% ethyle alcohol. Infusion of normal saline was maintained intravenously at the dose rate of 10 ml/kg body weight per hour during the intraoperative period.

2.2. Surgical technique

A draper was placed over the area of the site of surgery (**Figure 1.4**). A ventral midline incision, spanning from the umbilicus to the pubis along the linea alba was made to access the caudal abdominal viscera. The muscles were cut, securing all bleeding vessels and being cautious to avoid major blood vessels. Following muscle separation through blunt dissection, the peritoneum was incised, guided by a finger positioned beneath it. Then the urinary bladder was identified and extracted from the peritoneal cavity (**Figure 1.5**). An incision was made on the ventral side of the bladder (**Figure 1.6**), away from the dorsally situated ureters and urethra, and positioned between major vessels. The incision was extended using scissors and remaining urine in the bladder was drained out. Sterile forceps and a spoon were then employed to extract the cystic calculi (**Figure 1.10**), and the urinary bladder was rinsed with normal saline. After that the bladder incision sealed using polyglactin 3-0 (vicryl) suture material in a cushing pattern (**Figure 1.7**). The peritoneum and muscles were stitched using polyglactin 3-0 (vicryl) in a simple continuous pattern. Subcuticular sutures were used for skin closure, initially with polyglactin 3-0 and then reinforced with 1/0 silk in a cross mattress suture pattern (**Figure 1.8**). Finally, a radiograph was taken after performing surgery and there was no presence of bladder stones in the urinary bladder (**Figure 1.9**).

2.3. Post-operative care

Post-operative care involved administering ceftriaxone at the dose rate of 50 mg/kg body weight intramuscularly for seven days and dexamethasone at the dose rate of 0.5 mg/kg body weight intramuscularly for seven days. Pantoprazole was indicated for 15 days at the dose rate of 1 mg/kg body weight. A herbal drug named Nefrotec DS vet was indicated for 30 days. The owner was advised to keep the dog wearing an Elizabethan collar to prevent self-inflicted injury.

Chapter 3: Discussion

The elevated occurrence of urolithiasis in companion animals, compared to humans, is attributed to their four legged posture (Syme, 2012). This positioning causes the lower part of the bladder to be most dependent, leading to settling of particulate matter like crystals that can form stones. If these crystals linger in the urinary bladder without being expelled in urine, they amalgamate and give rise to sizable calculi, as observed in this particular case. The stones of different sizes in the current scenario might have been created through this particular process.

In uroliths, four types of mineral deposits are most common: urate, cystine, struvite and calcium (Dvorska et al., 2015). Struvite and oxalates are the primary types of bladder stones in dogs, with calcium phosphate often appearing as a minor component in both struvite and calcium oxalate stones (Fossum., 2007). The calculi type from this case couldn't be confirmed due to the lack of equipment at the surgery site. Classifying urinary calculi based on form, color, size and shape alone is insufficient (Osborne et al., 1999). Confirmation involves using optical crystallography, polarized light microscopy, X-ray diffraction, Fourier transform spectroscopy, and scanning electron microscopy in a specialized laboratory (Osborne et al., 1999).

Genetics play a significant role, with certain lines being more predisposed to urinary stone formation. Dietary factors, such as high levels of calcium or a lack of proper hydration, contribute to stone development. Additionally, underlying medical conditions like hypercalciuria can increase the risk. Age also plays a role, as older German Shepherds may be more susceptible.

Management of canine urolithiasis spans dietary modifications to various medical and surgical interventions, determined by factors such as urolith type, quantity, and location. The choice in this case was the traditional cystotomy procedure, contrasting with modern approaches like cystoscopic guided laser lithotripsy percutaneous cystolithotomy (Cleroux., 2018). Cystotomy, a frequent surgery in small animal vet practice, entails making an incision in the urinary bladder to eliminate cystic calculi. The procedure involves opening the abdomen on the ventral side, then opening and closing the bladder. The employed surgical technique mirrors that previously outlined by Khan et al. (2013), with slight procedural differences noted in the literature. There are no significant advantages to performing a dorsal incision and this approach is not recommended. Choosing a ventral cystotomy incision enhances the view of the bladder neck and

trigone, facilitating easier retrieval of cystic calculi. Additionally, the ventral approach reduces the chance of including the ureters in urinary bladder wall closure, as they located dorso-ventrally. In this present case ventral incision was performed. Bladder incision is closed typically using rapidly absorbable monofilament suture. Maiti et al. (2020) stated that they used polyglactin in a lambert pattern for bladder suturing. Similarly, Reddy (2017) described suturing the bladder with catgut using Cushing pattern. Chromic catgut rapidly losses the tensile strength in urine. Polyglactin 3-0 (Vicryl) suture in Cushing pattern was used in this case.

Cytotomy for urolithiasis management presents common issues, including urinary tract infection, uroabdomen, incomplete calculi removal, urolithiasis recurrence and surgical site infection (Appel et al. 2012). The frequency of these complications is tied to surgeon experience and patient physical status (Fossum et al., 2013). The choice of surgical methods, along with peri-opertive and post-operative use of antimicrobials and analgesics, as well as the pattern of sutures would also influence the probability of complications. In this reported case, no complications were reported later, and the surgical wound was completely healed and the dog was fully recovered two weeks post-operation.

Conclusion

Urolithiasis is a common disease in dogs and the lower urinary tract is affected more than the upper urinary tract. The urolithiasis case presented in this clinical report was confirmed by performing radiographic examination, and cystotomy was preferred to treat the case. A complete recovery of the case suggests that cystotomy is a quick and effective way for treating urolithiasis in dogs. It seems to be the preferred choice because medical alternatives might not cure the ailment completely or would be potentially lengthier.

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Figures

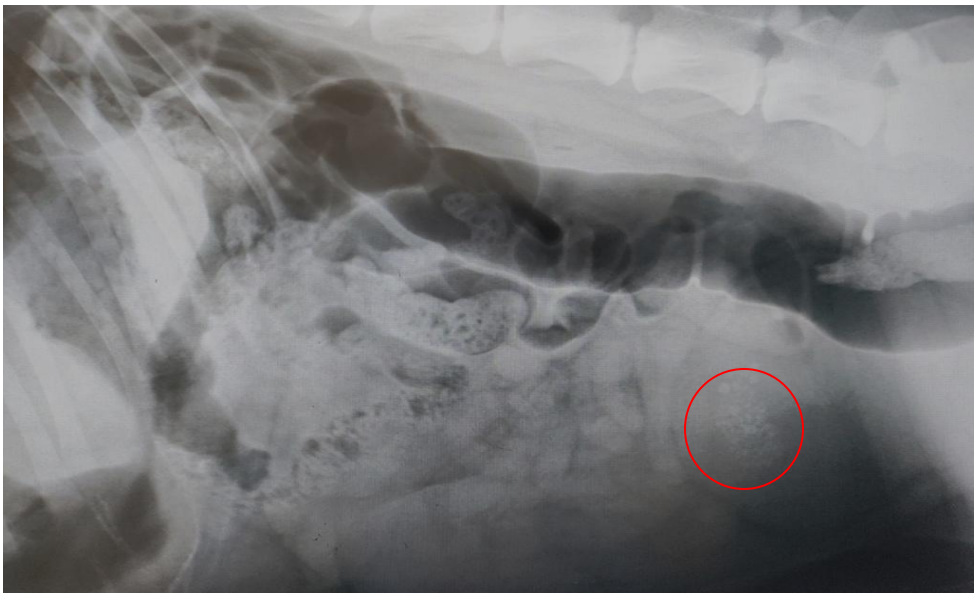

Figure 3.1. The left lateral view of abdominal radiograph showing multiple radio opaque shadow in urinary bladder

Figure 1.2. Extraction of urine from urinary bladder through catheter

Figure 1.3. Clipped and shaped intended surgical site

Figure 1.4. Placing draper over the area of the surgery

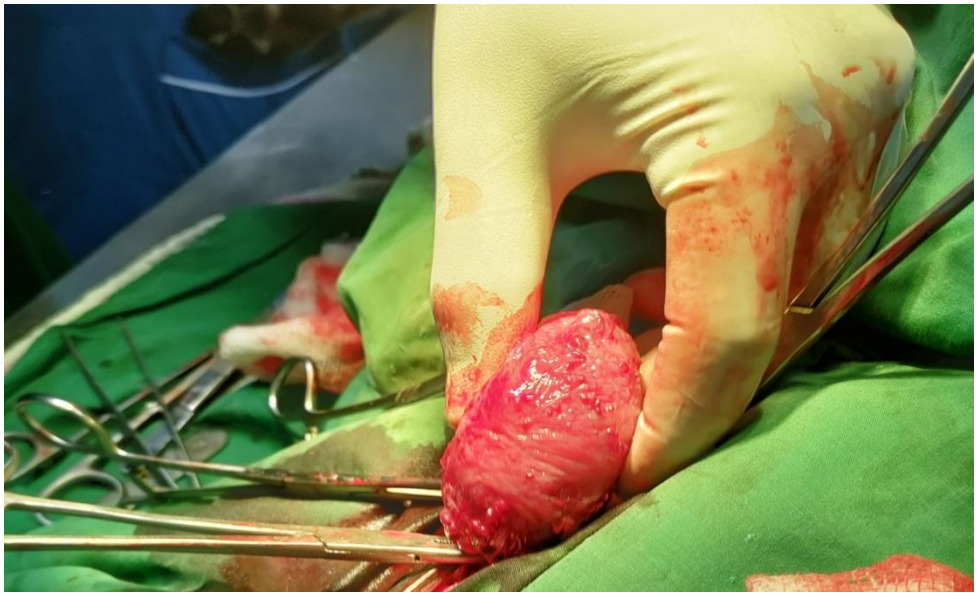

Figure 1.5. Pulling out the urinary bladder from the peritoneal cavity

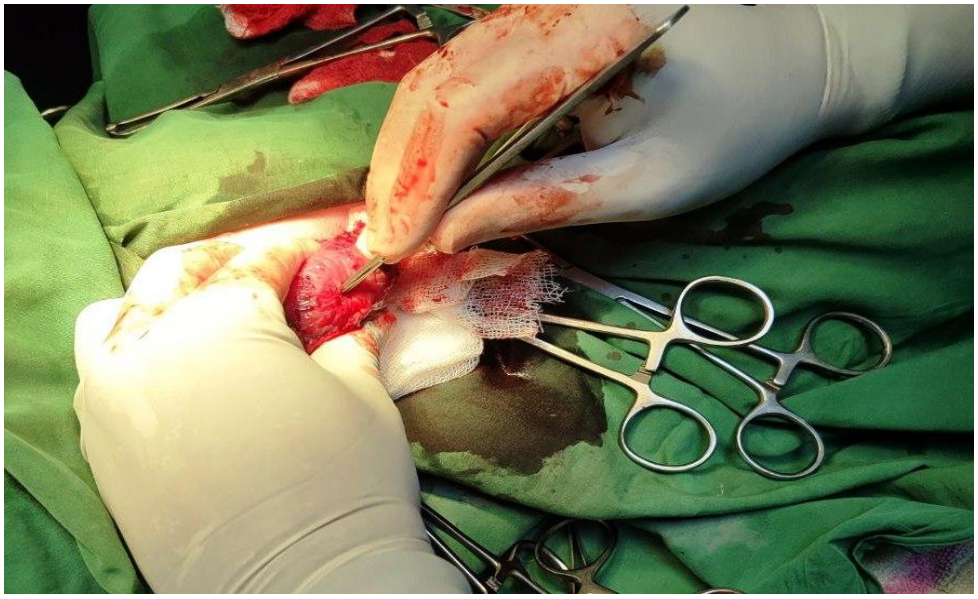

Figure 1.6. Incision on the ventral site of the urinary bladder

Figure 1.7. The urinary bladder incision closed in a cushing suture pattern

Figure 1.8. Abdominal incision closed initially in a subcuticular pattern and then reinforced in a cross mattress pattern

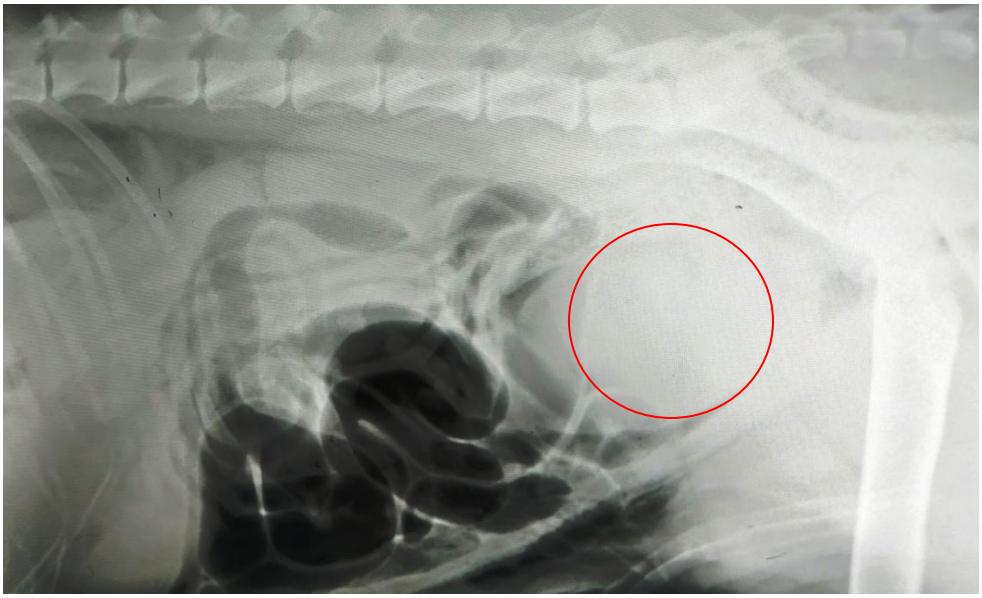

Figure 1.9. Radiograph after performing surgery showing no urolith

Figure 1.10. The bladder stones

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The Author

Biography

I am Md. Sayem Abdullah, son of Abu Ahmed & Momtaz Begum. I passed my Secondary School Certificate examination from Bandarban Govt. High School in 2014 & Higher Secondary Certificate examination from Bandarban Cantonment Public School & College in 2016. I enrolled for Doctor of Veterinary Medicine (DVM) degree in Chattogram Veterinary and Animal Sciences University (CVASU), Bangladesh. In future, I would like to work as a veterinary practitioner.