Cystic calculi removal in African spurred Tortoise (*Geochelone sulcata*) using transplstron coeliotomy

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Abstract

The present report was carried out to manage a case of calculi in the bladder of African spurred tortoise. A 6 year old African spurred tortoise presented with history of anorexia and whitish discharged from the vent. Upon physical examination, the tortoise were 10% dehydrated, hindlegs muscle wasting and whitish materials came out from the vent. Plain radiograph revealed increased radiopacity in the bladder and also both right and left kidney. Contrast gastrointestinal radiograph showed less possibility of foreign body. Inconclusive radiological findings required the decision to proceed with exploratory transplastron coeliotomy by using dental burr. About 4 cm solid, hard whitish mass was removed from the bladder and both kidney was congested with whitish material. The findings were suggestive for urates crystal calculi based on histology result.
Keywords: African spurred tortoise, Anorexia, Cystic calculi, Dehydrated, Transplastron coeliotomy

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Introduction

The term urinary calculi refers to any macroscopic precipitates, or polycrystalline concretions, found anywhere in the urinary tract. Uroliths have been reported in amphibians, lizards, turtles, and snake. The urolith is called cystic calculi or bladder stone when located in bladder [1]. This is usually due to accumulation of uric acid and no access to water source which lead to dehydration in tortoise [2,3]. According to Mader *et al*. [1], there are 100 reported cases of captive desert tortoise (*Gopherus agasizii*). Ninety-two of the cases were diagnosed during routine annual physical examinations. The calculi is usually an accidental finding upon physical examination in reptiles because there is no specific signs shown by the patient for this problem. Coeliotomy is defined as surgical incision into abdominal cavity [4]. Coeliotomy is usually the preferable approach in removing cystic calculi and combined with cystotomy.

Patient signalment and history

Balbasor is a 6 year-old African spurred tortoise (*Geochelone sulcata*), female, weighing 0.45 kg. She was managed indoor and fed with green vegetable such as pakchoy , cherry tomato and carrot. She was presented to University Veterinary Hospital (UVH), Faculty of Veterinary Medicine, Universiti Putra Malaysia with primary complaint of anorexia, dehydration and present of whitish discharged coming out from the vent. The tortoise also showed abnormal behavior of hiding behind the refrigerator and like to eat paper. On first day presented to UVH, she was given 9 ml warm saline subcutaneously and 3 ml diluted nutrigel orally. Contrast study was done and radiograph was taken. On the second day hospitalized, she was given another 3 ml saline subcutaneously. Another radiograph was taken,16 hours after contrast study using iohexol. On day 3, surgery was done and biopsy was taken . However, on day 1 post surgery , the tortoise had bradycardia and died. Post mortem was done on the same day and sample of kidney was sent for histology analysis.

Physical examination

Upon presentation to UVH, the tortoise was dull, weak and depressed. The tortoise was also dehydrated with 10% dehydration which can be assessed based on the skin turgor [5]. The tortoise also showed sign of anorexia and sunken eye. Besides that, the tortoise also

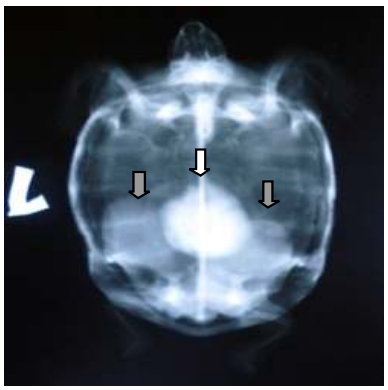

Figure-1. An increased opacity located at the centre of the coelomic cavity (Empty arrow) and in the kidney (Filled arrow).

Figure-2. Making outline on the plastron using high speed burr

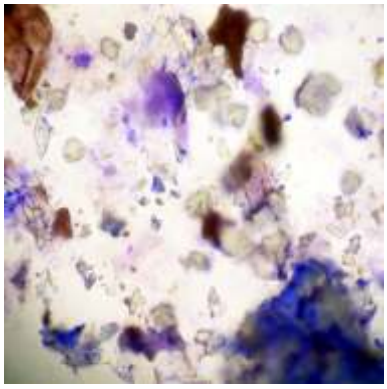

Figure-3. Urates salt precipitation observed

had sign of muscle wasting of both hind leg. There was whitish discharge observed at the vent.

Diagnostic workout and findings

Radiological findings: Plain radiograph was taken the first day presented to UVH. The radiograph was taken on ventral-dorsal view. On the ventro-dorsal view (Figure 1), there is increased radio opacity at the center of the coelomic cavity , around 4 cm in diameter which is suspected to be cystic calculi. Both right and left kidney also shows increased radio opacity which suspected due to accumulation of urate salt, and oval in shape without clear outline located caudo-laterally. On the same day, contrast study was done. Five ml iohexol was given orally and radiograph was taken at 1 minute, 10 minutes, 30 minutes, 1 hour and 16 hours. However, the finding was less likely suggestive for any obstruction along the gastrointestinal tract based on the clearance of the contrast media and the amount of contrast media left. A study have been done on Leopard tortoise (*Testudo pardalis*) which takes about 5 to 9 hours for gastric to be emptied [6].

Anaesthetic protocol: On the third day of hospitalization (27.10.2011) exploratory transplastron coeliotomy was done. The tortoise was premedicated with atropine 0.05 mg/kg and 0.03 ml of atropine was administered subcutaneously. She was induced using isoflurane 4% with oxygen flow rate of 0.4 L/min by mask induction. After induction, she was intubated with size 2, uncuffed endotracheal tude. She was maintained with isoflurane 1.5%, with oxygen flow rate of 0.4 L/min. Modified Jackson Rees, non-rebreathing circuit was used in this surgery.

Surgical protocol (Exploratory transplastron coeliotomy): Using a high speed burr , the outline for coeliotomy surgery was made on the plastron using the burr (Figure-2). After the outline was made, the plastron was cut by following the outline. Size 20 scalpel blade was used to help in completely cutting the plastron. Haemostat was used to open the plastron,once the plastron have been completely cut according to the outline. Once the four incised site of the plastron have been freed using the haemostat , the plastron was raised carefully. Extra care was taken to separate the soft tissue attachment from the plastron. After the plastron have been completely removed , the midline of the coelomic membrane was identified. Using size 15 scalpel blade, the midline of the coeliomic membrane was then punctured. The membrane was held using tissue forcep and mayo scissor was used to cut the membrane extended cranially and caudally. Once the coeliomic membrane have been successfully cut , the coeliomic contents are revealed. The ventral abdominal blood vessels are identified and preserved This vessel running parallel to the midline in a cranio-caudal direction. After incision of the coelomic membrane , the organ were examined in-situ. Then the bladder was identified and was filled with solid mass. Then the bladder was pull using the hook. Cystotomy was done by cutting the middle part of the bladder using mayo scissor. The content of the bladder, around 4 cm in diameter was removed. Warm saline was flushed to clean up the bladder inner side and to retain the moisture. Then, the bladder was closed using 3.0, vicryl, simple continuous suture pattern. After the bladder successfully sutured, it is placed back into the coelomic cavity. Then, coeliomic membrane was closed using 3.0, Vicryl, simple continuous suture patterns. The suture site was examined. For closure, hole was made at each four incised site of the plastron using speed burr. Size 2.0,

Ethilon was placed into each hole and tighten using surgeon's knot followed by square's knot. The surgical site was sealed using sealent. The gauze was placed on the plastron and wrapped using coban bandage.

Post-surgical medication:

1. Meloxicam, 0.2mg/kg , SID, PO for 3 days
2. Enrofloxacin,10mg/kg ,SID , PO for 7 days
3. Multivitamin syrup, 0.3ml ,PO, BID for 2 weeks
4. Nutrigel, diluted, PO, given as needed

Post-mortem findings: The tortoise died on day 1 post surgery and post mortem was done immediately. The only abnormal finding was the kidney. The kidney was filled and congested with whitish material. Sample of kidney was taken and sent to histology laboratory for analysis. Histology findings were the area is composed of large lightly eosinophilic areas which is suggestive for urate crystal deposition and almost lost of tubules. However, the remaining tubules were atrophied. A biopsy from sediment removed from the bladder and the result revealed it was urate salt (Figure-3).

Discussion

In this case the tortoise died most probably due to respiratory failure. Reptiles tend to breath-holding when they are under anaesthesia. This mechanism lead to retention of anesthetic drug in the circulatory system. This causing the tortoise not fully recover from anesthetic effect after surgery. This eventually lead to further breath-holding which finally lead to hypoxia which is most probable cause of death in this case. Because of the habit of breath holding in reptiles, usage of anesthetic drug alone such as isoflurane usually not successful in reptiles surgery. In this case, the tortoise was pre medicated with atropine because of the muscle relaxing properties effect of the drug. This effect will help to avoid breath-holding which will prolong the induction time [1]. During the surgery, intermittent positive pressure ventilation (IPPV) was performed every 30 seconds. This is to help in breathing process of the tortoise. In reptiles, they generate negative pressure in the lung by increase the size of coelomic cavity which is through movement of the pelvic, axillary limbs and muscles. Another way the reptiles generate negative pressure is through contraction of smooth muscle within the lung. During anesthesia, this movements are decreased and IPPV need to be performed. Performing IPPV will also shorten the recovery time from anesthesia. However, the mechanism is still not fully understood [3].

Calculi is common in some species namely African spurred tortoise, spur-tighed tortoise and Russian tortoise [7]. It can occur in terrestrial chelonians fed with high protein diet, water deprivation, inflammation of the bladder, a foreign body serves as a nidus around which urates accumulate to form one or more calculi [8].

Reptiles excrete their nitrogenous waste in form of uric acid. Uric acid is water insoluble which means less water will be used to removed it. This mechanism occur to prevent water loss in reptiles especially desert tortoise. This mechanism also is the main factor that lead to calculi formation in reptiles. The formation of calculi begins from degradation of protein into nucleic acid. Nucleic acid in the diet are then degraded by nucleases to nucleotides. These nucleotides undergo further enzymatic hydrolysis to yield free purines and pyrimidine bases. Additional purines and pyrimidine bases are synthesized in the liver from amino acid. If these free bases not reused by the body, they are further degraded and ultimately excreted. The pyrimidines are catabolized to end products CO2 and NH3. In reptiles, purines will undergo further breakdown . Purine will be degraded into adenine and guanine. Adenine will be converted to hypoxanthine and converted to xanthine by xanthine oxidase and eventually converted to uric acid by xanthine oxidase. Guanine is converted directly to xanthine and then become uric acid. Uric acid will be accumulated in the bladder and mixed with other cation such as potassium lead to urate precipitation. Prolong accumulation of urate salt finally lead to formation of calculi. The type of calculi usually formed are potassium or calcium urates salt [1].

Plastrotomy is the most commonly treatment because it provides access to the bladder. This invasive procedure often associated with prolonged healing and rehabilitation. Non-invasive technique is removing urinary calculi via the vent with forceps under sedation or anaesthesia. The limitation of this method is include cases which the calculus is trapped within the pelvic region or where the calculus can be visualized and directly palpated from the vent with forceps [7].

There are few complications that can occur following transplastron coeliotomy. One of it is poor healing of plastron. The plastron may not closed or healed if fissure between the flap is blocked by sealent due to non-union. The flap need to be in contact for healing process to take place. There are possibility of haemorrhage to happens. It is possible for haemorrhage to occur due to accidentally cut the vessel associated with the visceral surgery such as the ventral abdominal blood vessel. This can be prevented by identifying the vessel and preserved the vessel.

Contamination from bladder content can also occur. Reptiles bladder contents is always contaminated with organism such as *Aerococcus spp., Enterococcus spp., Salmonella spp., Micrococcus spp.,* and *Pasteurella spp.* [3]. This contamination can lead to coelomitis. Pericardial trauma also can happen. Heart is located just beneath the plastron. Trauma can happen when cutting the plastron. This can be avoided by understanding of the anatomy of the tortoise.

The formation of calculi can be prevented. The calculi formation is highly influenced by the hydration status of the tortoise. Tortoise should be provided with access to clean and shallow container of water [8]. This can be achieved by providing water source such as pond for the tortoise or by spraying water to their body. Tortoise need water for drinking ,urination and also defecation. When dehydrated, tortoise will automatically retained their urine. This mechanism is to avoid further water loss. Urine retention for a long time will eventually lead to calculi formation. One of the easiest ways to rehydrate tortoises is to immerse them in a bath of warm water for 30 minutes ,three or four times a day [5] .The tortoise also should not be fed with high protein diet especially dog food [8]. This happen when tortoise fed with dog food or cat food which is high in protein. High protein diet will lead to more breakdown of protein and lead to formation of uric acid which is the main component of calculi formation. The tortoise should be fed with vegetable and grass which will provide them with balance and sufficient nutrient. According to McArthur et al. [3], the diet should contain high fibre, rich in minerals such as calcium, vitamin A and vitamin D especially the calcium:phosphorus ratio which is one of the component that contribute to the calculi formation. The normal ratio is 2:1.

References

1. Mader, D.R. (2006). *Reptiles Medicine and Surgery*. pp. 25-800.
2. Reavill, D.R. and Schmidt, R.E. (2010). Urinary tract diseases in reptiles. *Journal of Exotic Pet Medicine.* 19 (4): 280 – 289.
3. McArthur, S., Wilkinson, R., Meyer, J.(2004). *Medicines and surgery of tortoise and turtles.* Blackwell publishing ltd. pp. 31-407.
4. Blood, D.C., Studdert, V.P., Gay, C.C. (2007). *Saunders Comprehensive Veterinary Dictionary*. pp 324.
5. Dermod, M. (1997). Reptile anaesthesia and the practicing veterinarian. *In Practice*. 19: 351-368.
6. Sharon, K.T., Scott, B.C., Jacqueline, M.Z.. and Bush, M.R. (1996). Radiographic anatomy and barium sulfate transit time of the gastrointestinal tract of the leopard tortoise (Testido pardalis). *Journal of Zoo and Wildlife Medicine*. 27 (2): 180 - 186.
7. Miwa, Y. (2008). Removal of calculi via the cloaca in tortoises. In: *Exotic DVM*. Vol. 10 (3). Kling, M. and Harrison, L.R. (eds). Zoological Education Network. 5 – 7.
8. Rosenthal, K.L., Forbes, N.A., Frye, F.L. and Lewbart, G.A. (2008). Tenesmus in a California desert tortoise. In: *Rapid Review of Exotic Animal Medicine and Husbandary*: pet mammals, birds, reptiles, amphibians and fish. Manson publishing. 210.

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