

## Unusual Vesical Calculus in Rhesus Monkey (*Macaca mulatta*)

<sup>1,2</sup>Hong Wang, <sup>1,2</sup>Wei Si, <sup>1,2</sup>Yuyu Niu, <sup>2</sup>Lixian Chen and <sup>1,2</sup>Ye Yan

<sup>1</sup>Kunming Institute of Zoology, Chinese Academy of Sciences, 650223 Kunming, P.R. China

<sup>2</sup>Kunming Biomed International and Yunnan Key Lab of Nonhuman Primate Biomedicine, 650550 Kunming, P.R. China

---

**Abstract:** Several cases of urinary calculi have been reported in cynomolgus monkeys but vesical calculi were not reported in rhesus monkeys. The adult male rhesus monkey (*Macaca mulatta*) presented here had a vesical calculi which was entire urate.

**Key words:** Vesical calculus, histopathology, rhesus monkey, urinary calculi, cynomolgus monkey

---

### INTRODUCTION

Vesical calculi appear to be definitely associated with obstruction of bladder neck contracture, prostatic enlargement and stricture of urethra, diverticulum of the bladder or recurrent lower urinary tract infection (Adsan *et al.*, 1996; Gurdal *et al.*, 2003). Several cases of urinary calculi have been reported in cynomolgus monkeys (O'Rourke *et al.*, 1995; Renlund *et al.*, 1986; Stephens *et al.*, 1979) but vesical calculi were not reported in rhesus monkeys. In this study, researchers present an entire uric acid calculus in bladder in an adult male rhesus monkey.

### MATERIALS AND METHODS

An 8 years old male rhesus monkey was bred in colony facility in Kunming Biomed International accredited by Association for Assessment and Accreditation of Laboratory Animal Care International (AAALAC). The animal was bred in a same shielding house with other rhesus monkeys. The animals were fed a monkey chow that contained 23.2% crude protein, 5.6% crude fat, 3.1% crude fiber, 1.2% calcium and 0.75% phosphorus. They were supplied with monkey chow twice a day and fresh fruits or vegetables including apples, bananas, oranges, cabbage and pears daily.

All of the animals were free to get water via an automated system. The animal had no previous medical problem and was negative for Herpes B virus and tuberculosis tests confirmed by the routine annual body examination. The animal was never involved in any experiment. On October 25, 2011 the animal was anorectic,

unanimated, fleshless, hypothermic and inactive. Considering the poor condition of the animal, it was euthanatized at that time by 100 mg kg<sup>-1</sup> sodium pentobarbital solution. Necropsy was performed subsequently and sections from liver, spleen, kidney and bladder tissue were submitted for histopathological analysis. The liver, spleen, kidney and bladder tissue collected from this monkey were fixed in 10% neutral buffering formalin, embedded in paraffin and prepared microscopic sections in diameter 5 µm, routinely processed for histopathology. All the sections were stained with haematoxylin and eosin. The tissue slides were observed by microscope (Leica DM2500M).

### RESULTS AND DISCUSSION

The calculus located in the bottom of the bladder and was easily removed from the bladder (Fig. 1a). Bladder outlet was obstructed by the calculus. The alone calculus was elliptical with 5.23 g weight and 2.1×1.8×1.5 cm<sup>3</sup> in size. The surface of the calculus was regular and yellowish colour (Fig. 1b). Chemical analysis of the calculus was composed of entirely urate. There is no urine in the bladder but a large area of hemorrhages was observed in the bladder wall. The bladder was significant erosions, erythema and edema (Fig. 1c).

No obvious pathological changes of the liver, spleen and kidney were observed. The wall of the bladder was diffusely thickened due to the epithelial hyperplasia. Plentiful desquamated epitheliums were observed from the bladder mucosal (Fig. 2a and b) and numerous polymorphonuclear neutrophil were observed filling bladder mucosal (Fig. 2c).

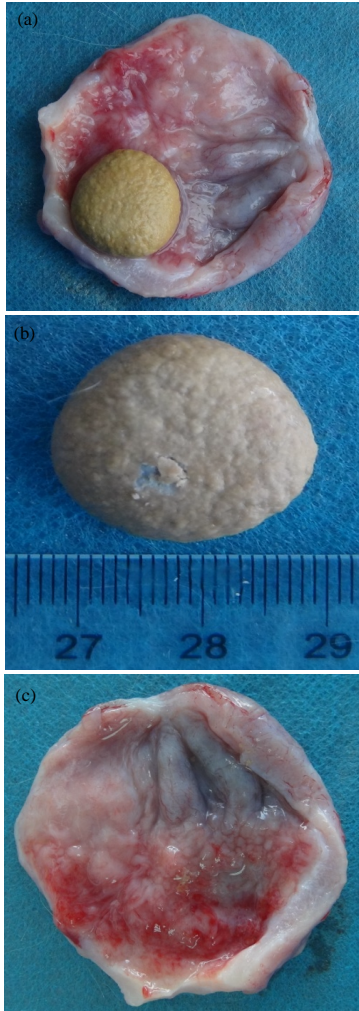


Fig. 1: a) Vesical calculus site; b) Calculus color and size and c) Hemorrhages in the bladder

Vesical calculi have been reported in cynomolgus monkeys (O'Rourke *et al.*, 1995; Renlund *et al.*, 1986; Stephens *et al.*, 1979). Furthermore, a lot of vesical calculi cases have been reported in human being (Benkaddour *et al.*, 2006; Gurdal *et al.*, 2003; Koide *et al.*, 1982; Mustafa and Wadie, 2007; Segarra *et al.*, 2001; Seth *et al.*, 2002; Washington *et al.*, 2008). Many reasons can cause calculus formation in animal bodies. Vesical calculus appears to be definitely associated with obstruction of bladder neck contracture, prostatic enlargement, stricture of the urethra or diverticulum of the bladder (Adsan *et al.*, 1996).

In the presented case, researchers presume that supersaturated urine leads to nucleation and subsequent growth of crystals which obstructed the bladder outlet of the rhesus monkey and the bladder outlet obstruction further deteriorated the inflammatory response.

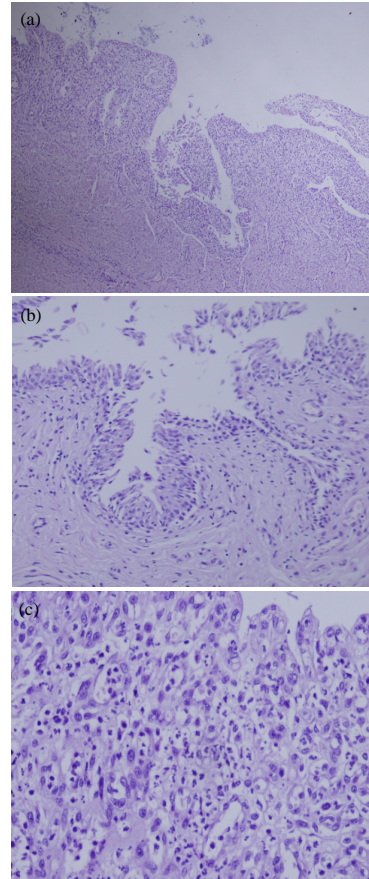


Fig. 2: Bladder mucosal epitheliums, a) x4; b) x10 and c) x40. All tissue stained by haematoxylin and eosin

Meanwhile due to bladder outlet obstruction, calculi and inflammatory cell were interactional to aggravate the calculi symptom, the bladder inflammation and the urinary infection. This case revealed that the vesical calculus is composed of urate. Previous reports revealed that the composition of bladder calculus were calcium carbonate or oxalates, phosphates, carbonates, ammonium salts, magnesium and calcium (Faltas, 2000; Stephens *et al.*, 1979). The most common type of vesical calculus in adult humans is composed of uric acid. Less frequently, bladder calculi are composed of calcium oxalate, calcium phosphate, ammonium urate, cysteine or magnesium ammonium phosphate (Douenias *et al.*, 1991; Hammad *et al.*, 2006). Pediatric calculi are composed mainly of ammonium acid urate, calcium oxalate or an impure mixture of ammonium acid urate and calcium oxalate with calcium phosphate (Kamoun *et al.*, 1999).

## CONCLUSION

The adult male rhesus monkey presented here had a vesical calculus which was entirely composed of urate.

The alone calculus was elliptical with 5.23 g weight and  $2.1 \times 1.8 \times 1.5 \text{ cm}^3$  in size, the surface of the calculus was regular and yellowish colour. Meanwhile, there are no urine in the bladder and large areas of hemorrhages in the bladder wall. The bladder was significant erosions, erythema and edema.

#### ACKNOWLEDGEMENT

The researchers gratefully acknowledge the Pathology Lab for histologic analysis in Kunming Biomed International.

#### REFERENCES

- Adsan, O., O. Yildiz, B. Ozturk and A Memis, 1996. A giant bladder stone: Managed with osteotome. *Int. Urol. Nephrol.*, 28: 163-166.
- Benkaddour, Y.A., A. Aboufalah and H. Abbassi, 2006. Bladder stone: Uncommon cause of mechanical dystocia. *Arch. Gynecol. Obstet.*, 274: 323-324.
- Douenias, R., M. Rich, G. Badlani, D Mozor and A. Smith, 1991. Predisposing factors in bladder calculi: Review of 100 cases. *Urology*, 37: 240-243.
- Faltas N.H., 2000. Urolithiasis in cynomolgus monkey (*Macaca fascicularis*): A case report. *Contemp. Top. Lab. Anim. Sci.*, 39: 18-19.
- Gurdal, M., A. Ayyildiz, H. Emre, H. Kanberoglu and M.I. Karaman, 2003. A huge bladder cystine stone. *Int. Urol. Nephrol.*, 35: 497-499.
- Hammad, F.T., M. Kaya and E. Kazim, 2006. Bladder calculi: Did the clinical picture change?. *Urology*, 67: 1154-1158.
- Kamoun, A., M. Daudon, J. Abdelmoula, M. Hamzaoui and B. Chaouachi, 1999. Urolithiasis in Tunisian children: A study of 120 cases based on stone composition. *Pediatric Nephrol.*, 13: 920-925.
- Koide, T., K. Yokogawa, M. Takemoto H. Itatani, S. Sagawa and T. Sonoda, 1982. Pure calcium carbonate urolithiasis in a human. *Eur. Urol.*, 8: 319-320.
- Mustafa, M. and B. Wadie, 2007. Bladder erosion of tension-free vaginal tape presented as vesical stone: Management and review of literature. *Int. Urol. Nephrol.*, 39: 453-455.
- O'Rourke, C.M., D.W. Brammer, G.St. Romain, G.K. Peter and G.L. Hofing, 1995. Calcium carbonate urolithiasis in an adult male cynomolgus monkey. *Lab. Anim. Sci.*, 45: 222-224.
- Renlund, R.C., G.E. McGill and P.T. Cheng, 1986. Calciteurolith in a cynomolgus monkey. *Lab. Anim. Sci.*, 36: 536-537.
- Segarra, J., J. Palou, M. Montlle'o, J. Salvador and J. Vicente, 2001. Hasson's laparoscopic trocar in percutaneous bladder stone lithotripsy. *Int. Urol. Nephrol.*, 33: 625-626.
- Seth S., S. Malik and S. Salhan, 2002. Vesical calculus causing dystocia. *Eur. J. Obstet. Gynecol. Reprod. Biol.*, 101: 199-200.
- Stephens, E.C., C.C. Middleton and L.J. Thompson, 1979. Urinary cystic calculi in a cynomolous monkey: A case report. *Lab. Anim. Sci.*, 29: 797-799.
- Washington, B., B. Hines and S. Stoneburg, 2008. Bladder calculi presenting as complete proctidentia. *Int. Urogynecol. J.*, 19: 157-159.