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Nephrolithiasis in two Arabian horses

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Abstract

Nephrolithiasis was incidentally diagnosed in 2 Arabian horses, a young foal and an adult mare, from Maybod, Yazd province, Iran. The foal had bilateral neophrolithiasis, as multiple sand like stones in renal papillary area. Large nephroliths were found in the left kidney of mare. Prominent composition of those nephroliths was magnesium ammonium phosphate. Risk factors and other aspects of nephrolithiasis in horses are discussed.

Key words: Arabian horse, nephrolith, water hardness, kidney

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Introduction

Nephrolithiasis is uncommon in horses comparing to bladder and urethral calculi. Of 68 horses reported with urolithiasis, 59.7% had calculi in bladder and 24% had urethral calculi while 12.6% had renal calculi, and 3.7% had ureteral calculi (Laverty et al., 1992). Equine uroliths are most commonly found in the bladder (60%) or urethra (24%). The pathogenesis of nephrolith formation is uncertain and the importance of nephroliths as causes of distal urinary tract obstruction are unknown (Macbeth, 2008). Nephroliths may develop around a nidus associated with a variety of renal diseases, including polycystic kidney disease, pyelonephritis, papillary necrosis, and neoplasia. Indeed, data on upper urinary tract stones in horses are insufficient to know whether they develop spontaneously (in the absence of damage) as in humans or whether they differ significantly in mineral composition from cystic calculi. On the other hand, although nephrolithiasis are quite painful in humans, horses with neproliths often remain asymptomatic until bilateral obstructive disease leads to development of acute or chronic renal failure (Schott, 1998). However, a history of chronic weight loss and colic in a horse with renal failure indicates the possible presence of renal calculi (Radostits et al., 2007). In the present report, for the first time in Iran, two cases of nephrolithiasis from Maybod, Yazd province are described.

A 7-year-old Arabian mare and a 7- month-old foal of same race were necropsied during investigation on an outbreak of carbamate poisoning in a small horse boarding stable in Maybod, Yazd province, Iran. Nephroliths were incidentally found in both of cases. The left kidney of adult horse was larger than normal and contained 6 calculi with different sizes. The stones were hard with irregular spongy appearance and milky in color (Fig 1). The stones weighed 750 gr.

Figure 1. One of the large nephroliths found in a 7-year-old Arabian horse.

Case report

There were numerous small sand-like and white calculi in papillary area of both kidneys in the foal. Neproliths of the adult horse were analyzed. The result of that analysis is showed in Table 1. The composition of the nephroliths was 20% calcium oxalate, 30% calcium phosphate and 50% magnesium ammonium phosphate.

The horses were fed a mixture of wheat straw, alfalfa hay and barley grain. Drinking water provided from a well and the owner complained for its high salinity. Drinking water of horses was analyzed for total hardness (TH), total dissolved solids (TDS), some elements and pH value. The results are indicated in Table 2. There was a history of several months of low performance for adult horse.

Discussion

Although cystic calculi are the most commonly recognized form of equine uroliths, a number of renal or ureteral calculi have been reported , describing nephrolithiasis and ureterolithiasis in horses (Ehnen et al., 1990; Laverty et al., 1992; Macbeth 2008). Nephroliths may develop around a nidus

associated with a variety of renal diseases, including congenital renal dysplasias such as polycystic kidney disease, pyelonephritis, papillary necrosis and neoplasia (Schott 1998). Renal papillary necrosis is a common phenomenon secondary to concurrent dehydration and non-steroidal anti-inflammatory therapy in horses (Dusterdiek 2003). Indeed, tissue damage is believed to be the most important factor for development of urolithiasis in horses. Tissue damage accompanied by necrotic tissue, desquamated cell and leukocytes can act as a nidus, then minerals deposited around the nidus followed by slow and continuous crystal growth, the second phase of calculus formation.

Equine urine is highly alkaline, favoring crystallization of most urolith components, especially calcium carbonate (Dusterdiek 2003).

Regardless of location, almost equine calculi are predominantly composed of calcium carbonate, usually in calcite or vaterite forms (Diaz-Espineira et al., 1997). However, predominant composition of calculi found in the adult Arab horse of this report was struvite (magnesium ammonium phosphate), which is less common component of equine urolithiasis (Schott 1998). High physical activities and insufficient replacement of water losses, as well as high ambient temperature increase the incidence and prevalence of urolithiasis (Siener and Hesse 2003). On the other hand a number of studies on human, beings have suggested that water hardness and magnesium levels in drinking water can contribute in greater incidence of urolithiasis (Bellizzi et al., 1999; Medina-Escobedo et al., 2002; Sahinduran et al., 2007). According to the water analysis in Maybod region, drinking water showed high hardness. Although the effect of water hardness on urolithiasis is not known in equine, but it can be attributed to imbalances of minerals intakes that may be a predisposing factor in the development of uroliths.

Table 1. Chemical Values of water sample.

Parameter	Water sample	Drinking water
TDS	2800 mg/l	1000 mg/kg
TH	1045 mg/l	100 mg/dl
Ca	320 mg/l	75 mg/dl
Mg	70 mg/l	50 mg/dl
Na	1012 mg/l	**175**
K	7.8 mg/l	**12**
Cl	2612 mg/l	200 mg/l
Sulfate	122 mg/l	200 mg/l
$HCO3^-$	620 mg/l	-
Ammonium	0.25 mg/l	0.0002 mg/l
Phosphate	0.4 mg/l	0.1 mg/l
pH	8.2	7

Although any breed predisposition for nephrolithiasis has not been described, it has been speculated that racehorses are at a greater risk, because of the common use of nonsteroidal anti-infalmmatory drugs and then associated risk of papillary necrosis.

Table 2. Constituents of analysed nephroliths

Element	%
Phosphate	30
Magnesium	7
Calcium	47
Oxalate	12
Ammonium	4

Horses with nephrolithiasis often remain asymptomatic until bilateral obstructive disease results in acute or chronic renal failure. Nonspecific signs of uremia such as poor performance, inappetance, and weight loss are commonly observed (Dusterdieck 2003). Diagnosis of upper urinary uroliths is usually made during rectal or ultrasonographic examination. Rectal palpation may reveal an enlarged kidney or ureter and in some instances, the calculus can be palpated on the enlarged ureter. In ultrasonography calculi are detected as hyperechoic structures with strong anechoic shadow. Small stones lesser than 1 cm in diameter can be missed despite of complete examination, but other findings such

as dilatation of renal pelvic and hydronephrosis supports the diagnosis (Schott 1998; Dusterdieck 2003). However, upper urinary tract stones may be an incidental finding at necropsy (Ehnen et al., 1990; Schott 1998). For decreasing the possibility of urolith formation, the owners should be cautioned to provide safe drinking water and balanced ration for horses and to avoid overdose non-steroidal anti-inflammatory drugs.

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سنگ کلیوی در دو اسب نژاد عرب

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چکیده

سنگ کلیوی به طور تصادفی در دو اسب نژاد عرب، یک کره اسب جوان و یک مادیان درمیبد استان یزد در ایران تشخیص داده شد. کره اسب دارای سنگ کلیوی دوطرفه به صورت سنگ ریزه های متعدد در ناحیه لگنچه کلیه بود. سنگ های کلیوی بزرگ در کلیه چپ مادیان یافت شدند. ترکیب غالب این سنگها فسفات آمونیوم منیزیوم بود. عوامل خطر ساز و سایر جنبه های ایجاد سنگ کلیوی در اسب‌ها در این مقاله مورد بحث قرار می گیرند.

واژه‌های کلیدی: اسب عرب، سنگ کلیه، سختی آب، کلیه

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Instruction for Authors

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