



Silica urolithiasis in a dog

- a case report

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Introduction

- Occurrence of silica-containing uroliths in dogs: ~ 0.5% of analysed uroliths in Europe^{1,2}
 - Schenk et al. (2010)³ reported a peak of 13% in 2009 in Switzerland
- Affected dogs⁴ predominately
 - 7- 9 years old
 - male (88-93%)²

¹Hesse et al. Canine cystine urolithiasis, Can Vet J. 2016 Mar; 57(3): 277–281;

² Roe et al. Analysis of 14,008 uroliths from dogs in UK, J Small Anim Pract (2012) 53, 634–640;

³ Schenk et al. Silica-containing uroliths in dogs from CH, ECVIM-CA Congress 2010, p 303;

⁴ Hesse & Neiger Harnsteine bei Kleintieren, Stuttgart: Enke, 2008

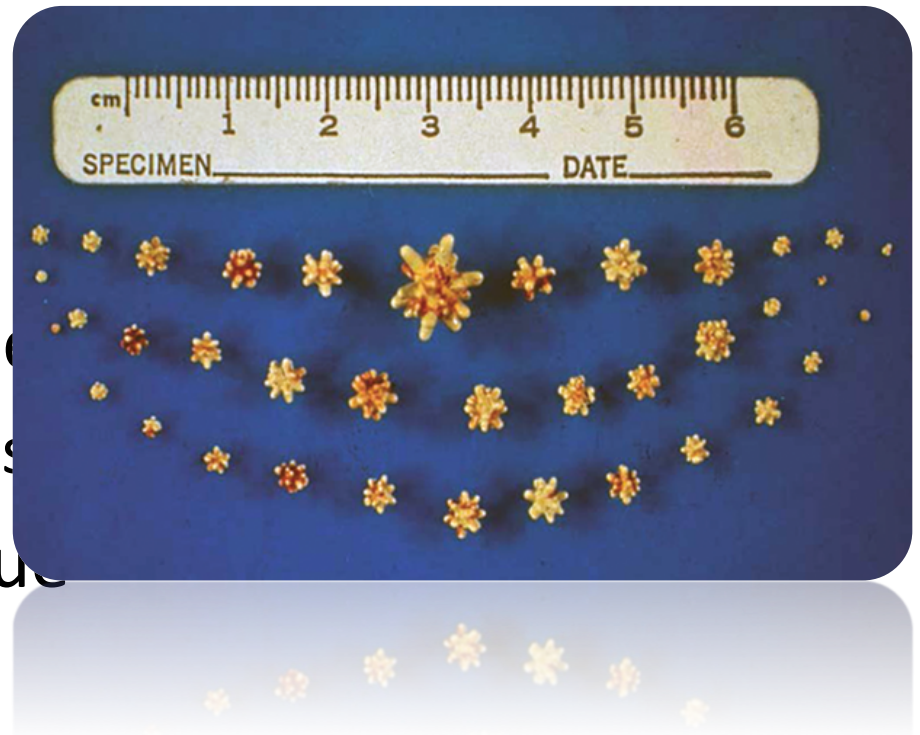
Introduction

Silica-containing uroliths

- Occurrence mostly numerous not solitary
- Often in jack-shape

Diagnostic Imaging

- Ultrasonographically detectable
 - No information about size
- Radiographically opaque



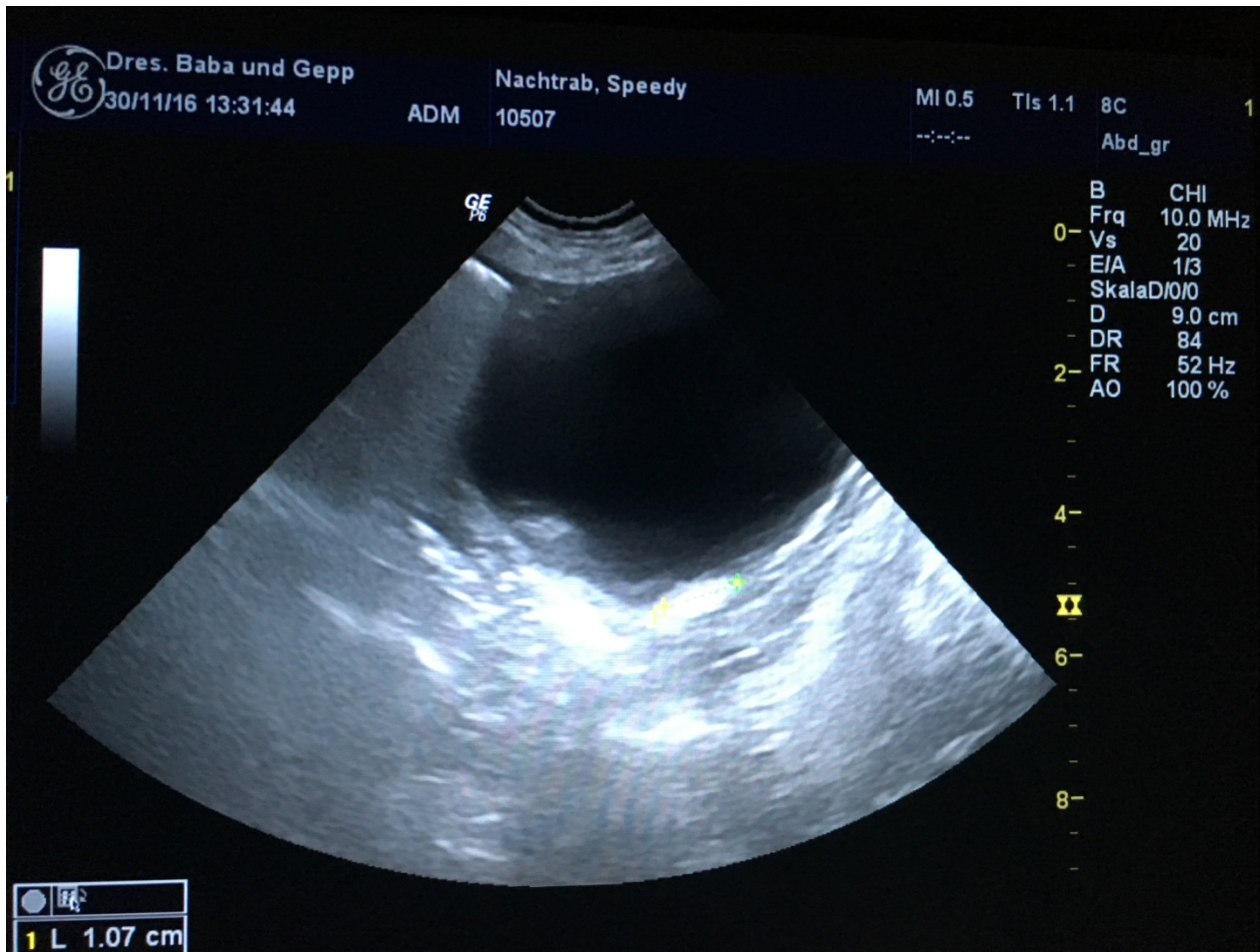
Case history – first appointment

- **Patient:** 10 y old neutered male terrier mongrel (BCS 3/5), history of pancreatitis, presented for strangury, abdominal pain
- **Diagnostic Imaging:** ultrasonic examination
 - Pancreas: no abnormalities
 - Bladder: hyperechoic structure



„Speedy“

Nov 2016



Case history – first appointment

- **Urinalysis** of sediment (spontaneously urinated)
 - Bacteria, erythrocytes, leucocytes, no crystals
- **Blood chemistry:** pancreatic lipase within reference range
- **Diagnosis:** urinary tract infection, suspected urolithiasis
- **Management:** Antimicrobial treatment



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Case history – second appointment

- **Urinalysis** urine sample collected by the owner
(2 wks after initial presentation)
 - numerous struvite crystals
- **Urinalysis** of urine sample from cystocentesis
(3 wks after initial presentation)

no crystals

no signs of inflammation

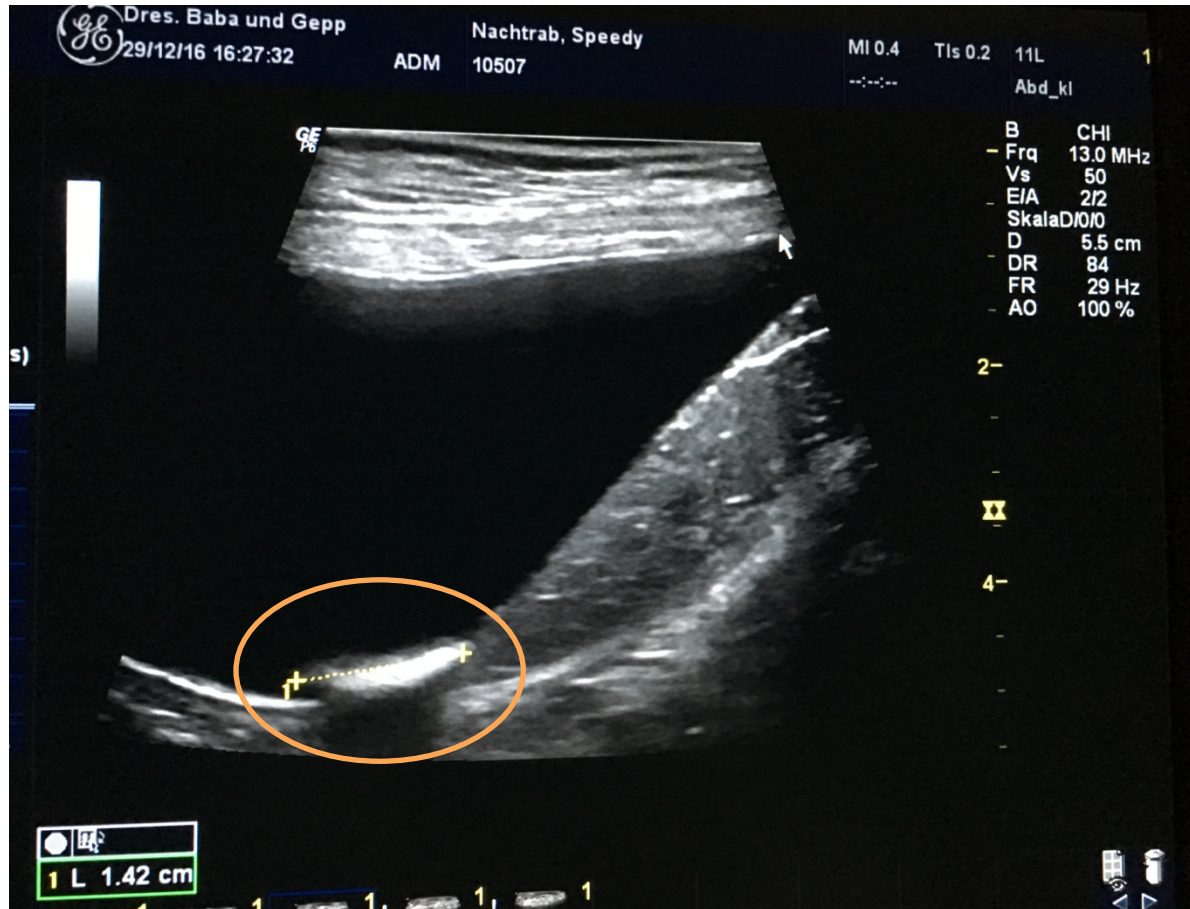
urine pH of 7.1

Diagnostic Imaging: Sonography of bladder



„Speedy“

Dec 2016



Surgery: 20 uroliths, lab analysis: 100% silica

Pathophysiology of silica uroliths⁵

- Not fully understood
- Related to intake of silica or silicate (salts of silicic acid)
 - silicic acid is easily absorbed and renally excreted
 - common in soil (silica content >90% / DM)
 - in certain plants / plant by-products⁵ (rice hulls 16 % / DM)
- Silica uroliths in humans after long-term consumption of large quantities of antacids containing magnesium trisilicate
- Dissolution characteristics unknown

⁵Osborne et al. Canine silica urolithiasis, J Small Anim Pract (1999) 1, 213-230

Case - Nutritional consultation

- **Feeding history:** low fat dry diet for 1y
- **Urine pH:**
 - Calculated: cation-anion-ratio, corresponding average urine pH 7 (after Kienzle & Schuhknecht 1993)
 - Measured: pH 7.1
 - Silica is less soluble in acid than alkaline water
-> avoid to acidify the urine

Dietary cation anion balance [mmol/100g DM]

$$50 \times \text{Ca}^* + 82 \times \text{Mg}^* + 43 \times \text{Na}^* + 26 \times \text{K}^* \\ - 65 \times \text{P}^* - 28 \times \text{Cl}^* - 13.4 \times \text{Met}^* - 16.6 \times \text{Cys}^*$$

$$50 \times 12 + 82 \times 1.2 + 43 \times 4.3 + 26 \times 7.6$$

$$- 65 \times 9.1 - 28 \times 7.3 - 13.4 \times 6.6 - 16.6 \times 3.7 =$$

$$135 \text{ mmol/100g DM}^6$$

$$\text{Dog urine pH} = (\text{CAB} \times 0.019) + 6.50$$

$$\text{Dog urine pH} = (135 \times 0.0019) + 6.50 = 6.8^6$$

*[g/kg DM], #this case

⁶Kienzle E., Schuhknecht A. (1993), Untersuchungen zur Struvitsteindiätetik: 1. Einfluss verschiedener Futterrationen auf den Harn-pH-Wert der Katze Dtsch. tierärztl. Wschr. 100: 198-203

Case - Nutritional consultation

- **Antacids** (because of a episode of gastro-intestinal problems in the past):
 - Omeprazol for 2 wks (do not contain silicate)



Case - Nutritional consultation

- **Habits:**

For more than 2 years



the dog consumed rabbits faeces during the daily walks



Rabbit faeces

Faeces of feral rabbits sampled from the same spot

Crude ash: 16.9% DM

Insoluble ash: 12.3% DM



For comparison:

Faeces of pet rabbits predominantly fed with hay (n=2)

Crude ash: 8.2 and 8.4% DM

Insoluble ash: 3.8 and 4.1% DM



Solidago canadensis

Diagnosis

- Intake of faeces (together with soil, sticking to it) might caused silica uroliths in this case.
- UTI might have occurred secondary as a result of mucosal irritation caused by the jack-shape.

Recommendation

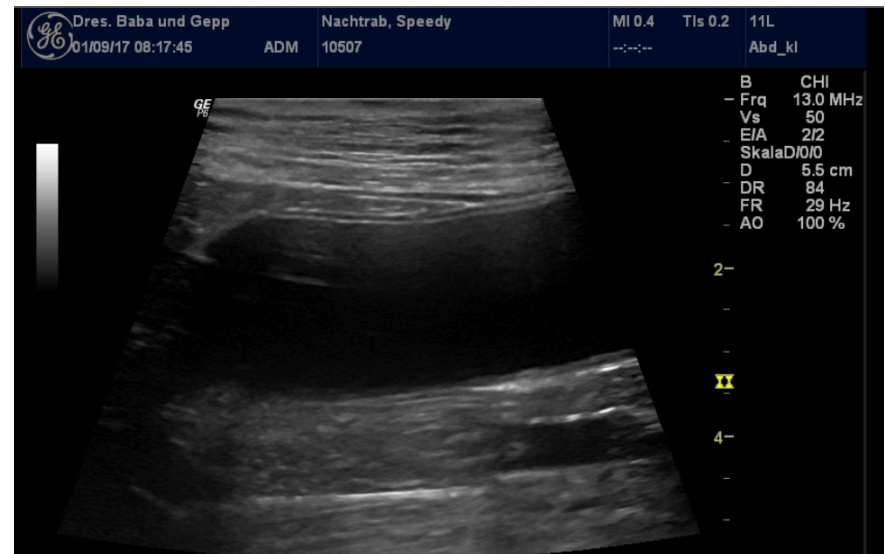
- Stop intake of rabbit faeces
- Prevent intake of feedstuffs containing silica (e.g. whole grain rice)
- Prevent acidifying or alkalizing of urine pH
- Increase water intake
- Increase frequency of outdoor access
- Frequently monitoring

Follow up

No signs of dysuria or abnormal findings in the urinalysis and ultrasonography of the bladder after 9 month following the recommendation



April 2017



September 2017

***Thank you for your
attention!***

