Diagnosis and treatment of urolithiasis in horses

Barrie Edwards and Debra Archer

Barrie Edwards is honorary professor of equine surgery at Liverpool. He has over 35 years of experience in all aspects of large animal surgery and was awarded a CBE in 2002 in recognition of this. He holds a PhD in veterinary medicine and is a fellow of the RCVS.

Debra Archer graduated from Glasgow in 1996 and worked in mixed and equine practice for three years before completing a residency in equine surgery at Liverpool, where she is now a senior lecturer in equine surgery. She holds the RCVS certificate in equine soft tissue surgery, the European diploma in equine surgery, and a PhD for studies on the epidemiology of colic.

doi:10.1136/inp.c7445

Obstructive disease of the urinary tract of horses is an uncommon but potentially serious disorder. Urolithiasis, the most prevalent form of this disorder, can occur at any location in the urinary tract but is most typically seen in the bladder of male adult horses. The presenting signs of urolithiasis are highly variable and depend on the anatomical location of the obstruction. This article discusses the diagnosis and treatment of various forms of urolithiasis in the horse.

Development of uroliths

Urolithiasis occurs relatively infrequently in horses compared with many other veterinary species. In contrast to humans, uroliths of the kidney and ureter are relatively uncommon and most uroliths diagnosed in the horse are located within the bladder (see Box 1).

Horses develop two basic forms of uroliths and both are composed primarily of calcium carbonate in various hydrated forms. More than 90 per cent are yellow, moderately friable, spiculated stones (Fig 1). Less commonly, they are grey-white, smooth stones that are resistant to fragmentation. The latter often contain phosphate in addition to calcium carbonate. Other components include magnesium, ammonium, struvite, hydroxyapatite and uric acid, but these are seen infrequently. As crystals of calcium carbonate and mucoproteinaceous material are normal components of equine urine, it is difficult to formulate an explanation for calculus formation based solely on the presence of these materials. In general, two steps are required for calculus formation – nucleation and crystal growth.

Factors predisposing to crystal precipitation include supersaturation of urine, prolonged retention and promoters of crystal growth. Genetic variations in ion excretion rates, which are well documented in humans and dogs, have not been described in horses. Although poorly documented, inhibitors of crystal growth in equine urine, including its high mucus content, are likely to play an important protective role, particularly in the light of the substantial urinary excretion of calcium carbonate crystals by normal horses. Spontaneous nucleation rarely initiates calculus growth because normal urine of most species is supersaturated and is in balance between crystal precipitation and dissolution. Tissue damage from a number of causes is likely to be the most important factor for the development of uroliths in horses. Desquamated epithelial cells, leucocytes or necrotic debris may form a nidus for crystal growth. Stasis of urinary flow favours nucleation by increasing the chance of contact between crystalloid material and damaged uroepithelium. Once crystal growth commences around a nidus, the highly alkaline urine of horses favours crystallisation of most urolith components, especially calcium carbonate.

Fig 1: Typical type 1 cystic calculus with characteristic spiculated surface

Box 1: Location of calculi diagnosed in the horse

- 84% develop in the bladder (cystic calculi)
  - → 60% remain within the bladder
  - → 24% pass into the urethra causing urinary obstruction at various levels
- 16% develop in the renal pelvis
  - → 12% remain within the renal pelvis
  - → 4% move distally causing ureteral obstruction

From Laverty and others (1992)

The role of urinary tract infection in the development of urolithiasis varies with species. Although positive urine culture in horses with urolithiasis is very low, in one series of cases, culture from the centre of the calculi examined yielded positive results in more than half of the cases (Schott 2010).

Epidemiology

Urolithiasis accounts for relatively few (0·1 to 0·5 per cent) admissions to referral hospitals. However, its prevalence may be underestimated, particularly that affecting the upper urinary tract, which can be difficult to detect. Urolithiasis typically occurs in adult horses (mean age 10 years) but may be seen in young horses as well; bilateral nephrolithiasis and multiple cystoliths on sutures used to repair a ruptured bladder have been reported in foals. Affected horses are generally male (75 per cent, mainly geldings). No breed predisposition has been recognised.

Cystic calculi

Cystic (bladder) calculi are the most commonly recognised form of urolith in horses. Males are clinically affected more frequently than mares due, in part, to differences between the male urethra (which is long and narrow, particularly at the ischial arch) and that of the mare (which is short, wide and easily distensible and permits the passage of a calculus before it attains a size that would cause clinical signs). Most cystic calculi are composed of calcium carbonate and the spiculated form is by far the most common. Therefore, it is not surprising that the presenting clinical signs are associated with the cystitis caused by the coral-like uroliths.

Diagnosis

Typical clinical signs include dysuria, stranguria and pollakiuria. Haematuria is often present, particularly after exercise or at the end of micturition. A short period of exercise (eg, 10 to 15 minutes) is usually sufficient to produce significant amounts of blood in the urine (Fig 2). The horse often maintains a prolonged urinary stance and males frequently protrude the penis. Restlessness, grunting and tenesmus may also be noticed during attempted urination. The frequent passage of small amounts of urine (pollakiuria) is probably due to mucosal irritation in most cases, although intermittent obstruction of outflow from the bladder may be a factor occasionally. This conclusion is supported by the fact that, on rectal palpation, the bladder is usually quite small and located on the pelvic floor; this finding may be missed if the bladder is expected to be located more cranially and the examiner does not carefully palpate the pelvic floor. A firm, oval mass is readily palpable within the bladder lumen. Only very rarely is there more than one calculus present. Although this is sufficient evidence on which to base a diagnosis, transrectal ultrasonography (Fig 3) and endoscopic evaluation of the bladder can provide additional valuable information. When performing cystoscopy, it is important to empty the bladder fully; failure to do so may result in some calculi being missed (Figs 4a, b). Direct visualisation of the bladder lumen allows assessment of the mucosa and ureteral openings

Fig 2: Urine samples collected before (left) and after (right) 15 minutes of exercise on the lunge. Heavy blood-staining of the second sample is clearly visible

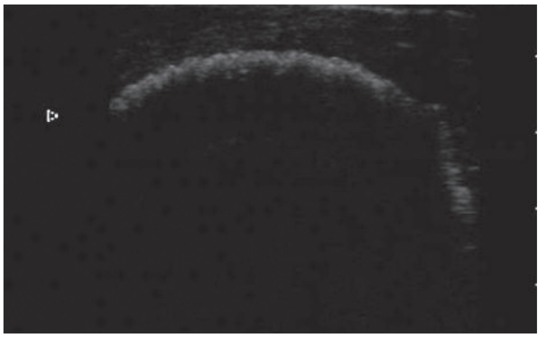


Fig 3: Transrectal ultrasonogram showing a cystic calculus using a 5 MHz probe. The surface of the calculus is evident as an irregular, hyperechoic arch-like line

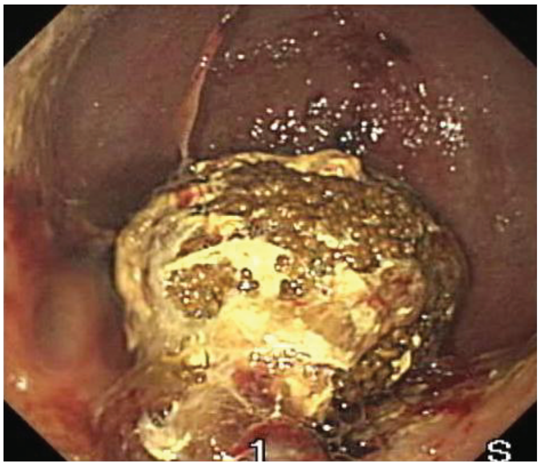
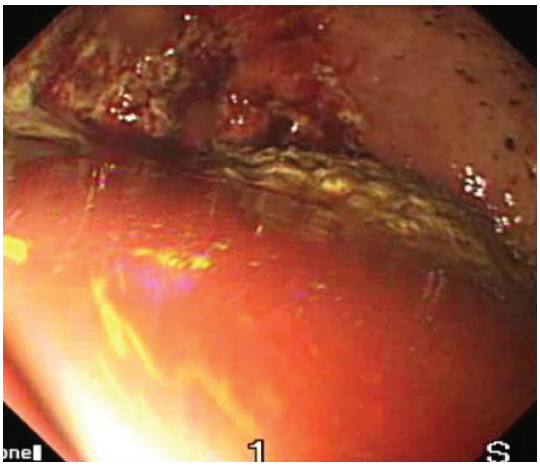


Fig 4a (above): Cystic calculus clearly visible on cystoscopy of a bladder emptied of urine.
Fig 4b (below): The same cystic calculus, almost completely obscured by urine on initial evaluation of the bladder



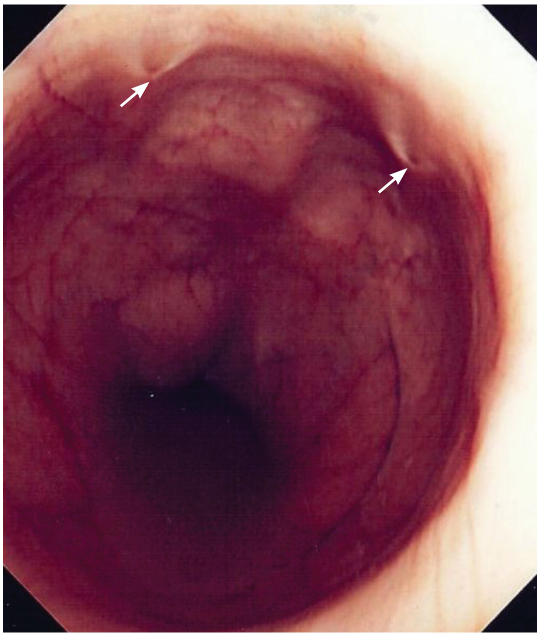


Fig 5: Ureteral openings are located at the 10 and 2 o'clock positions (arrows) on the dorsal aspect of the bladder trigone. Urine should be expelled in a pulsatile nature from these openings one to two times per minute

Box 2: Treatment options for calculi removal from the bladder and urethra

Mares

- Standing sedation and epidural anaesthesia
  - Manual dilation of the urethra and removal of cystic calculus <10 cm in diameter
  - Fragmentation of larger calculi using lithotrite, or laser or shockwave lithotripsy
  - Urethral sphincterotomy may be required
  - Laparocystotomy is rarely necessary

Male horses

- Recumbent techniques performed under general anaesthesia
  - Laparocystotomy
  - Laparoscopic or laparoscopic-assisted cystotomy
  - Urethrotomy for distal urethral calculi
- Standing surgical techniques
  - Perineal urethrotomy performed under standing sedation and using an epidural
    - Fragmentation and removal of cystic calculi using a lithotrite or laser instrument
    - Removal of urethral calculi lodged at the ischial arch or sometimes more distally
  - Pararectal cystotomy (Gokel's technique)
    - Not recommended for removal of cystic calculi
    - Has proved successful for removing large calculi lodged in the pelvic urethra
  - Electrohydraulic, shockwave and laser lithotripsy

(Fig 5), helps to determine the size and texture of the calculus and aids identification of multiple calculi.

Treatment

Cystic calculi can be managed using one of a variety of surgical procedures. The choice is dictated by the gender and physical condition of the horse, the size of the patient and the surgeon's preference. The availability of specialised equipment and cost are further considerations.

Treatment options in mares

Due to the urethra in mares being wide and easily distensible, uroliths can be extracted manually in some instances. Under sedation and epidural anaesthesia, the urethra should be gently dilated with a well-lubricated gloved hand. The calculus should then be manipulated into the trigone of the bladder by manual transrectal positioning. Once this has been achieved, a few fingers or grasping forceps can be introduced into the urethra allowing the calculus to be removed from the bladder. This technique is particularly useful in mares with calculi less than 10 cm in diameter. If this technique is unsuccessful, the calculus can be fragmented with a manual lithotrite or by using electrohydraulic or laser lithotripsy, after which the fragments can be removed manually or flushed from the bladder. Sphincterotomy in the dorsal part of the urethra may help to gain access to and assist the removal of larger stones. Laparocystotomy is rarely necessary in mares.

Treatment options in male horses

Laparocystotomy

The preferred technique in males, especially those with large stones, is laparocystotomy through a parapreputial or midline incision. This procedure allows removal without fragmentation, ensures that the urethra is not traumatised and enables thorough evacuation of debris and small stone fragments. However, it does require general anaesthesia and exposure of the bladder can be difficult.

A urinary catheter should be passed into the bladder before preparation of the surgical site, after which a 20 to 25 cm incision is made parapreputially (male) or in the midline (mare) extending caudally as close to the pubic brim as is feasible. The empty bladder with the enclosed calculus is identified within the pelvic canal. At this point, it seems very remote from the abdominal incision, but steady traction applied over 10 to 15 minutes will bring it up to, and partially through, the incision. Placement of stay sutures enables the bladder to be retained in this position throughout the removal of the calculus and closure of the cystotomy incision (Fig 6). Large, moist surgical swabs should be used to protect the edges of the incision and the peritoneal cavity from contamination. The bladder is then incised on its

Fig 6: Bladder fixed in position at a paramedian laparotomy incision using stay sutures

Fig 7: Incision into the bladder lumen to expose the cystic calculus

Fig 8: Facets on the surface of this cystic calculus indicate the presence of a second calculus

ventral aspect to reveal the calculus, which should be carefully separated from the mucosa and removed taking care to avoid dislodging spicules (Fig 7). The calculus should be carefully examined for any flattening of its surface, which would indicate a second calculus (Fig 8). Finally, the bladder lumen should be lavaged with sterile saline and suction applied to remove any debris and fragments of stone before the cystotomy incision is closed with two layers of continuous Cushing sutures using synthetic absorbable suture material. Inflating the bladder with saline introduced via the urinary catheter enables the surgeon to check for leakage. The abdominal incision is closed routinely. Parenteral broad-spectrum antibiotics should be commenced 24 hours before surgery and should be continued for a further five days; non-steroidal anti-inflammatory drugs should be administered for three days. Postoperative recovery, which is usually uneventful, varies according to the length of the laparotomy incision and surgeon preference (around nine to 12 weeks). Potential complications include peritonitis, bladder leakage and incisional infection.

Laparoscopic and laparoscopic-assisted cystotomy should be performed under general anaesthesia in dorsal recumbency in the Trendelenburg position. Laparoscopic-assisted cystotomy involves a combination of laparoscopic visualisation and parainguinal laparocystotomy. A portal for the laparoscope should be created at the umbilicus and an instrument portal made 2 to 3 cm medial to the external inguinal ring. The cranial aspect of the bladder should be grasped with laparoscopic grasping forceps and elevated to the ventral abdominal wall in the parainguinal region. The instrument portal should be lengthened longitudinally to facilitate exteriorisation of the bladder apex, open cystotomy and removal of the calculus. After closure of the cystotomy, the bladder should be returned to the abdomen and the incisions closed.

Closed laparoscopic urolith removal involves a similar initial approach for the laparoscope and instrument portals. However, the cystotomy, calculus removal and cystotomy closure are performed completely within the abdominal cavity using intracorporeal techniques.

Once removed from the bladder, the calculus should be placed in a specifically designed sterile plastic bag. The bladder is then lavaged and closed using intracorporeal suture techniques. After cystotomy closure, one of the instrument portals is enlarged to facilitate removal of the plastic bag and the calculus within it.

The primary advantages of laparoscopic techniques are that they negate the need for a large abdominal incision and minimise postoperative recovery time. They also provide excellent visualisation of the bladder and tension-free bladder closure. Disadvantages include prolonged surgery times, the cost of specialised equipment and the advanced laparoscopy skills required.

A subischial urethrostomy approach to a cystic calculus under epidural anaesthesia is an option in male horses of a suitable temperament, but has disadvantages. Accurate incision of the urethra is imperative and is greatly facilitated by having a catheter in place to identify it. Once entered, the pelvic urethra is dilated to admit grasping forceps or lithotrite, which the surgeon guides to the calculus in the bladder using their free hand in the rectum. Small calculi may be removed intact but larger ones require fragmentation into numerous small pieces, which must be removed by grasping or lavage, and siphonage. This is often time-consuming and frustrating and can result in considerable trauma to the urethra, bladder and surrounding structures. The urethrotomy is left to heal by second intention, but there is the potential for stricture or diverticulum formation at the site. Other complications that have been reported include grade 3 rectal tears, orchitis, tenesmus and dysuria.

Pararectal cystotomy (Gokel's operation) has been described as an alternative to perineal urethrostomy in horses with cystic calculus. However, this method is not recommended because of complications such as pelvic abscess, entry into the peritoneal cavity and damage to the genitourinary tract.

Lithotripsy

Fragmentation of the calculus can be performed using electrohydraulic, ballistic shockwave and laser lithotripsy. Electrohydraulic and laser lithotripsy (usually a holmium:yttrium-aluminum-garnet laser [Ho:YAG]) can be performed using a suitable flexible endoscope inserted via the urethra in the standing,

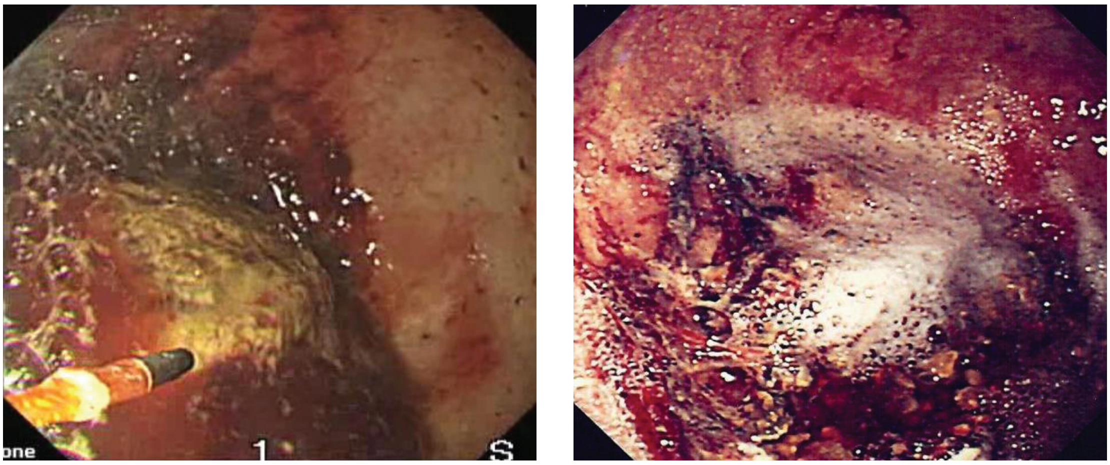


Fig 9a: Electrohydraulic lithotripsy being performed using a lithotripsy probe (Wolff Instruments) inserted transendoscopically via the urethral orifice. Fig 9b: The same case on completion of lithotripsy. The remaining small fragments are removed by suction and lavage of the bladder

sedated patient, which has obvious benefits (Figs 9a, b). However, it can take some time (several hours) to complete fragmentation of large calculi and remove the debris. In addition, the equipment is expensive, although this can be hired.

Urethral calculi

In the absence of predisposing primary disease within the urethra, urethral calculi are usually small cystic calculi that have passed into the urethra. The most common site at which they become lodged is the ischial arch in male animals where the urethra both narrows and changes direction. Smaller calculi may negotiate the ischial arch and subsequently become lodged at some point in the distal urethra. On rare occasions, a large calculus may obstruct the pelvic urethra.

Diagnosis

An obstructing calculus should be considered in a horse with signs of colic and frequent attempts at urination. Some horses have evidence of blood at the urethral orifice. Palpation of the penis may reveal rhythmic contractions of the urethra and the calculus may be palpable as a hard mass. Rectal examination reveals a full, turgid bladder (compared with a flaccid bladder seen in cases of paralysis). The diagnosis is confirmed by passing a urethral catheter or endoscope to the site of obstruction (Fig 10). Fortunately, most cases are presented early in the course of the condition and prompt action will avoid rupture of the bladder. Signs of depression and anorexia resulting from progressive electrolyte imbalances and azotaemia should alert the veterinarian to the possibility of bladder rupture, which can be confirmed by the presence of an empty bladder on rectal palpation and by comparing the creatinine level in peritoneal fluid with that of serum. A two-fold or greater increase is considered diagnostic.

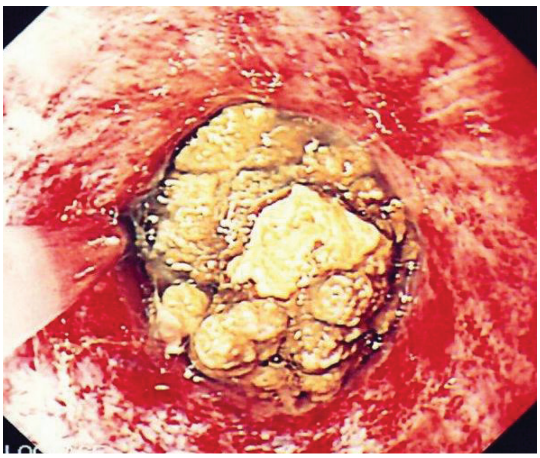


Fig 10: Urethral calculus in a horse that presented with signs of colic and urinary tenesmus. The calculus was identified endoscopically 15 cm distal to the ischial arch and was removed using arthroscopic instruments introduced via a perineal urethrotomy incision

Treatment

A calculus lodged at the ischial arch is removed by perineal urethrotomy in the standing, sedated horse under local infiltration or epidural anaesthesia. This involves making a precise midline incision through the skin, bulbourethral muscle, corpus spongiosum and mucosa directly over the calculus, which can be carefully removed. A catheter is passed into the bladder to ensure patency and the urethrotomy incision should be allowed to heal by second intention. For the first two or three days, urine should be voided via the incision but, as it heals, urination will progressively take place via the normal route. In some cases where the calculus is lodged just distal to the ischial arch, laparoscopic

Box 3: Treatment options for calculi removal from the upper urinary tract

Recumbent techniques under general anaesthesia

- Calculi in the kidney or proximal ureter removed by nephrotomy or preferably nephrectomy using a lateroretroperitoneal approach. Limited to unilateral cases
- Ureterolithectomy has been used for calculi lodged in the distal ureter

Standing technique using sedation and epidural anaesthesia

- Electrohydraulic and laser lithotripsy
- Use of a basket stone dislodger

Fig 11: Small calculus lodged in the distal urethra exposed via a urethrotomy incision, which was subsequently sutured

Fig 12: Large calculus that was firmly trapped in the pelvic urethra. It was removed via a pararectal approach

or arthroscopic instruments can be used under endoscopic guidance to remove the offending calculus via perineal urethrotomy.

Calculi that obstruct lower down the urethra and cannot be palpated can be removed in some cases using endoscopic instruments such as basket forceps or can be removed surgically under general anaesthesia with the horse in dorsal recumbency (Fig 11). The site for the skin incision is determined by passing a catheter to the point where the urethra is obstructed. As a urethrotomy at this location requires suturing, it is worth considering crushing the calculus before incising into the urethra. This can sometimes be achieved with minimal trauma to the urethra by applying a sharp towel clip across the calculus and applying pressure. If this is not possible, the urethra must be opened and subsequently sutured to prevent leakage of urine into the peripenile tissues. This must be performed precisely to minimise the risk of urine leakage and stricture at the site.

Obstruction of the pelvic urethra is rare. The calculus is usually large and is readily identified on rectal palpation. Ideally, it should be manipulated distally to the ischial arch and removed or, alternatively, propelled cranially into the bladder. The calculus is usually firmly lodged at the site and proves impossible to move in either direction (Fig 12). Experience has shown that the obstruction can be relieved via a pararectal approach in the standing sedated horse under epidural anaesthesia. The skin incision should be made to the right of the anus, medial to the semimembranosus muscle, and dissection continued forward between the rectum and urethra until the calculus is located. The urethra can then be incised and the calculus removed. A Foley catheter should be placed in the bladder via a urethrotomy to direct urine away from the perineum. This should be left in place for a few days during which time the urethral incision closes down onto the catheter. Following removal of the catheter, urine initially escapes from the remaining defect in the urethra and is voided from the pararectal incision. The volume passed by this route quickly decreases as the urethra heals. Provided scalding of the perineum is prevented by applying petroleum jelly, healing is uncomplicated. As the depth of the dissection required to reach the calculus in the urethra is less than that to remove a cystic calculus, the risk of complications is significantly less.

Nephrolithiasis and ureterolithiasis

The prevalence of renal and ureteral calculi in horses is very low and, until the past 15 years, they were rarely described. Increased recognition can probably be attributed to the greater availability and quality of images obtained by transabdominal ultrasonography rather than an actual increase in numbers. Horses in which cystic calculi have been diagnosed should undergo ultrasonographic examination of the upper urinary tract to determine whether additional calculi are present at these sites.

Although nephrolithiasis and ureterolithiasis are painful conditions in humans, horses often remain asymptomatic until bilateral obstructive disease leads to acute or chronic renal failure. Renal calculi may be incidental findings on postmortem examination (Fig 13a, b). Clinical signs, including weight loss, poor performance, decreased appetite and lethargy consistent with uraemia, are more common than signs of obstructive disease (eg, colic, haematuria, lumbar pain and hindlimb lameness). Signs of chronic azotaemia (eg, oral ulceration, excessive dental tartar and melaena) may be present. Biochemistry may provide evidence of renal failure, but azotaemia does not develop until 75 per cent

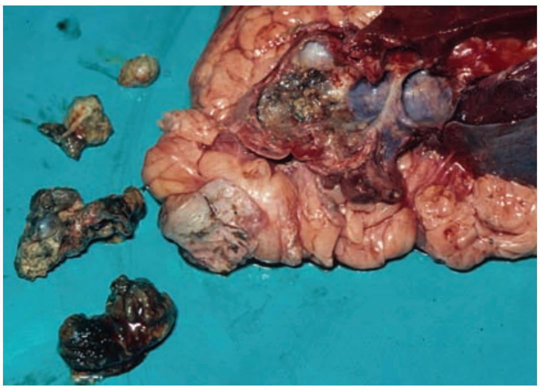
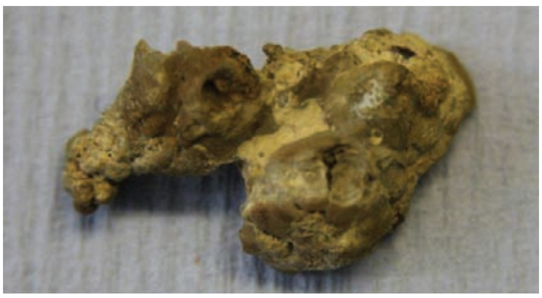


Fig 13a, b (left and right): Renal calculi found coincidentally on postmortem examination. The horse had shown no clinical signs attributable to these calculi



of nephrons cease to function. Nephroliths may develop around a nidus associated with a variety of renal diseases, including pyelonephritis and papillary necrosis.

Diagnosis

Initial diagnosis of renal and ureteral calculi may be made on rectal examination, which may reveal an enlarged kidney or ureter. Palpation of a urolith is physically possible when it is lodged in the mid to distal ureter. As normal ureters are not palpable, they must be carefully palpated along their course from the kidney, retroperitoneally along the dorsal abdominal wall to the dorsolateral aspect of the pelvic canal and onto the neck of the bladder.

Percutaneous and transrectal ultrasonography can provide information regarding the presence, number and location of calculi. A 2·5 to 3 MHz probe is required for percutaneous evaluation of the kidneys in adult horses. The right kidney is visualised between the last two or three intercostal spaces and lies just beneath the abdominal wall. The left kidney is more deeply positioned and may be visualised medial to the spleen via the last two intercostal spaces and the paralumbar fossa. Ultrasonographic examination of an affected kidney is characterised by a hyperechoic line that casts an acoustic shadow deep to the urolith. Other ultrasonographic findings include dilation of the renal pelvis or proximal ureter and, in long-standing cases, hydronephrosis. In horses with chronic renal failure, the kidney is reduced in size and has irregular surfaces and increased echogenicity due to fibrosis. Careful evaluation is required as small stones that are <1 cm in diameter can be missed.

Patency of the proximal urinary tract may be evaluated by cystoscopic examination of the ureteral openings using a flexible videoendoscope introduced via the urethra. In clinically normal horses, urine is expelled from ureteral orifices in a pulsatile fashion at a frequency of approximately one or two discharges per minute. Failure to observe this, or observation of haemorrhage or cloudy discharge from a ureteral opening, suggests a proximal urinary tract obstruction. On rare occasions, a calculus has been seen protruding from a ureteral orifice. Radiography is rarely used to evaluate urinary tract disease in adult horses. If a calculus is found in one kidney or ureter, strong consideration should be given to the possibility of disease in the other kidney. Quantitative urine analysis and culture should be performed to assess the possibility of intercurrent urinary tract infection.

Treatment

Removal of the urolith (limited to unilateral cases or those with mild azotaemia) has been the only effective treatment. In the absence of early signs of obstructive disease of the proximal urinary tract, early detection and treatment before the onset of renal failure is difficult. Renal biopsy and measurement of glomerular filtration rate are important in determining the presence and extent of renal disease before surgical removal of a stone is considered. Once signs of chronic renal failure are present, surgical treatment may prolong life but long-term recovery is unlikely.

Calculi located in the kidney or proximal ureter are removed by nephrotomy or nephrectomy using a lateroretroperitoneal approach. In the absence of azotaemia, nephrectomy is the preferred treatment for unilateral renal calculi. Those located more distally in the ureter have been removed by ureterolithectomy through a ventral laparotomy; however, visualisation and access are limited. Temporary placement of an ureteral stent following this procedure, with or without closure of the ureteral incision, has been used successfully to ensure patency.

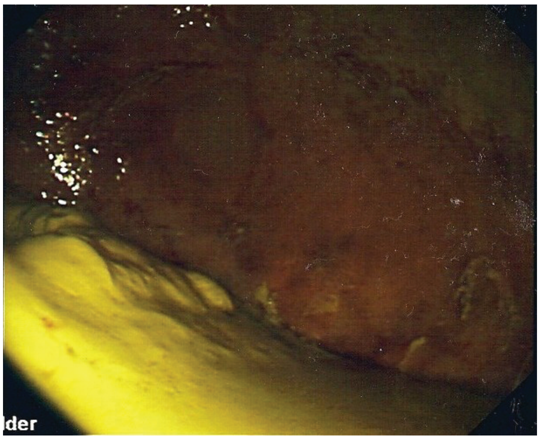
Ureteral calculi have also been retrieved by passing a basket stone dislodger using a vestibule urethral approach, guided by digital manipulation per rectum. To allow successful removal using this technique, the calculus must be 2 cm or less in diameter and lodged within 30 cm of the trigone. Electrohydraulic and laser lithotripsy have been used in a few cases to fragment calculi in this location.

Preventing recurrence

Although some reports document a low rate of recurrence, one case series reported recurrence of uroliths in 41 per cent of cases between one and 32 months (mean 13 months) after surgical treatment (Laverty and others 1992). These authors found a greater incidence of recurrence of calculi after treatment by perineal urethrotomy compared with laparocystotomy. Meticulous removal of debris and fragments of calculus following surgical removal or lithotripsy is the single most important factor in preventing recurrence of urolith formation. A number of management changes may also be implemented to try to reduce recurrence of uroliths (see Box 4), but the efficacy of many of these strategies has not been clinically proven.

Box 4: Preventing recurrence of urolithiasis

- Remove debris and stone fragments after surgical removal or lithotripsy
- Acidify urine by reducing urinary pH to <6·0. The efficacy of many of the following products is unproven or their effects are inconsistent, and many are unpalatable at these doses:
  - Ammonium chloride (20 to 40 mg/kg/day orally). Some reports use higher doses (60 to 520 mg/kg/day)
  - Ammonium sulphate (175 mg/kg/day orally)
  - Methionine (1 g/kg/day orally)
  - Ascorbic acid (1 to 2 g/kg/day orally)
  - Add grain to the diet (this has only a slight urinary acidification effect)
- Instigate dietary changes. Reduce absorption of calcium from the gastrointestinal tract and alter the dietary cation–anion balance by:
  - Avoiding calcium supplements and alfalfa
  - Feeding lower calcium hay (eg, grass/oat hay)
  - Using urinary acidifiers and promoting diuresis
- Promote diuresis by:
  - Adding 50 to 75 g of loose salt daily to the concentrate ration
  - Providing warm water during cold weather
- Control urinary infection if recurrent cystitis occurs following urolith removal by:
  - Administering antibiotics based on urinary culture and sensitivity results



Figs 14a: Sabulous urolithiasis. Thick, sticky urine sediment can be visualised on the ventral aspect of the bladder. Fig 14b: This sediment will adhere to the bottom of a sample container

Sabulous urolithiasis

Sabulous urolithiasis (termed sabulous cystitis by some authors) comprises the accumulation of large amounts of crystalloid (primarily calcium carbonate) urinary sediment in the ventral aspect of the bladder (Figs 14a, b). It occurs secondarily to neurological and non-neurological disorders interfering with bladder emptying and, in some cases, is attributed to idiopathic bladder paralysis syndrome. Affected animals usually present for evaluation of urinary incontinence or hindlimb weakness/ataxia. Careful history taking and clinical examination can identify the cause in up to 80 per cent of cases of urinary incontinence. Rectal examination reveals accumulation of sediment in a distended, flaccid bladder and this diagnosis can be confirmed by endoscopic examination of the bladder.

Treatment

The prognosis for animals with sabulous urolithiasis is poor unless the primary cause of the bladder paralysis can be resolved (eg, surgical correction of congenital defects). Long-term management comprises of symptomatic treatment, including repeated bladder lavage to remove the sedimented material, antimicrobial therapy and feeding a diet low in calcium (ie, avoid feeding alfalfa and sugar beet pulp). Bethanechol chloride (0·25 to 0·75 mg/kg orally every six to 12 hours) has also been suggested by some authors to aid effective emptying of the bladder. Such management can be successful in some cases where the owners are committed to long-term treatment.

Summary

Urolithiasis in horses is uncommon with lower urinary tract calculi accounting for more than 80 per cent of diagnosed cases. Any horse exhibiting the frequent passage of small amounts of blood-stained urine should be suspected of having cystic calculi. Diagnosis can usually be confirmed on rectal examination without the need for specialised equipment, but endoscopy and ultrasonography provide additional diagnostic aids that are also applicable to the diagnosis of upper urinary tract lithiasis involving the kidneys or ureter, which is seen much less often. A number of conventional surgical techniques are still frequently used to treat affected horses. Technological and surgical advances have provided new treatment options such as laparoscopic surgery, and laser or electrohydraulic lithotripsy that are more minimally invasive and can avoid the need for general anaesthesia. However, the use of these techniques is currently restricted to referral centres.

References and further reading

DUESTERDIECK-ZELLMER, J. F. (2007) Equine urolithiasis. *Veterinary Clinics of North America: Equine Practice* **23**, 613-629
FOLEY, A., BROUNTS, S. H. & HAWKINS, J. F. (2009) Urolithiasis. *Compendium on Continuing Education for the Practicing Veterinarian* **4**, 125-133
LAVERTY, S., PASCOE, J. R., LING, G. V., LAVOIE, J. P. & RUBY, A. L. (1992) Urolithiasis in 68 horses. *Veterinary Surgery* **21**, 56-62
MENZIES-GOW, N. (2007) Diagnostic endoscopy of the urinary tract of the horse. *In Practice* **29**, 208-213
RENDLE, D. I., DURHAM, A. E., LLOYD, D., SUMMERHAYS, G. E. S. & HUGHES, K. J. (2008) Long-term management of sabulous cystitis in five horses. *Veterinary Record* **162**, 783-787
SCHOTT, H. C. (2006) Urinary incontinence and sabulous urolithiasis: chicken or egg? *Equine Veterinary Education* **18**, 17-19
SCHOTT, H. C. (2010) Disorders of the urinary system. In Equine Internal Medicine, 3rd edn. Eds S. M. Reed, W. M. Bayly and D. C. Sellon. W. B. Saunders. pp 1198-1209

InPractice

Diagnosis and treatment of urolithiasis in horses

Barrie Edwards and Debra Archer

In Practice 2011 33: 2-10
doi: 10.1136/inp.c7445