Clinical Commentary

Surgical treatment of urolithiasis in male horses

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This commentary will focus on surgical treatment of urolithiasis in the male horse as surgical treatments are more 'complicated' in the male compared to the female. Females have a wide and accessible urethra that allows for manual removal, urethral sphincterotomy, and/or physical crushing and removal of calculi fragments (DeBowes 1988). Laparocystotomy is not usually performed in mares for these reasons. In the male, calculus removal can be challenging and presents unique surgical considerations. Surgical options described for urolithiasis in male horses include: laparocystotomy with and without laparoscopy, physical crushing of the calculus through perineal urethrostomy, Gokel's cystotomy and electrohydraulic/laser lithotripsy.

Urolithiasis can be confirmed with one or more of the following diagnostic techniques: rectal palpation of the urinary bladder, ultrasonography and cystoscopy (Laverty *et al*. 1992; Duesterdieck-Zellmer 2007). The most common clinical sign associated with urolithaisis in the male is haematuria. Other clinical signs include stranguria, pollakiuria, dysuria and ventral abdominal/preputial urine scalding. The most efficient way to confirm the diagnosis is cystoscopy. Cystoscopic examination begins with intravenous sedation, aseptic prep of the glans penis, and disinfection of the endoscope. Cystoscopy allows for direct visualisation of the calculus or calculi. Uroliths can be present in the urethra and urinary bladder, with the majority being found within the urinary bladder. Less than 10% of cases have more than one calculus. Cystoscopy is the most accurate way to quantify the number of calculi present. In the absence of cystoscopy the diagnosis may be confirmed with manual palpation of the bladder *per rectum* and ultrasonography of the urinary bladder. Before performing manual palpation of the bladder *per rectum* the bladder should be catheterised to remove all urine. In some horses excessive mucus and sediment accumulation may require endoscopic lavage and suction to ensure complete visualisation of the bladder. Excessive sediment accumulation can make visualisation of all calculi difficult.

Once urolithiasis has been confirmed, surgical options should be discussed with the owner. If financially feasible, I feel the best method of surgical management is laparocystotomy. Although technically challenging, this procedure has the advantage of removing the calculus in one piece without fragmentation. The fragmentation of urinary calculi has been associated with a higher risk of recurrence because of incomplete removal of debris from the urinary bladder or urethra. Owners not electing for laparocystidotomy have the following options: perineal urethrotomy with fragmentation of the calculus, Gokel's cystotomy, and laser or electrohydraulic lithotripsy. The advantages and disadvantages of these procedures will be discussed.

Laparocystotomy has the primary advantage of complete calculus removal without fragmentation. The disadvantage of this technique is the requirement for general anaesthesia and abdominal exposure of the urinary bladder. Access to the urinary bladder can be performed through a paramedian or ventral midline incision or can be performed under laparoscopic guidance. Laparoscopy has been described for intracorporeal removal of calculi from the bladder. Reported complications associated with intracorporeal techniques include: septic peritonitis, cystotomy leakage and prolonged anaesthesia times. It also requires a surgeon skilled in intracorporeal suture techniques. Röcken *et al*. (2006) have described laparoscopic-assisted cystotomy for calculi removal with excellent results. Laparoscopic-assisted cystotomy involves paramedian placement of an instrument portal to aid in elevation of the urinary bladder to the abdominal wall. The instrument portal is then enlarged to allow for exteriorisation of the urinary bladder. Once exteriorised standard cystotomy techniques are used to remove the calculus (Ragle 2000; Röcken *et al*. 2006; Stratico *et al*. 2012).

In the absence of laparoscopic techniques, paramedian incision is favoured by some surgeons because preputial reflection is not necessary whereas others prefer the ventral midline approach with reflection of the prepuce (Beard 2004). The author prefers the ventral midline approach because it gives improved access to the urinary bladder compared to the paramedian approach. However, the midline approach does require reflection of the prepuce and the ligation of several large vessels. Although some surgeons have reported difficulties with this approach the author feels these concerns are over rated and a surgeon experienced with abdominal surgery in the horse should be able to perform this approach without complications. The greatest difficulty in completion of the procedure is bladder exposure. Male horses with urolithiasis typically urinate frequently and maintain a small bladder size. To overcome this, the author has found that preoperative intravenous fluid loading (20 l preoperatively) and the administration of diuretics (furosemide 1 mg/kg bwt i.v. or DMSO 1 g/kg bwt i.v., diluted in 5 l of balanced polyionic fluid) aids in bladder access by increasing bladder size. In a similar fashion Russell and Pollock (2012) recently described the use of local anaesthesia and hydro-distension of the bladder prior to surgery to increase bladder size prior to paramedian cystotomy with success. Other surgeons report that continued gradual tractionon the bladder or the placement of a towel around the neck of the urinary bladder is useful in improving urinary bladder access (Beard 2004; Russell and Pollock 2012).

Once the bladder becomes accessible to the surgeon, the remainder of the procedure becomes straightforward. Stay sutures are used to aid in bladder retraction and a longitudinal incision is made over the calculus. The calculus is removed and the bladder is palpated for additional stones before being lavaged. Occasionally, smaller calculi are lodged in the proximal urethra or trigone and require manual removal. I have used a Dormia basket inserted under endoscopic guidance to remove calculi lodged in the proximal urethra/trigone. Once all calculi and debris have been removed from the bladder, a 2 layer inverted suture pattern is used to close the cystotomy. Closure of the abdominal incision is routine. Incisional complications have been reported with open surgical techniques. Incisional complications can be minimised with accurate reconstruction of the abdominal wall and fascial layers, and elimination of the dead space. It is also important to lavage between the layers to remove blood clots and fibrin accumulation and this seems to help minimise post operative incisional infections. Ventral oedema following laparocystotomy is common and should not be unexpected. This typically resolves with administration of anti-inflammatories, time and hand walking.

Perineal urethrotomy is performed with the horse sedated and perineal anaesthesia is provided epidurally (Laverty *et al.* 1992). The incision is made just ventral to the anus. Identification of the urethra is aided by palpation of an indwelling urethral catheter. Prior to incision into the urethra, sterile obstetrical lubricant is infused into the urinary bladder via the urinary catheter. This aids in manipulation of the calculus and helps minimise the adhesion of calculi fragments to the bladder mucosa. The calculus is manipulated transrectally by the primary surgeon or assistant so that it is positioned as close as possible to the urethrotomy site. Once stabilised, the calculus is crushed with a lithotrite or fractured into smaller pieces using an orthopaedic mallet and osteotome. Fragments must be small enough to be removed through the urethrotomy site. Fragments can be grasped with sponge forceps, canine whelping forceps, or under endoscopic guidance with a Dormia basket. Concurrent lavage is also useful to flush out the debris associated with disruption of the calculus. The time required to remove the multiple fragments ranges from 30 min to several hours. It is very important to remove as many fragments as possible to lessen the risk of urethral obstruction or reoccurrence of bladder calculi. Urethral and bladder mucosa disruption is unavoidable but efforts should be made to minimise this complication if at all possible. Calculus fragments routinely become adhered to the damaged mucosa and can be difficult to remove even with copious lavage. The administration of antimicrobials and anti-inflammatories should be performed. Intravenous fluid therapy or the administration of diuretics can be useful in increasing urine output and aiding calculus fragment removal. A cystoscopic examination should be performed 2–4 weeks following surgery to ensure complete fragment removal via urination. Owners should be advised to monitor urination carefully because there is a risk of urethral obstruction via remaining small calculi fragments. Complications associated with perineal urethrostomy include surgical site infection, urethral stricture and urethral obstruction. Because of the time commitment and the risk for surgical trauma to the bladder and urethra, I only elect for perineal urethrostomy when owner financial restraints eliminate laparocystotomy as a surgical option.

Gokel's cystotomy has been recently reported as an effective method to remove intact urinary bladder calculi with the horse standing (Abuja *et al.* 2010). This procedure is performed with intravenous sedation, epidural anaesthesia, and a perirectal incision to gain access to the urinary bladder. In summary, following a perirectal incision (right side for a right-handed surgeon) the tissue planes are bluntly dissected to gain access to the retroperitoneal aspect of the trigone region of the bladder. The internal pudendal artery, vein and nerve are identified and avoided. The surgeon's left hand is inserted into the bladder and the calculus is retracted and stabilised in the neck of the bladder. Concurrent cystoscopy is useful in confirming the location of the ureters and guiding incision placement over the calculus. A 2 cm sharp incision is made over the calculus and the cystotomy incision can be digitally enlarged to facilitate calculus removal. The bladder is lavaged via the cystotomy incision using a sterile nasogastric tube and the incision site and bladder are examined with cystoscopy. If desired the cystotomy incision can be closed primarily or left to heal via second intention. The dorsal half of the incision is then closed and the remainder left open for ventral drainage. This technique, in contrast to perineal urethrostomy, has the primary advantage of complete, intact calculus removal. Of the 9 cases reported by Abuja *et al.* (2010), 8 returned to previous use with no recurrence of clinical signs and one horse had prolonged incisional healing, which ultimately resolved, but the horse could not return to previous use. Gokel's cystotomy should be considered when laparocystotomy is not an option and when complete, intact calculus removal is desired. Reported complications associated with Gokel's cystotomy include septic peritonitis, perirectal abscessation and persistent drainage. These complications were not observed by Abuja *et al.* (2010).

Finally, laser or electrohydraulic lithotripsy has been described as a minimally invasive method of calculus destruction and eventual removal (MacHarg *et al.* 1985; Eustace *et al.* 1988; Koenig *et al.* 1999; May *et al.* 2001; Judy and Galuppo 2002; Verwilghen *et al.* 2008; Grant *et al.* 2009; Röcken *et al.* 2012). Two types of surgical lasers have been employed, the Ho:YAG (holmium: yttrium, aluminium, garnet) and the pulsed dye laser. The Ho:YAG has been used with success and with failure. Two retrospective studies with a combined number of 12 horses treated with the Ho:YAG laser have been reported with reasonable success. However, not all types of calculus are amenable to Ho:YAG laser lithotripsy and may require other methods of removal. May *et al.* (2001) reported the failure of the Ho:YAG laser to fragment adequately the calculi of 2 horses with urolithiasis. Both horses were subsequently treated successfully with the pulsed dye laser. The primary reason for failure was the hardness of some forms of calcium carbonate calculi. The equipment required for this technique is not readily available and is usually limited to referral or university veterinary practices. Pulsed dye laser lithotripters can be rented in the USA but the rental fee is expensive, approximately $1500 per use.

Laser lithotripsy techniques have been performed under general anaesthesia but the majority are performed standing using intravenous sedation and epidural anaesthesia. The laser lithotripsy procedure is greatly aided by gaining access to the bladder via perineal urethrostomy, which improves endoscopic access to the calculus and aids in removal of calculi fragments. It has been reported to be an effective technique for calculi removal but my experience with this technique is that it is time consuming and not necessarily atraumatic.

Electrohydraulic lithotripsy is an additional minimally invasive type of treatment that results in physical disruption of the calculus using electrical energy. It is available for use transendoscopically or can be placed in direct contact with the calculus via perineal urethrotomy. It appears that this technique is more commonly performed in Europe. Once the calculus has been fragmented, the smaller pieces are either eliminated via urination (intact urethra) or lavaged via perineal urethrotomy. Bladder lavage is an absolute requirement to remove the multiple fragments. High flow lavage with a fluid pump is the most effective way to lavage the many fragments. In the absence of perineal urethrotomy there is a risk for urethral obstruction, which can require additional lithotripsy or urethrotomy incision over the obstructing fragments. This was described by Reichelt and Lischer (2013) in the case report in this issue.

With the time required to fragment the calculus and repeated patient sedation required, I am not sure that the procedure is less traumatic than other procedures or less expensive. This is illustrated by the described case report where it took 9 h to successfully fragment a bladder calculus and obstructing urethral calculus fragments. Equine calculi can be particularly hard therefore requiring many pulses and prolonged treatment times to gradually disintegrate the calculus. Unfortunately it is not possible to determine the hardness of a cystic calculus prior to laser or electrohydraulic lithotripsy. It is therefore recommended to put a time limit on either laser or electrohydraulic lithotripsy to minimise patient discomfort, urethral or bladder irritation, or risk for continued dysuria or stranguria associated with prolonged operative times when using this technique. If substantial progress cannot be made within 1 h of treatment time with either technique, laparocystotomy or laparoscopic cystotomy should be strongly considered.

In summary, there are indications and contraindications for each of the described techniques. If complete calculus removal is desired then traditional laparocystotomy, laparoscopic assisted cystostomy or Gokel's cystotomy should be discussed with the owner. Complete calculus removal is more invasive but negates the need for fragmentation and thus can minimise surgical time and decrease the risk for urethral obstruction and post operative inflammation of the bladder and urethra. Physical disruption of the calculus via perineal urethrotomy, laser or electrohydraulic lithotripsy can all be associated with complications including prolonged treatment times and the risk for urethral stricture. Laser or electrohydraulic lithotripsy both require expensive equipment and carry the risk of unsuccessful fragmentation of hard, dense calculi for some horses. Surgeons should fully understand the pros and cons of each of these procedures to better serve our clients and improve the care of male horses with urolithiasis.

Author's declaration of interests

No conflicts of interest have been declared.

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Case Report

Septic osteitis of the axial border of the proximal sesamoid bones in two foals

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Summary

This case report describes the history, clinical findings, clinical pathology and diagnostic imaging of 2 cases of septic osteitis of the proximal sesamoid bones in foals. Treatment with doxycycline (10 mg/kg bwt *per os* b.i.d.) was successful in treating both of these cases.

Introduction

The proximal sesamoid bones (PSBs) are a common source of lameness in foals. The PSBs are frequently involved in infectious arthritis of the metacarpo/metatarsophalangeal (fetlock) joint and infectious tenosynovitis involving the digital flexor tendon sheath (DFTS) (Hunt 2011), while fractures of the PSBs occur in up to 25% of all foals (Bramlage 2009). There are several reports of axial osteitis of the PSBs in the literature (Wisner *et al*. 1991; Sedrish *et al*. 1994; Dabareiner *et al*. 2001); however, none involve foals, or documentation of successful medical treatment.

This report details 2 cases of septic osteitis of the axial border of a proximal sesamoid bone that were successfully treated with medical management. Success was defined as a return to previous level of athletic activity (paddock exercise), resolution of associated lameness, and no radiographic evidence of lesion progression, one month after cessation of antibiotic treatment.

Case 1

History

A 5-month-old weaned Clydesdale filly initially presented with a right hindlimb lameness of approximately 3 days' duration. The filly was *Grade 4/5* (American Association of Equine Practitioners lameness scale) lame in the right hindlimb, with effusion of both right hind fetlock joint and DFTS, and was moderately painful on palpation of the plantar fetlock area. The foal had an elevated temperature of 39.2°C. Antibiotic therapy consisting of procaine penicillin (Propercillin)[1] 22,000 iu/kg bwt i.m. b.i.d. and gentamicin (Gentavet 100)[2] 6.6 mg/kg bwt i.v. s.i.d. was instigated. The lameness increased in severity despite the antibiotic treatment, and 5 days later the filly was referred for further examination.

Clinical examination

The foal was bright and in good body condition. Pulse and respiration rate were within normal limits; however, the foal had a temperature of 39.4°C. She was *Grade 5/5* lame in the right hindlimb. Examination of the right hind distal limb revealed marked effusion of the DFTS, mild effusion of the fetlock joint, and a marked pain response was elicited upon palpation of the plantar aspect of the fetlock.

Radiography

Four radiographic views were obtained of the right hind fetlock joint: dorsoproximal15°-plantarodistal oblique (DP); standing lateromedial (LM); dorso45°proximo15°lateral-plantarodistomedial oblique; and dorso45°proximo15° medial-plantarodistolateral oblique (DMPLO). A 15 × 10 mm lucency was evident in the axial margin of the lateral PSB, as shown on the DP (**Fig 1**), DMPLO and LM projections. A 7 × 6 mm lucency was also present in the corresponding area of the medial PSB.

Ultrasonography

Ultrasound examination of the affected plantar fetlock did not reveal any significant abnormalities.

Clinical pathology

Haematological examination at the time of initial veterinary attention showed a white cell count (WCC) of 14 × 10^9 cells/l and fibrinogen of 6 g/l.

Analysis of synovial fluid obtained from the DFTS showed a moderately elevated nucleated cell count (NCC; 4 × 10^9 cells/l) and total protein (32 g/l). Without a differential WCC it is not possible to rule out sepsis, although these results are more consistent with inflammation of the DFTS (Schramme and Smith 2011).

Differential diagnosis

The differential diagnoses considered in this foal were septic arthritis, septic tenosynovitis, septic osteitis/osteomyelitis and fracture. Septic osteitis of the axial PSB was considered the most likely diagnosis based on the radiographic evidence of bone lysis and synovial fluid analysis.

Treatment

The filly was treated with 10 mg/kg bwt doxycycline (Doxine 100)[3] *per os* b.i.d. for 6 weeks and confined to stall rest for this period. Regular follow-up phone calls were made to the owner, who reported the filly to be progressing well.

Outcome

When examined one week after cessation of doxycycline treatment, the right hindlimb lameness had resolved. Repeat radiographs taken at this time showed that the lucency in the lateral PSB was still present and of a similar size (15 × 9 mm), although the margins were more distinct (**Fig 2**). The abaxial margin of the lateral PSB was moderately irregular. The medial

Fig 1: **Case 1*; 5-month-old Clydesdale filly. DP radiograph of the right hindlimb showing axial lucencies in both the lateral and medial PSBs.***

Fig 2: **Case 1*; 7-month-old Clydesdale filly. DP radiograph of the right hindlimb 7 weeks after initial presentation. Note that the lucency in the lateral PSB remains but has more defined border.***

sesamoid lucency was no longer evident. At this time the filly was turned out into a small paddock.

Radiographs taken 14 months after completion of antibiotic therapy show a marked reduction in the axial lucency of the lateral PSB, although it is still readily identifiable (**Fig 3**). The filly was not lame, and the owner reported that she had not experienced any further problems associated with the affected limb.

Fig 3: **Case 1*; 20-month-old Clydesdale filly. DP radiograph of the right hindlimb. Note only a small lytic area remains.***

Case 2

Clinical examination

A 6-month-old weaned Thoroughbred colt presented with acute right hindlimb lameness (*Grade 4/5*). There was marked effusion of the right hind fetlock joint and DFTS, and flexion of the joint was markedly resented. The foal had an increased temperature of 39.3°C. There was no evidence of a penetrating wound. Antibiotic therapy (procaine penicillin 22,000 iu/kg bwt i.m. b.i.d. and gentamicin 6.6 mg/kg bwt i.v. s.i.d.) was instigated, and the colt was confined to a stall.

Radiography

The 4 radiographic views described in *Case 1* were obtained of the right hind fetlock joint. A diffuse area of lucency, approximately 20 × 10 mm, was evident axially in the lateral PSB in both the DP (**Fig 4**) and DLPMO projections. The axial borders of both medial and lateral PSBs also appeared irregular.

Clinical pathology

Analysis of synovial fluid obtained from the right hind DFTS showed an elevated NCC (22×10^9 cells/l) with 76% neutrophils, consistent with inflammation. A sample from the corresponding fetlock joint had a mildly elevated NCC (2.8×10^9 cells/l), and 17% neutrophils, again consistent with inflammation.

Differential diagnosis

The differential diagnoses in this case were the same as for *Case 1*. Septic osteitis of the axial PSB was again considered the most likely diagnosis based on the radiographic evidence and synovial fluid analysis.

Treatment

No improvement was observed after 48 h treatment with procaine penicillin and gentamicin. At this time, the colt's treatment was changed to 10 mg/kg bwt doxycycline *per os* b.i.d. for 6 weeks, and he was confined to stall rest for this period. Regular follow-up phone calls were made to the

Fig 4: ***Case 2; 6-month-old TB colt. DP radiograph of the right hindlimb showing a diffuse axial lucency in the lateral PSB.***

Fig 5: ***Case 2; 9-month-old TB colt. DP radiograph of the right hindlimb 7 weeks after completion of antibiotic therapy, showing the axial lucency still present in the lateral PSB.***

owner, who reported the colt to be progressing well, with no lameness reportedly evident after 2 weeks of treatment.

Outcome

The colt was examined one week prior to cessation of doxycycline therapy (due to veterinary attention being required for another horse at the property), at which time there was no apparent lameness and all associated swelling had resolved. After 6 weeks stall confinement the colt was turned out into a small paddock. Radiographs taken 7 weeks after completion of antibiotic treatment (13 weeks since initial presentation) showed that the lucency was still present distally in the axial lateral PSB (**Fig 5**), although the margins were more discreet when compared with the original radiographs. The colt had no signs of lameness 20 weeks after initial presentation.

Discussion

Bacterial infection resulting in septic arthritis, tenosynovitis and osteomyelitis is relatively common in young foals. The pathogenesis of these conditions is similar, and involves bacteria entering through the umbilicus, gastrointestinal or respiratory tracts, or directly into synovial structures via external trauma. Haematogenous dissemination then allows the bacteria to localise in the epiphysis, metaphysis, physis or synovium (Firth 1983). The vascular anatomy of the physis and metaphysis in young foals results in slow blood flow, and is thought to contribute to the development of osteomyelitis in this age group (Firth 1992).

While septic osteitis of the PSBs in foals appears to be an uncommon condition, vascular compromise or abnormally slow blood flow may play a role in its pathogenesis. It has been proposed that compromise of the vascular supply to the axial PSBs (which may occur due to trauma to the insertion of the intersesamoidean ligament on the PSB, or subsequent to thrombosis) may increase susceptibility to infection from haematogenous bacteria (Wisner *et al.* 1991). The blood supply to the forelimb PSBs is derived from the medial and lateral palmar digital arteries (with the hindlimb assumed to be similar). These vessels enter on the proximal abaxial surface of the PSB, and then course dorsally, axially and distally. Barr *et al.* (2005) suggested that the branching of blood vessels within the PSB causes blood flow to slow, possibly facilitating focal bacterial colonisation axially.

It is reported that Gram-negative organisms are the most commonly isolated from foals with osteomyelitis (Goodrich and Nixon 2004); however, Neil *et al.* (2010) also suggested an increase in the number of Gram-positive organisms now being isolated. Without culture and sensitivity results to guide antibiotic selection (as in both these cases), doxycycline seems an appropriate choice for the treatment of this condition due to its ease of administration, broad spectrum activity and tissue (in particular bone) penetrating properties (Bryant *et al.* 2000).

At a dose of 10 mg/kg bwt orally every 12 h, doxycycline has been shown to achieve serum concentrations in foals sufficient to treat those bacteria with a MIC $\leq$3 µg/ml (Womble *et al.* 2007). This includes a number of Gram-positive organisms as well as over 50% of *E. coli* and *Klebsiella* spp. (Ensink *et al.* 1993; Bryant *et al.* 2000; Jacks *et al.* 2003). Neil *et al.* (2010) reported successful treatment of osteomyelitis using oxytetracycline, and advocated its use when there is poor response to initial antibiotic regime.

In children, the adverse effects of doxycycline, such as teeth staining, do not occur as commonly as with other tetracyclines (Bryskier 2005). A dose rate in the horse of 10 mg/kg bwt orally every 12 h has previously been used in several studies (Bryant *et al.* 2000; Womble *et al.* 2007) without incident. Although there is at least one record of fatal colitis in a mature horse (Davis *et al.* 2006), doxycycline appears to have less propensity than other tetracyclines for inducing diarrhoea in horses, as it causes minimal disturbance to microbial flora (Riond and Riviere 1988; Bryant *et al.* 2000).

There do not appear to be any reports in the English literature of successful medical treatment of axial osteitis of the

PSBs. Dabareiner *et al*. (2001) documented successful treatment (return to original level of activity) of 6/8 horses using arthroscopic debridement of the affected PSB and intersesamoidean ligament (which is typically involved in these cases), followed by a short course of broad spectrum antibiotics. Of these 6 horses, 5 had no evidence of septic arthritis or tenosynovitis. All 7 horses in the report by Wisner *et al*. (1991) were subjected to euthanasia, regardless of treatment chosen (surgical, medical or none). Surgical treatment of a single horse described by Sedrish *et al*. (1994) was not successful.

There also appear to be no reported cases of treatment of axial osteitis of the PSBs in foals in the literature. In mature horses, this condition has previously been given a poor prognosis (Wisner *et al*. 1991) unless surgical treatment is attempted. However, results from the current case suggest that treatment with oral doxycycline may be a viable alternative to surgical therapy in situations where there is no involvement of the fetlock joint or DFTS.

Dabareiner *et al*. (2001) reported that 3 out of 8 affected horses had concurrent septic arthritis and tenosynovitis of the associated fetlock joint and DFTS. Only one of these horses returned to its previous level of use. This increase in treatment failure may reflect septic involvement of the adjacent synovial structures, although Wright *et al*. (2003) reported that 81% of horses with infected synovial structures returned to their preoperative level of performance following endoscopic surgery. Rather than an outcome of sepsis on its own, the outcome in these horses may be due to the time interval between onset of synovial infection and surgical intervention. Fraser and Bladon (2004) reported that 76% of horses with infection of the DFTS returned to intended use when surgery was completed within 36 h of injury, compared with just 33% of those where it was >36 h since injury.

In the cases described above, the lesions were evident radiographically long after complete resolution of lameness (up to 15 months). As neither horse is undergoing sustained exercise at the time of writing, the residual effect of osteitis on the strength of the PSB (when subjected to increased loads associated with training) is unknown.

Despite the potential limitations of this report, including the small number of cases and limited case follow-up, it outlines a previously unreported treatment for septic osteitis of the axial PSBs in foals. This condition should be included as a differential diagnosis when assessing moderate to severe lameness associated with the fetlock joint, which is accompanied by synovial effusion.

Authors' declaration of interests

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