CASE REPORT

Diagnosis and surgical resection of a choroid plexus cyst in a dog

A three-year-old neutered male toy fox terrier presented for a Chiari-like malformation. No neurological deficits were found on examination, although diffuse cervical, thoracolumbar and head pain were present. A mass within the fourth ventricle was apparent on magnetic resonance imaging (MRI) of the brain. The lesion was hyperintense to brain parenchyma on T2-weighted images, hypointense on T1-weighted images and there was strong, homogeneous contrast enhancement. The cystic mass was removed through a suboccipital craniectomy. Histopathology was consistent with a choroid plexus cyst. The dog recovered well from the procedure and was clinically normal three months after surgery. To the authors’ knowledge this is the first description of the appearance of a choroid plexus cyst on MRI in a dog and of its surgical removal. Although they are an uncommon finding, choroid plexus cysts should be considered as a differential diagnosis for mass lesions within the fourth ventricle.

INTRODUCTION

Choroid plexus cysts are thought to occur from in-folding of the epithelial lining of the choroid plexus in early development, creating a fluid filled cavity (Odake and others 1990, Lopez and others 2006). The neck of this cyst may occasionally be pinched off, separating it from the rest of the ventricular system (Odake and others 1990). This report describes the diagnosis of a choroid plexus cyst in the fourth ventricle of a dog. Although such a cyst has been reported in a dog previously (Galano and others 2002), this report represents the first description of the magnetic resonance imaging (MRI) characteristics and successful surgical removal of a choroid plexus cyst.

CASE HISTORY

A three-year-old neutered male toy fox terrier (3.6 kg) was presented for a possible Chiari-like malformation. Eight months prior the dog had been evaluated for fly-biting episodes. MRI of the brain at that time had reportedly been consistent with a Chiari-like malformation. There was mild cerebellar herniation and dilation of the fourth ventricle. No syringomyelia was evident at that time. Because the significance of the Chiari-like malformation in relation to the fly-biting episodes was unknown, surgery was not recommended. The dog was discharged on phenobarbital (Solfoton, ECR Pharmaceuticals; 4.4 mg/kg, PO, q12h) as a treatment for focal seizures. Although the fly-biting episodes initially decreased in frequency, after three months they began to occur daily. The dog also began to scratch its neck and display signs of discomfort (restlessness, frequent changes in body position and aggression when lifted). A serum phenobarbital level obtained four months prior to presentation was 31 µg/ml (therapeutic range 15 to 45 µg/ml).

On presentation the dog was bright, alert, and responsive, with normal vital signs. Neurological examination was normal except for diffuse cervical, thoracolumbar and head pain consistent with multifocal or diffuse central nervous system disease. Given the dog’s history and clinical signs of scratching and spinal pain, it was suspected that syringomyelia secondary to the previously diagnosed Chiari-like malformation was now present. A complete blood count and a chemistry panel were within normal limits. MRI of the brain revealed a small (approximately 5.5 mm in diameter) right-sided paramedian mass within the fourth ventricle (Fig 1). The lesion was hyperintense to brain parenchyma on T2-weighted images and hypointense on precontrast T1-weighted images. There was strong, homogeneous contrast enhancement of the mass. Cer-ebellar herniation was not seen. Differential diagnoses included an epidermoid cyst and neoplasia (for example, ependymoma, choroid plexus tumour). MRI of the cervical spine was normal. The owners elected surgical mass resection. A suboccipital cranietctomy was performed (Dewey, 2005).
The meninges overlying the cerebellum were incised and reflected. The cerebellar vermis was retracted dorsally, allowing for visualisation of the mass within the fourth ventricle. The mass was removed in its entirety with blunt dissection. Closure was routine. The dog recovered from anaesthesia uneventfully. The cyst fluid could not be analysed prior to fixation due to its small volume. Histopathology revealed a single section of choroid plexus with a simple cuboidal epithelium-lined cyst expanding the subchoroidal ependymal interstitium (Fig 2). The cyst contained scant eosinophilic debris. These findings were consistent with a choroid plexus cyst.

The dog was discharged five days post surgery on phenobarbital (Solfoton, ECR Pharmaceuticals; 4.4 mg/kg PO, q12h). Gabapentin (Neurontin, Pfizer; 9.7 mg/kg PO, q8h), prednisone (Prednisone, Qualitest Pharmaceuticals; 0.5 mg/kg PO, q12h), tramadol (Ultram, Ortho-McNeil; 3.5 mg/kg PO, q8h) and cefadroxil (CefadTabs, Fort-Dodge; 22 mg/kg PO q8h) were added post-surgery. At the time of discharge the dog had a moderate vestibular ataxia, a right head tilt and mild torticollis. He would occasionally vocalise when picked up but appeared otherwise comfortable. Two weeks after surgery the dog had not experienced any fly-biting episodes or scratching. Torticollis and cervical hyperaesthesia were the only abnormalities on neurological examination. Prednisone and cefadroxil administration was discontinued at this time. Three months after surgery, the dog appeared pain-free and was normal on neurological examination; only one fly-biting episode had been noted since surgery. He was receiving phenobarbital (Solfoton, ECR Pharmaceuticals) and gabapentin (Neurontin, Pfizer) alone, at the previous dosages. These were being given to treat fly-biting episodes and hyperesthesia, respectively. The owners reported no recurrences of clinical signs five months postoperatively. Gabapentin administration was discontinued at that time.

**DISCUSSION**

Choroid plexus cysts are rare in veterinary medicine; a single case has been reported in a dog, also located within the fourth ventricle.
ventricle (Galano and others 2002). The solitary, unilateral nature of the cysts seen in these two cases concurs with what is commonly seen in people, although choroid plexus cysts in humans are most frequently located within the lateral ventricle (Odake and others 1990, Cakir and others 2002, Nahed and others 2007, Bozic and others 2008). Although the majority of cysts are asymptomatic in people, they may enlarge and, if they are attached by a pedunculated stalk, prolapse through the interventricular foramen leading to obstructive hydrocephalus (Parizek and others 1998, Radaideh and others 2002, Nahed 2007). Hydrocephalus has also been reported secondary to cysts in the third ventricle (Vlaho and others 2003, Miyagi and others 2006, Kariyattil and others 2008).

In dogs, choroid plexus cysts are reported to cause vestibular dysfunction (Galano and others 2002). In the present case it was unclear whether the choroid plexus cyst had caused the dog’s head and spinal pain and fly-biting episodes or if these were unrelated findings. The dog’s fly-biting episodes were most likely to be partial seizure events unrelated to the choroid plexus cyst. In contrast, focal changes in cerebrospinal fluid (CSF) flow dynamics within the fourth ventricle and foramen magnum secondary to the cyst may have contributed to the dog’s clinical signs of pain. Similar signs may be caused by exaggerated systolic CSF pulse waves in the vertebral canal secondary to focally obstructed CSF flow (Milhorat and others 1999). Unfortunately, CSF flow studies could not be performed to determine whether flow disturbances were present. Although cerebellar herniation may have similar clinical manifestations, as part of a Chiari-like malformation, this was not present at the time of diagnosis of the choroid plexus cyst. In addition, encephalitis was not performed.

Although cerebellar herniation may have led to the presentation, a choroid plexus cyst may have been present but undetectable with these imaging modalities (Kariyattil and others 2008). In cases where a choroid plexus cyst is suspected but not apparent with routine MRI, the use of a smaller field of view and slice thickness may aid in its detection (Radaideh and others 2002). Alternatively they may be visualised with ventriculography or endoscopic ventriculostomy (Kariyattil and others 2008).

Choroid plexus cysts in people are best identified on MRI as focal hyperintense lesions on fluid-attenuation-inversion-recovery (FLAIR) sequences and diffusion-weighted imaging (DWI) sequences (Cakir and others 2002, Kinoshita and others 2005). The lack of attenuation on FLAIR images is likely caused by the higher protein and at times gelatinous characteristics of cyst contents. These qualities also slow water diffusion, which, along with T2 shine-through, is responsible for the cyst’s hyperintense appearance on DWI (Odake and others 1990, Kinoshita and others 2005). Although a cyst could also appear hyperintense to brain parenchyma on T2-weighted sequences, surrounding CSF would obscure its borders. Rim contrast enhancement is frequently seen on T1-weighted post-contrast studies due to the presence of blood vessels within the cyst wall (Kinoshita and others 2005). Similarly, the cyst in this report appeared diffusely hyperintense to brain on T2-weighted and FLAIR sequences, although it showed uniform contrast enhancement on T1-weighted post-contrast sequences. The cause of this degree of contrast enhancement remains unclear. Vascularisation has been implicated previously, although this was not seen on histopathological examination (Baka and Sanders 1993). Contrast enhancement may also result from blood–brain barrier disturbances (Kinoshita and others 2005). Using computed tomography a choroid plexus cyst has been identified in one dog as a well-defined, circular and hypo-attenuating lesion (Galano and others 2002).

Treatments for cystic lesions include fenestration or excision through a craniotomy or endoscopy, or placement of a cystoperitoneal shunt (Jeon and others 2005, Dewey and others 2007). Surgical excision was recommended in this dog due to the cyst’s accessibility and the possibility of obtaining a definitive histopathological diagnosis. The histopathological characteristics of the cyst in this report are in accordance with those of previously described choroid plexus cysts.

This report describes the MRI appearance and surgical excision of a choroid plexus cyst in a dog. Although clinical signs of pain resolved several months after surgery and a reduced frequency of fly-biting episodes was seen, it is difficult to determine whether these improvements were the result of removal of the cyst. The analgesic and anti-epileptic effects of treatment with gabapentin and phenobarbital, respectively, may have led to the perceived improvements (Hussain and others 2008).

References


