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Abstract

Case summary A 1-year-old, female spayed domestic shorthair cat with a 6 week history of upper respiratory signs and a progressive reluctance to move, which culminated in a right-sided hemiparesis, was found to have a sewing needle foreign body lodged in the brainstem. Surgical extraction of the needle was successful and the cat's neurological deficits resolved over the days to weeks following its removal.

Relevance and novel information This case report describes, to our knowledge, the first reported incidence and management of an ingested sewing needle migrating into the central nervous system of a cat.

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Introduction

In both human and veterinary medicine, there exist numerous reports of foreign bodies, ingested or otherwise, introduced into the body, that migrate to distant locations. It is not uncommon for clinical signs to develop weeks to months after the introduction of foreign material into a patient's body.¹ The clinical signs in such situations are referable to the location in which the material ultimately becomes lodged, as well as any infection or inflammation in the affected tissues. Sharp and elongated foreign objects, such as sticks, grass awns or sewing needles are more prone to migration as their shape makes penetration of, and migration through, soft tissues more likely. This case report describes a case of a migrating sewing needle through the oropharyngeal tissues into the brainstem of a cat.

Case description

A 1-year-old, spayed female domestic shorthair cat was presented to the emergency service with a history of mild lethargy, gagging and occasional sneezing for 24 h. The owner had taken the cat's temperature at home, and brought the cat in for examination as the cat had a fever of 103.6°F (39.8°C). On physical examination, the cat had an elevated temperature of 103.9°F (39.9°C), and markedly inflamed, painful gingiva. The gingivitis was extending across multiple teeth, but was not generalized, and its degree was assessed as being particularly advanced for such a young cat. Mild, bilateral mucoid nasal discharge was noted, and the remainder of the

physical examination was unremarkable. The possibility of an upper respiratory infection was discussed with the owner, as was proper dental care for cats. The cat was treated with amoxicillin-clavulanate 13.75 mg/kg PO q12h (Clavamox; Pfizer) and buprenorphine 0.01 mg/kg PO q12h and discharged. The owner was instructed to follow up with her regular veterinarian in 5–7 days.

Six weeks later the cat was returned for an acute onset of reluctance to move or walk. The owner felt that the cat's behavior had become markedly different. The owner reported no known history of trauma. The cat continued to have upper respiratory signs, including nasal discharge, which had become serous. On physical examination the cat had a normal gait, but was resentful of lateral flexion of its neck in either direction. The remainder of the physical examination was unremarkable. The patient was again sent home with buprenorphine and instructed to return if there was no improvement in 2–3 days.

Two days later, the cat was returned for progression of its clinical signs. The owner reported that the cat wasn't walking normally, but that it would 'army crawl' to get

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Figure 1 Ventrodorsal projection of the head and cervical spine

around at home. The cat was vocalizing as if painful and was still reluctant to move around the house. The cat had become anorexic. On physical examination, it was obtunded and found to have a right-sided hemiparesis with extensor rigidity in both the fore- and hindlimb. On the right side the cat had no conscious proprioception, and no withdrawal reflex was able to be elicited. The cat also had a left head tilt. The cat's cranial nerves were otherwise within normal limits. Radiographs were taken (Figure 1), and interpreted by a board-certified veterinary radiologist. The radiographs showed a metallic foreign body, consistent in appearance with a sewing needle, extending into the C1 vertebral canal and the skull at the level of the foramen magnum. The cat was admitted to the hospital for analgesia (0.1 mg/kg IV q4h hydromorphone), monitoring and removal of the foreign body.

Surgical exploration of the cat's neck was performed the next day. The cat's neurological condition had declined overnight, and it was now non-ambulatory tetraparetic with minimal motor function in the forelimbs. Preoperative bloodwork was within normal limits. Presurgical radiographs were repeated, which showed that the needle was in approximately the same location. In surgery, a left-sided dorsal approach was used. The surgeon bluntly dissected through the muscles and fascia until the tip of the needle was identified via palpation. The end of the needle was found to be located near the body of C1, embedded in the surrounding fascia. The needle was gently extracted. The surgeon noted a very small amount of tissue adhered to the other end of the needle after it was extracted, but no obvious trauma

to the surrounding tissues was seen. The tissue was not submitted for culture and sensitivity testing. After surgery the cat was given a subcutaneous injection of 8 mg/kg cefovecin (Convenia; Zoetis) and postoperative analgesia (0.02 mg/kg IV q6h buprenorphine).

In the immediate postoperative period, the cat still had a left head tilt, but was beginning to use its limbs, particularly its right side, with more strength than before surgery. If assisted in standing, the cat attempted to walk, but was very ataxic. The cat was not able to support itself in a standing position. On day 3 of hospitalization, the cat's head tilt had resolved and it was able to walk with a mildly ataxic gait. The cat began to eat again, and was discharged on day 4 of hospitalization, 2 days after surgery. The owner reported that the cat was doing well when a follow-up telephone call was made approximately 5 months after surgery.

Discussion

Previous reports of oropharyngeal foreign bodies (OFB) in veterinary patients describe acute (injury occurring within 7 days of presentation) and chronic (injury occurring >7 days before presentation) scenarios.^{1,2} The clinical signs of acute OFB include hypersalivation, dysphagia, pain, reluctance to move the head, open the mouth or masticate, exophthalmos or enophthalmos, prolapsed nictitans, palpable cervical swelling or abscessation.^{1,2} Pyrexia is reported to be an inconsistent feature. The more severe cases present with dyspnea. Chronic OFB cases are more likely to have developed an abscess and an associated draining tract that incites the owner to bring the patient in for examination. These patients have been described as having fewer signs associated with systemic illness.^{1,2} Chronic cases were also found to have a worse prognosis in one study.² This was suggested to be due to a combination of factors, including initial mismanagement of cases, fragmentation and migration of foreign material making its localization, and therefore removal, challenging, and formation of chronic inflammatory tissue.

In this case, the most likely progression of events based on the history and timeline start with the cat ingesting the sewing needle prior to the initial presentation to the emergency service. The clinical signs described at the initial visit (gagging, painful gingiva and fever) are consistent with those previously reported in cases of acute oropharyngeal foreign bodies. The nasal discharge may be explained by the presence of foreign material in the oropharynx causing development of an inflammatory response, and subsequent formation of an exudate that extended through the nasopharynx and ultimately drained from the nares. Treatment with a broad-spectrum antibiotic and pain medication alleviated the cat's initial signs, but as the needle continued to migrate, the cat



Figure 2 Lateral projection of the head, cervical and cranial thoracic spine

developed a set of clinical signs referable to the needle's presence (reluctance to move, gait deficits that eventually progressed to first hemi- and then tetraparesis, and depressed mentation) in the cat's central nervous system.

Chronic cases of penetrating OFB are often associated with abscess formation secondary to the foreign body itself or, alternatively, in cases where the foreign body has been removed, secondary to bacterial inoculation at the time of injury.^{1,2} The majority of cases of chronic OFB previously described were wooden foreign bodies, usually sticks – 57% in one study and 72% in another.^{1,2} Most of these referenced cases were dogs that incurred injuries from sticks during play. Pieces of wooden material can break off as the OFB migrates, inoculating the tissues with microbial species. Most modern sewing needles are made of steel and may be plated with other metals to prevent corrosion. Therefore, in this case, the metal material of the migrating sewing needle was less porous, less likely to fragment and presented less risk of introducing microbial contaminants into the tissues through which it migrated. It is also possible that the amoxicillin-clavulanate prescribed at the initial visit would have killed the most likely types of bacteria to be found on the skin and oral mucosal surfaces of the cat that the sewing needle would have carried deeper into the tissues.

Sewing needle foreign bodies in the human medical literature have been reported as migrating foreign bodies found in the liver,^{3,4} pericardium,⁵ mediastinum,⁶ cervical spine,⁷ lung,⁸ appendix,⁹ right ventricle¹⁰ and, most commonly, the brain.^{11–16}

Most of the non-brain cases are presumed to be secondary to ingestion, accidental in some cases, intentional in others. The majority of cases of intracranial sewing needle foreign bodies are believed to be failed attempts at infanticide from needles inserted prior to closure of the fontanelles.^{11–14} These are generally located perpendicular to the cranial vault near the anterior fontanelle.¹³

The most common clinical signs are headache, seizures and proprioceptive deficits. Symptoms may initially manifest in adulthood, and numerous asymptomatic cases exist, diagnosed as incidental findings on cranial radiographs obtained for unrelated reasons. There is some speculation that in these delayed and asymptomatic cases, the lack of symptoms can be attributed, at least in part, to the insertion of needles during infancy and the associated blunting of the inflammatory response because of the individual's young age.¹⁴

Removal of the needle generally results in resolution of neurological deficits, although removal is not performed in all cases. In asymptomatic patients, or in cases where the needle has migrated to a difficult-to-access region of the brain, no corrective intervention is taken. The headaches associated with sewing needle insertion into the brain have been postulated to be secondary to iron rust surrounding the needles,¹² although the presence of a space-occupying lesion may also be a factor.

In veterinary medicine, there are numerous reports of migrating sewing needle foreign bodies. A recently published retrospective study of sewing needle foreign bodies diagnosed at a veterinary teaching hospital, discussed that the three most common locations of needles after ingestion were the oropharyngeal region, the upper gastrointestinal (GI) tract and the lower GI tract,¹⁷ with the upper GI tract being the most common location of ingested sewing needles in both dogs and cats at the time of diagnosis. In addition to these 'common' locations, sewing needles have been reported in the stomach and myocardium of dogs,^{18,19} and there has been a report of a sewing needle inducing struvite urolithiasis within the lumen of the urinary bladder in a dog.²⁰ In another report, an 8-month-old Labrador Retriever gained access to a sewing kit, and was later found to have a sewing needle in its cervical vertebral canal.²¹ In that case, the needle was removed and the dog made a full recovery. Most reported cases of sewing needle ingestion in veterinary medicine have been in cats, possibly because sewing needles are often attached to a length of thread, to which cats are drawn.²² There is one case of a sewing needle ingested by a cat, which penetrated through the pharynx and migrated to the suborbital region, dorsal to the left maxillary third premolar,²³ but to our knowledge, there are no known cases of sewing needle migration into the brain of small animals.

The brainstem includes the sections of the brain caudal to the diencephalon (the medulla, pons and mesencephalon). Among its many functions, it serves as a control center for cardiovascular and respiratory function, as well as sensory and motor functions of the head. This includes eye movements and the vestibular system. Lesions in this area of the brain can lead to altered

mental status, proprioceptive and gait abnormalities, deficits in cranial nerves III–XII and central vestibular dysfunction.²⁴ The sewing needle in this case appears to be extending into the C1 vertebral canal at the level of the foramen magnum (Figures 1 and 2), and presumably penetrating into the brainstem causing the neurological deficits that were being seen clinically.

It is not possible to say definitively that this needle is penetrating the brainstem with the images available for review. In order to determine foreign body penetration, magnetic resonance imaging (MRI) would have been the ideal imaging modality. However, metallic objects can cause image distortion secondary to susceptibility artefact.²⁵ It is also possible for foreign material not anchored by fibrous tissue or by fixation to bony structures (as would be seen with an identification microchip or a surgical implant) to migrate through tissues when exposed to the high magnetic fields used with MRI. In this case, as the area of interest was directly associated with a metallic object, it is likely that we would not have been able to assess the area adequately owing to image distortion. It is also possible that we could have caused additional trauma to the tissues involved due to migration of the sewing needle by placing the patient in a high magnetic field. It was determined that the radiographs and clinical presentation together gave us enough information to recommend surgical intervention to the owner of the patient.

Conclusions

This is, to our knowledge, the first known report of successful management of sewing needle removal from the brain of a cat. In this case, removal of the needle resulted in complete resolution of clinical signs. The fact that an abscess and associated draining tract did not develop may be owing to the fact that this cat was treated with antibiotics early in the course of its illness, or that the metal material was not a good vehicle for carrying bacteria into the deeper tissues as it migrated. This case further demonstrates that with appropriate management, full recovery from a penetrating injury to the central nervous system secondary to foreign body migration is possible.

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