A REVIEW OF OROPHARYNGEAL INJURIES & CASE STUDIES OF SOFT TISSUE SURGICAL CASES IN THE DOG

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Summary

A series of 41 dogs with oropharyngeal injury cases referred to Glasgow University Veterinary Hospital between the period of 1979-1993 were studied. The common cause of the trauma appeared to be pieces of wood in 28 cases (68.2%), and other causes included metallic foreign body (3 cases), bone (2 cases), and one ball. In seven dogs (17%) the cause was not ascertained. The Collie type of breed showed a higher presentation followed by Crossbred and Springer spaniel. Although, not significant statistically, male dogs were over presented (61%). Young (60.9%) and medium to large size dogs (64.8) were the typical victims. The majority of the dogs (84.2%) were chronically presented. The common presenting feature recorded was swelling (20 cases) and most swellings were on the cervical region (11cases). History of trauma was the main recorded historical finding (43.5%). The typical clinical findings were swelling (29 cases) and discharging sinus (28 cases). The sites of original injury found were sublingual (6 cases), lateral pharyngeal (4 cases), tonsilar- (3 cases), rostral pharyngeal (1 case), and one dorsal pharyngeal. Surgical exploration was performed in 38 of the cases. The outcome of the treatment was obtained in 26 cases. All of the acutely presented dogs (6 cases) were cured and recurrence was the feature of the chronic cases.

In addition, the presentation and management of ten cases referred to the Soft Tissue Surgery Unit are described.

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Dedication

To: Kelemework G/Hiwot and Almaz Tiruneh, my parents

Yilma Jobre, my husband

Declaration

I, Roman Tiruneh, do hereby declare that the work carried out in this thesis is original, was carried out by myself or with due acknowledgement, and has not been presented for the award of a degree at any other University.

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I wish to thank Dr. M.J.A. Harvey, Head of Department of Surgery and Reproduction for the support provided me during my study period.

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Section 1

1. A REVIEW OF OROPHARYNGEAL INJURIES IN THE DOG

1.1. Introduction

The canine pharynx is one of the least traumatised sites of the head and neck region (White and Lane 1988). However, the mouth or pharynx in the dog can be lacerated or penetrated by objects such as chicken bones, fish hooks, sewing needles, grass awns, or wooden sticks (Hallstrom 1970, Brennan and Ihrke 1983). Lane (1982) suggested that dogs which chase sticks were more vulnerable to oropharyngeal stick penetrations. This risk factor was subsequently substantiated by White and Lane (1988) in a review of a large series of pharyngeal stick injuries.

A penetrating foreign body may be retained within the sublingual, retrobulbar, pharyngeal, peripharyngeal soft tissues, or migrate in the inter-mandibular space, retropharyngeal tissue, or soft tissue of the neck. The common features of recent injuries are dysphagia, pain, pyrexia, and local cellulitis (Baker 1972, White and Lane 1988). Pharyngeal abscesses can develop when antibiotic therapy or local defence mechanisms effectively contain a foreign body embedded in the connective tissues. The tissues continue to react to the foreign body, and a serosanguinous effusion collects that may drain by taking the path of least resistance (Harvey 1985). Lane (1982) found that abscesses could be located in the inter-mandibular space, retropharyngeal tissue, ventral and lateral aspect of the neck, or the pharynx.

White and Lane (1988) demonstrated that there was a relationship between the site of pharyngeal injury and regions involved in abscess formation. The angle and the elevation of a stick as it enters the mouth was thought to determine the part of the pharynx impacted by the stick. Thus, the site of pharyngeal penetrations have been classified as rostral, lateral, and dorsal pharyngeal wounds (White and Lane 1988).

Baker (1972) and White and Lane (1988) recommended vigorous management of the fresh injury in order to preclude the development of chronic complications. The difficulty of diagnosing and treating the chronic injury compared to a fresh injury was stressed by the same authors in the light of their experience. Surprisingly, and in contrast to many other conditions affecting the dog, pharyngeal injuries have received scant attention in the literature.

An analysis of 41 consecutive pharyngeal injury cases seen at Glasgow University Veterinary School was carried out to determine the most important factors involved, to compare the results of this retrospective study with previous reports, and to forward recommendations for future case management.

1.2. Material and Methods

A retrospective study of 41 dogs with oropharyngeal injury examined and treated at Glasgow University Veterinary Hospital during the period of 1979-1993 was performed. The data was extracted from the hospital and personal case databases. Additional cases were retrieved by searching the theatre logbooks for the same period.

The case record was obtained, and data was compiled concerning breed, sex, age, body weight, presenting signs, history, clinical findings, ancillary aids, treatment and its outcome.

The breed and sex distribution of dogs admitted to the hospital were calculated from the number of all first admissions from 1979-1993. The number of dogs used in determination of breed and sex distribution were 10660 and 16597, respectively. However, the number of breed of dogs involved did not permit rigorous statistical analysis. The sex data was evaluated using a chi square test at a p value of 0.05.

The two main presenting signs were recorded. All the history and clinical findings were included in the data. When analysing the surgical procedure, the use of drains and muscle suturing were considered. The presence of sinus tracts, and the retrieval of foreign body and its type were also taken into consideration.

The time lapse from injury or illness to presentation at Glasgow University Veterinary Hospital was noted. According to the descriptions of White and Lane (1988), the cases were categorised as acute and chronic, when presented within seven days and beyond seven days of the injury, respectively. When a referral letter was available surgical intervention carried out by the referring veterinarian was also noted.

To determine the outcome of the surgical intervention, owners were contacted through a telephone call in those cases not brought for check-up. The outcome was stated unknown in the absence of satisfactory information.

1.3. Results

1.3.1. Causes of oropharyngeal injury

In 28 cases (68.2%) penetration by a piece of wood appeared to be the cause of the oropharyngeal injury. This supposition was based on a foreign body being recovered during surgical exploration (46.4%), a history of a stick being the injurious agent, or by implication as the animal was an inveterate stick carrier (53.5%). Of those cases that had a stick or piece of wood recovered at surgery (13), five had a history of trauma and two were known stick carriers. In the 15 cases where no wooden foreign body was recovered on surgical exploration, seven dogs had a history of both stick catching and trauma. History of trauma alone was recorded in four dogs and stick catching was noted in another four dogs. In a further six cases (14.6%) foreign material other than wood was identified. These were bone (2), ball (1), and metallic foreign bodies (3). In the remaining seven cases (17%) there was no history of stick catching, or trauma recorded, nor was foreign body recovered on surgical exploration, but strongly suspected because of the typical history and clinical finding.

1.3.2. Breed distribution

The breeds found to have sustained oropharyngeal injuries are shown in Table 1, where the numbers are compared to the hospital population. The four most common breeds based on the frequency of hospital admission were Retrievers (Golden Retrievers, Labrador Retrievers), German Shepherd, Collie (including Collie-cross), and Cross-breed, and all had a presentation above average. However, the presentation of Collie was higher when compared with its admission to the hospital. The next predominant type was the Crossbred. The presentation of Springer Spaniel was also higher when compared with its hospital admission. Small breeds of dogs were not presented. The breed of dogs where injury was not caused by wooden foreign body (6 cases) were German Shepherd, Retrievers, Border Terrier, and Springer Spaniel.

	Oropharyngeal injury cases		Hospital population Subset	
Breed	No	%	No	%
Akita	1	2.5	21	0.19
Belgian Shepherd Dog	1	2.5	17	0.15
Border Terrier	1	2.5	103	0.96
Cocker Spaniel	2	5	832	7.8
Collie	8	20	1248	11.79
English Setter	1	2.5	256	2.4
Greyhound	2	5	456	4.27
German Shepherd (Alsatian)	8	20	2646	24.8
Retriever	5	12.5	2838	26.6
Rottweiler	1	2.5	483	4.53
Springer Spaniel	4	10	695	6.5
Crossbred	6	15	1065	9.9
Total	40	100	10660*	99.9*

Table 1. Comparison of breeds involved with oropharyngeal injury and those of hospital population at Glasgow University Veterinary Hospital from 1979-1993 (* = total numbers of the indicated breeds in the hospital population not the total no of all breeds). The breed type of one dog was not recorded.

1.3.3. Sex distribution

The sex distribution of oropharyngeal injury cases were showed on Figure 1, and it was compared to the hospital population. Male dogs seemed considerably more frequently represented. However, no significant difference was found among all categories tested, but there was a tendency for entire female to have lower prevalence (Table 2).

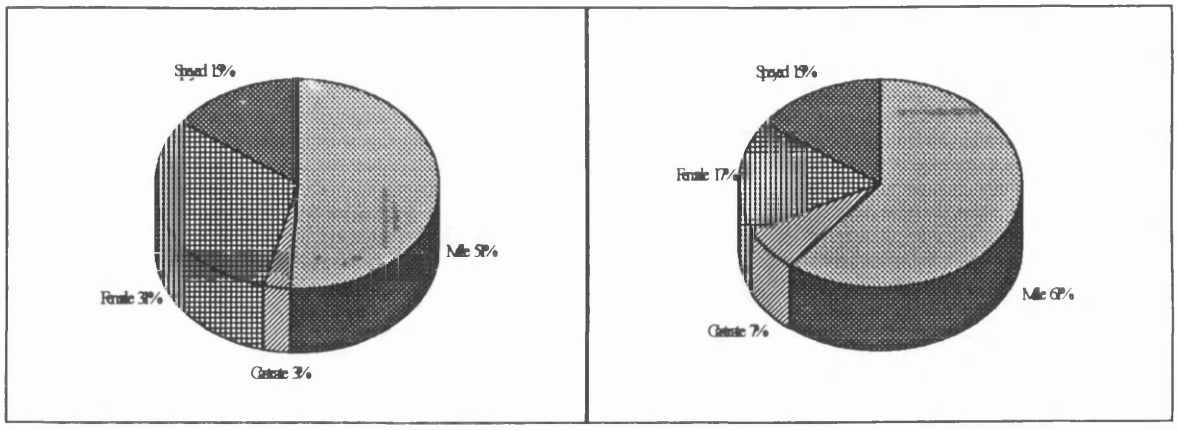

Figure 1. Pie charts. Showing the sex distribution of hospital admissions at Glasgow University Veterinary Hospital and 41 dogs with oropharyngeal injuries from 1979-1993.

Gender	Chi square value	P value
Male:female	3.5	0.06
All male:all female	3.47	0.06
Male:female:speyed	3.76	0.15
Over all	6.2	0.1

Table 2. Statistical analysis of various genders of oropharyngeal injury cases compared with hospital admissions. No significant difference was observed between animals with oropharyngeal injuries and those in the hospital population as far as gender was concerned at a 5% level of significance.

1.3.4. Age distribution

The average age was 4.2 years with a range of 0.5-10years. However, the age distribution of animals with oropharyngeal injury was uneven. The majority of animals (60.9%) with this type of injury were dogs aged between three and six years. Dogs less than one year and more than six years of age were not frequently involved.

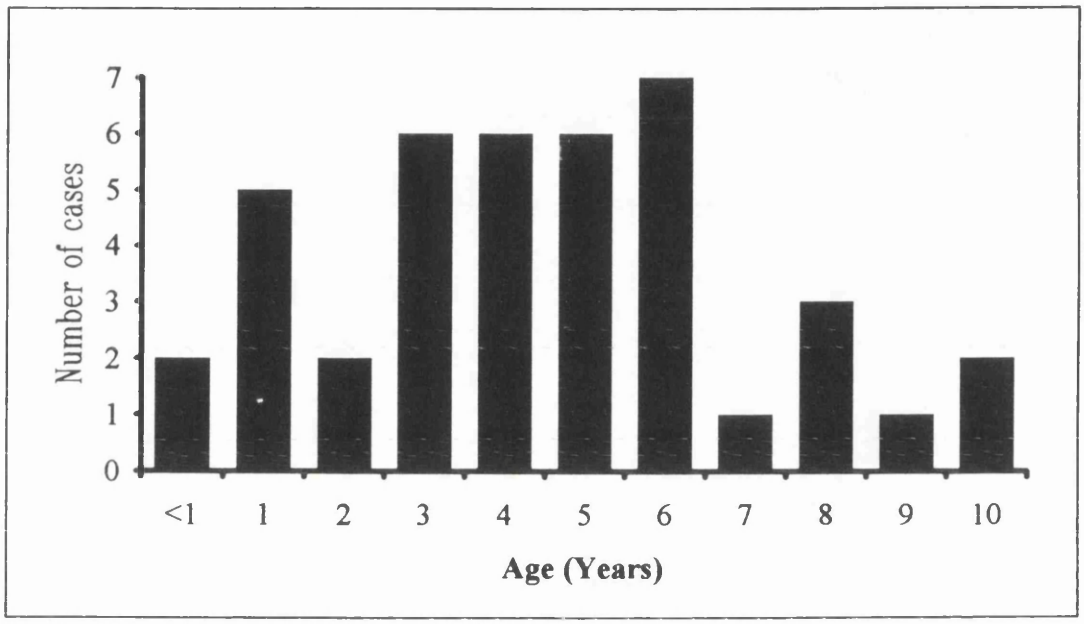

Figure 2. Bar chart. Age distribution of 41 dogs with oropharyngeal injury.

1.3.5. Weight distribution

The majority of the dogs (64.8%) had a body weight between 23-32kg. The average weight of the cases was 25.7kg, with a range of 13-40kg.

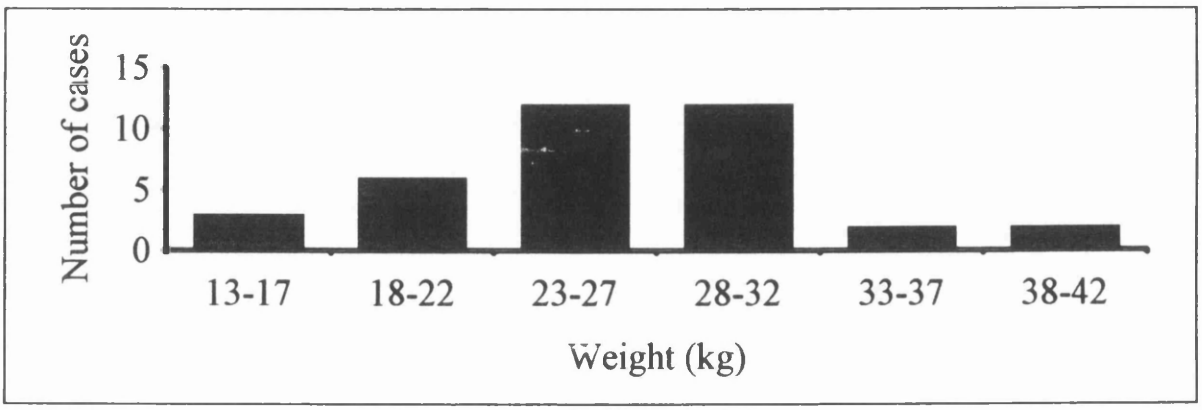

Figure 3. Bar chart. Weight distribution of 37 cases of oropharyngeal injury (weight not recorded in 4 dogs).

1.3.6. Duration of clinical signs

The clinical signs resulting from oropharyngeal injuries fell into two distinct categories depending on the interval since injury. Those cases presented within seven days of the injury (6 dogs) were considered acute, while those cases presented over periods varying from 8 days to 11 months (32 dogs) were chronic. The interval between onset of clinical sign/trauma and presentation ranged from less than one day to 11 months. Information was not recorded in three dogs.

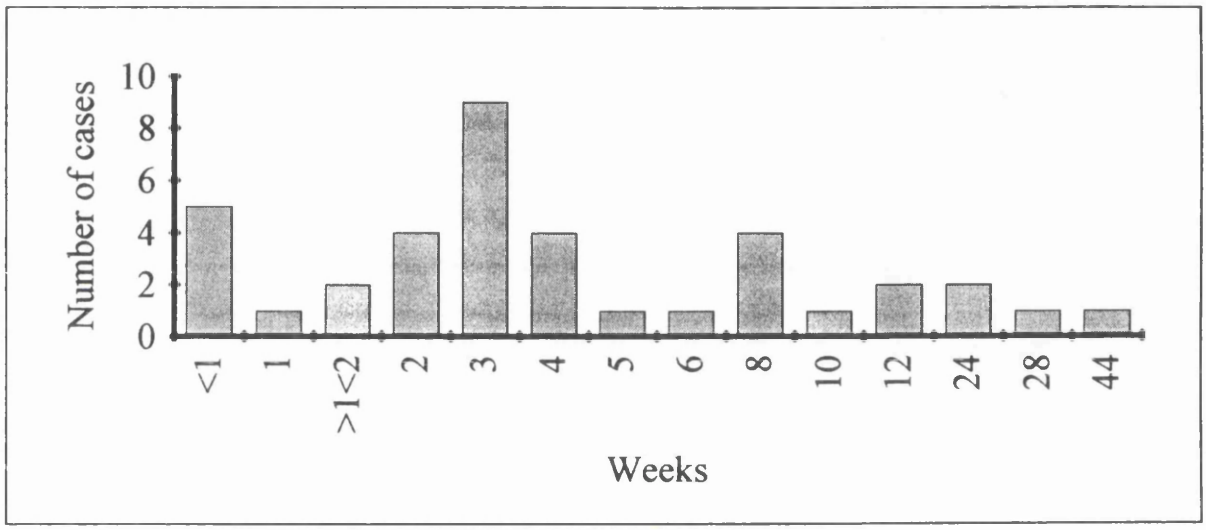

Figure 4. Bar chart illustrating the duration of illness of 38 oropharyngeal cases (information not recorded in 3 dogs).

1.3.7. Presenting signs

The major presenting feature recorded was swelling (20 cases). The location of the swelling was variable. Most swellings were found on the cervical region (11 cases). These included lateral cervical (7), ventral cervical (2), and two not specified. The other location of swelling was submandibular (9). Four dogs were presented with discharging sinuses. The location of the discharging sinuses were recorded as cervical and submandibular. One of the dogs with oesophageal rupture had a ventral cervical discharging sinus from where the ingested milk emptied through the opening. In one dog protrusion of the eye was present. Dysphagia was manifested with difficulty of opening the mouth and difficulty of swallowing. The dogs presented with pain had oral pain, neck pain, painful sternum, and jaw pain. Two presenting signs were recorded in seven of the dogs.

Presenting signs	Number of cases
Swelling	20
Dysphagia	10
Pain	5
Discharging sinus	4
Excessive salivation	2
Lameness	2
Protrusion of the eye ball	1
Halitosis	1
Snorting	1

Table 3. Presenting signs of 39 oropharyngeal injury cases (presenting signs not recorded in two dogs).

1.3.8. History of oropharyngeal injury

A positive history of trauma was recorded in 17 (43.5%) of all oropharyngeal injury cases where the history was recorded. It was noted in two of the six non-wooden foreign body cases. History of stick catching was recorded in 33.3% of the oropharyngeal injury cases. No history of stick catching was recorded in those cases where a non-wooden foreign body was recovered. The other common owner comment was the presence of discharging sinus (13 cases), it was present in the dogs where non-wooden foreign bodies were removed.

Recorded history							
Series number	History of trauma	Known stick catcher	Discharging sinus	Difficulty in opening the mouth	Anorexia	Dullness	Abnormal respiration
1	+	-	+	-	-	-	-
2	-*	-	+	-	-	-	-
3	+	-	-	-	+	+	-
4	-	+	+	-	-	-	-
5	-	-	-	-	-	-	-
6	-	-	+	-	-	+	-
7	+	+	+	-	-	-	-
8	-	+	+	-	-	-	-
9	+	+	+	-	-	-	-
10	+	+	+	-	+	+	+
11	-	-	-	-	+	-	-
12	+	+	-	-	+	+	-
13	+	+	-	-	+	+	+
14	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-
17	-	-	-	-	+	+	+
18	-*	-	-	-	-	+	-
19	-	-	-	-	+	+	+
20	+*	-	+	-	+	+	-
21	-	+	-	-	-	-	-
22	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-
24	-*	-	-	-	-	+	-
25	+*	+	+	-	-	+	-
26	+	-	-	-	-	-	+
27	-	-	+	-	+	+	+
28	+	-	-	+	-	-	-
29	+	-	-	-	-	-	-
30	-	+	+	-	-	-	-
31	+	+	+	-	-	-	-
32	+	+	-	-	-	+	-
33	-	-	-	-	-	-	-
34	-*	-	-	-	+	+	+
35	+	+	-	+	-	-	-
36	-	-	-	-	-	+	-
37	+	-	-	+	+	-	-
38	+	-	-	-	-	-	-
39	-	-	-	-	-	-	+
41	-	-	-	+	+	+	+

Table 4. Specific historical features of 39 oropharyngeal injury cases (history not recorded in two cases). + = present, - = absent, * = injury caused by non-wooden foreign bodies.

1.3.9. Clinical finding

A summary of the clinical findings is shown in Table 5. Swelling and the presence of a discharging sinus were the usual findings. Both swelling and discharging sinus were together in 22 of the cases. On palpation pain was found in 10 of the dogs with discharging sinus and swelling. Pain and dullness were noted in all of the acute cases (6), and pyrexia was present in two of them. Two dogs with difficulty in opening the mouth had excessive salivation and blood in the saliva. Halitosis was present in two dogs with difficulty in opening the mouth.

Clinical findings	No of cases
Swelling	29
Discharging sinus	28
Pain	19
Dullness	15
Pyrexia	9
Difficulty of opening the mouth	7
Halitosis	4
Excessive salivation	4
Blood in saliva	3

Table 5. A summary of results of clinical examination of 39 oropharyngeal injury cases (clinical finding not recorded in two dogs).

1.3.10. Site of the original injury and organ or tissue involved

Inspection of the pharynx in the anaesthetised dog allowed the original site of injury to be identified in 15/28 of stick injury cases. The sites were sublingual (6 cases), lateral pharyngeal (4 cases), tonsilar (3 cases), rostral pharyngeal (1 case), and dorsal pharyngeal (1 case).

In most dogs the cervical region/neck was involved in injury or abscess formation (32 cases). Other tissues or organs injured were oesophagus (4 cases), masseter muscle (3), retrobulbar tissue (2), and mediastinum (1). Multiple organ or tissue involvement was present in 8 cases. These were oesophagus & neck (3), tonsil & neck (2), neck, oesophagus, and mediastinum (1), masseter muscle & retrobulbar tissue (1), and retrobulbar tissue & neck (1).

In 13 of the stick injury cases the original site of injury and tissue or organ injured or site of abscess formation were all recorded. A summary is shown in Table 6.

Original site of injury	No of cases	Organ/Tissue involved
Sublingual	6	Tongue (2)
		Tongue and neck (4)
Tonsilar	3	Tonsil (1)
		Tonsil and neck (2)
Lateral pharyngeal	2	Neck (1)
		Neck, oesophagus, and Mediastinum (1)
Rostral pharyngeal	1	Masseter muscle
Dorsal pharyngeal	1	Neck

Table 6. The relationship of original site of penetration to the tissue/organ injured, and/or site of abscessation of 13 stick injury cases.

1.3.11. Radiological, haematological, laryngoscopic and endoscopic examinations and findings

Radiographic examination was carried out in 21 cases. The most common abnormal feature on lateral radiographs of the cervical region was the presence of gas within the tissues (7 cases). Gas was seen between tissue planes and subcutaneously (Fig. 5). The other radiographic findings were periosteal and lytic reaction (Fig. 6a & 6b), evidence of metallic foreign body (Fig. 7), gas in the mediastinum (Fig. 8), soft tissue mass causing ventral depression of the larynx and trachea (Fig. 9), and increase in soft tissue density and swelling. No abnormalities were found in six of the 21 dogs radiographed.

The only haematological investigation carried out was total white blood cell count. It was done in eight of the cases. Leukocytosis was apparent in four dogs. The white blood cell count was 41,000, 25,000, 21,000 and 20,000/μl.

Laryngoscopic examination was carried out to examine the oral cavity, pharynx and larynx. Rostral traction of the soft palate was usually required to appreciate the full extent of the pharynx. In three dogs the offending foreign body was seen and was retrieved (Fig. 10). In other dogs the point of penetration/original site of injury was represented either by an obvious mucosal tear, scar formation, and by abscessation.

Further endoscopic examination was carried out in four of the dogs. Endoscopy of the oesophagus revealed tear/rupture in two cases where oral examination revealed nothing (Fig. 11).

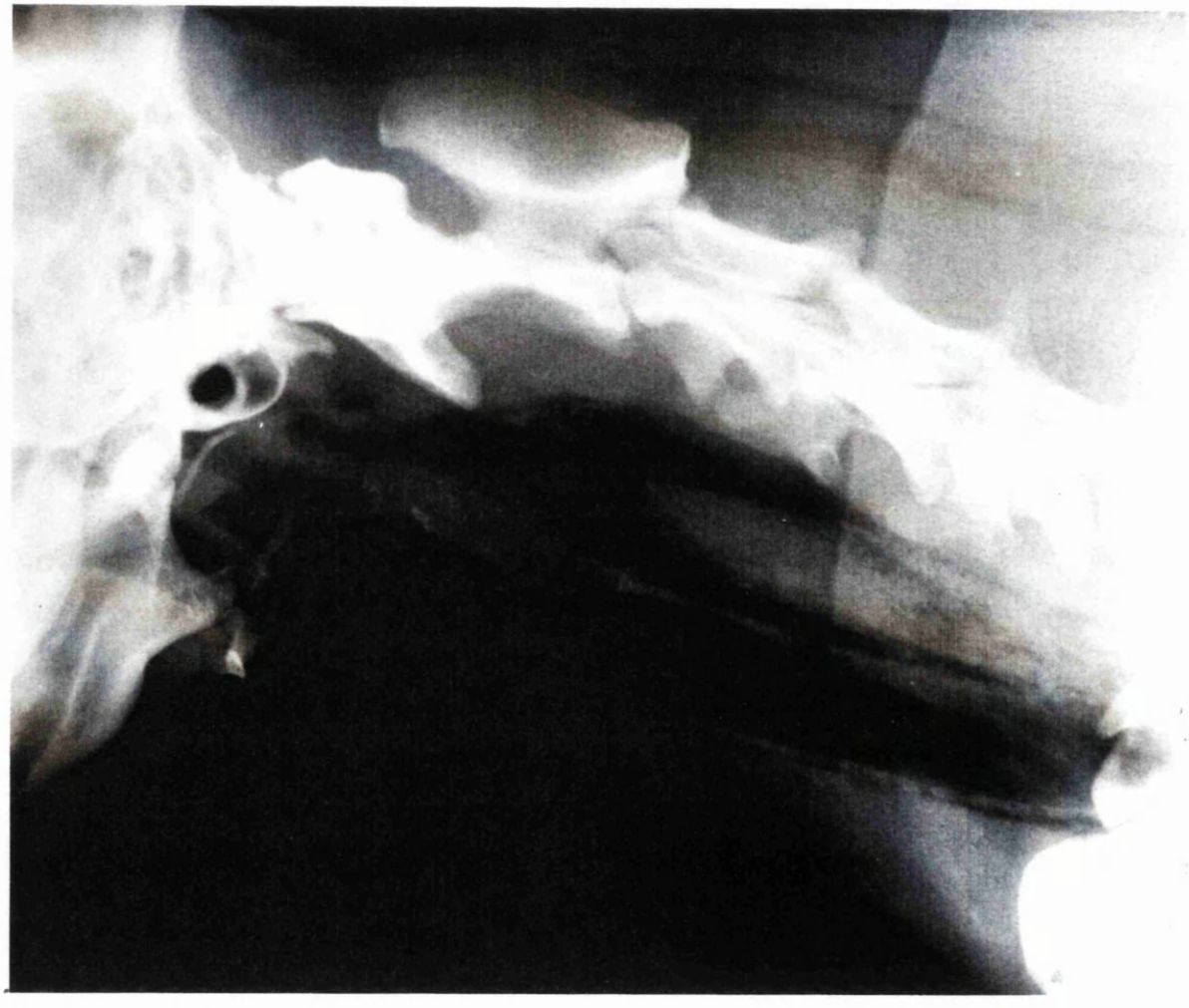

Fig. 5. Chronic pharyngeal injury, lateral cervical radiograph. Gas within the soft tissue planes and subcutaneously is demonstrated. An oesophageal rupture was revealed on post-mortem.

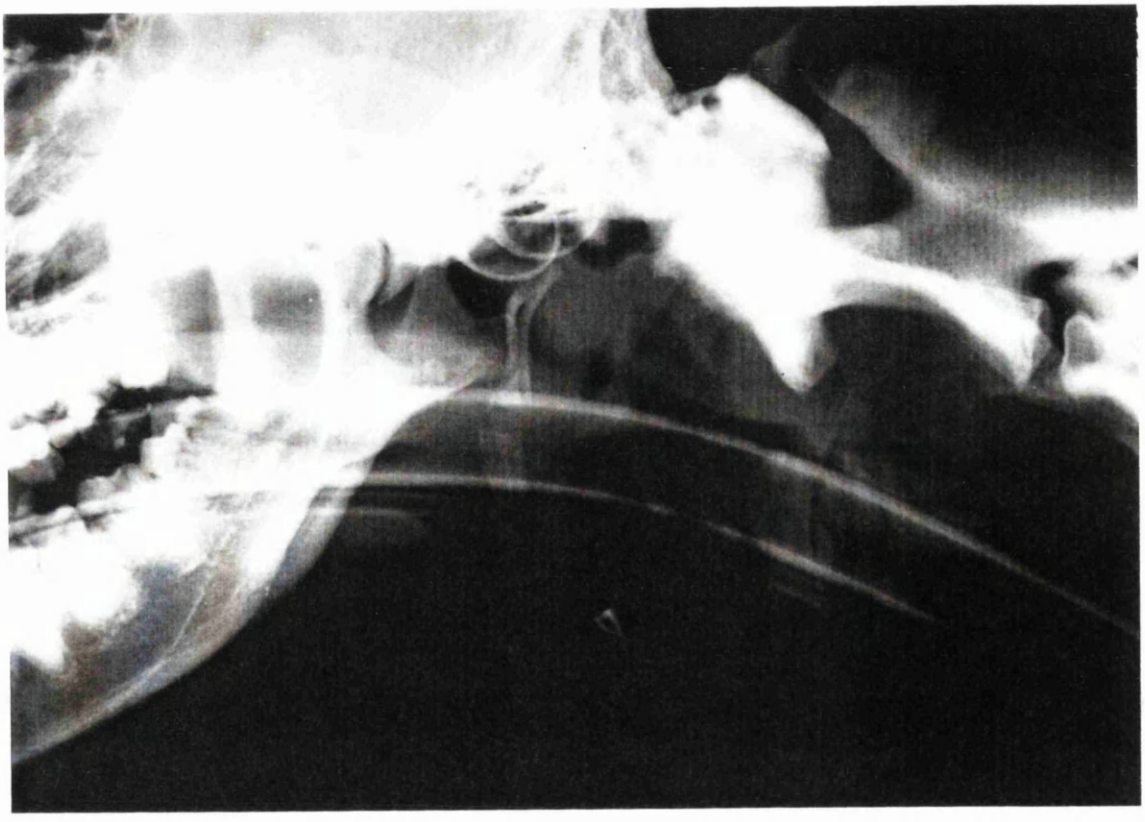

Fig. 6a. Chronic pharyngeal injury lateral neck radiograph. Extensive periosteal reaction. Shown on the ventral aspect of the first cervical vertebrae. Gas shadow around the pharynx and larynx as a result of post-surgical emphysema is also present.

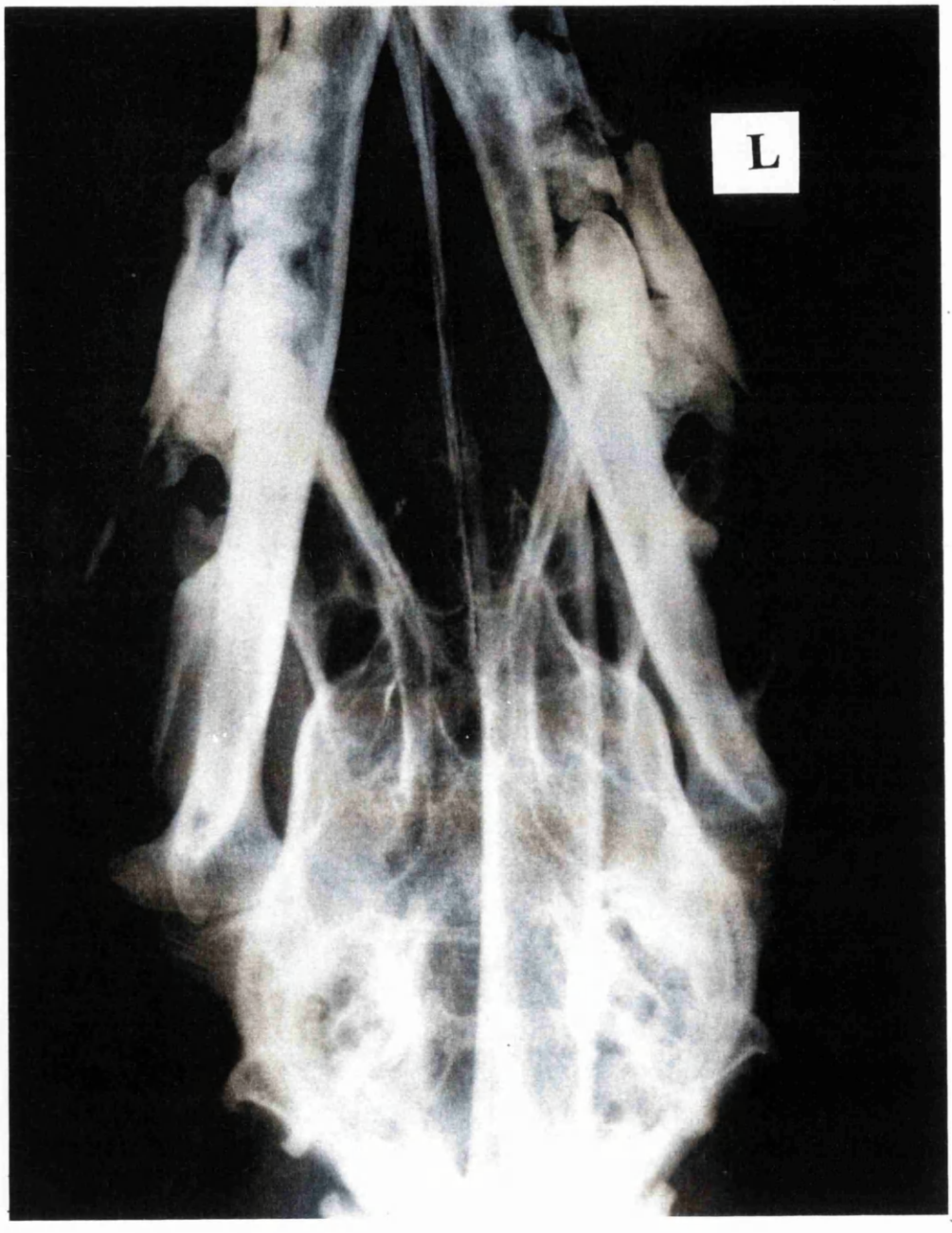

Fig. 6b. Chronic pharyngeal injury dorsoventral skull radiograph. Lytic and periosteal reaction on the left mandibular coronoid process is evident. A wooden foreign body was removed during surgical exploration.

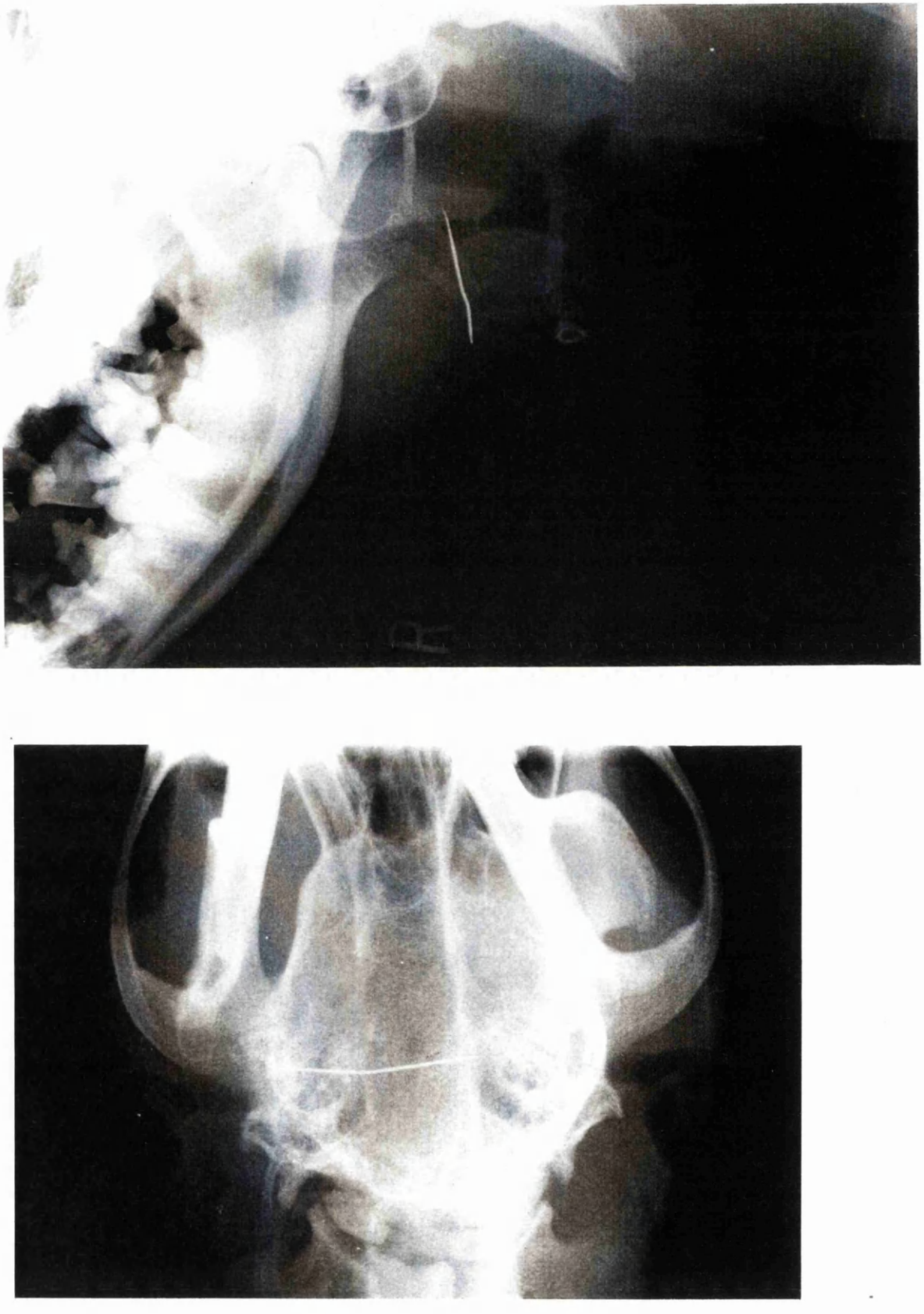

Fig. 7. Acute pharyngeal injury lateral and dorsoventral cervical radiograph. There is a metallic foreign body at the level of the hyoid apparatus. There is also a mild associated soft tissue swelling.

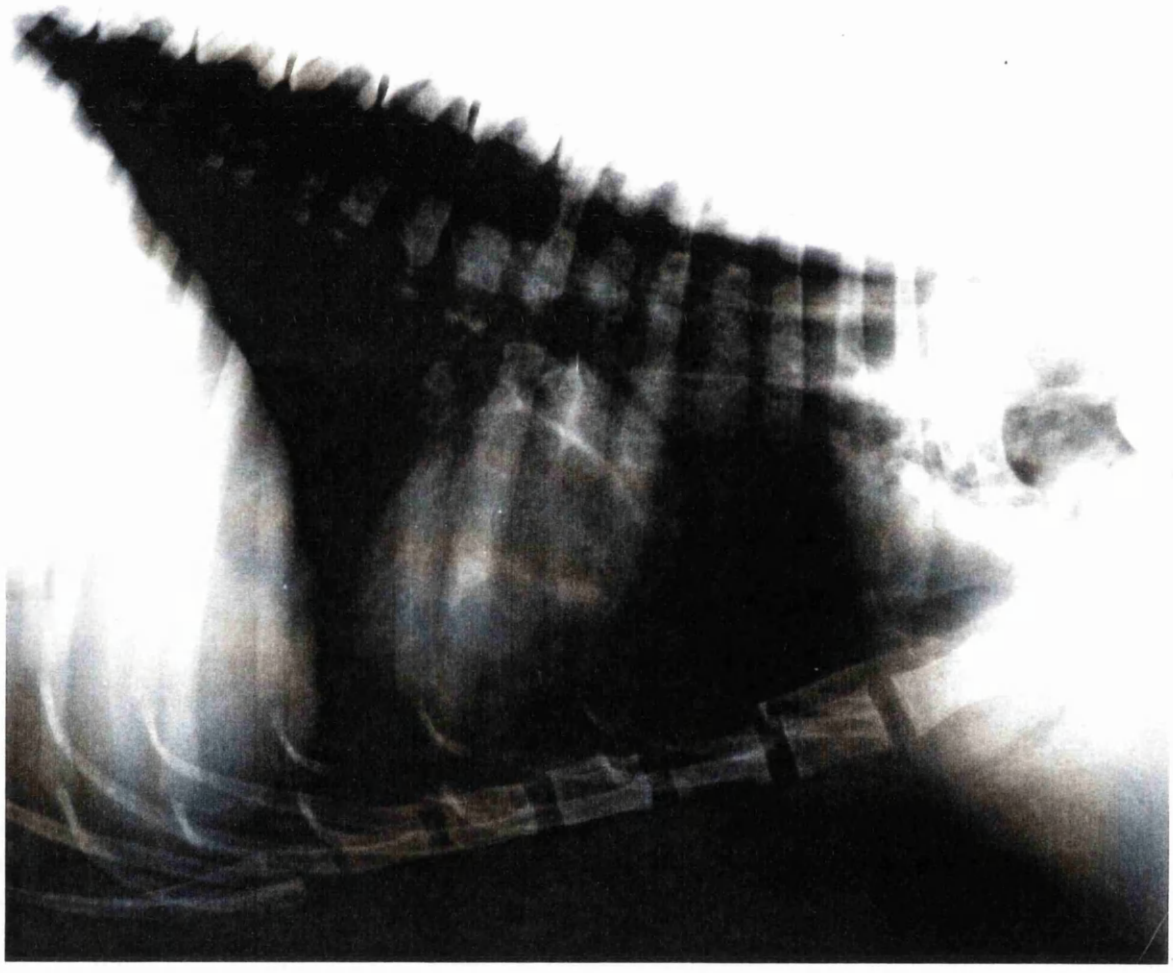

Fig. 8. Chronic pharyngeal injury lateral thoracic radiograph. Gas in the cranial mediastinum outlining the dorsal and ventral wall of the trachea is shown. The gas also extend into the caudal mediastinum resulting in increase in radioluceny of the thorax. Oesophageal tear measuring 4cm was seen at post-mortem.

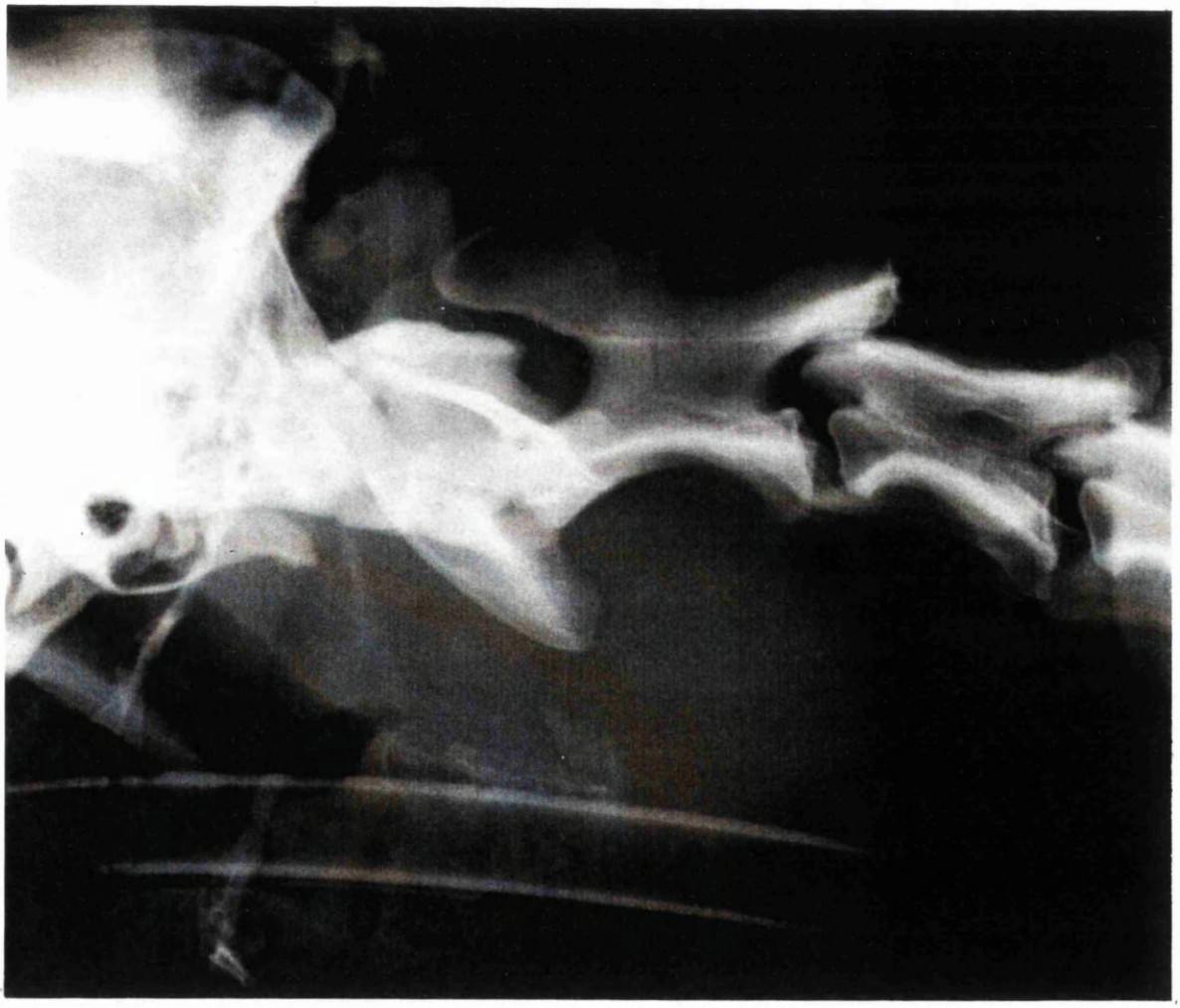

Fig. 9. Chronic pharyngeal injury cranial cervical radiograph. There is soft tissue swelling ventral to the first cervical vertebrae, causing depression of the larynx and trachea. Gas is also present in the soft tissue ventral to the larynx.

Fig. 10. Oral cavity. Retrieval of a wooden foreign body penetrating pharyngeal wall during oral examination.

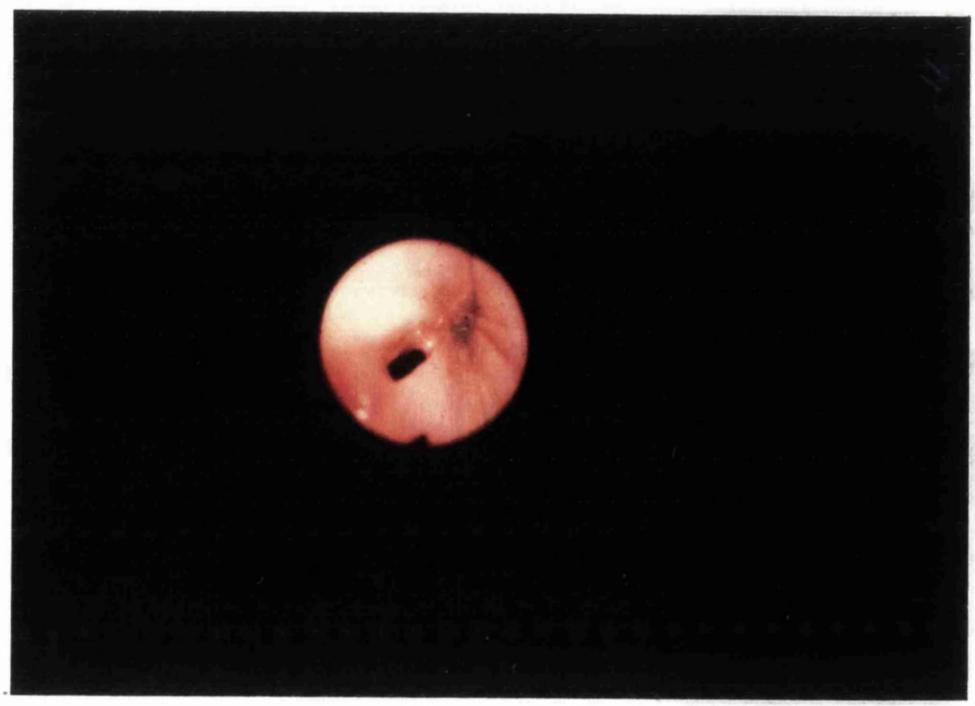

Fig. 11. Endoscopy of the oesophagus. Showing oesophageal tear as a result of wooden foreign body.

1.3.12. Surgical intervention and result of management

Nine of the dogs had undergone at least one surgical exploration prior to referral. Surgical exploration was performed in 38 of the oropharyngeal injury cases. Sinus tracts were present in 32 dogs. During surgical exploration of the cervical region, probes were passed into the sinus tracts from the surface. The path taken by them was exposed by longitudinal incisions made through the skin and deeper tissues on either side. Opening into the abscess cavities encountered during the dissection were enlarged bluntly and all granulation tissue lining the sinus tracts and any foreign body encountered were removed. Drains were placed across the wound. Subcutaneous tissue and skin were apposed. In those cases with oesophageal rupture the oesophagus was apposed with two layers of sutures. In six dogs with the discharging sinus in the pharynx itself, the abscess was drained in the mouth through an incision in the oral mucosa, and the abscess cavity was explored digitally to break down loculations and palpated for foreign bodies. In one dog with fresh laceration in the oropharynx, the soft palate and pharyngeal mucosa were repaired. In 13 dogs a wooden foreign body was recovered (Fig. 12). Other foreign bodies recovered were needle (2 cases), bone (2 cases), ball obstructing the pharyngeal opening in one dog, and an unknown metallic foreign body in one case. A drain was used in 24 of the operated cases. The type of drain used was not specified in most cases. The muscle layer was closed in few of the cases (4 dogs). Antibiotics were prescribed for 33 of the dogs, but bacterial culture and sensitivity were performed rarely (5 cases).

The result of management of oropharyngeal injury was summarised in Table 7. The outcome of the treatment was obtained in 26/41 cases. The remaining cases were lost to follow-up because of either difficulty in getting the exact telephone number and/or the owner. Twelve dogs were brought for check-up or re-examination, of which five were eventually cured and seven dogs were returned because of recurrence. The owners of the dogs which were not re-examined after operation and those showed recurrence were interviewed by telephone. A metallic foreign body and a ball were recovered from the acutely presented and cured dogs. In those six dogs presented chronically and cured a wooden foreign body was retrieved. Among the four dogs presented with oesophageal rupture, two dogs were cured, and one dog with the involvement of the mediastinum died. In one dog the outcome was not known. Involvement of the retrobulbar tissue was present in each of the dogs euthanased, and died. Of the nine chronically presented and cured dogs, operation prior referral was carried out in six of the cases.

Results of management

	Acutely presented		Chronically presented		Total
	Foreign body recovered	No foreign body recovered	Foreign body recovered	No foreign body recovered	
Eventually cured	2	4	6	3	15
Recurred	-	-	5	3	8
Died	-	-	-	2	2
Euthanased	-	-	-	1	1
					26

Table 7. Showing the results of management of 26 oropharyngeal injury cases (information not obtained in 15 cases).

Fig. 12. Wooden foreign body recovered during surgical exploration measuring 8cm.

1.4. Discussion

The most predominant breed type affected by pharyngeal stick injury was the Collie, followed by Labrador retriever and Springer spaniel (White and Lane 1988). The excitable nature of the collie type, its frequent use for obedience work, and the use of stick retrieval as a convenient form of training and play have been mentioned as reasons for high presentation of this breed type. Likewise, in this retrospective study a high predisposition of Collie type of dogs was noted, and it was followed by cross breeds and Springer spaniel. However, if these factors do actually play a part they must act in combination as these features could individually be ascribed to other breeds. The Retriever type was the most popular breed of the hospital population. However, unlike the findings of White and Lane (1988), this breed type did not have high presentation when compared with its hospital admission. Thus, on the basis of these findings information regarding hospital admission of breed types is essential to pin-point the predominant breed type affected, although the hospital population is biased and may not reflect general population.

No difference on presentation among the sexes was observed (White and Lane 1988). In this series of cases there was an apparent greater preponderance of males, although not significantly greater. This may have been due to an over presentation of males in the hospital. However, a more plausible explanation is different behavioural patterns in the sexes.

Young dogs were found to be the typical victim of pharyngeal stick injury (White and Lane 1988). Similarly, the present data showed a higher presentation of young to middle age dogs. Immature dogs (less than one year of age) and old dogs (above seven years) were less frequently represented. This finding is in agreement with the reports of Hallstrom (1970), where a survey of dogs with foreign body in the oral cavity showed a lower presentation in dogs less than one year of age. The reason for high presentation of young dogs could be due to increased activity, increased interest in their surrounding and relative lack of experience in catching sticks. On other hand, the lower presentation of old dogs might be attributed to lack of interest in play or because of experience. The relatively greater care taken with very young dogs or decreased access to foreign bodies could be the reason for the lower risk observed in this age group.

The most commonly implicated foreign body in this series causing pharyngeal injury was a wooden foreign body, which is in agreement with the large series published by White and Lane (1988). Conversely, Hallstrom (1970), found needles to be the most common, followed by pieces of bone, pieces of wood, and others

including pins, and awns. This disparity could be due to the relative ease of diagnosing and recovering metallic or osseous foreign bodies whereas a wooden foreign body may not show on radiographs because of absorption of fluid, becoming radiolucent and hence similar to the surrounding tissue, and surgical removal might be unsuccessful because of fragmentation.

It has been speculated that the angle between dog and stick at the point of impact is important as far as this type of injury is concerned (White and Lane 1988). Thus, medium to large breed of dogs are likely to be victim of pharyngeal stick injury. The posture of the dog's head and neck as it collects the stick, where the need for large dogs to adopt a head down attitude with the neck extended was given as explanation for exposing the pharynx to injury (White and Lane 1988). The importance of the mass of the dog for gaining the necessary momentum required to penetrate the pharyngeal mucosa was also mentioned by the same authors. Similarly, in the present series of oropharyngeal injury cases medium to large breed of dogs were affected.

White and Lane (1988) described three possible trajectories involved in pharyngeal injury caused by a stick as rostral, lateral, and dorsal pharyngeal wound. Rostral pharyngeal wound occurs when the stick enters the mouth at an acute angle and impacts the tonsilar region, or in case of steeper elevation the area immediately behind the last molar tooth. Deep penetration and subsequent migration may lead to involvement of the retrobulbar, orbital, temporal or masseteric structures. However, this series of cases was not able to substantiate this postulated trajectory because the original site was only noted in 1/4 cases with retrobulbar or masseteric involvement. The development of a retrobulbar abscess with proptosis due to a foreign body entering through the fauces or tonsilar area has been mentioned (Lane 1982). The name tonsilar and rostral pharyngeal wound would be similar on the basis of the two reports (Lane 1982, White and Lane 1988). On the other hand, in this study involvement of the neck was found where the original site of the injury was tonsilar. The lateral pharyngeal wound results from a stick that enters the mouth somewhat obliquely. This route results in involvement of parapharyngeal cervical tissue. As a result of migration of wooden fragments wounds may be found anywhere from the intermandibular tissue to the cranial thoracic region (White and Lane 1988). Although, the cervical region was the most common region involved in the injury, the lateral pharyngeal as the site of original injury was recorded in only one case. In contrast with the descriptions of White and Lane (1988), one dog with a presumably lateral pharyngeal wound had the involvement of the oesophagus and mediastinum. The dorsal pharyngeal wound occurs where steeply elevated sticks lacerate the soft palate and impact the dorsal pharynx, the retropharyngeal structures and oesophagus

when the stick passes distally. Among the four cases with oesophageal injury, the site of original injury was known only in one of the dogs. Involvement of the neck was recorded in one dog with a dorsal pharyngeal wound. The most common site of injury recorded in this series of cases was the sublingual area. With this site of injury abscess formation in the intermandibular and ventral cervical areas were noted. Similarly, Lane (1982), mentioned sublingual penetration leading to an abscess formation in the intermandibular space. Some of the discrepancies regarding the original site of injury would be partly due to lack of proper description in the case record, which could be as a result of difficulties in identifying the original injury in chronic cases.

The chronic form of the disease has been found to be common (White and Lane 1988) as it was also observed in this retrospective study. Fragments of wooden foreign bodies may lodge in the soft tissue when the stick is withdrawn by the dog or the owner and subsequent migration through parapharyngeal tissues was suggested to be the cause of chronic suppuration by the same authors. Another reason could be due to lack of early recognition of cases and inadequate interrogation of the owners. Lack of vigorous management of the fresh wound would be an important factor contributing to the development of chronic suppuration (White and Lane 1988).

Dysphagia and discharging sinus have been the most common presentations of recently traumatised and chronic cases, respectively (White and Lane 1988). Dysphagia may arise from temporo-masseteric trauma which provokes pain on opening mouth or mastication, or as a result of pharyngeal laceration and cellulitis which promote pain during swallowing. In these series of cases dysphagia was recorded in the acute as well as in the chronic cases with involvement of the masseter or retrobulbar tissue and in the chronic cases of abscessation of the cervical region. Difficult mastication in the chronic cases might be related to atrophy or fibrosis of the masticatory muscles. In this retrospective study, cervical swelling was the main presenting feature of chronic cases while both cervical swelling and discharging sinus were the commonest clinical findings. The reason would be the coexistence of both features and the relative ease of noticing swelling rather than discharging sinus by the owners. The other disparities between presenting features and clinical findings were pain and halitosis. From these findings it seems that the owners may not be able to appreciate these symptoms fully, hence this demonstrates the superiority of clinical examination over just owner responses to questions relating to presenting features.

The presence of gas shadow within tissue planes on radiographs could be related with entry of air through an opening caused by the trauma in recent injuries, and in chronic cases it could be due to the bacterial activity. In this series of cases it was found only in the chronic cases unlike the previous reports (White and Lane 1988). A wooden foreign body was discovered during surgical exploration in 3/7 cases where radiography showed a gas shadow. On the other hand, gas shadow and/or periosteal reaction were evident on radiographs in three dogs where neither history of trauma nor foreign body on surgical exploration were present. Hence, in these dogs the typical clinical findings of cervical swelling and discharging sinus in addition to the radiographic findings mentioned were suggestive of injury or a foreign body reaction.

In many of the chronic pharyngeal stick injury cases, assessment has been limited to swelling and/or discharging sinus involving the head and neck as it was made in some of the dogs in this study (7cases) (White and Lane 1988). This was because of the absence of history of trauma, difficulty of localising the site of original injury, unreliable radiographic changes, and absence of foreign body on surgical exploration. As a result the diagnosis was based on presumption. However, sinuses of foreign body origin should be differentiated from other causes of recurrent discharge involving the head and neck region including para-aural abscess resulting from chronic aural disease (Lane and Watkins 1986) and pyogranulomatous swelling in the submandibular region caused by *Actinomyces* species (Staman and others 1978, Wykes 1982).

Successful management of chronic oropharyngeal injury is more difficult than with the fresh wound (Baker 1972, White and Lane 1988), as it was also true in this retrospective study. The cause of recurrence in chronic cases might be inadequate or incomplete removal of fragments of foreign body or microscopic organic debris (White and Lane 1988). Another reason mentioned by the same authors as a cause of difficulty in locating a foreign body and hence preventing resolution of the problem was suppression of the suppurative reaction by antibiotics and corticosteroid therapy. Lack of aggressive exploration prior to referral seems to prevent resolution of the problem in 66.6% of the dogs cured after the second exploration. On the other hand, Staman and others (1979) found recurrence of submandibular abscess caused by a foreign body penetrating the oral cavity in two dogs where *Actinomyces* species were involved. Necrotic areas caused by trauma and contaminating bacteria produce the conditions necessary for the growth of *Actinomyces* species. Additionally, the possibility of anaerobic infection with this type of injury has also been pointed out (White and Lane 1988). In this series of cases bacteriological swabs and sensitivity were taken rarely, this could be due to

the delay in obtaining results and the pre-emptive initiation of broad spectrum antibiotics. Improper selection of medical therapy might be the other reason in those dogs showed recurrence despite repeated exploration. Since based on the findings of the surgical outcome, resolution of abscess formation was not entirely depend upon the retrieval of foreign body and/or repeated exploration.

Major oesophageal rupture that allowed mediastinal contamination has been mooted as a cause of death (White and Lane 1988). The dogs were died shortly after the injury. Similarly, among the dogs with oesophageal tear the one dog died had a major tear (4cm long) resulting in mediastinitis. However, in contrast with previous report this dog had died three weeks after the injury. Failure to withdraw oral alimentation and fluids that help to minimise mediastinal contamination would be the reason for the development of mediastinitis.

Although oropharyngeal injury is uncommon, the difficulty associated with resolution of chronically discharging sinus would affect not only the dog but also the owner. On the other hand, the prevention of this type of injury is entirely dependent upon the awareness of the risk associated with retrieval of a wooden stick by the dog-owning public. Hence, the dog-owning public should know about the problem of this form of exercise to their pets. The recurrence of abscess formation despite vigorous and repeated management might be related to improper selection of antibiotics. Therefore, this warrants routine bacteriological swab and sensitivity tests.

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Section 2

Case Studies

Nasal Aspergillosis in a Dog

Introduction

Aspergillosis is a common and severe disease of the nasal cavity and paranasal sinuses of the dog (Bright 1979, Harvey and others 1981, Sharp and others 1991a). In the cat (Sauter and others 1955), sheep (Austwick and others 1960), and cattle (Griffin 1969) it usually occurs in bronchopulmonary form. In man infection with *Aspergillus* species may involve the cutaneous, pulmonary, central nervous, genitourinary, osseous and cardiovascular systems (Abernathy 1973).

The two other common causes of chronic intranasal disease from which aspergillosis must be differentiated are neoplasia and chronic hyperplastic rhinitis. The occurrence of aspergillosis at different referral centres has been reported to be 12 per cent (Lane and Warnock 1977), 34 per cent (Harvey and others 1981), 18 per cent (Sullivan 1987a) of cases with canine intranasal diseases.

The aetiological agent is nearly always *Aspergillus fumigatus*, although other species have been incriminated occasionally (Sharp 1989). *Aspergillus* species are saprophytic organisms that are ubiquitous in the environment, being particularly common in compost piles, stables and barns (Braude 1981).

Mesaticephalic and dolicocephalic breeds are predominantly affected and is rare in brachycephalic breeds (Sullivan 1987a, Sharp 1989). In many cases of nasal aspergillosis the dogs appear to have been previously healthy (Sharp and others 1991a). However, it has been occasionally reported in dogs with chronic metabolic disease (Soltys and Sumner-Smith 1971), or debilitating conditions such as malignancy (Dawson and others 1973), or in those receiving immuno-suppressive drugs (Sharp and others 1993).

The invasive form of the disease is common (Parker and Cunningham 1971, Soltys and Sumner-Smith 1971), though a single case of non-invasive fungal ball has been described in the dog (Hargis and others 1986). In early reports extensive invasion into the brain was found (Sharp and others 1993). In addition, invasion into the periorbital soft tissue was recorded. However, characteristically marked destruction of the turbinate mucosa and bones were present in most dogs (Sharp and others 1991a).

The most consistent presenting signs are a continuous profuse unilateral or bilateral nasal discharge and sneezing (Lane and others 1974, Lane and Warnock 1977,

Sharp and others 1984, Sullivan 1987a, Pavletic and Clark 1991). Other findings include epistaxis, ocular discharge, facial pain and rhinarial ulceration (Lane and Warnock 1977, Sharp and others 1984, Sullivan 1987a, Sharp and Sullivan 1989). The most important clinical features that help to distinguish aspergillosis from neoplasia are the presence of rhinarial ulceration and facial pain (Sullivan 1987a).

Given the necessity to distinguish nasal aspergillosis from other nasal conditions diagnostic aids are important. Lane and others (1974) and, Gibbs and others (1979) suggested radiography was the most useful diagnostic method. The use of rhinoscopy has also been advocated (Sullivan 1987b). Serology is the only non-invasive method able to confirm the diagnosis of aspergillosis (Lane and Warnock 1977, Sharp and others 1984). Culture and smear testing have been found to be unreliable (Lane and Warnock 1977, Sharp and others 1984).

In the treatment of nasal aspergillosis of dogs both medical and surgical treatment or a combination of both have been used with a variable success rate. Oral thiabendazole and turbinectomy resulted in about 57% failure (Harvey 1984). The use of oral ketoconazole alone and in combination with rhinotomy resulted in about a 50% success rate (Sharp and others 1984). Fluconazole given orally at a dose rate of 2.5mg/kg of body weight or 5mg/kg of body weight has been resulted in a 60% success rate, regardless of the dosage used (Sharp and others 1991b). Surgical exposure of the nasal cavity and involved frontal sinus with excision of the diseased tissue followed by swabbing with cotton tipped applicators dipped in 10% povidone iodine solution was effective in all five so treated dogs (Pavletic and Clark 1991). Topical application of enilconazole through tubes implanted surgically into the frontal sinus alone or in combination with systemic ketoconazole has been suggested to be an effective therapy (Sharp and Sullivan 1986). Recently, the use of topical administration of enilconazole alone has been found very effective (Sharp and others 1993).

Case Report

Case details

A 3-year-old male Rough Collie was presented to GUVH first with a three month history of bilateral serous nasal discharge, sneezing and occasional itchy nose. On the second occasion the nasal discharge was profuse, and greenish-yellow. Epistaxis was also present.

Clinical findings

Initially, a bilateral profuse serous nasal discharge was the only finding. On the second visit there was marked depigmentation on both sides of the nostril and tenderness of the nose.

Diagnostic aids

Rhinoscopy

Examination during the first visit revealed profuse turbid nasal discharge which was suggestive of chronic rhinitis.

Radiography

At the first visit a dorsoventral intraoral view of the nasal cavity showed masking of the turbinate pattern throughout the left nasal cavity with several lytic areas (Fig. C1.1). On the second occasion, there was widespread turbinate loss in the left nasal cavity both rostrally and caudally. A mixed pattern of ill-defined lucency and patchy areas of increased density was present particularly caudally. A reduction in turbinate pattern was also noted on the caudal half of the right nasal cavity (Fig. C1.2).

Serology

On the first examination aspergillus titre was negative, but a positive titre (1:4) was found at the second examination.

Culture

Direct biopsy and swab showed heavy growth for *Aspergillus fumigatus* at the second visit.

Diagnosis

Based on radiographic and serological findings chronic hyperplastic rhinits was diagnosed initially. The lack of response to treatment, and new clinical and radiographic findings were more suggestive of aspergillosis at the second examination, being confirmed by further serology.

Treatment

Initially the dog was treated with antibiotics (potentiated sulphonamides 480 mg) twice daily for two weeks without any response. Then treatment using topical

enilconazole through tubes implanted in the frontal sinus was carried out once the correct diagnosis had been established.

After routine general anaesthesia, aseptic preparation of the area around the frontal sinus was made. The animal was placed in sternal recumbency with the head supported by a sandbag. Then a 1.5cm skin incision was made in the centre of a triangle bounded by the frontal crest, supraorbital rim and midline. The muscle layers were separated and a hole made in the frontal sinus using an 8mm trephine. The same procedure was done on the other side. Finally, a drain approximately 30cm long was inserted through the opening, directed into the nasal cavity for about 7-8cm. The same procedure was done on the other side of the nasal cavity. The drains were sutured into place with zinc oxide butterfly tapes.

Flushing with 10mg/kg enilconazole twice daily was started 24 hours after surgery. With the dog's head lowered each tube was flushed with the drug diluted with equal amount of normal saline to increase the bulk of the infusion. This was immediately followed by flushing air through each tube to evacuate the solution from the tubes. Flushing was done for one week and the dog was discharged after the completion of treatment.

Follow-ups

After six weeks the dog was returned and the owner reported little improvement. Sneezing was violent, there was still a nasal discharge but no blood in it.

The dog was re-admitted and a dorsoventral intraoral view examination of the nasal cavity showed destruction of the turbinate bones on both sides except on the caudal part of the right side, where there was masking of the turbinate pattern, and an increase in radiopacity in the left frontal sinus (Figs. C1.3 & 4).

The same operation was done, but on this occasion two drains were placed into each frontal sinus directed rostrally and caudally. Flushing with enilconazole was rpeated twice daily for two weeks. Treatment with oral ketoconazole at a dose rate of 10mg/kg of body weight twice daily for four weeks was also instituted.

Serum alkaline phosphatase and alanine aminotransferase become elevated during therapy and follow-up period with ketoconazole (338iu/L and 81iu/L). A fall to normal level was noted two weeks after completion of the therapy. Lymphopenia was present during the first and second weeks of the last treatment (726 and 552/μl) but returned to normal on examination carried out a month later. The dog has had no discharge or other signs related to the nasal cavity in the four months since the last treatment stopped.

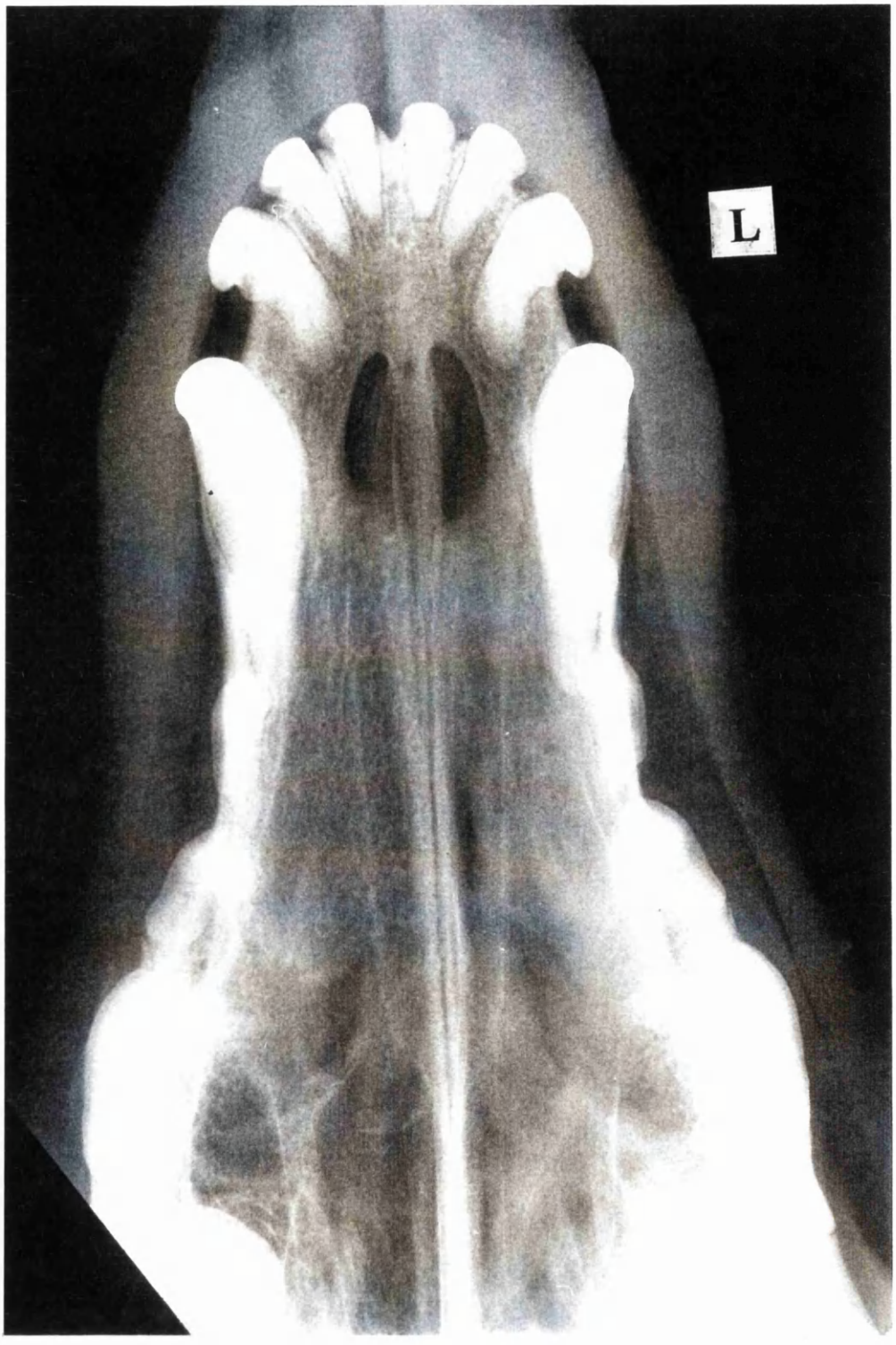

Fig. C1.1. Dorsoventral intraoral view of the nasal cavity. There is masking of the turbinate pattern through out the left nasal cavity with lytic areas.

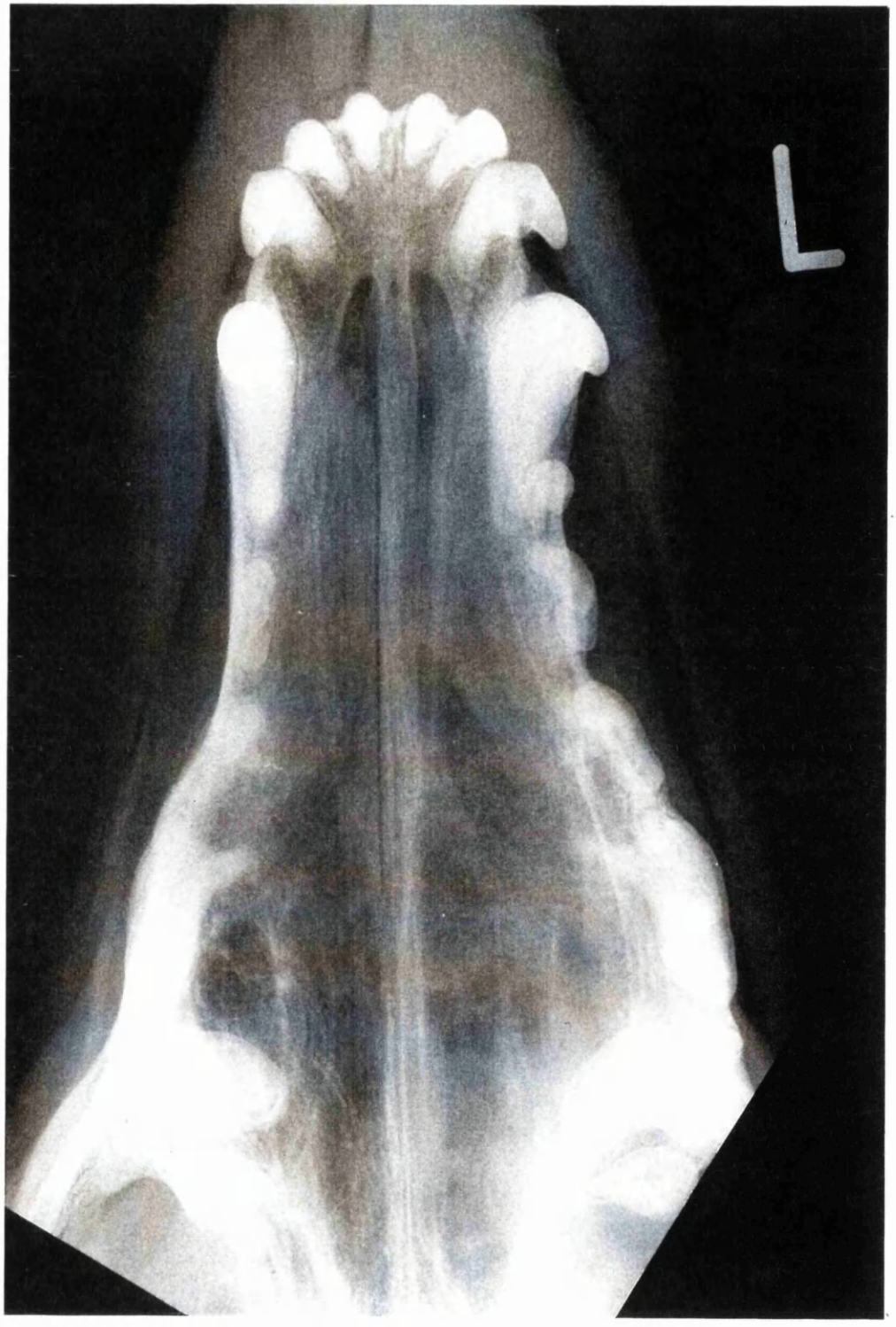

Fig. C1.2. Dorsoventral intraoral view of the nasal cavity. There is widespread turbinate loss in the left nasal cavity with a mixed pattern of ill-defined and patchy areas of increased density particularly caudally. A reduction in turbinate pattern is noted in the caudal half of the right side.

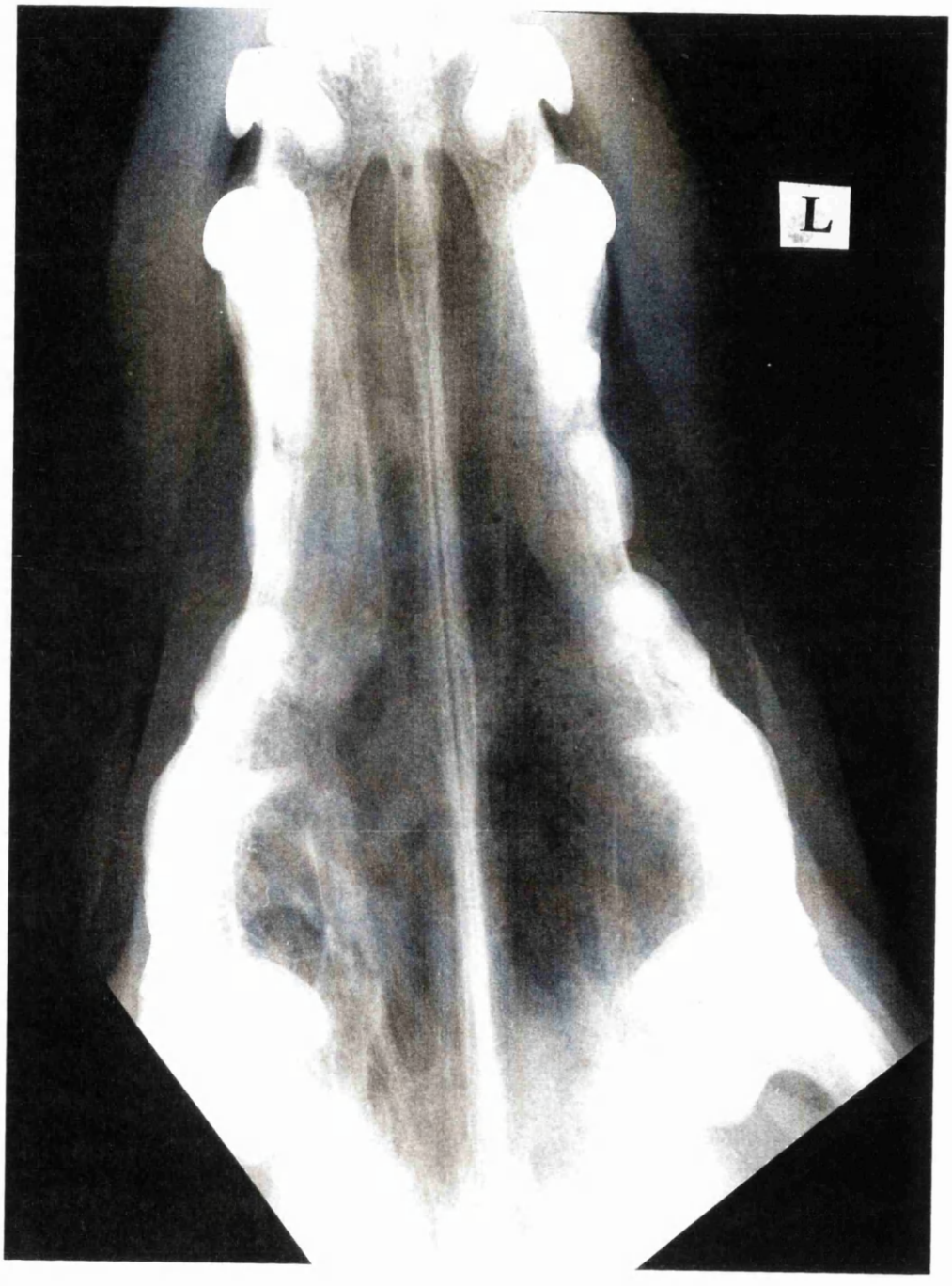

Fig. C1.3. Dorsoventral intraoral view of the nasal cavity. Extensive turbinate destruction is shown in the left nasal cavity resulting in mixed density pattern with more radiolucency in the rostral part. On the right side focal areas of increased density is shown centred on cranio-medial part of the carnassial tooth.

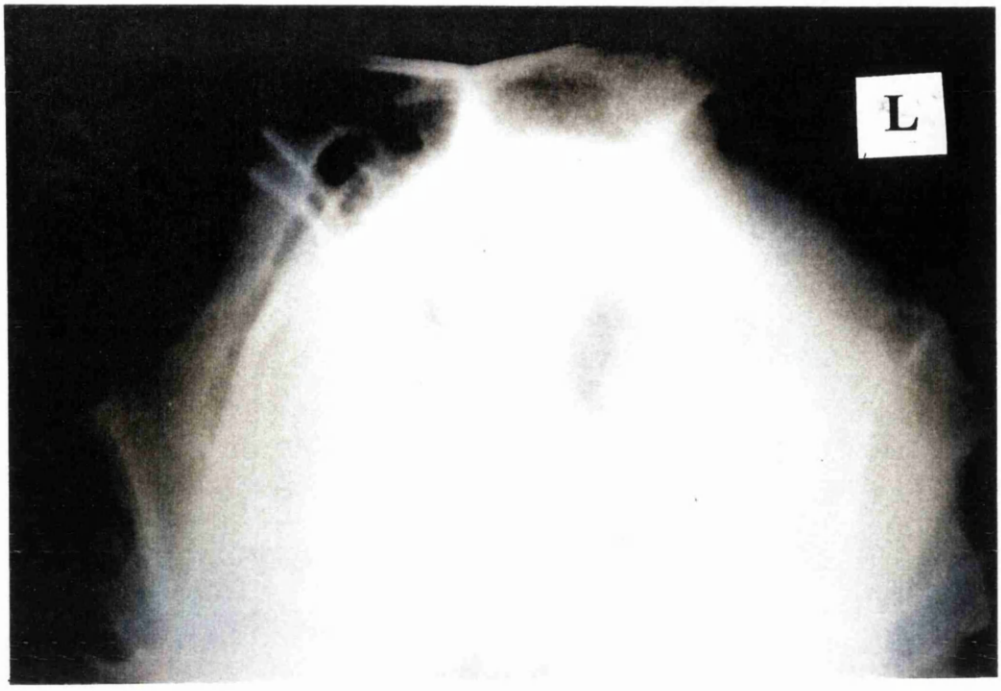

Fig. C1.4. Rostrocaudal view of the frontal sinus. An increase in radiopacity is present in the left frontal sinus.

Discussion

Previous reports of nasal aspergillosis in the dog have shown that there is a preponderance of young dogs (Sullivan 1987a, Sharp 1989, Sharp and others 1991a), and in some reports a predisposition amongst the Collie type (Lane and others 1974, Barrett and others 1977, Sharp and others 1991a). Thus, based on previous reports this case was typical age, and although the Collie breed was unusual in being a Rough Collie a breed not previously noted as being prone to nasal aspergillosis.

The presence of lymphopaenia has been reported in dogs with nasal aspergillosis even though no explanation was forwarded about the relationship of the abnormality to the fungal disease process (Barrett and others 1977, Harvey and O'Brien 1983, Sharp and others 1991a). Products of *A. fumigatus* have been stated to inhibit lymphocyte transformation of both **B** and **T** cells *in vitro* (Chaparas and others 1986). Barrett and others (1977) and Sharp and others (1991a) have recorded lymphopaenia before treatment and they also found it persisted in some cases after therapy. In this dog the lymphocyte count returned to normal after completion of treatment. The presence of lymphopaenia during the first two weeks of treatment period may suggest the presence of lymphopaenia before therapy, as it is unlikely that therapy would supress lymphocyte production so quickly. Thus, the presence of lymphopaenia before treatment and its absence after therapy as it occurred in this dog and as reported elsewhere (Barrett and others 1977, Sharp and others 1991a), it seems that the fungus can be incriminated in causing immuno-suppression.

The quoted incidence of ketoconazole-associated hepatic injury is low in man (Lewis and others 1984). Although, there was no information on liver function tests carried out before treatment, patients receiving other known hepatotoxic drugs and with previous hepatic dysfunction were not included in the study. The mean age of the patients was 54.2 years. The clinical and biochemical features associated with hepatic injury reported were anorexia, malaise, nausea and vomiting and increased serum alkaline phosphatase, alanine and aspartate aminotransferases. However, the clinical and biochemical abnormalities were found to be reversible after discontinuation of the drug. Similarly, in the dog, anorexia, vomiting, and a transient rise in serum alkaline phosphatase and alanine aminotransferase were observed (Sharp and others 1984, Sharp and Sullivan 1989). In this case the same pattern of hepatotoxicity was noted. Whilst changes are reversible careful clinical and biochemical supervision of patients taking ketoconazole are essential to avoid serious reaction especially in patient with previous liver disease and older patients.

The use of enilconazole administered topically through tubes surgically implanted into the frontal sinus alone or with systemic ketoconazole are treatment strategies currently used against intranasal aspergillosis. Although, treatment using topical enilconazole has been found an effective treatment, failure was also reported in a few number of dogs (Sharp and others 1993). Inadequate drug distribution and drug resistance were stated as the causes of treatment failure. In this case, the first treatment with enilconazole alone resulted in failure. Since the involvement of the frontal sinus was not ascertained the tubes were only placed in the nasal cavity. As a result topical flushes could not bathe the frontal sinus, thus fungal infection of the frontal sinus could be one reason for treatment failure. Another reason might be an advanced invasion of the nasal tissue that might shelter the fungal element from medication. The topical antifungal agent enilconazole, kills the fungus by acting directly on the fungus itself. While the oral antifungal agent ketoconazole, provides an even distribution of the drug -to kill the fungus it must pass through the nasal or frontal sinus mucosa. Thus, the use of both drugs seems beneficial especially in those cases with extensive invasion to achieve a maximum effect.

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Bronchiectasis in a Dog

Introduction

Conditions that cause chronic respiratory disease in dog have been reviewed by Wheeldon and others (1977) and Brownlie (1990), and included chronic bronchitis, non-specific chronic tracheobronchitis, bronchopneumonia, eosinophillic bronchitis, bronchiectasis, filariasis, bronchial foreign body, primary and secondary lung tumors, actinomycotic infection, and tuberculosis.

Chronic bronchitis in dog is defined as a chronic or recurrent excessive mucus secretion in the bronchial tree not attributable to other lung disease, and is manifested clinically by coughing occurring on most days of at least two consecutive months in the preceding year (Wheeldon and others 1974). The exact cause of the disease is not known. However, in man it is assumed to be multifactorial in nature and is associated with chronic exposure to atmospheric pollutants. Additionally, the involvement of previous episodes of viral bronchitis especially in childhood, and superimposed bacterial infection have also been implicated (Amis 1989). In the dog, the condition is recognised particularly in middle-aged or older dogs of small breeds, such as terriers and poodles (Wheeldon and others 1977).

The main clinical sign associated with chronic bronchitis is a chronic intractable cough of insidious onset (Wheeldon and others 1974). Treated animals show varying periods of remission followed by exacerbation, which may be linked to a change in weather (Amis 1989). Coughing may be unproductive, resonant, dry, harsh, or hacking occurring in paroxysms, which is easily elicited by tracheal palpation, excitement, or exercise. Early morning or nocturnal productive moist cough followed by gagging can also occur. Exercise tolerance is limited by coughing bouts and severe airway obstruction, collapse following paroxysmal coughing is rare (Amis 1989).

Peribronchial thickening is a feature that can be visualised as annular and parallel linear opacities on plain film radiographs (Wheeldon and others 1977). The main features of bronchoscopic examination are diffuse airway inflammation with hyper-secretion and thick tenacious mucus found in sticky strands or small plaque-like accumulations, coupled with roughening of bronchial mucosa (Amis 1989).

According to Moulton (1978) the overall frequency of primary lung tumors among dogs examined post-mortem in various veterinary establishments around the world was 1.24%. However in a later publication, Moulton and others (1981) found an

increase of lung carcinomas by about 100% during the last 20 years. This was explained by the increase in the average life span of dogs over the same period (Nielsen 1983). Among the domestic animals lung tumors occur most frequently in the dog (Wheeldon and others 1977).

Canine lung tumors resemble those of man but there are marked differences in the proportion of each histological type between the two species (Wheeldon and others 1977). Adenocarcinoma of the bronchus is the most common form of primary lung tumor in the dog (Wheeldon and others 1977, Brownlie 1990), this is in contrast to the situation in man, in whom there is a large proportion of epidermal and anaplastic tumors, which are linked to cigarette smoking (Stunzi and others 1974). The predominant presenting signs recorded were coughing accompanied by haemoptysis, inappetance, weight loss, decrease in exercise tolerance, and dyspnoea or tachypnoea (Barr and others 1986). On the other hand, absence or infrequent occurrence of cough has been mentioned (Wheeldon and others 1977).

Bronchiectasis is characterised by an irreversible bronchial dilatation caused by destruction of the elastic and muscular components of the bronchial wall (McKiernan 1983). The dilatation may be localised (saccular), or extend down the air way (cylindrical) (Hawkins and others 1989). The saccular form of the disease results in circumscribed bronchial wall out-pouching that are separated by inflamed or indurated portions of the lung. Cylindrical bronchiectasis is the most common form of the disease in the dog and is characterised by tubular dilatation affecting, primarily, the third to fifth generation bronchi (Myer and Burt 1973).

Persistent cough of long duration that eventually becomes productive has been reported as the typical presenting sign (Archibald and others 1955, O'Brien and others 1966, Myer and Burt 1973, Wheeldon and others 1977, Brownlie 1990). Recurrent pyrexia with signs of respiratory tract infection, anorexia, and debilitation with exercise intolerance and crackling respiratory sounds are features of the advanced disease (Nelson 1993). Similarly, in man productive cough is one of the classic symptoms of bronchiectasis, except in diseases of the apical and caudal segments of the upper lobes that are well drained by gravity (Bradford and DeCamp 1966). In those cases with extensive destruction of the lung or associated pulmonary or cardiac disease dyspnoea, recurrent fever, anaemia, fatigue, and anorexia are further signs that may be found (Bradford and DeCamp 1966).

Case Report

Case details

A 3.5-year-old male Rottweiler was referred with a three week history of frequent coughing, breathing difficulty, and anorexia. On presentation additional complaints included lethargy, marked weight loss, and "blood-shot" eyes with slight ocular discharge. Only slight improvement had been observed after three weeks of antibiotic treatment.

Clinical findings

At presentation, there was marked abdominal effort on expiration, flaring of the nostril and hyperaemic conjunctiva. On auscultation, there was audible expiratory noise manifested by crackles on both sides of the chest, which was worse on the left side. Tachypnoea (52/minute) was also noted. The body temprature was normal.

Diagnostic aids

Radiography

Lateral and dorso-ventral chest x-rays were taken. Initially, the findings were of a diffuse, fluffy and patchy increase in opacity throughout the cardiac and caudal lung fields. On the second presentation, similar changes were present, and additionally there were several dilated lucent areas situated in the caudo-ventral lung field (Fig. C2.1).

Bronchoscopy

A flexible paedatric gastroscope was used to examine the bronchial tree. The bronchi were plugged with inspissated cheese-like material around which fluid pus was forced during respiration (Fig. C2.2). β-haemolytic *E. coli* were isolated from bronchial washing.

Haematology

The total white blood cell count was 18,000/μl and differential count revealed an eosinophilia of 3800/μl.

The diagnosis of bronchiectasis was confirmed during the second presentation.

Treatment

Initially the dog was treated with antibiotics but only very slight improvement was obtained. Then after the diagnosis was confirmed, a decision to perform pneumonectomy was made.

Routine general anaesthesia for thoracotomy was performed. A muscle relaxant (atricurium) was given after induction to permit control of ventilation. Intermittent positive pressure ventilation at 12 breaths per minute was started after induction of anaesthesia. The left thorax was surgically prepared and the dog was placed in right lateral recumbency with the forelimbs pulled cranially. The surgical site was isolated with sterile drapes and then a curved skin incision was made along the fifth intercostal space after counting the ribs cranio-caudally. The incision extended from just below the vertebrae to a point above the costochondral junction. The fifth intercostal space was confirmed by counting the space again under the skin. The latissmus dorsi muscle was divided parallel to the intercostal space and the scalenus muscle was transected perpendicular to its fibres. The serratus ventralis muscle was transected in order to expose the intercostal muscles. After incising the intercostal muscle the pleura was entered first by making a small hole using a reversed scalpel blade to allow the lung to collapse. Moist swabs were packed along the incision and Gosset retractors were applied to facilitate exposure of the lungs by forcing the ribs apart. Both the cranial and caudal lobes were found to be consolidated, with the caudal lobe more severely affected. First, the cranial lobe was exteriorized and the root of the lobe was placed between a linear stapler (Ethicon) and two rows of staples were applied to ligate the blood vessels and bronchus. The lobe distal to the staples was cross-clamped to prevent leakage and excised between the clamp and staples. The same procedure was carried out on the caudal lobe. The thoracic cavity was then filled with warm saline to test for air leaks from the staple line. A chest drain made from redundant drip tubing was placed in the pleural space to evacuate residual air and fluid following surgery. The drain was placed two ribs spaces caudal to the incision and it was passed through a skin incision made in the dorsal third of the eighth intercostal space. Bupivacaine was injected to block the intercostal nerves. The ribs were apposed with 3.5m polydioxanone using a preplaced simple interrupted suture pattern placed round the ribs on either side of the incision. The muscle were closed in two layers with simple continuous 3m polyglactin 910. The subcutaneous tissue was closed using the same type of suture material and pattern. Simple interrupted pattern was placed to appose the skin using monofilament (3m) nylon. The drain was anchored to the skin. The thoracic cavity was drained of air or fluid once the muscle layer was sutured. The excised lung was sent for histopathological examination.

The dog recovered in the intensive care unit to allow for observation and management of the chest drain, to monitor pulse, respiratory pattern and colour. One hour after the end of the operation 60ml of air was withdrawn, but four hours later nothing was aspirated and thus the drain was removed. Laboured breathing and variable respiratory rate were present while the dog was in the intensive care unit and during the hospitalisation period.
Intravenous fluids (Hartman's solution) and antibiotics (potentiated sulphonamide) were started during the operation. The fluid was continued for 24 hours post operatively. The antibiotics and carprofen were given throughout the period of hospitalisation (6 days). The dog was discharged with the same antibiotics.

Histopathology

Microscopic examination confirmed the presence of severe bronchiectasis in both lobes. There was destruction of larger bronchial walls with cartilage loss and a massive cellular infiltrate, dominated by eosinophils. A mixed infiltrate that also contained many eosinophils was present in the bronchial lumina. Foci of more typical exudative pneumonia around small bronchioles were present.

Follow-ups

Two weeks after surgery the dog was returned for suture removal, he was eating well and doing fine. One week later he was brought with a history of difficulty of breathing, and coughing. Clindamycin hydrochloride and prednisolone were prescribed. One month post-operation the owner reported improvement and a chest x-ray also showed improvement in the lungs. The same treatment was prescribed. Three months after surgery further improvement had not occured, he was reluctant to exercise and was coughing, however the appetite was good. The dose of predninsolone was reduced from 8 tablets per day to 5 tablets. A month later the dog was doing fine, with only little coughing, good appetite, and gaining some weight. During this time prednisolone was reduced to 3 tablets per day and he was on the same antibiotics.

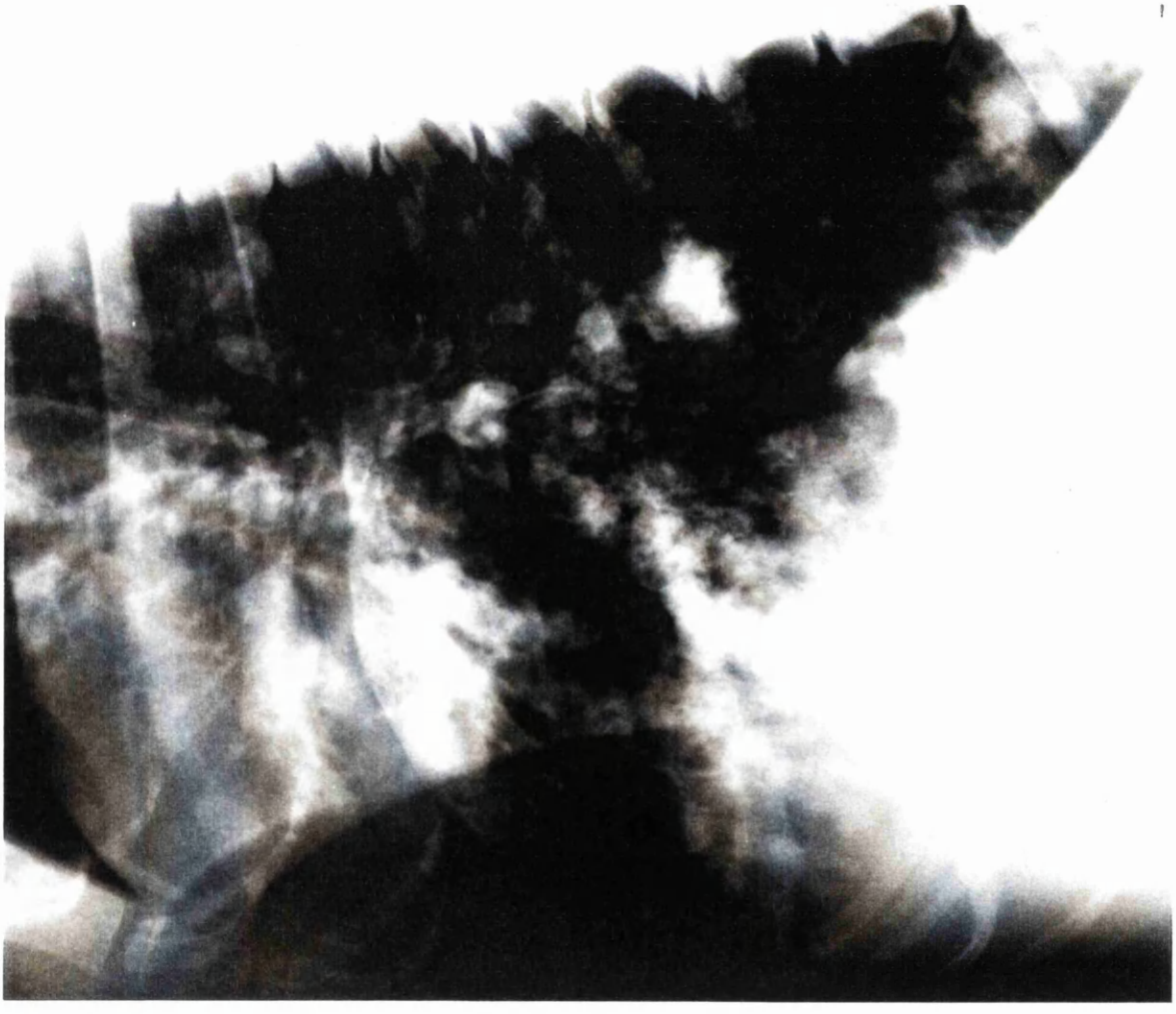

Fig. C2.1. Lateral thoracic radiograph. There is diffuse increase in soft tissue density throughout the cardiac and diaphragmatic lung lobes, with air-alveolograms due to bronchopneumonia. There are several dilated and truncated bronchi visible.

Fig. C2.2. Bronchoscopy. Cheese-like material is shown emerging from the bronchus.

Discussion

This dog had bronchiectasis and bronchopneumonia involving the left lung, and the same but milder changes on the right lung. Bronchiectasis has been reported to occur as a sequel to a large number of pulmonary diseases, and as a congenital disease in man and in the dog. In man, bronchiectasis has been reported to occur following bronchopneumonia, tuberculosis, pulmonary abscess, foreign body, and tumor and occasionally as a congenital lesion due to abnormality of the bronchial tree (Bradford and DeCamp 1966). Similarly in the dog both the acquired and the congenital form of the disease were reported (Archibald and others 1955, O'Brien and others 1966, Myer and Burt 1973, Randolph and Castleman 1984, Hoover and others 1989, Brownlie 1990). Non-responsive tracheobronchitis or pneumonia were found to be the predisposing causes of bronchiectasis (Archibald and others 1955, O'Brien and others 1966, Myer and Burt 1973, Brownlie 1990). Bronchiectasis associated with allergic bronchitis/eosinophlic bronchitis has been reported (Myer and Burt 1973, Brownlie 1990). Randolph and Castleman (1984) and Hoover and others (1989) found the congenital form of the disease associated with abnormal functioning of the cilia, with sinusitis and bronchiectasis, and bronchiectasis and lobar pneumonia, respectively. Similarly, chronic cough associated with Kartanger's syndrome characterised by a triad of clinical signs consisting of rhinosinusitis, bronchiectasis, and *situs inversus* (partial or complete reversal or organ placement within body producing an anatomical mirror image of normal) has been reported (Foodman and others 1989). In this dog the absence of previous respiratory disease and the age of the animal may suggest a congenital form. On the other hand, the absence of the other disorders associated with abnormal functioning cilia may suggest an acquired disease. Thus, based on the eosinophilic infiltration of the bronchial wall, and the history of a good response to corticosteroids therapy, an allergic condition is the most probable initiating cause.

Productive cough has been mentioned as a major clinical sign of the acquired form of bronchiectasis (Archibald and others 1955, O'Brien and others 1966, Myer and Burt 1973, Brownlie 1990). Clinical signs mainly observed in the advanced disease are dyspnoea, anorexia, and weight loss (Nelson 1993). The other clinical signs reported in bronchiectasis associated with allergic bronchitis included sneezing, pruritis, vomiting, diarrhoea and conjunctivitis (Brownlie 1990). The clinical feature of congenital bronchiectasis are variable. Randolph and Castleman (1984) Edward and others (1989) found chronic purulent nasal discharge since birth in two pups, whereas Hoover and others (1989) reported chronic cough and progressive dyspnoea in a two year old dog. On the basis of the previous descriptions the clinical findings in this dog fit more with the acquired form of the disease and the presence of conjunctivitis would support an allergic condition.

Bronchiectasis can not be diagnosed on the basis of historical and clinical information. Radiography is essential to the diagnosis as the signs of persistent cough of long duration are only suggestive of chronic lower respiratory disease and are not specific (Archibald and others 1955, Myer and Burt 1973, Wheeldon 1977, Brownlie 1990). Plain chest radiographs were stated as useful only in the advanced stage of the disease, as in the early stage non-specific radiographic features of peribronchial inflammation or fibrosis were noted (Myer and Burt 1973). Kneller (1986) reported radiographic findings included lack of the airway wall to appear parallel, loss of the normal gentle taper and consolidation distal to the bronchus. Increase in diameter of the airway lumen was mentioned (Hawkins and others 1989). Similarly, in this case bronchiectasis was not evident on plain film at first presentation instead bronchopneumonia was the diagnosis. But on the second occasion the diagnosis of bronchiectasis was confirmed using plain chest radiography. This might be because of the advancement of the disease process. The radiographic findings of this case were similar with the previous reports, except the more generalised nature of pulmonary tissue involvement.

As the disease is uncommon and the interpretation of the radiographs can be difficult bronchography has been used to diagnose early or mild lesions (Myer and Burt 1973). Not only will bronchography highlight the dilated bronchi it will also allow delineation of the extent of involvement (Myer and Burt 1973). In addition this method of examination allows the differentiation of the saccular and cylindrical form of bronchial dilatation. However, bronchography has largely been supplanted by bronchoscopy with the introduction of flexible fibreoptic endoscopes as judged by the paucity of recent articles relating to bronchography in the veterinary literature.

Bronchiectasis may result from any disease process that causes weakening or destruction of the bronchial wall and affects primarily the third to fifth generation bronchi (Myer and Burt 1973). Dilation of the bronchus secondary to weakening of its elastic or muscular support favours mucus retention. The resulting mucus accumulation greatly increases the susceptiblity of the lung to secondary infection. Myer and Burt (1973) reported radiographic evidence of secondary pneumonia manifested by diffuse alveolar infiltration and visualisation of multiple bronchograms. Similarly, in this dog bronchopneumonia was apparent during the first and consecutive visits and may have cause some masking of the bronchiectatic changes on the intial radiographs.

Lobectomy of the affected lobes is the definitive treatment in patients with one or two involved lobes, and continuous monitoring of the remaining lobes and intense

medical management of respiratory infection is recommended to prevent recurrence (Nelson 1993). Excision of an entire left lung is tolerated where there is a healthy right lung because the right lung is larger than the left (Nelson 1993). In man, pulmonary resection has been used in those patients in whom disease progresses despite medical treatment (Dogan and others 1989). Conversely, in the dog due to the generalised nature of the disease, surgical excision has been stated feasible only in those cases showing localised lesions (Myer and Burt 1973). Hence, the prognosis of this case was presumed to be guarded due to the involvement of the right lung, but fortunately this dog was doing fine except occasional coughing and some degree of exercise intolerance. This may be due to the suppression of eosinophilic infiltrate with corticosteroid therapy.

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Traumatic Diaphragmatic Rupture in a Dog

Introduction

Diaphragmatic defects are the most commonly encountered diaphragmatic disorders in the dog and cat (Park 1986) and, as in man, may be of congenital or traumatic origin. Those that are congenital are termed hernias and those that follow trauma are called ruptures. In the dog and cat ruptures are relatively common, whilst congenital hernias are seen infrequently (Wilson and others 1971, Carb 1975).

According to some studies, trauma in the dog and cat can be implicated in 75% of all clinical cases (Kolata and others 1974). The majority of diaphragmatic ruptures in dogs and cats are caused by blunt abdominal trauma, usually as a result of impact with a motor vehicle (Carb 1975, Kolata and others 1975, Garson and others 1980, Boudrieau 1990). Other reported causes of diaphragmatic ruptures are dog fights, kicks, and falls (Boudrieau and others 1987). The underlying pathophysiology is thought to be a sudden increase in intra-abdominal pressure coupled with an open glottis leading to a tear in the diaphragm (Boudrieau 1990).

Congenital diaphragmatic hernias develop when the ingrowing folds of the diaphragm fail to fuse (Levine 1987). This type of hernia can range in size from a small defect to complete absence of the diaphragm (Carb 1975). In the dog and cat, congenital diaphragmatic hernias include pleuroperitoneal, hiatal or peritoneopericardial hernias (Barrett 1966). The most commonly described type has been the peritoneopericardial hernia (Bolton and others 1969, Levine 1987). The possibility of a congenital defect in the diaphragm predisposing to an acquired diaphragmatic hernia has been suggested (Carb 1975, Wilson and others 1971).

The predisposition of young male dogs to traumatic diaphragmatic ruptures has been widely reported (Brodey and Sauer 1964, Wilson and others 1971, Kolata and others 1974, Garson and others 1980, Boudrieau and others 1987).

The only consistent clinical sign is an altered breathing pattern due to compromised respiratory function that is exacerbated by stress (Stockholf 1986, Boudrieau 1990). Stockholf (1986) reported dyspnoea and exercise intolerance in 38% of victims. Other clinical signs reported were adoption of a sitting position with elbow abduction and head extension, vomiting, diarrhoea, constipation and dysphagia (Johnson 1993). Depression, weight loss and difficulty lying down have been less commonly reported (Stockholf 1986). Since the abdominal organs can move in and

out of the thoracic cavity, clinical signs may be intermittent (Carb 1975, Garson and others 1980).

The location of the defect can be quite variable. Right-sided diaphragmatic tears were observed as frequently as left-sided tears, and bilateral tears have been reported (Wilson and others 1971, Garson and others 1980). Tears have been classified into three types; namely circumferential, radial or a combination of the two as 'T' or 'Γ' shaped tear (Sullivan and Reid 1990). The most commonly herniated organs on the left-sided rupture were stomach, spleen or small intestine, while liver lobe or lobes and small intestine were found on the right-sided ruptures (Garson and others 1980).

The diagnosis of traumatic diaphragmatic rupture depends on the evaluation of clinical signs, physical examination, a history of traumatic insult, and radiography. Farrow (1983) stressed the importance of radiographic examination in confirming the diagnosis. Fagin (1989) recommended that survey radiographs should be carried out of on any animal that has been struck by an automobile.

Surgery is considered as an emergency in acutely injured animals with dyspnoea, cyanosis, and respiratory distress in those cases with massive herniation and possible organ entrapment (Carb 1975, Boudrieau 1990). However, pre-operative assessment of cardiopulmonary function and stabilisation of these parameters are crucially important, since simple re-establishment of diaphragmatic continuity is of minimal concern (Boudrieau 1990).

Case Report

Case details

A 7-year-old female Springer Spaniel was presented to GUVH with a one week history of hind limb discomfort, reluctance to exercise, increased panting, hyperpnoea, and coughing. There was a history of a possible traumatic incident three months previously.

Clinical findings

The dog adopted a sitting position and panted excessively. On auscultation, there was muffling of the heart sounds, and no respiratory sounds were evident except over the dorsal lung fields.

Diagnostic aids

Radiography

Lateral and dorsoventral thoracic radiographs and lateral abdominal radiographs were obtained. Lateral and dorsoventral thoracic films showed an obscured cardiac shadow. The lateral thoracic film, additionally, showed obscured diaphragmatic line, a number of loops of intestine extending ventrally along the thorax, a triangular soft tissue structure probably spleen. In addtion, a large viscus filled with very mottled content wedged between the heart and diaphragm represented the stomach (Fig. C3.1). Absence of the hepatic and gastric shadows was evident on the lateral abdominal radiograph.

The history, clinical examination findings were indicative of traumatic diaphragmatic rupture, this was confirmed by radiography.

Treatment

Intravenous fluid therapy was initiated a day prior to surgery. Routine general anaesthesia used for thoracic surgery was carried out. To facilitate oxygenation of the patient positive pressure ventilation was instituted immediately after intubation.

A ventral midline laparotomy from the xiphoid to just caudal to the umbilicus was carried out. The edges of the linea alba were drawn apart and held by self-retaining retractors. Examination of the diaphragm revealed a radial tear on the right side, through which abdominal contents had herniated. Adhesions were present between the caudal half of the spleen and the edge of the defect. These were broken down by blunt dissection. The defect was enlarged to allow retraction of the herniated organs. The intestines and part of the spleen were the only herniated organs. Before closure the lungs were inspected to check for lobe torsion. The defect was sutured by starting from the most dorsal portion and proceeding to the costal area. The suture material used was 3m polydioxanone in a horizontal mattress pattern. At the owners request the bitch was also speyed. Abdominal closure was routine.

Residual air and fluid were removed from the chest to allow full expansion of the lung lobes. This was done by using an intravenous catheter and 3-way tap placed through the 8^{th} intercostal space. Aspiration removed 200 ml of air from the thorax.

Follow-up

Post-operatively the dog was monitored in the intensive care unit. Four hours post-surgery the dog became dyspnoeic and cyanotic. A chest radiograph showed a severe pneumothorax (Fig. C3.2). About 700 ml of air was drained using an

intravenous catheter. The dog become stable after 24 hours. Amoxycillin trihydrate 250 mg twice daily for 5 days and carprofen 2mg/kg three times daily for 3 days were prescribed. Three months after the operation the dog showed no residual respiratory abnormalities.

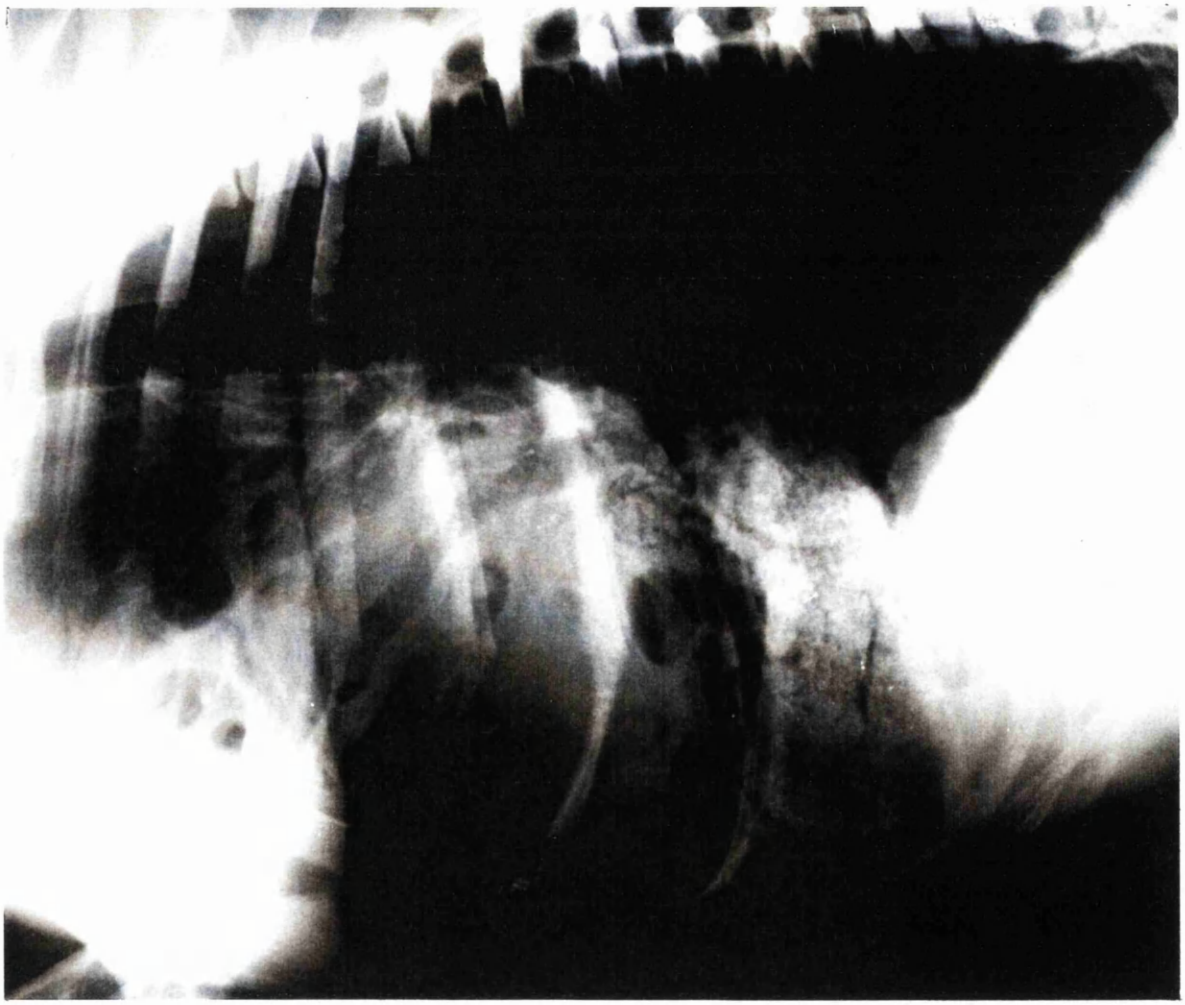

Fig. C3.1. Diaphragmatic rupture. Lateral thorax. The diaphragmatic line is obscured. There are loops of bowl extending ventrally along the thorax, triangular soft tissue structure caudo-ventrally and viscus filled with mottled content wedged between the diaphragm and the heart representing the stomach.

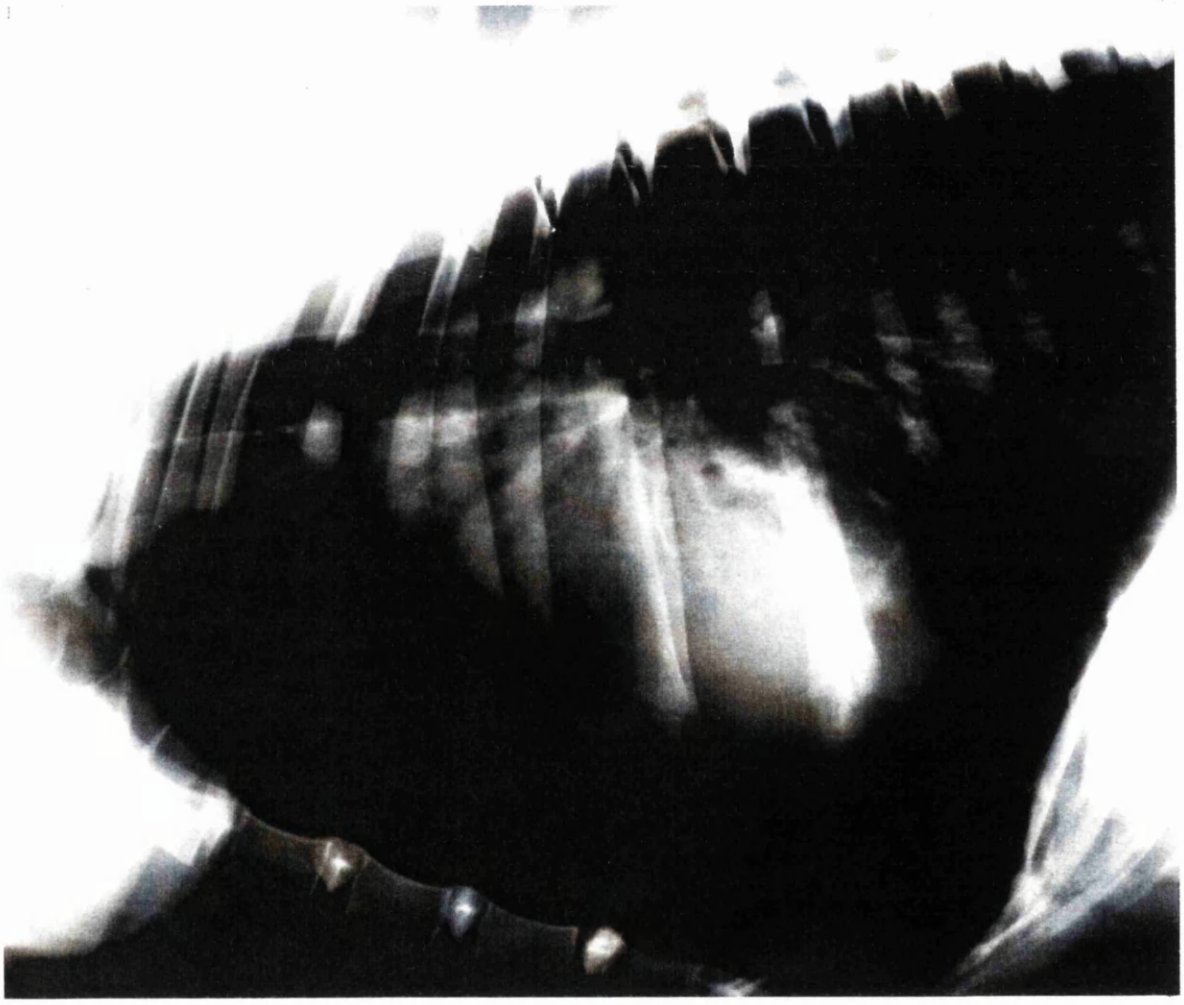

Fig. C3.2. Pneumothorax. Lateral thorax four hours post-operation showing air in the thoracic cavity. The findings are displacement of the heart from the sternum, increased radiolucency of the thorax at the periphery, and separation of the lung edges from the vertebral column and the diaphragm.

Discussion

The presenting signs of long-standing diaphragmatic hernia suggests chronic respiratory disease, with intermittent cough and exercise intolerance (Levine 1987). The gap between the possible traumatic incident and presentation demonstrates the difficulty in using history to narrow the possible cause of this problem. However, the abnormal posture observed was more suggestive of an acute condition (Carb 1975). One plausible explanation for this apparent discrepancy is the presence of a defect through which initially little abdominal contents have passed, or where the volume of abdominal organs in the thorax is variable due to to-and-fro movement.

Clinically, important findings of muffled respiratory and heart sounds were present in this case, as have been reported previously (Garson and others 1980, Stockholf 1986, Johnson 1993). Other clinical findings reported included hypo-resonance on chest wall percussion as a result of pleural effusion, hyper-resonance due to gastric tympany, the presence of intestinal sounds in the chest, and a tucked-up or empty appearance of the abdomen. The cause of muffled heart sounds in this dog would be as the result of organ displacement. However, physical examination can be unrewarding in some animals (Johnson 1993). Hence, the use of radiography is essential to reach at a diagnosis.

Plain radiography was enough to confirm the diagnosis in this dog. This could be due to the absence of excess pleural fluid, as it has been stated to affect the visibility of herniated organs and make differentiation of diaphragmatic hernia from hydrothorax or haemothorax difficult (Sullivan and Lee 1989, Boudrieau 1990). Loss of the diaphragmatic line and masking of the cardiac shadow are the most common radiographic findings (Sullivan and Lee 1989). Of the potential herniated organs the presence of gas-filled bowel loops in the thoracic cavity is particularly helpful in confirming the diagnosis (Boudrieau 1990). Other radiographic signs of diaphragmatic rupture are displacement of abdominal structures and radiographic evidence of trauma to other structures such as fractured ribs (Fagin 1989). Upper gastrointestinal contrast studies were helpful in making a diagnosis when plain radiographs were non-diagnostic (Sullivan and Lee 1989). Stickle (1984) mentioned the use of positive contrast peritoneography. The possibility of identifying a herniated organ using selective abdominal angiography has been described (Koper and others 1982). However, excessive and potentially dangerous manipulation of the animal or the use of anaesthesia during the contrast studies with the exception of the upper gastrointestinal contrast studies have pointed out as adding stress to the patient (Sullivan and Lee 1989). Evaluation of the diaphragmatic silhouette by ultrasonography has been mentioned as a safe, reliable

and useful technique (Boudrieau 1990). This method is particularly useful in animals with pleural effusion (Johnson 1993).

The surgical approach for repairing diaphragmatic defects depends on individual preference. However, the ventral midline laparotomy which offers visualisation of the entire diaphragm, the examination and evaluation of the abdominal organs is the preferred technique (Boudrieau 1990). The lateral thoracotomy via the 9th intercostal space is useful in chronic hernias where adhesions of the abdominal contents within the thorax are suspected. However, this approach require pre-operative knowledge of location of the hernia including knowledge that the hernia is not bilateral (Boudrieau 1990). The other disadvantage of this approach is that it does not allow inspection of the abdominal contents and results in more post-operative pain than laparotomy (Walker and Hall 1965). A paracostal approach was successfully used by Hulse (1975) but like thoracotomy the sides of diaphragmatic rupture must be determined before operation. Anatomic reduction and repair in both approaches is cumbersome and time consuming.

Incarceration, obstruction, and strangulation are the hazardous sequelae that may affect abdominal viscera following diaphragmatic rupture. The major effects on the liver following herniation are hepatic venous stasis, hepatic necrosis, and biliary tract obstruction. Fibrinolysis associated with congestion of the liver resulting in a decline in serum content of fibrinolytic inhibitors, apparently produced in the liver, has been reported in dogs with diaphragmatic rupture (Engen and others 1974). Elevation of serum enzymes used to assess liver function (transaminases and alkaline phosphatase) were detected in those cases where the liver was herniated (Garson and others 1980). Similarly, Schulman and others (1985) reported an increase in serum alanine and aspartate aminotransferase in congenital peritoneopericardial diaphragmatic hernia where the liver was one of the herniated organs. In this dog the liver was not found herniated in the thoracic cavity during the operation, however a marked increase (480iu/L) in serum alanine aminotransferase was observed. The movement of herniated organs in and out of the thoracic cavity could be the reason for the absence of the herniation of the liver.

In dog and cat, variable survival rate following surgical correction of traumatic rupture of the diaphragm has been reported. Walker and Hall (1965) achieved a 90.2% survival rate in 32 cases of diaphragmatic hernias. Wilson and others (1971) reported a 65.4% success rate. A 54.7% survival rate was obtained by Garson and others (1980). Recently, Sullivan and Reid (1990) reported a success rate of 90% in 60 cases. A marked improvement in success rate between the last two reports would be due to improvement in the management of patients before, during and

post-operation. The most common cause of death in dogs in the 24 hours period following surgery was as a result of pneumothorax that was occasionally complicated by haemothorax (Garson and others 1980). The cause of the pneumothorax has been suggested to be related with faulty technique of evacuation of gas from the thoracic cavity by the same authors. The placement of a tube chest drain before closure of the diaphragmatic defect allows complete evacuation of air from the pleural space and is preferable to using positive pressure ventilation to force intrathoracic air through a space left in the diaphragmatic wound (Boudrieau 1990). The use of indwelling tube drain was also shown to be superior to repeated needle aspiration (Boudrieau 1990). The cause of pneumothorax four hours post-operation in this dog could be related with the technique of evacuation of air from the thoracic cavity since an intravenous catheter after closure of the wound was used to drain air and fluid from the pleural space. Alternatively, the pneumothorax may have been surgically induced.

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Ectopic Ureter in a Bitch

Introduction

The normal ureter is a fibromuscular tube originating at the renal pelvis, extending to the bladder, and passing obliquely through the vesicular wall to terminate at the trigone. Ectopic ureter is a condition resulting from termination of one or both ureters at a site other than the trigone of the bladder. It may result from faulty differentiation of the mesonephric and metanephric ducts (Smith and others 1981). The exact cause of ureteral ectopia is not known, but maternal exposure to teratogenic agents has been suggested as a cause (Hays 1974).

In a small group study a female susceptibility was reported (Holt and others 1982). A later larger study showed significant female prevalence with a female:male ratio of about 20:1 (Howard and Hays 1984). Smith and others (1981) and Stone and Mason (1990) reported a similar sex predisposition.

In the United States a predisposition among Siberian Husky, Newfoundland, Bulldog, West-highland White terrier, Fox terrier, and miniature and toy Poodle breeds has been found (Howard and Hays 1984). On the other hand, in the United Kingdom, Holt and others (1982) reported a breed predisposition in the Golden Retrievers, Shetland sheep dog, Labrador, and Spaniel.

Smith and others (1981) and Dean and others (1988) found that 70-80% of ureteral ectopia is unilateral in dogs. Most ectopic ureters contact and enter the bladder wall normally, but lack a normal orifice at the trigone area of the bladder (Stone and Mason 1990). In some cases, the ureter remains completely extra-mural and by-passes the bladder before terminating in the urethra, vagina or uterus. Uncommonly, some are intramural with troughs, where the ureter enters the bladder wall, courses within the wall and opens into the bladder trigone in a normal location and then continues as a trough through the urethral sphincter area, or intramural with double openings, that has the same pathway as the intramural type, where the ureter opens in the typical location in the trigone and continues distally and has a second opening in the urethra or vagina (Stone 1990).

Other abnormalities of the urinary tract associated with ectopic ureter include hydroureter, hydronephrosis, cystic and renal hypoplasia, and ureterocoele (Lane 1973, Smith and others 1981, Holt and others 1982, Lapish 1985, Ross and Lamb 1990).

The main clinical presentation of ureteral ectopia is urinary incontinence. Dogs with ectopic ureter may show dribbling, in addition to normal voiding. In the male, the long urethra and strong external sphincter allows retrograde filling of the bladder, and normal voiding can be observed even in bilateral ectopia. Hence, the lack of urinary incontinence is given as the reason for the apparent low incidence in the male (Osborne and others 1975, Lennox 1978). Vulvar pruritis, vulvar eczema and excoriation of the peripreputial skin are also owner complaints (Lane 1973, Holt and others 1982). In addition, urinary tract infection is a common feature (Stone and Mason 1990).

Other reported causes of urinary incontinence are behavioural disorders, neurogenic disorders, cystitis, urethral obstruction, urethral incompetence, and hormonal imbalance (Faulkner and others 1983). However, ectopic ureter is the most common cause of urinary incontinence in the young female dog (Dean and others 1988, Stone and Mason 1990).

The recommended special radiological procedures for detection of ectopic ureters are excretory urography, urethrography, pneumocystography, fluoroscopy and combinations of these (Smith and others 1981, Holt and others 1982). Excretory urography has been reported to be the most useful procedure to diagnose ureteral ectopia, as it provides information about the renal parynchyma and pelvis, bladder size and distensibility, ureteral size and possibly ureteral termination (Faulkner and others 1983, Dean and others 1988). The termination point may be more easily visualised by combining excretory urography with negative contrast cystography, and by taking oblique radiographic views (Stone 1990). The presence of an abnormally straight uretero-vesical junction on the excretory urogram rather than the normal "J" shaped junction was considered to be diagnostic by Mason and others (1990). Renal pelvis dilation, irregular pelvic margins, shortened and blunted diverticuli, hydroureter, distal ureteral dilation and increase renal size are some of the changes associated with the disease (Dean and others 1988). Although, intravenous urography is an important diagnostic aid, visualisation of exact termination is difficult. Dean and others (1988) suggested the use of retrograde urography, cystography or vaginography to visualise ureteral reflux at the termination if the excretory urogram is not diagnostic. Additionally, Holt and others (1982) also advocated the use of a retrograde vaginogram contrast technique to demonstrate the distal insertion of ectopic ureters. The most reliable way to diagnose and identify the type of ectopic ureter is by examination of the urinary bladder and trigone through a ventral cystotomy (Rawlings 1990).

The treatment of choice is surgical intervention (Dean and others 1988). Based on the type of ectopia and termination different techniques have been described. Vesico-ureteral anastomosis with re-implantation is recommended for ureters that completely by-pass the bladder. Surgical correction of intramural ureters, require neostoma formation, and closure of the ectopic extension for intramural with double opening (Alaxander 1993). Ureteronephroectomy is considered when the ipsilateral renal segment is compromised and the contralateral kidney is functional (Lane 1973, Holt and others 1982).

Case Report

Case details

A one-year-old stunted Corgi was presented to GUVH with a four month history of constant dribbling of urine. The owner discovered the incontinence just after purchase. The bitch was also noted to be able to squat and pass small amounts of urine.

Clinical findings

There was ulceration around the vulva, wet perivulvar hair, and with a strong ammonical odour.

Diagnostic aid

Radiology

As for any routine contrast radiographic examination of the abdomen, the bitch was prepared by cleaning the colon and rectum with an enema 24 and 3 hours before the procedure. The examination was carried out under routine general anaesthesia. Preliminary lateral abdominal radiographs preceded contrast retrograde vaginography using meglumine iothalmate (*Conray 280,* May and Baker) at a dose rate of 1ml/kg body weight. The solution was injected through a male dog (10Fr) catheter placed in the vaginal vestibule, the catheter was filled with the contrast medium before insertion to avoid introducing air bubbles. The vulvar lips were clamped with Doyen bowel clamps to prevent leakage of the contrast. The exposure was made at the end of the injection. A diagnosis of left ectopic ureter, and intra-pelvic bladder was made (Fig. C4.1). Retrograde filling of the renal pelvis had occurred because of the inadvertent placement of the catheter in the ectopic ureter.

Treatment

Under routine general anaesthesia a standard ventral midline laparotomy was performed. Firstly, at the owners request routine ovariohysterectomy was carried out. After thorough exploration of the urinary system, the bladder was exteriorized and held with stay sutures to facilitate atraumatic tissue handling. Visual examination of the bladder trigone through ventral cystotomy further confirmed the diagnosis. Slight enlargement of the ectopic ureter was observed. The other ureter and ureteric orifice were checked and found to be normal. Then the ectopic ureter was dissected free, double ligated, and transected. After placing a stay suture, the ureter was dragged through an incision made in the dorsal bladder wall. The end of the ureter was excised, spatulated and sutured to the mucosa of the bladder using simple interrupted pattern with 1.5m polyglactin 910. The bladder wall was closed with the same suture pattern and material. The laparotomy was closed in a routine manner.

Intravenous fluid (Hartman's solution) was administered during operation, and continued for 24 hours post surgery. Dexamethasone 7mg and ampicillin 140mg was added to the drip and the ampicillin was continued for one week.

Follow-ups

The bitch was returned for post-operative examination after eight weeks. There was much improvement in the incontinence, this was confirmed by slight wetness of the vulvar hair and absence of ammonical odour. Retrograde vaginogram showed an enlarged ureter and intra-abdominal bladder (Fig. C4.2). Phenylpropanolamine 2mg/kg of body weight one times daily was prescribed to increase urethral resistance to urine flow since urethral sphincter abnormality was suspected as the cause of residual incontinence. An interview made four months after the initiation of phenylpropanolamine revealed that the bitch was showing improvement but complete control of urination had not been achieved.

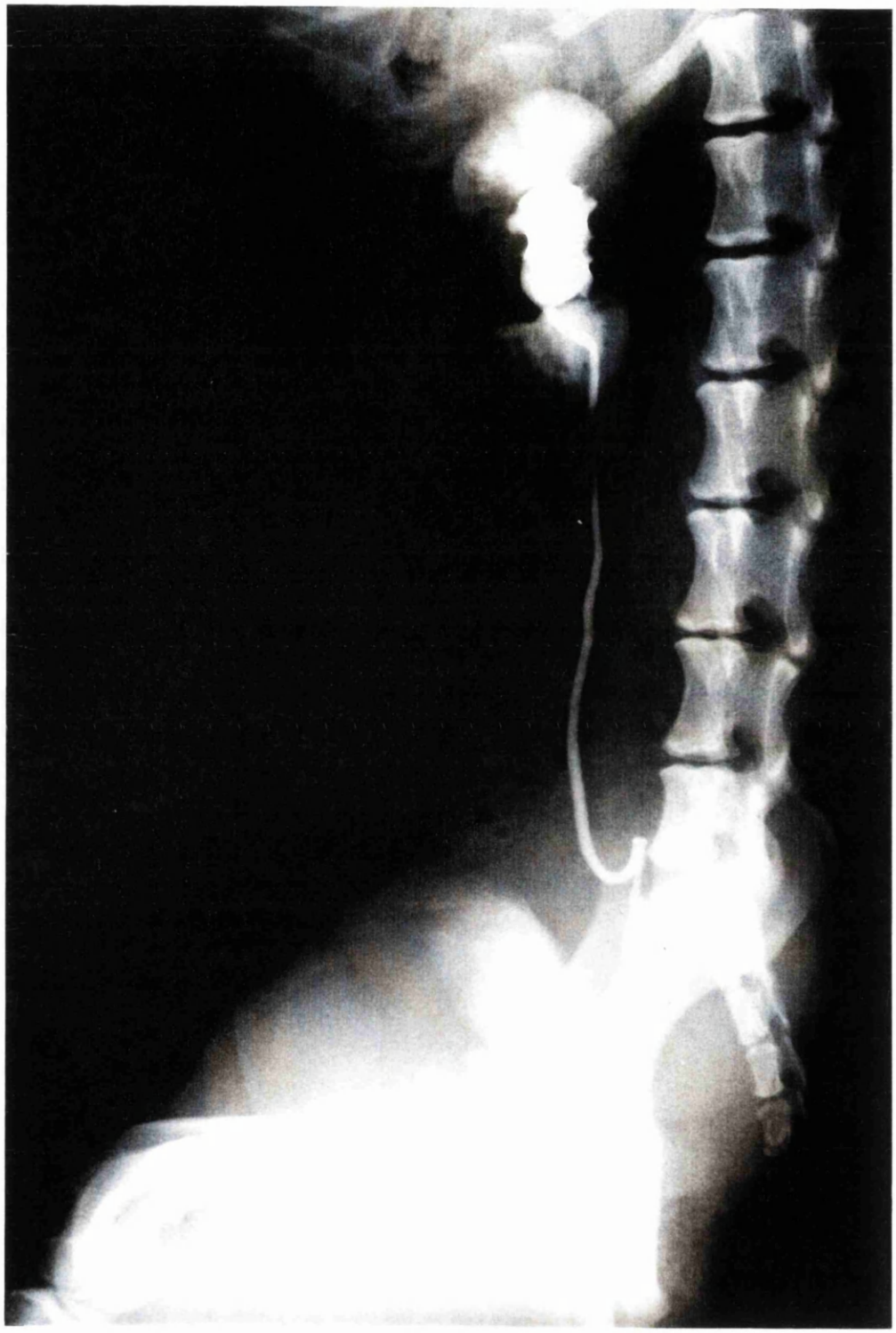

Fig. C4.1. Retrograde vaginogram. Lateral caudal abdomen of a one-year-old intact female Corgi showing retrograde filling of an ectopic ureter. Pelvic location of the caudal portion of the urinary bladder is also shown.

Fig. C4.2. Follow-up contrast study. Post-operative lateral caudal abdominal radiograph showing an enlarged ureter and normally placed bladder eight weeks after surgical correction of the ectopic ureter.

Discussion

Urinary incontinence in young bitches, with secondary scalding of urine in addition to normal voiding is a common feature of unilateral ureteral ectopia (Lane 1973, Owen 1973b, Holt and others 1982, Webbon 1982, Stone and Mason 1990, Tabar and others 1991). Normal passing of urine is due to the filling of the bladder from the normal ureter. Similarly, this case is presented with the typical signs of a unilateral ectopic ureter.

Since ectopic ureter is the result of an embryonic error, it is common to find other congenital abnormalities of the urinary tract that stem from the same basic error (Alexander 1993). Small under-developed and intra-pelvic bladders are some of the abnormalities associated with ureteral ectopia (Owen 1973a). Additionally, the lack of filling of the bladder as a result of ectopic ureter was also mooted as the cause of small under-developed and intra-pelvic bladder (Owen 1973b). Although, lack of filling of the bladder as a cause of intra-pelvic location is a feature of bilateral ectopia, it might be one reason for intra-abdominal location of the bladder between surgery and follow-up in this dog. The age of the animal during the first examination might be the other reason, although the significance of intra-pelvic bladder in the juvenile animal is a matter of debate.

Although, intravenous urography is indicated to confirm the presence of related disease in the kidneys, it was not carried out in this case because it was considered that the presence of hydronephrosis would not affect the decision to re-implant and is time consuming to carry out.

Retrograde filling of the ureter and renal pelvis occurred due to inadvertent placement of the catheter into the ureter instead of placing it into the vaginal vestibule. In addition to the length of catheter inserted, the catheter used was too large for the bitch. A small catheter (3Fr-5Fr) should have been used. These faults were due to the procedure being done by an inexperienced radiologist. However, Holt and others (1982, 1984) noted that retrograde filling of the uterine horn and ectopic ureter resulted in no ill-effects associated with the technique. Similarly, Leveille and Atilola (1991) found that there was minimal risk of pyelitis and other urogenital infection. The increase diameter of the ureter observed during surgery could also have been due to oedema as a result of trauma associated with the placement of the catheter in the ureter.

In order to assess the possibility of persistent hydroureter and to evaluate the functional anatomy of the repair, an excretory urogram should be carried out 5-6 weeks following surgery. Following surgical correction by neostoma formation and distal ureter segment ligation, improvement in ureter and bladder size and

compensatory renal hypertrophy have been reported (Mason and others 1990). Similarly, Holt and others (1982) and Ross and Lamb (1990) found a reduction in the degree of hydroureter. On the other hand, persistence of hydroureter either as a result of stricture at the implantation site or due to uretro-vesical reflux may occur (Holt and others 1982). These factors might explain the residual hydroureter in this bitch.

In many cases, urinary incontinence stops after corrective surgery, but occasionally incontinence continues even though surgery has successfully relocated the ectopic ureter (Rigg and others 1983). In the bitch, the prognosis for post-operative continence is associated with the site of termination and conformation of the ectopic ureter. The prognosis is better for patients with ureter terminating in sites other than the urethra because urethral sphincter abnormalities are common when the ureter terminates in the urethra (Faulkner and others 1983, Dean and others 1988, Stone and Mason 1990). Dogs having non-distended intra-mural ureter were more likely to be continent (Stone and Mason 1990). Urethral sphincter incompetence is often a component of congenital ectopic ureter and has also been implicated as a contributary cause of incontinence (Rigg and others 1983). Cystic hypoplasia has also been mentioned as a cause of post surgical incontinence (Waldrone 1984). In this bitch incomplete resolution of the problem occurred but no certain reason was found to explain this. However, urethral sphincter abnormality as a component of the congenital problem could be the reason for the continued incontinence.

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Recurrent Incisional Hernia in a Bitch

Introduction

Incisional hernias are acquired hernias formed when a surgically closed cavity disrupts (Smeak 1993a). They are the only ventral wall hernias that are truly iatrogenic and they represent a breakdown or loss of continuity of fascial closure. Acute incisional hernia generally occurs within the first seven days post-operatively, while chronic hernias may take weeks or years to develop or be noted (Smeak 1993a).

In man, incisional hernias after abdominal operation have been reported to occur in between 2 and 11% of the cases (Santora and others 1993). In the horse, a 15% incidence have been reported following laparotomies (Gibson and others 1989). However, in small animals incisional hernia occurrence is less common (Smeak 1993a).

In the human patient the most important factors in the genesis of primary incisional hernia are associated with surgery, and include improper surgical technique, haematoma formation, wound infection and post-operative pulmonary complications. Obesity, diabetes mellitus and the use of steroids are some of the accessory factors (Larson and Vandertool 1984, George and Ellis 1986). In the equine, factors that had significant association with the development of incisional hernia after midline laparotomy were incisional drainage, use of gut suture for linea alba closure, previous abdominal surgery, post-operative leukopaenia, excessive incisional oedema and post-operative pain (Gibson and others 1989). In small animals incisional hernia results from either excessive force acting on the abdominal incision due to vigorous uncontrolled activity, violent coughing, or straining post-operatively, or poor holding strength of the sutured wound (Smeak 1993a).

The most common site for abdominal incisional hernia in man is the midline (83%), and lower midline incisional hernias have a higher, but not significantly higher, recurrence rate compared with upper midline, and other than midline incisional hernias (Hesselink and others 1993). The high incidence of lower midline hernia was explained by the great number of operations performed through lower midline incisions, and also partly by gravity, the effect of which is greater in the lower part of the abdomen (Akman 1962).

Wound oedema and inflammation are signs of altered wound healing and may be seen early in the sequence leading to herniation. Serosanguinous drainage from the

incision and swelling are important and consistent signs of impending acute abdominal wound dehiscence (Smeak 1993a). Soft painless swelling is the usual presentation in the chronic case. Evisceration is more common in acute hernia, whereas enough strength is usually present in the skin, subcutaneous tissue, and hernial sac in chronic hernia to preclude evisceration (Smeak 1993a).

The preferred treatment of incisional hernia is surgical closure of the defect, that is simple direct approximation of the musculofascial edges. However, larger or complicated hernias frequently require the use of prosthetic material such as mesh or a graft of fascia lata (Larson and Vandertool 1984). Early surgical intervention is recommended for patients with acute incisional hernia or for patients with eviscerated hernias, but surgical repair of chronic hernia is an elective procedure unless the presence of palpable adhesions to protruding organs are detected (Smeak 1993a).

Case report

Case details

A 4-year-old Border collie (working cattle dog) was referred to GUVH because of recurrent incisional hernia after several repairs. Eighteen months prior to referral the animal had an ovariohysterectomy, subsequently developing the hernia one month later. In the intervening period the bitch had four operations but the wound had failed to seal. In the first two hernial repairs the linea alba had been closed with 1m chromic catgut using a simple interrupted suture pattern. Monofilament nylon (1m) had been used in a simple interrupted and mattress pattern during the third and fourth operations respectively in an attempt to close the linea alba.

Clinical findings

Two round masses were present on the ventral abdomen. On palpation the masses were soft and painless, and a series of ventral midline defects in linea alba were present. The contents were reducible and caused the animal no discomfort. Extensive skin scarring was visible (Fig. C5.1).

On the basis of history and clinical findings incisional hernia was diagnosed.

Treatment

Following routine general anaesthesia, skin preparation, and draping; a skin incision was made as an ellipse extending around the limits of the cranial and caudal margins of the hernia. The free skin border comprising the hernial sac was grasped

with Allis tissue forceps, and the subcutaneous tissue was dissected sharply, exposing the margins of the hernial ring. The hernial ring was found to be 22cm in length and 7cm in width (Fig. C5.2) after incising the islands of healed linea alba splitting the ring into four sections. The hernial opening was "toweled off" with a saline-moistened operating towel to protect the intestines. The margin of the hernial ring was freshened using scissors, bleeders were grasped and ligated. The initial plan was to repair the hernia with a mesh, but the linea alba could be apposed easily without undue tension on the body wall. The hernial ring was closed with a simple interrupted sutures of monofilament nylon (1m), which were supported with horizontal mattress sutures placed across the rectus abdominus using 4m polydioxanone. The closure of the subcutaneous tissue and skin was routine.

The owner was advised to rest the dog for one month to allow the linea alba to regain strength.

Follow-up

Interview made with the owner nine weeks after the repair revealed that the wound had healed without evidence of re-herniation.

Fig. C5.1. Incisional hernia. Showing the extensive scarring on the ventral abdomen.

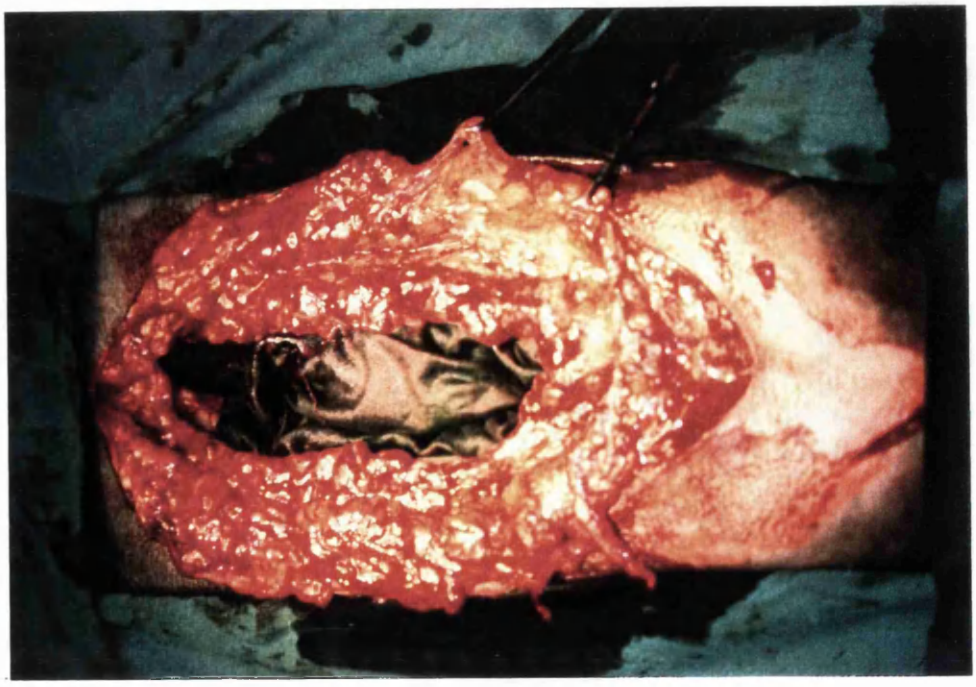

Fig. C5.2. Hernial ring. The appearance of the hernial ring after dissection of the subcutaneous tissue and islands of healed linea alba splits the ring. It is 22cm long and 7cm wide.

Discussion

A search of the veterinary literature going back 20 years failed to find papers written on the subject of post-laparotomy incisional hernias in the dog. This might be considered surprising given that laparotomy is one of the commonest surgical approaches in small animal surgery. Two potential explanations can be advanced for the paucity of published reports. It may be that incisional hernias rarely occur in the dog or cat because the mass of abdominal viscera is less and puts little pressure on the abdominal wound. Alternatively, they are more likely to occur as single incidents in a practice situation and therefore not enough are collected to justify a series publication.

Predisposing causes of acute and chronic incisional hernia vary and appear to be inter-related (Smeak 1993b). The hernia in this bitch had presented initially as a chronic incisional hernia. Of the reported predisposing factors wound infection, poor post-operative care and inappropriate use of suture material (Larson and Vandertool 1984, George and Ellis 1986), seem to be associated with hernia formation in this bitch. Although, previous history was not obtained, history and clinical examination findings at presentation would suggest the absence of wound infection, but the use of gut suture for linea alba closure as has been mentioned elsewhere (Larson and Vandretool 1984, Gibbson and others 1989), might be the cause of the primary incisional hernia. The vigorous activity of the bitch observed during examination and the nature of the dog's work may have been the other contributing factors.

The results of incisional hernia repair are often disappointing (Hesslink and others 1993). In humans the recurrence of incisional hernia was stated to be worrisome and a cause of great concern for surgeons (Santora and others 1993). George and Ellis (1986) reported a recurrence rate of 46% following the repair of primary incisional hernia and the major factor implicated in recurrence was the development of posto-perative wound complication (wound infection, haematoma or seroma). Hesslink and others (1993) reported a higher recurrence rate (56, 48 and 47%) after second, third, and fourth incisional hernia repair, respectively. Most hernia recurrences stem from infection, extreme tension on the repair, incorporation of tissue with poor strength in the repair, poor anatomic reconstruction or more obvious technical failure such as inappropriate suture type or size (Smeak 1989). Regarding the type of suture material, synthetic absorbable suture materials like polyglyconate or polydioxanone were considered ideal for hernia repair because of chronic sinus or granuloma formation caused by using non-absorbable multifilament suture material (Smeak 1989). On the other hand, Dorfilinger and Kiil (1984) mentioned the importance of the technique of placement of the suture material

rather than the type of the suture material in the prevention of hernial recurrence. Concerning the role of peritoneum during closure of the hernia, Rosin (1985) stated the absence of great risk in incisional hernia disruption if the peritoneum is not sutured. Additionally, rapid regeneration of the peritoneum and complete healing of large defects in less than a week has been pointed out (Smeak 1989). In this bitch catgut and nylon had been used for linea alba closure. However, the role of the suture material as a cause of wound breakdown seems less important because recurrence was not avoided by using nylon in the last two operations. On the other hand, the number of sutures placed, the underlying tissue weakness due to insufficient removal of scar tissue or lack of incorporation of healthy fascial tissue might be the cause of recurrence.

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Nasal Foreign Body in a Dog

Introduction

The nasal cavity extends from the nasophrynx to the external nares. It is enclosed by the nasal septum medially, cribriform plate caudally, hard palate ventrally, and is bounded dorsally and laterally by maxilla, frontal and lacrimal bones. Within the nasal cavity are the delicate scrolls of compactly arranged turbinate bones. Conditions affecting the nasal chambers include neoplasia, fungal rhinitis, and chronic hyperplastic rhinitis. The less common ones are nasal foreign bodies, destructive rhinitis, oronasal fistula, idiopathic epistaxis, macroglobulinaemia and polyps (Sullivan 1987a).

Intra-nasal tumor is the most common chronic intra-nasal condition affecting older dogs (Norris 1979, Gibbs and others 1979). Sneezing is one of the earliest signs, but unlike intra-nasal foreign body and acute rhinitis the sneezing is generally not paroxysmal (Bright 1981). Unilateral nasal bleeding and mucoprulent nasal disharge which become bilateral are also common presenting signs. Excessive mouth breathing, snorting while eating, difficulty sleeping and facial deformity are additional owner complaints (Sullivan 1987a). Involvement of the central nervous system has also been recorded (Norris 1979).

Nasal aspergillosis is an infection caused by an opportunistic fungus (*Aspergillus fumigatus*) that results in a destructive rhinitis. Trauma and immuno-incompetence are suspected to be predisposing factors (Barrett and others 1977, Hargis and others 1986). The usual presentation is of unilateral nasal discharge, and sudden bouts of epistaxis. Rhinarial ulceration, pain on touching the affected side and ocular discharge are some of the common features. Radiology, rhinoscopy, and serological examination are diagnostic aids (Lane and Warnock 1977).

Chronic hyperplastic rhinitis can reputedly be caused by bacteria, trauma, fungus or parasites (Bright and Birchard 1985). The nasal cavity signs include serous to purulent profuse nasal discharge, sneezing, and stertor. Radiological changes are turbinate masking producing a mixed pattern of density (Gibbs and others 1979).

Foreign bodies are uncommon causes of intra-nasal disease (Delmage 1973, Gibbs and others 1979, Sullivan 1987a). Nasal foreign bodies are seen most frequently in hunting dogs, and the typical foreign body is that of plant origin (Bright and Birchard 1985). Twigs or plant stem, grass awns, grass seeds, hay particles, thorns, foxtail, bamboo stick, dress makers pin, sewing needle, hair pin, and metal hook

were some of the foreign bodies reported (Delmage 1973, Bright 1981, Wells and others 1982, Wright 1982, Sullivan 1987b).

Case Report

Case details

A one-year-old Shih Tzu was presented to GUVH with a one week history of a sudden onset of snorting noise. Five days before presentation the bitch had been treated with antibiotics and steroids without improvement.

Clinical findings

There was intermittent snorting, slight reduction in air flow on the right side of the nostril. On auscultation there was referred noise in the chest. Nasal discharge, ocular discharge and pain were not present.

Diagnostic aids

Rhinoscopy

Initially laryngoscopy was carried out to examine the soft palate and larynx under routine general anaesthesia. Then because of the absence of abnormality on these structures, retrograde rhinoscopy with a paediatric bronchoscope was carried out. The examination showed a seed head buried in the mucosa of nasopharynx and disappearing through the caudal choanae.

Treatment

A diagnosis of nasal foreign body was made. Endoscopic removal of one seed was achieved but the head was found to be firmly embedded in the nasopharyngeal mucosa. Nasal washing using saline solution failed to dislodge the foreign body. Following this an attempt was made to remove the foreign body surgically. After placing the animal in dorsal recumbency with the mouth open to the maximum extent, a midline full thickness incision in the soft palate was made. The palate incision was retracted with sutures placed at the edge of the incision. A search was made for the foreign body without success. Finally, a decision was made to make a further attempt to remove the remaining foreign body after the palate wound healed. The incised tissue layers (nasal mucosa, muscle, and oral mucosa) were apposed separately with 1.5m polyglactin 910 using a simple interrupted suture pattern. potentiated sulphonamide was prescribed for 14 days and soft food was recommended for two weeks.

Follow-ups

After two months the dog was returned. The snorting noise was still present. The palate was checked and had healed well. Rhinoscopy using a paediatric gastroscope was carried out after routine anaesthesia. After several attempts the foreign body was grasped and dislodged with endo-forceps (Fig. C6.1). The same antibiotic was prescribed. After two months the owner was contacted, and a full recovery was reported. Seven months after the last operation the owner reported a full recovery except for a slight snorting noise observed while the dog is asleep or excited.

Fig. C6.1. Nasal foreign body, retrieved from the caudal nasal passage.

Discussion

The usual site of a foreign body in the upper respiratory tract of dogs and cats is the nasal cavity (Riley 1993). Paroxysmal sneezing and unilateral epistaxis are the common presentation in early cases (Bright 1981, Sullivan 1987a). Additional clinical manifestations include snorting, gagging, head shaking, rubbing and pawing of the nose (Delmage 1973, Bright 1981). Bright and Birchard (1985) stated that the absence of typical signs and the presence of stridulous breathing, gagging, and a lack of air flow through the nostrils are signs of a foreign body lodged in the nasopharynx. Thus, the absence of typical signs during the first visit could be explained by the location of the foreign body. The snorting noise observed was the result of obstruction of the air flow through the nasopharynx, and this might be aggravated in this case by the nature of the upper airway of this particular breed. Consequently, the clinical presentation of the case resembled brachycephalic airway disease. However, the sudden onset of the snorting noise can be used to exclude brachycephalic airway disease. This presentation in the cat would typically have suggested a nasopharyngeal polyp. These are very common in cats, but this entity has been recorded once in the dog (Fingland and others 1993). A unilateral or bilateral mucopurulent nasal discharge associated with erosion of the surrounding turbinate tissue is a manifestation of the chronic case (Delmage 1973, Bright 1981, Wells and others 1982, Bright and Birchard 1985). Sterilisation of the foreign body by antibiotics could be the reason for the absence of the nasal discharge or that any discharge flowed back into pharynx to be swallowed.

Different diagnostic aids have been described to confirm nasal foreign body. Radiological findings are not sufficiently diagnostic in most of the cases (Delmage 1973, Sullivan 1987a). The use of contrast rhinography in the diagnosis of intra-nasal foreign bodies has been mentioned (Bright 1981, Goring and others 1984). Bright and Bojrab (1976) and Sullivan (1987b) considered rostral rhinoscopy being the most useful diagnostic aid for foreign bodies lodged in the rostral third of the nasal cavity. Pen light and dental mirror can be used to examine the caudal portion of the nasal cavity and nasopharynx *per os* (Bright 1981, Sullivan 1987b). The flexible fibreoptic endoscope can also be used to examine these areas.

Endoscopic examination and removal of nasal foreign bodies from the caudal nasal passage and nasopharynx through the oral cavity using a fibreoptic endoscope has been described (Bright 1981, Nelson 1993, Wolf 1993). Paediatric or adult bronchoscopes and paediatric gastroscopes can be used to carry out endoscopic examination of the nasopharynx and caudal nasal passage (Ford 1990). Although, both types of endoscopes are useful, better results are obtained by the use of a flexible endoscope having at least bi-directional tip control. Flexible bronchoscopes

are considered to be inferior to gastroscopes because they have two way deflection capability. Additionally, Ford (1990) indicated the benefit of using a paediatric gastroscope in providing a larger visual field and biopsy channel. Therefore, the incomplete removal of the foreign body in this case at the first endoscopy could be attributed to the type of endoscope used. Surgical removal through soft palate incision has been described (Nelson 1993), but difficulty in locating the foreign body due to the narrow confines of the oral cavity was encountered by Wells and others (1982). Thus, the incomplete removal at the first attempt could be due to patient size, breed type, and partly by the barbed nature of the foreign body.

Thus, nasal foreign body should not be dismissed in those dogs that do not have a typical history of paroxysmal sneezing, and do not belong to the breeds that work rough cover.

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Idiopathic Haemorrhagic Pericardial Effusion in a Dog

Introduction

The pericardium is a sac-like structure that envelopes the heart, the root of the aorta and pulmonary arteries, the termination of the vena cava, pulmonary and azygous veins (Evans 1979). The most important function of the pericardium is the prevention of over-dilatation of the heart.

Pericardial disease usually cause signs attributable to right-side heart failure as a result of ventricular compression and restriction of diastolic ventricular volume (Ettinger and Suter 1970). Cardiac tamponade associated with pericardial effusion, tricuspid insufficiency and pulmonary vascular disease are considered to be the most frequent causes of right-sided heart failure in dog (Schertel 1993). In the dog, the commonest compressive cardiac syndrome is tamponade associated with pericardial effusion (Thomas 1984). However, pericardial effusion accounts for a small proportion of all cardiovascular disease in dog (Ettinger and Suter 1970).

The most common form of pericardial effusion that produces significant disease is sanguineous or serosanguineous (Schertel 1993). Transudates that arise secondary to congestive heart disease, hypoalbuminaemia and peritoneo-pericardial diaphragmatic hernia can also cause cardiac tamponade, though less frequently. Exudative pericardial effusion resulting from an infectious process is a rare form of effusion in dog (Schertel 1993). Berg and others (1984) indicated that the sanguineous or serosanguineous form of effusion is usually either caused by neoplasia involving the right atrium/heart base or is idiopathic. Other causes of sanguineous or serosanguineous type of effusion are left atrial rupture secondary to mitral regurgitation, other neoplasms of the pericardium and heart, trauma and iatrogenic injury (Schertel 1993).

Although the cause of idiopathic haemorrhagic pericardial effusion is unknown, viral or immune-mediated causes have been implicated as the most probable causes (Berg and others 1984). Based on histopathological examination, the blood vessels and lymphatics of the parietal and visceral pericardium appear to be the primary targets of the disease process (Berg and others 1984).

This syndrome appears to occur in large or giant breed of dogs, predominantly in males (Gibbs and others 1982, Berg and Wingfield 1983, Berg and others 1984, Matthiesen and Lammerding 1985).

Abdominal distension due to ascites is the most common manifestation (Gibbs and others 1982, Berg and others 1984, Matthiesen and Lammerding 1985). Other signs are weight loss, decreased exercise tolerance, cough or dyspnoea, and episodes of collapse (Berg and Wingfield 1983, Berg and others 1984, Schertel 1993). Abnormalities of physical examination include elevated heart rate with a weakened pulse, muffled heart sounds, jugular distension and pulsation, hepatomegaly, and pleural effusion (Gibbs and others 1982, Berg and Wingfield 1983, Berg and others 1984, Matthiesen and Lammerding 1985).

The diagnosis of pericardial effusion is confirmed by thoracic radiography, electrocardiography, and echocardiography (Eyster and others 1993). Pericardiocentesis and analysis of the pericardial fluid, and examination of the pericardium during operation are used to identify the type of the pericardial effusion (Berg and Wingfield 1983, Berg and others 1984, Matthiesen and Lammerding 1985).

Medical treatment using diuretics is useful for transient remission of signs (Gibbs and others 1982). Surgically, pericardiocentesis, pericardiotomy, and pericardiectomy have been used to treat the disease, but the safest and most reliable procedure is thought to be partial pericardiectomy (Gibbs and others 1982, Berg and Wingfield 1983, Matthiesen and Lammerding 1985).

Case Report

Case details

A 3-year-old male Golden Retriever was presented to GUVH with a three month history of cough. Hyperpnoea and abdominal distension of shorter duration were also present. Treatment with antibiotics and diuretics had been unsuccessful. On the second, presentation, additional complaints were exercise intolerance, lethargy, and weight loss.

Clinical examination

The findings of physical examination were poor body condition, a very distended abdomen with fluid thrill, retching, coughing, and harsh respiratory sounds. Normal heart sounds, pulse rate and volume were recorded.

Ancillary aids

Radiography

Initially abdominal and thoracic radiographs showed an enlarged liver, and collapse of lung lobes due to pleural effusion, respectively. On the second occasion, chest films showed an obscured cardiac shadow, tracheal elevation, mottled cranial thorax due to mediastinal fluid, outlining of interlobular fissures and scalloping of lung lobes (Fig. C7.1).

Electrocardiography
Low amplitude complexes on all leads of the ECG and rhythmical alteration in QRS shape (electrical alternans) were recorded (Fig. C7.2).

Echocardiography
The examination indicated the presence of pericardial effusion (Fig. C7.3).

Cytology and Biochemistry
Cytological and biochemical examination of the pericardial fluid showed a modified transudate with low cellularity and high protein content. No bacteria or fungi were isolated.

Finally, based on the history, clinical findings and diagnostic aids used a tentative diagnosis of idiopathic haemorrhagic pericardial effusion was made.

Treatment
Before operation the dog was treated repeatedly with antibiotics, diuretics, and pericardiocentesis without complete resolution of the problem. Thus, a lateral thoracotomy and partial pericardiectomy were carried out. The diagnosis was confirmed during the operation.

After routine general anaesthesia for thoracotomy the left thorax was prepared for the operation. The thoracic cavity was entered via the fifth intercostal space and retractors were used to hold the ribs apart. The pericardium was thick and fibrous. First a stab incision was made to allow pericardial drainage. A transverse incision was made below the phrenic nerves using an electroscalpel. A second incision perpendicular to the mid point of the first incision that extended past the apex of the heart was made to create two wedge-shaped perpendicular flaps. Dissection of the flaps was continued in a cranioventral and caudoventral direction to complete the removal of the pericardium. The same procedure was made on the right side of the

heart after elevating the heart with a malleable retractor. Prior to closure a drain was placed in the thorax. The thoracotomy was closed by preplacing the suture material (3.5m polydioxanone) around the 5th and 6th ribs using a simple interrupted pattern. The muscle layers and subcutaneous tissue were apposed individually with 3m polyglactin 910 using a simple continuos pattern. The skin was closed with monofilament (3m) nylon. Residual air and fluid were drained from the chest through the drainage tube using a three-way tap and syringe.

The pericardium and the small pieces of tissue found floating in the pericardium were sent for histopathology and it was found that there was pericarditis. After the operation the dog was placed in the intensive care unit for 36 hours. Pulse rate, respiration rate, and blood pressure became stable after 24 hours. The drain was removed 36 hours post-surgery. Fluid support with colloid and crystalloid solutions was maintained during the first 36 hours. Analgesics and antibiotics were prescribed.

Follow-ups

The dog was uncomfortable with slight hyperpnoea a week after the surgery, and radiographic examination revealed pleural effusion. About 400 ml fluid was drained from each side of the chest. Thoracocentesis was repeated after two weeks because of x-ray findings of continued pleural effusion. Antibiotics and diuretics were prescribed. The dog was returned and thoracocentesis was repeatedly carried out. After 2.5 months the dog was doing quite well except intermittent coughing. The dog was put to sleep 3.5 months post operation because of an unrelated condition.

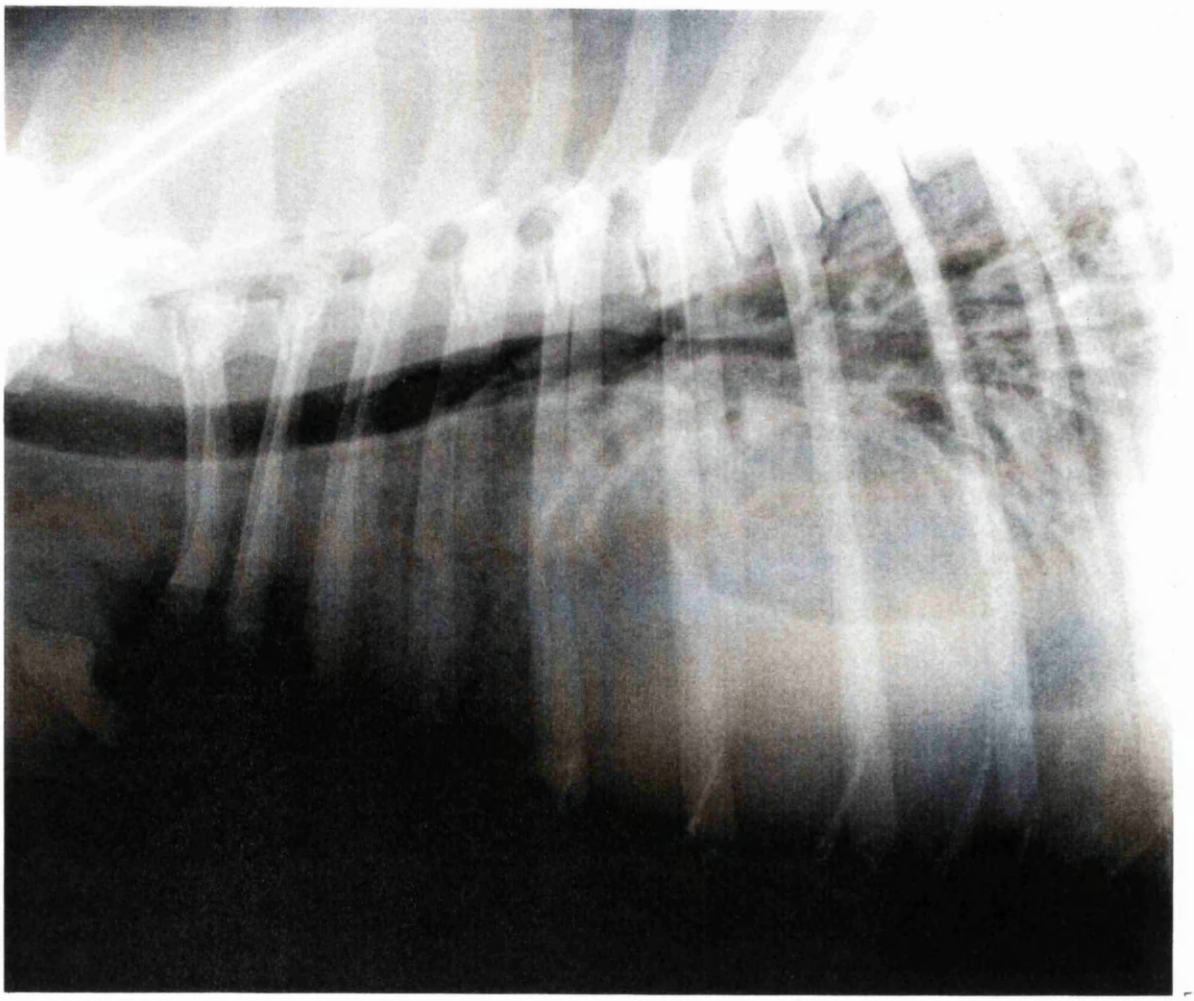

Fig. C7.1. Lateral thoracic radiograph. There is tracheal elevation, collapse of the lung lobes, and an obscured cardiac shadow due to pleural and pericardial effusion.

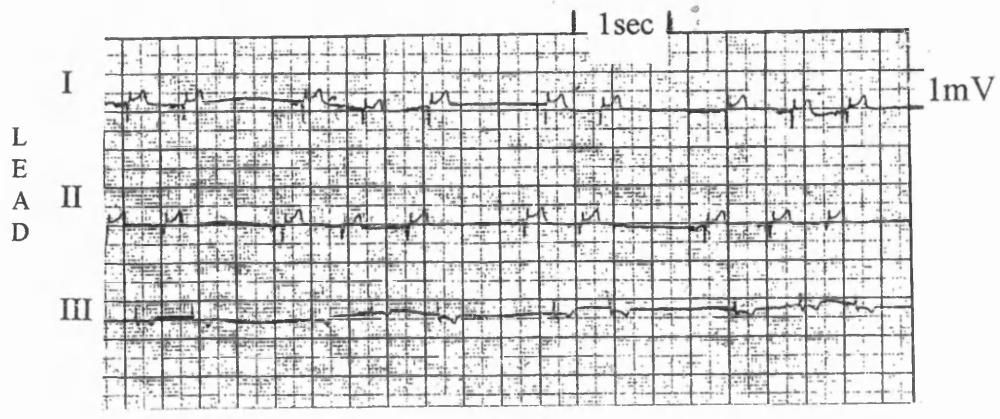

Fig. C7.2. Electrocardiogram, recorded before pericardiocentesis; shows diminished QRS voltage and electrical alternans (alteration of tall and small QRS complexes). Paper speed=25mm/sec, 1cm=1mV.

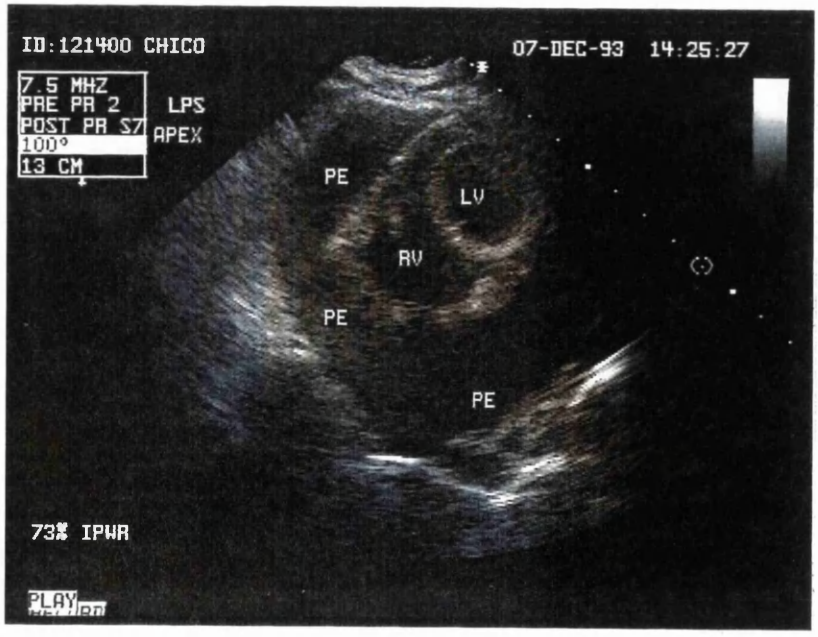

Fig. C7.3. Two dimensional echocardiogram. Demonstrating pericardial effusion; LV=left ventricle; RV=right ventricle, PE=pericardial effusion.

Discussion

Pericardial effusion becomes apparent when cardiac tamponade develops. Since the right ventricle is thin walled, it is more readily compressed when cardiac tamponade develops and thus the history and clinical signs in any form of pericardial effusion tend to reflect right sided heart failure (Shabetai 1983). This dog had the typical history of abdominal distension, coughing, decreased exercise tolerance, but the usual clinical signs of muffled heart sound, tachycardia, and weak pulse were absent. The abnormal heart sounds, particularly the muffled heart, might be missed during clinical examination.

The radiological findings in this case were consistent with previous reports of pericardial effusion - a circular cardiac shadow on both standard views, cardiomegaly, sharp outline of the cardiac shadow and absence of splitting of the main stem bronchi, coupled with pleural effusion (Gibbs and others 1982, Berg and Wingfield 1983). Loss of abdominal detail and hepatomegaly were the abdominal radiological findings (Matthiesen and Lammerding 1985). The usual electrocardiographic indicator of pericardial effusion of diminished QRS voltage caused by a decrease in electrical conduction through fluid media and a decreased ventricular filling, and electrical alternans which is produced by a rhythmic swinging of the heart within the fluid-filled pericardial sac were also present in this case (Shabetai 1983). Echocardiography is the most sensitive diagnostic test in detecting pericardial effusion (Berg and Wingfield 1983). Normally the pericardial sac is only a potential space and the heart is in direct contact with surrounding structures and thus barely detectable. In pericardial effusion this space is filled with relatively anechoic fluid, resulting in an echocardiographic separation between the pericardium and the epicardium (Berg and Wingfield 1983). Pericardial effusion was unremarkable initially, but marked later. Pericardial contrast studies and two-dimensional echocardiography can be used to rule out the presence of cardiac masses as a cause of pericardial effusion (Berg and Wingfield 1983, Matthiesen and Lammerding 1985). Pericardial contrast studies were not carried out in this case because of the availability of ultrasonography. Pericardiocentesis and analysis of the fluid can also help to define the cause of pericardial effusion (Ettinger and Suter 1970, Matthiesen and Lammerding 1985). The results associated with idiopathic haemorrhagic effusion are classified as non-clotting, non-septic, haemorrhagic or sanguineous with a variation in red blood cells, nucleated cell counts and protein concentration (Matthiesen and Lammerding 1985). More accurately, the absence of neoplastic mass at surgery and histopathological demonstration of chronic, non-specific, inflammatory, haemorrhagic pericarditis was the best diagnostic aid (Berg and Wingfield 1983, Berg and others 1984).

Idiopathic haemorrhagic pericardial effusion is characterised by a thick pericardium attributable to focal pericardial inflammation and neovascularization with fibrin deposition (Berg and others 1984). The findings in this dog met these criteria. The pericardial fluid usually does not clot or contain thrombi (Berg and Wingfield 1984). However, Madrone and others (1987) found that the presence of thrombi in the pericardial fluid and recurrence of effusion 24 hours after centesis is related to the severity of the disease process. Hence, the reason for the recurrence of effusion in this dog might be the same. On the other hand, partial pericardiectomy has been shown to be a useful procedure in controlling recurrence (Berg and Wingfield 1983, Matthiesen Lamerding 1985). But in this dog multiple thoracocentesis after the operation were required to control the pericardial effusion.

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Inflammatory Polyps and Tumor in the Ear Canal of a Dog

Introduction

Disease involving the structures of the ear account for a significant percentage of the problems encountered in small animal practice (Krahwinkel 1993). A prevalence of 5-20% in dogs and 2% in cats has been recorded (August 1988). This disparity between dogs and other species, particularly cats, was attributed to differences in the anatomy of the canine ear to that of other species (Harvey 1990).

The causes of external ear canal disease are numerous. August (1988) classified the causative factors of external canal disease into predisposing, primary and perpetuating. The most common predisposing factors contributing to otitis externa are the anatomy of the ear, moisture and hair in the ear canal (Bojrab and others 1993, Krahwinkel 1993). Other predisposing factors are systemic disease, immuno-suppression, debilitation, neoplasms and polyps. Primary causes are fungi, foreign bodies, parasites, viral diseases and hypersensitive diseases (Bojrab and others 1993). Perpetuating factors include bacteria, yeast, otitis media, and progressive pathological changes.

Clinical manifestation of early cases of otitis externa are pruritis, manifested by scratching, rubbing the ears, and head shaking. When the disease becomes chronic the animal exhibits pain while being examined and a prominent aural exudate is frequently observed (Fraser and others 1970, Krahwinkel 1993).

Inflammation of the middle ear occurs as a result of extension of infection across the tympanic membrane (Shell 1988). Infection through the eustachian tube and haematogenous spread are uncommon (Seim 1993). Trauma, polyps, neoplasms, and foreign bodies in the middle ear can cause middle ear disease (Seim 1993).

The presenting symptoms of otitis media are largely those of otitis externa, and in long standing otitis externa cases where response to treatment is poor otitis media is common and should be suspected (Fraser and others 1970). Pain is the usual sign of primary otitis media, the dog occasionally holds its head at an angle with the affected ear downward.

Neoplasms of the ear canal are most common in cats and usually are ceruminous gland carcinomas. In the dog the majority of the tumors are malignant (Macy 1989). In this species neoplasms of the external ear canal include malignant

melanoma, squamous cell carcinoma and ceruminous adenocarcinoma (Matthiesen and Scavelli 1990). The clinical presentation of animals with aural tumors generally resemble unilateral otitis.

Case Report

Case details

A 11-year-old Labrador Retriever was presented to GUVH with a 3-year history of malodorous discharge from the right ear. A polyp had been detected by the referring veterinary surgeon one year previously. The dog had been treated with systemic antibiotics and ear drops. Removal of the polyp had been performed by the referring veterinarian by simple excision initially, and later following lateral wall resection but the polyp had recurred again.

Clinical findings

The opening to the horizontal canal of the right ear was not visible because the stoma was occluded by a pink mass (Fig. C8.1). There was a purulent and smelly discharge from and around the ear. The left ear was normal. On the basis of the history and clinical findings an aural polyp was diagnosed.

Treatment

A decision was made to carry out total ear canal ablation and to remove the lateral wall of the bulla. Routine general anaesthesia was used. After aseptic preparation of the surgical site the animal was placed in lateral recumbency. The cranial neck was tented with a sandbag to move the mandible away from the bulla. A "V"-shaped skin incision was made enclosing the medial wall of the vertical ear canal and horizontal ear canal. The ear canal was isolated from the surrounding soft tissue by blunt dissection. The dissection was aided by hand-held retractors and by grasping the ear canal with Allis tissue forceps. To avoid injury to the delicate structures dissection was made in a spiral fashion staying as close as to the cartilage as possible. The horizontal canal was freed to the level of the osseous bulla and was transected at the external acoustic meatus, and with it part of the polyp was removed Fig. C8.2). Rongeurs were used to remove residual canal cartilage, epithelium and lateral wall of the bulla. The polyp appeared to extend into the middle ear and was removed by traction. Debris was cleared by curettage and flushing with saline solution. The deep tissues were closed with two layers of simple interrupted sutures using 3m polyglactin 910. The skin was closed with the same pattern using 3m nylon. Antibiotics (potentiated sulphonamides) was initiated post-surgery. The excised masses were sent for histopathology.

Pathology

The mass occluding the horizontal ear canal was composed of dense fibrous tissue with superficial ulceration and granulation typical of inflammatory polyps. The other tissue excised from the middle ear was diagnosed as a low grade ceruminous cell carcinoma (Fig. C8.3a & b).

Follow-ups

After 4 months the dog was doing very well and no illness in relation to the ear was apparent. However, seven months after the operation, the owner reported signs of head shaking and ear scratching in the absence of ear discharge.

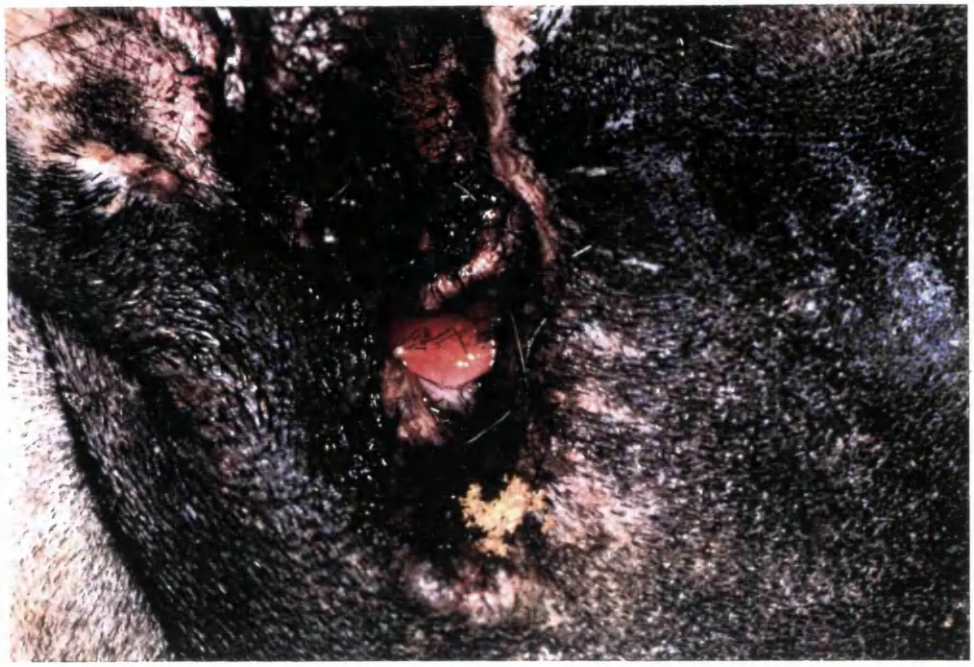

Fig. C8.1. The opening into the horizontal ear canal is occluded by a pink mass, that was found to be a polyp on histopathology.

Fig. C8.2. Tissue specimen of the ear canal after removal, the polyp is shown occluding the ear canal.

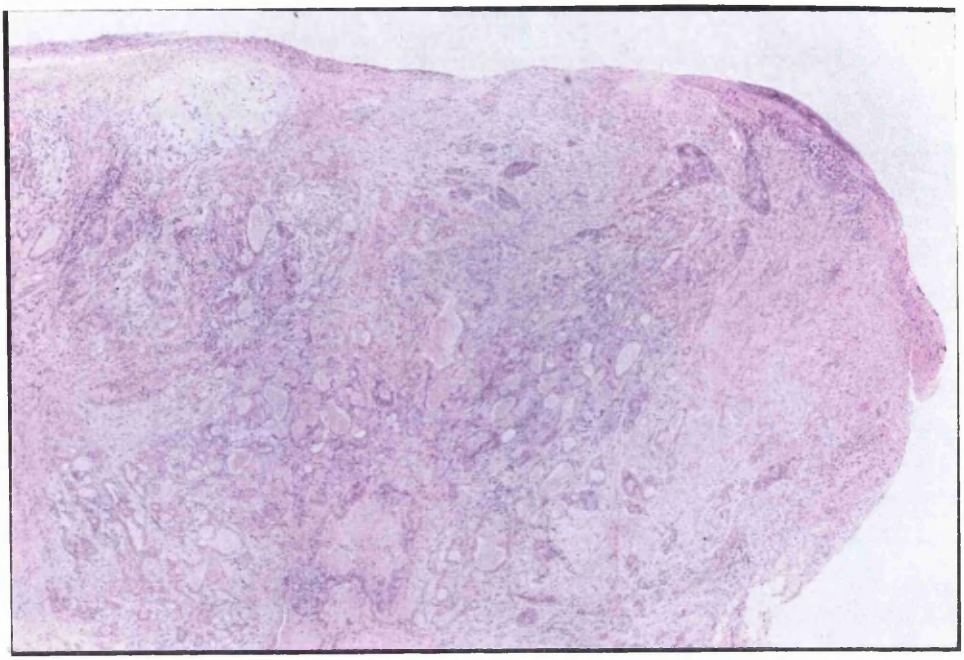

Fig. C8.3a. Ceruminous tumour (Haematoxylin and eosin X40). Irregular tubules of glandular epithelial cells are distributed throughout the nodule. A pale staining focus of myoepthelial proliferation with a myxoid stroma is present near the upper left margin. The surface is composed of amorphous debris without a covering epithelium.

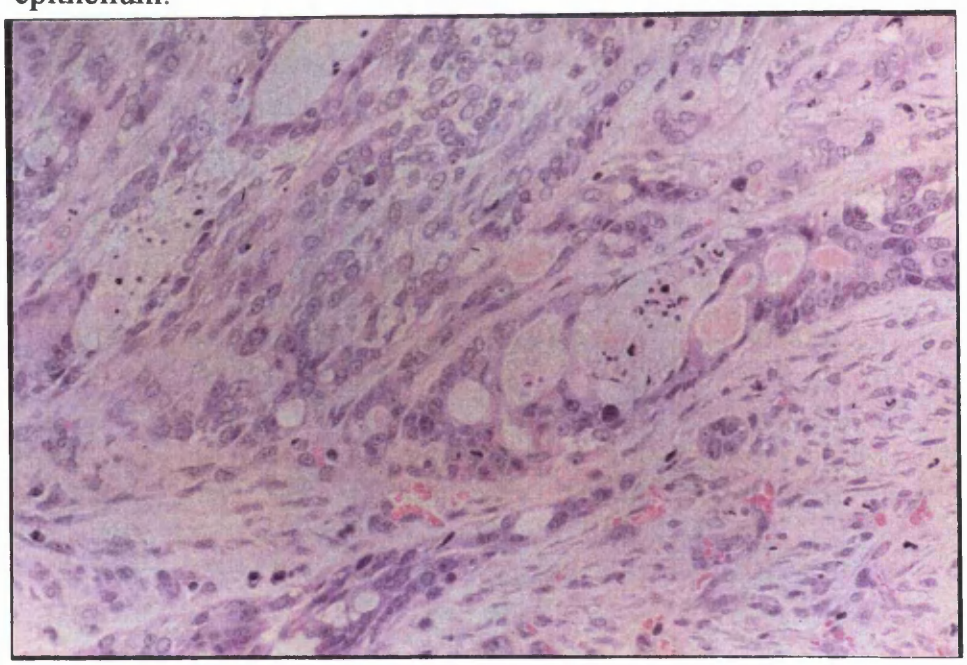

Fig. C8.3b. Ceruminous tumour (Haematoxylin and eosin X400). The irregular tubules contain eosinophilic secretions and some cell debris. The epithelial cells vary in size and from cuboidal to spindle in shape. Some cells are hyperchromatic and there are occasional mitosis.

Discussion

The presence of visible proliferation and its characteristic appearance in the external ear canal was used to diagnose the polyp clinically, but histopathological examination revealed the presence of an underlying ceruminous gland carcinoma. Kang and others (1992) reported the presentation of primary cutaneous melanoma of the external ear canal as a polypoid obstructive lesion in man. Likewise, in this dog the obvious lesion was the polyp. Hence, the inclusion of external ear canal tumor as a differential diagnosis and submission of excised tissue for histopathological examination should be considered when dealing with polyps of the ear canal.

Inflammatory polyp would appear to be a rare cause of otitis in dogs judging by the scant attention this entity has received in the literature. However, this may be because the concomitant otitis externa is more prominent and the potential significance of polyps has been overlooked. Van der Gaag (1986) reported an incidence of 2% for polyps in the ear canal among 106 resected ear specimens. Only one specific case report of a polyp in a dog was found (Fingland and others 1993). Among the tumors that involve the specialised cerminous gland lining the ear canal, adenomas are more common than carcinomas (Fraser and others 1970, Rose 1978, Matthiesen and Scavelli 1990).

The exact causes of polyps are unknown (Bojrab and others 1993). However, the predisposition of young cats has suggested a congenital origin (Bradley and others 1985). On the other hand, chronic infection within the middle ear has also been implicated in the development of polyps in cats (Harvey and Goldschmidt 1978, Lane and others 1981, Macy 1989). Similarly, it has been also speculated that stimulation of the glands to hyperplasia as a result of chronic ear disease may be part of the path leading to the transition to ceruminous gland adenoma or carcinoma (Fraser and others 1970, Rose 1978). On the other hand, Lane (1979) stressed the role of any process that cause obstruction of the lumen of the external ear canal will affect the microclimate of the region, by preventing the release of secretions and predispose the patient to opportunistic infections. Thus, polyp or tumoral growth in the ear canal could occur primarily or secondarily to ear infection. On the basis of the history of chronic ear infection, the polyp and tumoral growth in this dog was supposed to occur secondary to otitis.

In the cat polyps has been reported to involve the nasopharynx, middle ear, or external ear canal (Harvey and Goldschmidt 1978, Bedford and others 1981, Lane and others 1981). Concurrent middle ear involvement has been frequently seen with nasopharyngeal polyps in cats (Bedford and others 1981, Lane and others 1981).

Conversely, polyps of the nasopharynx reported in the dog did not involve the ear canal (Fingland and others 1993). The polyp was confined to the ear in this case.

The origin of inflammatory polyps is a matter of debate and different opinions have been expressed. Lane and others (1981) pointed to the tympanic opening of the eustachian tube and middle ear as sites of origin. The deeper part of external auditory canal and middle ear have been suggested (Harvey and Goldschmidt 1978). In contrast, Bedford and others (1981) have stated that polyps originate within eustachian tube and enlarge to invade either the nasopharynx or tympanic bulla. The external auditory canal was presumed to be the origin of the polyp in this dog. Extension of ceruminous gland tumors into the middle ear has been reported (Little and others 1989). Similarly, in this dog the tumor was found to invade the middle ear.

A definitive diagnosis of polyp is made based on direct visualisation of the growth, radiography and histopathology (Lane and others 1981, Bradley 1984). In this dog radiography was not carried out because of the assumption that recurrence of the growth and long-standing infection could involve the middle ear, but the clinical examination alone would not be reliable and radiography may also help to differentiate the changes in the bullae associated with tumoral growth and otitis media.

Histologically feline nasopharyngeal polyps can be characterised by the presence of granulation tissue with submucosal proliferation of inflammatory cells (Bradley 1990). The inflammatory cells reported include polymorphonecular leukocytes (Harvey and Goldschmidt 1978, Lane and others 1981). Fingland and others (1993) noted the presence of macrophages, lymphocytes and plasma cells. The microscopic appearance of the polyp in this case was similar to that reported previously in the dog (Fingland and others 1993). Their histological description was essentially similar to the description of nasopharyngeal polyps in the cat implying that either the initiating cause is the same or that the tissue in the different species responds in a similar fashion, even if the aetiology is not the same.

Different methods are used to remove polyps of the nasopharynx and ear. Lane and others (1981) preferred simple traction to bulla osteotomy as the method of removal despite the risk of recurrence because of the danger of iatrogenic neurological disturbance associated with this procedure in cat. Similarly, surgical excision has been found to be not totally satisfactory (Harvey and Goldschmidt 1978). Bradley and others (1985) reported recurrence of the polyp with incomplete nasopharyngeal removal, but not in cats treated by bulla osteotomy. Consequently, more radical removal of involved tissue is required. Total ear canal ablation and lateral bulla

osteotomy have been mooted as an effective method of treating neoplasia of the horizontal ear canal in dog because the technique allows extensive removal of aural tissue without the development of para-aural abscessation (Matthiesen and Scavelli 1990). Little and others (1989), on their report of neoplasia involving the middle ear cavity in 11 dogs, found three ceruminous gland adenocarcinoma that were inoperable because of local aggression. However, total ear canal ablation and lateral bulla osteotomy has been used to treat adnexal tumors involving the middle ear in three dogs, and recurrence was observed in one dog. In this dog excision of the growth did not avoid recurrence during the first two operations. Initially, the results of lateral bulla osteotomy seems successful but the clinical signs reported seven months after the operation might be due to the recurrence of tumoral growth.

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Partial Pyloric Outflow Obstruction in a Dog

Introduction

The pylorus is an important anatomical structure because it represents the exit to the stomach. Thus it functions to impede gastric emptying of solids and to prevent reflux of duodenal contents. Mechanical obstruction in the gastric antrum or pylorus may result in the blockage of the passage of contents into the intestine. Hence gastric retention, distension, and vomiting are manifestations of these obstructive lesions (Twedt and Magne 1989).

Disease causing partial or complete obstruction of the gastric outflow tract includes congenital and acquired antral pyloric hypertrophy, gastric neoplasia, granulomatous fungal disease, eosinophillic granuloma and chronic pyloric foreign body (Matthiesen 1993). Other infrequent causes that obstruct the pylorus externally causing delayed gastric emptying are pancreatic neoplasia or abscessation. In addition, gastric motility disorders can also cause delayed gastric emptying (DeNovo 1989, Matthiesen 1993)

Antral pyloric hypertrophy is obstruction of the pyloric canal caused by hypertrophy of the pyloric circular smooth muscle, mucosal hyperplasia, or both (Walter and others 1985, Matthiesen and Walter 1986, Sikes and others 1986, DeNovo 1989). Antral pyloric hypertrophy has two clinical forms, namely the congenital and the acquired forms. The cause and pathogenesis of either the congenital or acquired forms of the disease are not known (Matthiesen 1993). However, excess secretion of gastrointestinal hormones inducing pyloric stenosis has been hypothesised (Twedt and Magne 1989).

Young brachycephalic dogs were the most common victims of congenital pyloric muscular hypertrophy (DeNovo 1989). On the other hand, small middle-aged to older dogs were predominant in the acquired form of the disease where the most commonly affected breeds were Lhaso Apso, Shih Tzu, Pekingese, and Poodle (Walter and others 1985a & b, Matthiesen and Walter 1986).

Different names have been used to describe acquired antral hypertrophy. It has been called multiple gastric polyp (Happe and others 1977), hypertrophic gastritis (Happe and Wolvekamp 1981), chronic hypertrophic pyloric gastropathy (Walter and others 1985a, Matthiesen and Walter 1986, Sikes and others 1986). This is probably because of variations of the same disease process (DeNovo 1989).

Vomiting at fairly regular intervals following ingestion of solid food accompanied by gastric distension are the primary signs of pyloric outflow obstruction (Twedt and Magne 1989). The most frequent owner complaint is chronic intermittent vomiting occurring within a few hours of eating (Matthiesen and Walter 1986, Sikes and others 1986). Other clinical presentations reported by the same authors include anorexia, weight loss, concurrent disease (chronic renal failure, hyper-adrenocorticism, congestive heart failure), and abdominal distension. Projectiie vomiting is associated with complete or partial pyloric obstruction, not common in antral pyloric hypertrophy (DeNovo 1989).

Gastric outflow obstruction can be diagnosed tentatively on the basis of history, signalment, physical examination and by excluding metabolic disease that cause chronic vomiting (DeNovo 1989). Gastrointestinal contrast studies to outline the lumen of the stomach and evaluate gastric emptying have been used to confirm the diagnosis in almost all published cases (Matthiesen and Walter 1986, Sikes and others 1986). Endoscopy is useful in assessing the pylorus and antrum for ulceration, mucosal hyperplasia, and masses (Matthiesen 1993). The use of haematological and biochemical tests in ruling out metabolic or concurrent diseases causing chronic vomiting was stressed by the same author. Definitive diagnosis is based on operative findings and histopathology of full thickness biopsies (Matthiesen and Walter 1986, Sikes and others 1986).

Obstruction to gastric outflow is best managed surgically. The goals of surgery are to establish a definitive diagnosis, excise abnormal tissue, and restoration of gastrointestinal function by eliminating the outlet obstruction (Matthiesen 1993). Many surgical techniques have been described. The most commonly used surgical techniques for correcting partial or complete gastric outflow obstruction include the Heineke-Mikulicz (H-M) pyloroplasty (Matthiesen and Walter 1986), the Y-U antral flap pyloroplasty (Bright and others 1988), and pylorectomy with gastroduodenostomy (Billroth I) (Walter and others 1985b). The other procedures that are less frequently used are Fredet-Ramstedt pyloromyotomy, Finney pyloroplasty, Jaboulay procedure and gastrojejunostomy (Matthiesen 1993).

Case Report

Case details

A 9-year-old Shih Tzu was referred to GUVH because of a chronic history of frequent but intermittent retching, vomiting and bouts of inappetance. The dog had showed these symptoms intermittently since a pup. Occasional coughing was also reported.

Clinical finding

No abnormality was found on clinical examination.

Diagnostic aids

Haematology and blood biochemistry were unremarkable.

Radiography

Lateral chest and abdomen radiography were initially carried out. No obvious abnormality was found on chest x-ray. Abdominal radiographs showed a grossly enlarged gastric pylorus and marked gravel sign (Fig. C9.1). The initial film of a barium study showed pooling of the barium in the antrum and pylorus and irregularity of the mucosal line ventrally. At 30 minutes, the pylorus was still distended but some barium was present within the small intestine. The retention of barium was confirmed on one, two, five and seven hour films (Fig. C9.2).

Endoscopy

Gastroscopy demonstrated extremely marked pyloric mucosal hypertrophy.

Treatment

Initially the dog was treated medically using a course of metoclopramide and cimetidine for three weeks with only slight improvement.

With routine general anaesthesia and aseptic skin preparation, a cranial ventral midline laparotomy was carried out. The pylorus was identified and palpated. Due to extensive involvement of the whole circumference of the pylorus, it was decided to perform a pylorectomy with gastroduodenostomy. Firstly, the right gastric artery and vein were isolated by blunt dissection through the lesser omentum and were ligated near the pylorus and on the lesser curvature of the stomach just orad to the tissue to be excised. Injury to the gastroduodenal vessels was avoided. The right gastroepiploic vessels were isolated on the medial surface of the duodenum by taking care not to injure the pancreas, and the pyloric and gastric branches supplying the area to be resected were ligated. Then two straight atraumatic intestinal clamps were placed 9cm apart across the proximal duodenum and the antrum. The pyloric sphincter and canal were excised by transecting the antrum distal and duodenum proximal to the two clamps leaving 1.5cm stumps. The gastric mucosa was apposed with 2m polyglactin 910 sutures in an inverting pattern starting from the lesser curvature and continuing towards the greater curvature. The suture line was continued until the opening of the stomach was equal in size to that of the

duodenal stump. The gastric seromascular layer was similarly apposed with 2m polyglactin 910. The stomach was then anastomosed to the duodenum with the same suture material using a simple interrupted pattern in the mucosal layer and a continuous pattern in the seromuscular layer by starting the suturing from the dorsal surface. The laparotomy was closed in the routine manner. The excised tissue was sent for histopathology.

Pathology

Microscopic examination revealed hyperplasia of the mucosa with an increase in fibrous tissue in the lamina propria. Thus the diagnosis of gastric mucosal hypertrophy was made.

Follow-ups

Post-operatively, nothing was given *per os* for 24 hours. Maintenance fluid requirement was sustained with intravenous fluids. Small amounts of soft food were given for the first three days. Cimetidine, amoxycillin trihydrate, and buprenorphine were prescribed. The dog showed an uneventful recovery with the exception of a recurrence of an anal gland impaction, which he had suffered in the past. Nine weeks post-surgery, the owner was contacted and great improvement was reported. The dog is eating well and putting on weight despite occasionally vomiting. At the moment the dog is on sucralfate.

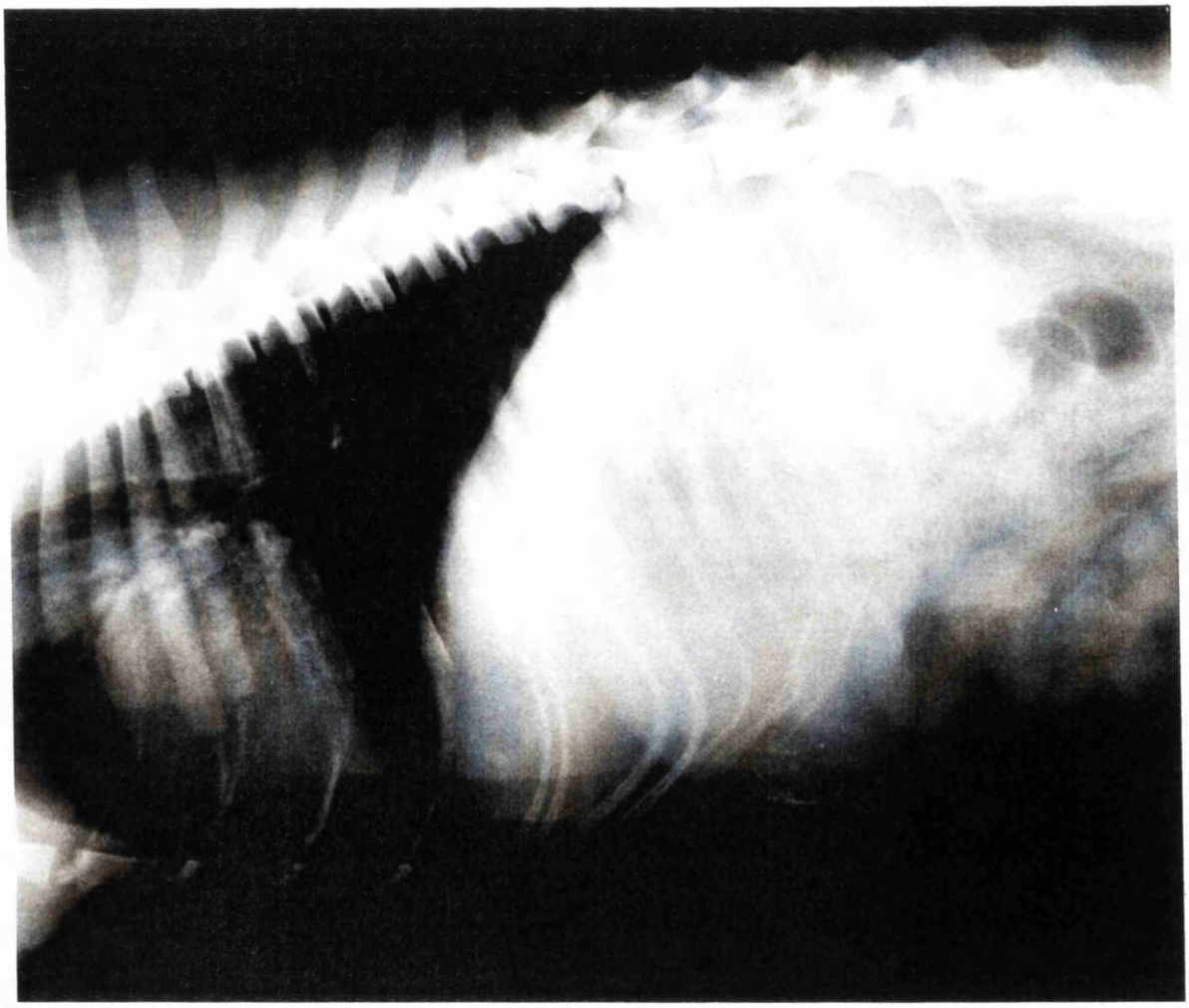

Fig. C9.1. Lateral plain abdominal radiograph. There is an enlarged pylorus and slightly caudally displaced pylorus with marked gravel sign.

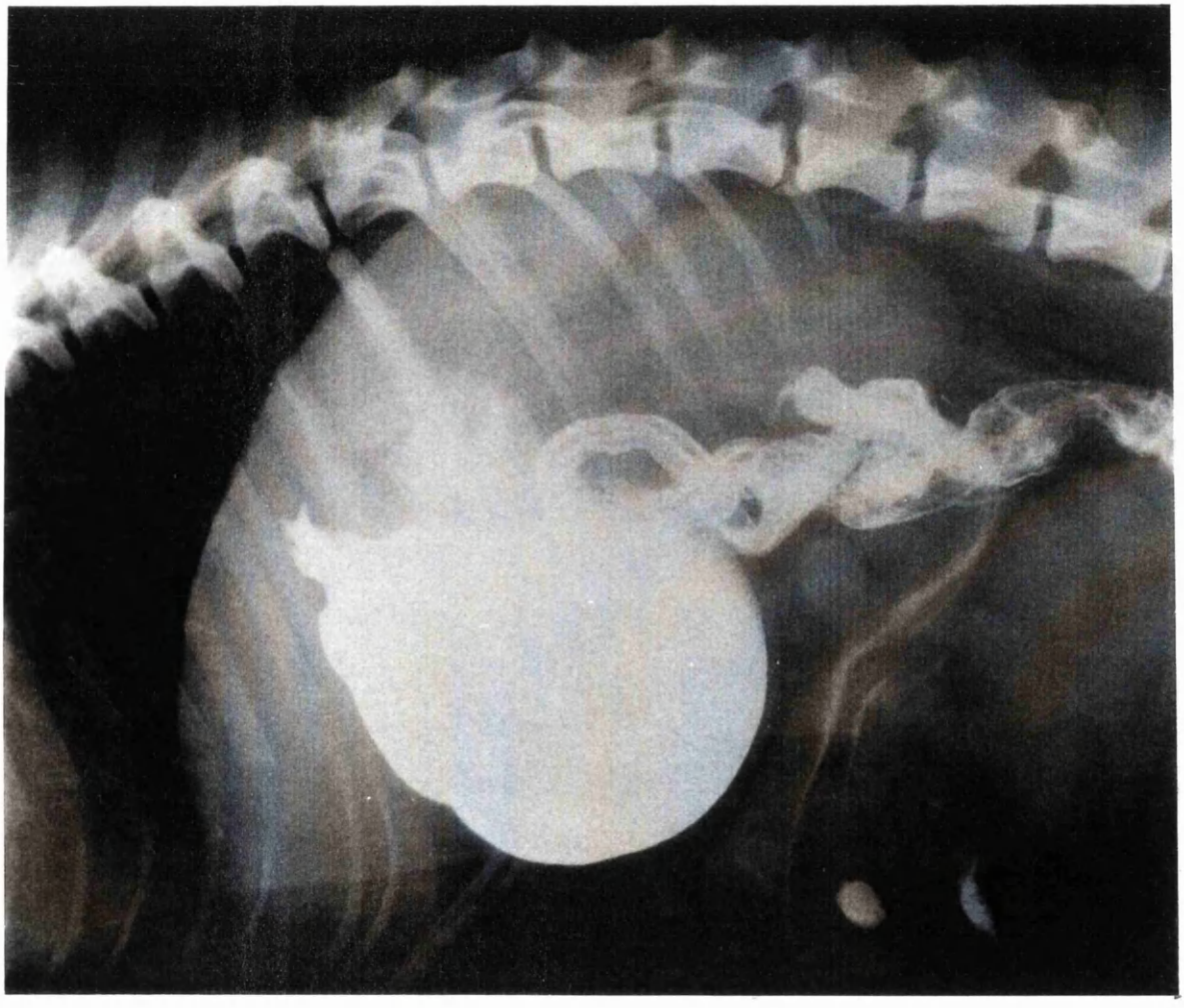

Fig. C9.2. Lateral abdominal radiograph of upper gastrointestinal positive contrast study. At 7 hours, barium retention in the pylorus is still present.

Discussion

The gastric outflow obstruction in this dog was caused by mucosal hypertrophy. The age, breed type, history of this dog is strongly suggestive of an acquired form of the disease as has been recorded elsewhere (Matthiesen and Walter 1986, Sikes and others 1986), although the manifestation of a problem since puppyhood may lead one to suspect a congenital problem. The small-breed predisposition to the disease has been suggested to be due to the excitable or vicious nature of certain small breeds (Walter and others 1985a). Stimulation of the sympathetic tone to the stomach causes a decreased gastric motility and retention of gastric contents. Consequently, distension of the antrum results in stimulation of the G cells in the antral mucosa to produce gastrin. The trophic effect of gastrin is believed to result in pyloric mucosal and muscular hypertrophy (DeNovo 1989). This explanation would support the neuroendocrine events associated with such behaviour. Measurement of serum gastrin concentration in affected dogs might be beneficial to fully understand the pathogenesis of this disease.

Chronic vomiting can cause electrolyte and acid-base imbalances. Prerenal azotaemia, hypochloraemia, metabolic alkalosis, anaemia, and dehydration can potentially occur secondary to chronic outflow obstruction. However, these metabolic abnormalities were found to be uncommon in most animals owing to the typically low-grade chronic nature of vomiting associated with partial obstruction (Matthiesen 1993). No abnormalities were found on routine haematological and biochemical testing, which is not surprising given that Matthiesen and Walter (1986) found no consistent abnormalities in their series.

The plain film results in this case were an increase in diameter of the pyloric lumen and the presence of gravel sign as has been recorded elsewhere (Matthiesen and Walter 1986). However, care must be taken in not over interpreting plain film changes. Hence contrast studies have been utilised to confirm the diagnosis. In this case the barium contrast showed delayed gastric emptying at more than seven hours and thickening of the pyloric wall which were the findings used to confirm the diagnosis. Retention of most of the contrast within the stomach after four hours or the presence of any barium within for longer than 12-24 hours is considered abnormal (Twedt and Magne 1989).

The choice of the corrective procedure was made during surgery. The extension of the lesion into the antrum dictated that a more radical procedure than (for example) a Y-U pylorplasty was required. Walter and others (1985b) recommended complete pylorectomy because of the difficulty of distinguishing chronic hypertrophic gastropathy and non-ulcerated tumors on the basis of clinical signs and gross

appearance of the lesion. The other reason forwarded by the same authors was, since the pathogenesis and natural behaviour of chronic hypertrophic gastropathy is not known, the non-excised tissue might cause recurrence of the gastric outlet obstruction after pyloroplasty by further hypertrophy with time.

Complications associated with pylorectomy and gastroduodenostomy are bilary tract damage, suture line leakage and iatrogenic pancreatitis (DeNovo 1989). Bile duct damage could occur due to accidental transection or when the suture line or healing process is too close to the bile duct or major duodenal papilla (Walter and others 1985b). The most common cause of suture line leakage was thought to be due to ischemia of the tissue, which could result from improper suture technique or damage or from interruption of mesenteric and omental blood supply to non-excised tissue (Walter and others 1985b). However, these complications were not observed in this dog.

The long-term results after excision and gastric duodenostomy in dogs with chronic hypertrophic gastropathy are excellent (Walter and others 1985b). Likewise, complete resection of the pylorus with gastroduodenostomy (Billroth I) and an alternative procedure, which involves resection of a wedge-shaped section of the pylorus where a small section of tissue was left intact along the mesenteric aspect of the pylorus with gastroduodenostomy resulted in a good to excellent response (Matthiesen and Walter 1986). Although, the follow-up is relatively shorter, the result of surgery in this case is good despite the occasional vomiting reported.

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Sublingual Sialocoele in a Dog

Introduction

The major salivary glands of the dog and cat that are of clinical significance are the paired parotid, mandibular, sublingual, and zygomatic glands (Harvey 1989). However, diseases of these salivary glands are not considered to be common (Spangler and Culberston 1991). Yet, salivary glands and associated ducts are affected by inflammation, neoplasia, calculus formation, and rupture (Knecht 1990).

Inflammatory diseases of the salivary glands are rarely recognised in dogs and cats (Harvey 1993a). Auto-immune-induced sialadenitis producing xerstomia has been seen in some dogs with keratoconjunctivitis sicca (Kaswan and others 1983). Sialadenitis associated with periorbital disease was reported in a dog where the most likely cause was presumed to be bacterial infection or immune-mediated disease (Simison 1993). Parotid or mandibular gland swelling is occasionally recognised as part of a regional or systemic disease such as distemper (Harvey 1989). Swelling of the parotid and mandibular glands in the dog and cat associated with the paramyxovirus, which causes mumps in man, occurs occasionally (Chandler 1975). Possibly the best recognised, but least understood, inflammatory disease is idiopathic necrosis of the mandibular salivary glands in dogs resulting from constriction of the enlarged inflamed glands within the tight, thick mandibular gland capsule, causing severe pain (Kelly and others 1979). Sialoliths are occasionally found in the parotid salivary duct of the dog (Mulkey and Knecht 1971, Chastain 1974).

Neoplastic disease of the salivary glands, again rare, has been reported. Carberry and others (1988) reported that salivary gland tumors compose less than 0.2% of tumors in dogs and cats. Adenocarcinoma of the parotid and mandibular glands is the most common and occurs in dogs and cats with a mean age of greater than 10 years (Karbe and Schiefer 1967). Other neoplasms are malignant melanoma and mast cell tumor of the salivary gland (Carberry and others 1987). Neoplasms of the salivary glands are generally characterised by progressive unilateral enlargement and slow metastasis (Knecht 1990).

Clinically the most common condition of the salivary gland in the dog is the sialocoele, also known as salivary mucocoele, salivary cyst or honey cyst (Glen 1972, Harvey 1989). A salivary mucocoele is a collection of salivary gland mucus in a non-epithelium-lined swelling (Harvey 1989). This accumulation results from disruption of a salivary gland or its duct. Most sialocoeles have been reported to

arise from disruption of the sublingual salivary gland or its duct (Glen 1966, Spruell and Head 1967).

Case Report

Case details

A 4.5-year-old male Shetland sheepdog was referred because of a 1.5 month history of sublingual swelling. The referring veterinarian had given antibiotics and steroids that resulted in a decrease in the size of the swelling. On presentation, the dog had no difficulty on eating or drinking, and was alert.

Clinical examination

A pink fluid-filled fluctuating mass was found on the left side of the under surface of the tongue that pushed the tongue a little to the opposite side (Fig. C10.1). The swelling was not painful. The saliva was not blood-tinged.

Diagnostic aids

The swelling was aspirated and a small amount of blood-tinged fluid was obtained. However, its viscosity was noted by forming strings when extruded from the syringe through a needle.

The diagnosis of sublingual sialocoele was made based on history, clinical examination and macroscopic examination of the aspirates.

Treatment

Treatment was made by mandibular and sublingual gland resection combined with drainage of the sublingual swelling.

Under routine general anaesthesia the left intermandibular and cranial neck area was clipped and prepared for aseptic surgery. A skin incision was made over the mandibular salivary gland. The maxillary and linguofacial veins were avoided. The platisma muscle was incised, and blunt dissection was continued until the fibrous capsule covering the mandibular gland was reached. The capsule of the gland was incised longitudinally to expose the mandibular gland and monstomatic part of the sublingual gland. The glands were separated from the capsule by blunt dissection by commencing at the caudal and ventral edge. The gland was grasped with Allis tissue forceps and exteriorised. Blunt dissection was continued to free the glands further. Blood vessels entering the medial aspect of the gland were clamped. The glands were retracted to expose the mandibular and sublingual ducts. Blunt

dissection was used to elevate the ducts and adjacent rostral lobes of the sublingual glands. Once four lobules of the polystomatic part of the sublingual gland were isolated a haemostat forceps was placed across the most rostral part of the duct and pulled caudally.

The muscle layer was apposed with 2m polyglactin 910 suture material using a simple interrupted suture pattern. The same pattern was used to appose the skin using 2m nylon. The sublingual swelling was marsupialised to allow drainage. The resected tissue was send for histopathology. Carprofen was given twice daily for two days. The dog was discharged two days post-operation.

Follow-up

An interview made 6 weeks after the operation showed that there was no recurrence of sialocoele.

Fig. C10.1. Ranula. The fluid-filled mass on the under surface of the tongue is shown.

Discussion

The term ranula has been used to describe a sublingual sialocoele. Initially it was thought to represent a dilatation of the sublingual or mandibular salivary ducts (Hulland and Archibald 1964). However, lack of an epithelial lining like other sialocoeles confirmed it to be due to the leakage of saliva in the surrounding tissue as has been reported elsewhere (Karbe and Nielsen 1966).

The definitive cause of salivary gland duct damage has not been established. Spreull and Head (1967) found traumatic injury and an inflammatory process as a cause of damage in only three of 59 cases investigated . Similarly, Bellinger and Simpson (1992) recorded a traumatic aetiology in only 16% of the cases. The trauma was associated with abscess drainage, dental procedure, tumor removal, dog bite, and tongue laceration. Harvey (1969) and Battershell (1971) reported foreign body as a cause of submandibular gland damage. Additionally, blunt trauma squeezing the sublingual gland from bones or sticks the animal chews were mentioned as likely causes (Harvey 1993b). Grass seed penetration of the oral mucosa and disruption of the duct system has been stated (Durthell 1977). Aberrant migration of an adult *Dirofilaria immitis* as a possible cause of salivary mucocoele has been recently reported in a dog (Henry 1992). Neither history of trauma nor evidence of foreign body during surgery was obtained in this dog, hence the cause of the ranula could not be ascertained.

Swelling is the most common sign of disease of the salivary gland due to swelling of the gland itself or to accumulation of salivary gland secretion in an abnormal area in case of sialocoele (Harvey 1993a). A cervical sialocoele may commence with an acute period when the swelling is firm and painful, followed by a reduction in the swelling as the initial inflammatory response to the saliva subsides (Hulland and Archibald 1964). The usual presenting complaint is of gradual enlargement of soft, non-painful mass (Harvey 1993a). Sublingual mucocoele or ranula become apparent because it is damaged by the teeth, causing bleeding around the mouth or into the water bowel. The clinical presentation of this case meet the criteria of the above description with the exception of the signs associated with damage of the swelling by the teeth. This might be due to inadequate observation by the owner.

The diagnosis of sialocoele is made on the bases of history, clinical examination of the fluid obtained by paracentesis (gross appearance, viscosity, cytology and the demonstration of mucin using Giemsa or other a more specific stain such as Periodic acid-schiff (Bellenger and Simpson 1992, Harvey 1993a). The physical location of sublingual sialocoele is easier to diagnose than the cervical sialocoele, hence the diagnosis was straightforward in this dog (Spreull and Head 1967).

However, aspiration of golden-coloured or blood stained mucus which form strings when extruded from the syringe through needle is diagnostic (Harvey 1993b). Although, sialography is useful to confirm the diagnosis and identify the side affected, it was found to be time consuming and unrewarding because of the conjoined mandibular ducts that often prevent canulation of the sublingual duct (Knecht 1990, Harvey 1993a). Determination of the side affected was not a problem in this dog since the ranula was placed laterally, hence sialography was not considered necessary.

The two methods described in the treatment of sialocoele are periodic drainage in animals with severe anaesthetic risk, and removal of the salivary glands on the affected side together with drainage of the sialocoele (Knecht 1990, Harvey 1993a). However, to prevent further accumulation of saliva and drainage of sialocoele, removal of the salivary gland has been found to be the appropriate type of management (Glen 1972, Bellinger and Simpson 1992). Similarly, the sublingual sialocoele in this dog responded well to extirpation of the sublingual and mandibular salivary glands and marsupilisation of the sialocoele. The careful dissection of the rostral lobules of the sublingual gland has been mentioned vital to this success (Brown 1989), since this helps to remove all the sublingual salivary gland caudal to and including, the site of extravasation.

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GLOSSARY

μl - microliter

cm - centimeter

ECG - Electrocardiogram

FG - French Gauge

Fig - Figure

GUVH - Glasgow University Veterinary Hospital

iu - international unit

kg - kilogram

L - Litre

m - meteric

mg - milligram

mm - millimetre

mV - millivolt

sec - second