Structured summary:

**Objectives**

To survey the current treatment techniques of aural haematomas in dogs and investigate veterinary opinion regarding treatment success.

**Methods**

2,386 emails were sent to veterinary surgeons and practices inviting them to complete an on-line survey. Questions investigated veterinary surgeons’ treatment selection for initial and repeat presentations of aural haematoma in dogs and their opinion of treatment success to prevent recurrence and for good cosmesis.

**Results**

312 email addresses were invalid. 259 questionnaires were completed (12.5% response rate) and 251 were included in analysis. On initial presentation, treatments included needle drainage with local deposition of corticosteroids (43%), surgery (29%) and needle drainage without corticosteroids (16%). Surgical procedures included linear incision with sutures alone (35%) or sutures plus stents (24%) and an ‘S’ shaped incision with sutures (23%). The most common reason to select a particular treatment was previous success (76%). Recurrent haematoma was treated more commonly with surgery (67%) than initial presentation. Cosmetic results with medical management were excellent and with surgical treatment were good.

**Clinical Significance**

This study describes the relative popularity and perceived success of treatments used for aural haematoma in the dog. Surgery is considered more likely to definitively treat the condition with good cosmetic results.
Introduction

Aural haematoma is a common condition affecting dogs presenting to general practice (Bojrab and Constantinescu 1998, Fossum 2007, Henderson and Horne 2003, Joyce and Day 1997) although there is no data describing the true prevalence of the condition.

The pathogenesis of aural haematomas remains unclear, but theories include traumatic haemorrhage (Cechner 1998, Dubielzig et al. 1984, Kuwahara 1986) autoimmune disease (Kuwahara 1986) and other immunological factors (Joyce and Day 1997). Associations with hypersensitive skin disease (Joyce and Day 1997), otitis externa (Joyce 1994, Kuwahara 1986, Stephenson 1941, Wilson 1983) and otocariasis (Henderson and Horne 1993, Kuwahara 1986, Stephenson 1941,) have been identified.

If left untreated, the haematoma will fibrose and scar, leading to deformation of the pinna. This may predispose to future otitis externa and produces a poor cosmetic outcome (Yool 2012). Although the chronicity of the haematoma should be taken into account, therapeutic objectives should be to identify and treat the source of irritation, establish drainage, maintain tissue apposition and prevent recurrence (Henderson and Horne 2003). Identification and treatment of underlying disease is important in preventing recurrence (Cechner 1998).

There are a variety of treatment options described, although the quality of evidence for their use remains poor, with small numbers of cases in the reports and no prospective comparative studies, limiting the conclusions which may be made (Hershey and O’Conner 2011). Minimally invasive options include needle aspiration alone (Henderson and Horne 1993) or needle aspiration followed by local deposition of corticosteroids (Fossum 2007, Kuwahara 1986). Open drainage is described by surgical incision and placement of a Penrose drain (Kagan 1983), a Penrose drain in conjunction with systemic corticosteroids (Joyce 1994), a self-retaining disposable teat cannula (Wilson 1983) or in
combination with various suturing techniques to eliminate dead space within the pinna (Bacon 2012, Cowley 1976, Fossum 2007, Henderson and Horne 1993). Incisional techniques involve multiple biopsy punch holes, a longitudinal linear incision (Fossum 2007, Fraser et al. 1969, Henderson and Horne 2003), an S-shaped incision designed to minimise longitudinal contracture of the pinna (Bacon 2012, Fossum 2007, Henderson and Horne 2003, Yool 2012) and excision of a small strip of skin to create a defect to improve drainage (Henderson and Horne 2003). Techniques are described to relieve suture tension using stents (McCarthy 1996) and x-ray film (Ott 1974). Stents may be associated with pinna infection and necrosis (Yool 2012). Alternatively, a closed, in-dwelling drain can be used (Swaim and Bradley 1996). Additional procedures using a carbon dioxide laser (Dye et al. 2002) and local proteolytic enzymes as an adjunct treatment are described (Ott 1974). There is little evidence on which to judge the best treatment option for canine aural haematoma.

This study surveyed the techniques currently used for the treatment of aural haematomas and veterinary practitioners’ opinions on the success of the methods they employ with regards to recurrence rate and cosmetic outcome. This information is intended to guide the management of this common condition. Additionally, this data is to be used to plan a randomised clinical trial using the most common and successful treatments.

**Materials and Methods**

Electronic messages were sent to 2,386 veterinarian and veterinary practice email addresses inviting them to complete an on-line survey. The message contained a cover letter, a link to an online questionnaire (https://smartsurvey.co.uk; Appendix 1) and explanatory document (Appendix 2). Email addresses were obtained using the RCVS website’s ‘Find a Vet’ function. Practices were included if they treated small animals and if the contact information was published. The survey was also distributed via an emailing list courtesy of the Association of Veterinary Soft Tissue Surgeons, UK. Questions were included regarding first line treatment of aural haematomas, treatment of
recurrent cases, perceived success of treatment with respect to recurrence and cosmesis, and practitioners’ main reasons for selecting a particular treatment. Responses were excluded if they did not complete all of the questions essential for the key aims of the survey. Surgical techniques were defined as those in which an incision was made along the ventral aspect of the pinna.

**Results**

312 email addresses were invalid. 259 questionnaires were completed (12.5% response rate) and 251 questionnaires were included in analysis.

**First incidence**

The most common treatment options (Figure 1a) were needle drainage of the haematoma with local deposition of corticosteroids (43%), surgery (29%), needle drainage without corticosteroids (16%) and placement of a Penrose drain (4%). Procedures described as other (8%) included systemic corticosteroid treatment alone or in conjunction with needle drainage, needle drainage with the delayed local use of corticosteroids 3 to 5 days later, medical treatment of otitis externa only or the treatment of otitis externa for 7 to 10 days followed by needle drainage with local administration of corticosteroids and homeopathy alone or in combination with needle aspiration or bandaging. No responses described placement of a bovine teat tube, placement of a drain other than a Penrose, or use of proteolytic enzymes.

Surgical procedures (Figure 2) included a linear incision with sutures alone (35%) and sutures plus stents (24%) or an ‘S’ shaped incision with sutures (23%). Other techniques (18%) included biopsy punch incisions alone, linear incision or biopsy punch fenestration in combination with a custom foam pad (Buster Orthaematoma pad; Kruuse UK Ltd, Sherburn in Elmet, North Yorkshire, UK), hexalite stent or x-ray film and various personalised permutations on the shape of the surgical incision made.
The most common reason given for the selection of a particular treatment option (Figure 3) was previous success (77%), followed by owner preference (6%), cost (5%), practice policy (4%), convenience (4%) and other (4%). Veterinarians rated their chosen first line treatment for the prevention of recurrence as excellent (24%), good (43%), average (27%) and poor (6%, further breakdown Table 1). This tallied with predicted recurrence rates, with 65%, 21%, 10% and 4% of vets predicting 0-25%, 26-50%, 51-75% and 76-100% recurrence respectively. Ninety-six percent of veterinary surgeons who chose surgery as a first line treatment expected recurrence in only 0-25% of cases, as opposed to 51% of veterinary surgeons who initially drained the haematoma and instilled steroid locally. Cosmetic outcome was considered to be excellent (25%), good (37%), average (35%) and poor (3%) following initial treatment. Cosmetic results with medical management were excellent and with surgical treatment were good. Owner satisfaction was described to be excellent (16%), good (56%), average (26%) and poor (1.5%) with their chosen treatment option.

Recurrent or persistent haematoma

The most common treatment of a recurrent haematoma (Figure 1b) was surgery (67%) followed by needle drainage with local deposition of corticosteroids (16%), needle drainage alone (7%), placement of a Penrose drain (7%) and other options (3%). There was therefore an increase of 38% in the number of respondents electing to treat surgically. Surgical procedures for recurrent haematomas were broadly similar to initial treatment techniques (Figure 2b), although there was a tendency for more surgeons to use stents in combination with the sutures.

Expected recurrence rates were lower following a second treatment compared with the initial treatment, with 83%, 8%, 5% and 4% of vets predicting 0-25%, 26-50%, 51-75% and 76-100% recurrence respectively. Cosmetic outcome was considered to be excellent (14%), good (46%), average (36%) and poor (4%) following initial treatment. Predicted owner satisfaction was no
different to the first occurrence; excellent (14%), good (52%), average (30%) and poor (4%) with their chosen treatment option.

Multiple recurrence
Many respondents answered that this had never happened to them. Treatment at this stage was divided into surgery (64.3%), drainage and local steroid (5%), needle drainage alone (2%), Penrose drain placement (2%) and other (26%), the latter category largely being to leave the haematoma to resolve naturally. Veterinary surgeons predicted 0-25% recurrence in 92% of cases.

Discussion
The unclear aetiopathogenesis of canine aural haematoma and lack of evidence comparing the efficacy of available treatments has resulted in the continued use of a multitude of techniques by veterinary surgeons based on their personal preference or the anecdotal experience and advice of colleagues. The most popular initial treatment in this survey is by needle drainage with or without the concurrent use of local corticosteroids (59%). Treatment of human aural haematoma is generally successfully performed by needle aspiration (without corticosteroid injection), but surgical drainage may be performed if the haematoma is recurrent or older than 7 days (Giles et al. 2007). Veterinarians often qualified in their response that multiple factors would influence their treatment choice including the size and chronicity of the haematoma, the age of the animal and suitability for general anaesthesia.

The authors feel that treatment of concurrent skin or ear disease is mandatory. Whether these conditions underlie the aetiology of aural haematoma or not, it is logical to treat any condition causing patient morbidity and which could lead to self-excoriation of the affected pinna. Questions regarding the treatment of skin and ear disease were not included in the survey as the aetiology of
haematoma is still unclear and the authors felt that respondents would invariably agree with a leading question asking whether they would treat concurrent disease.

A successful treatment for canine aural haematoma should resolve clinical signs, prevent recurrence and have minimal negative effects, including cosmetic outcome. In the absence of controlled prospective clinical trials, treatment success in practice may be inferred from data describing the prevalence of procedures currently performed and veterinary surgeons’ opinions of their outcome. Veterinary surgeons are more confident that surgery is better at preventing recurrence of aural haematoma compared with medical management. This is evidenced by the lower expectation of recurrence following initial treatment with surgery and the increased use of surgery compared with medical treatment for persistent cases. However, veterinary surgeons reported that the cosmetic outcome was inferior with surgical versus medical management and, whilst it was still considered good, this may be a reason why surgery was not elected as the most popular first line treatment. Medical management initially has low morbidity, is simple, quick, inexpensive and there is a minimal requirement for equipment, technical training or expertise and offers an acceptable chance of success. Complication rates of surgical procedures were not investigated in this survey as it was felt that they would be inaccurately described, but may include infection and persistent discharge. A retrospective study of human auricular haematoma treatment concluded that recurrence was less likely following surgical drainage and placement of mattress sutures (Giles et al. 2007).

Broadly speaking, the surgical procedures used to treat aural haematoma in dogs were very similar, using either a linear or curved incision to provide drainage and then mattress sutures alone or in combination with stents to close dead space within the pinna. The use of stents was more commonly described in the recurrent haematoma procedures compared to the initial surgical treatments, probably reflecting the preference of different veterinarians who had previously tried needle drainage or conservative management rather than modification of the surgical technique by those
who had already performed surgery. Stents are intended to prevent the sutures cutting through the skin, but they can lead to pressure necrosis of underlying tissue and careful tensioning of sutures should prevent iatrogenic injury. Newer custom designed commercially available products may be under-represented compared to traditional techniques until they are more widely familiar, rather than reflecting on their success.

Limitations include those common to any survey based investigation, for example, misinterpretation of questions and bias in replies from a particular subset of clinicians or personalities. Additionally, distribution of questionnaires by email may have resulted in distribution bias to veterinary practices and surgeons with a certain technological bias which could reflect their practice facilities and treatment options available. There was no distinction between cases of recurrent or de novo haematoma.

Conclusion
This study describes the relative popularity and perceived success for the management of aural haematoma. The treatment of affected dogs is primarily dependent on individual patient history and clinical examination findings and the veterinary surgeon should tailor the treatment offered and performed accordingly. Medical and surgical management both offer good to excellent cosmetic outcomes, and surgical management is considered to be more likely to prevent recurrence. A prospective clinical trial can now accurately identify the best treatment options from those identified to be most successful and in popular use.

References


Figure 1. Treatment at the first presentation of aural haematoma (a) and in the event of recurrence (b)

Figure 2. Procedures used by veterinary surgeons when surgery is chosen for initial treatment (a) or for persistent aural haematoma (b)

Figure 3. Reason for selecting a particular treatment option for the first line treatment of aural haematoma