

1 **Title: Treatment of canine aural haematoma by UK veterinarians**

2

3 **Structured summary:**

4

5 **Objectives**

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

8 **Methods**

9 2,386 emails were sent to veterinary surgeons and practices inviting them to complete an on-line
10 survey. Questions investigated veterinary surgeons' treatment selection for initial and repeat
11 presentations of aural haematoma in dogs and their opinion of treatment success to prevent
12 recurrence and for good cosmesis.

13 **Results**

14 312 email addresses were invalid. 259 questionnaires were completed (12.5% response rate) and
15 251 were included in analysis. On initial presentation, treatments included needle drainage with
16 local deposition of corticosteroids (43%), surgery (29%) and needle drainage without corticosteroids
17 (16%). Surgical procedures included linear incision with sutures alone (35%) or sutures plus stents
18 (24%) and an 'S' shaped incision with sutures (23%). The most common reason to select a particular
19 treatment was previous success (76%). Recurrent haematoma was treated more commonly with
20 surgery (67%) than initial presentation. Cosmetic results with medical management were excellent
21 and with surgical treatment were good.

22 **Clinical Significance**

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

26

27 **Introduction**

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

31

32 The pathogenesis of aural haematomas remains unclear, but theories include traumatic
33 haemorrhage (Cechner 1998, Dubielzig *et al.* 1984, Kuwahara 1986) autoimmune disease (Kuwahara
34 1986) and other immunological factors (Joyce and Day 1997). Associations with hypersensitive skin
35 disease (Joyce and Day 1997), otitis externa (Joyce 1994, Kuwahara 1986, Stephenson 1941, Wilson
36 1983) and otocariasis (Henderson and Horne 1993, Kuwahara 1986, Stephenson 1941,) have been
37 identified.

38

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

45

46 There are a variety of treatment options described, although the quality of evidence for their use
47 remains poor, with small numbers of cases in the reports and no prospective comparative studies,
48 limiting the conclusions which may be made (Hershey and O'Conner 2011). Minimally invasive
49 options include needle aspiration alone (Henderson and Horne 1993) or needle aspiration followed
50 by local deposition of corticosteroids (Fossum 2007, Kuwahara 1986). Open drainage is described by
51 surgical incision and placement of a Penrose drain (Kagan 1983), a Penrose drain in conjunction with
52 systemic corticosteroids (Joyce 1994), a self-retaining disposable teat cannula (Wilson 1983) or in

53 combination with various suturing techniques to eliminate dead space within the pinna (Bacon 2012,
54 Cowley 1976, Fossum 2007, Henderson and Horne 1993,). Incisional techniques involve multiple
55 biopsy punch holes, a longitudinal linear incision (Fossum 2007, Fraser *et al.* 1969, Henderson and
56 Horne 2003), an S-shaped incision designed to minimise longitudinal contracture of the pinna (Bacon
57 2012, Fossum 2007, Henderson and Horne 2003, Yool 2012) and excision of a small strip of skin to
58 create a defect to improve drainage (Henderson and Horne 2003). Techniques are described to
59 relieve suture tension using stents (McCarthy 1996) and x-ray film (Ott 1974). Stents may be
60 associated with pinna infection and necrosis (Yool 2012). Alternatively, a closed, in-dwelling drain
61 can be used (Swaim and Bradley 1996). Additional procedures using a carbon dioxide laser (Dye *et al.*
62 2002) and local proteolytic enzymes as an adjunct treatment are described (Ott 1974). There is little
63 evidence on which to judge the best treatment option for canine aural haematoma.

64

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

70

71 **Materials and Methods**

72 Electronic messages were sent to 2,386 veterinarian and veterinary practice email addresses inviting
73 them to complete an on-line survey. The message contained a cover letter, a link to an online
74 questionnaire (<https://smartsurvey.co.uk>; Appendix 1) and explanatory document (Appendix 2).

75 Email addresses were obtained using the RCVS website's 'Find a Vet' function. Practices were
76 included if they treated small animals and if the contact information was published. The survey was
77 also distributed via an emailing list courtesy of the Association of Veterinary Soft Tissue Surgeons,
78 UK. Questions were included regarding first line treatment of aural haematomas, treatment of

79 recurrent cases, perceived success of treatment with respect to recurrence and cosmesis, and
80 practitioners' main reasons for selecting a particular treatment. Responses were excluded if they did
81 not complete all of the questions essential for the key aims of the survey. Surgical techniques were
82 defined as those in which an incision was made along the ventral aspect of the pinna.

83

84 **Results**

85 312 email addresses were invalid. 259 questionnaires were completed (12.5% response rate) and
86 251 questionnaires were included in analysis.

87

88 *First incidence*

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

98

99 Surgical procedures (Figure 2) included a linear incision with sutures alone (35%) and sutures plus
100 stents (24%) or an 'S' shaped incision with sutures (23%). Other techniques (18%) included biopsy
101 punch incisions alone, linear incision or biopsy punch fenestration in combination with a custom
102 foam pad (Buster Orthaematoma pad; Kruise UK Ltd, Sherburn in Elmet, North Yorkshire, UK),
103 hexalite stent or x-ray film and various personalised permutations on the shape of the surgical
104 incision made.

105

106 The most common reason given for the selection of a particular treatment option (Figure 3) was
107 previous success (77%), followed by owner preference (6%), cost (5%), practice policy (4%),
108 convenience (4%) and other (4%). Veterinarians rated their chosen first line treatment for the
109 prevention of recurrence as excellent (24%), good (43%), average (27%) and poor (6%, further
110 breakdown Table 1). This tallied with predicted recurrence rates, with 65%, 21%, 10% and 4 % of
111 vets predicting 0-25%, 26-50%, 51-75% and 76-100% recurrence respectively. Ninety-six percent of
112 veterinary surgeons who chose surgery as a first line treatment expected recurrence in only 0-25% of
113 cases, as opposed to 51% of veterinary surgeons who initially drained the haematoma and instilled
114 steroid locally. Cosmetic outcome was considered to be excellent (25%), good (37%), average (35%)
115 and poor (3%) following initial treatment. Cosmetic results with medical management were excellent
116 and with surgical treatment were good. Owner satisfaction was described to be excellent (16%),
117 good (56%), average (26%) and poor (1.5%) with their chosen treatment option.

118

119 *Recurrent or persistent haematoma*

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

126

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

131 different to the first occurrence; excellent (14%), good (52%), average (30%) and poor (4%) with
132 their chosen treatment option.

133

134 *Multiple recurrence*

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

139

140 **Discussion**

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

151

152 The authors feel that treatment of concurrent skin or ear disease is mandatory. Whether these
153 conditions underlie the aetiology of aural haematoma or not, it is logical to treat any condition
154 causing patient morbidity and which could lead to self-excoriation of the affected pinna. Questions
155 regarding the treatment of skin and ear disease were not included in the survey as the aetiology of

156 haematoma is still unclear and the authors felt that respondents would invariably agree with a
157 leading question asking whether they would treat concurrent disease.

158

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

175

176 Broadly speaking, the surgical procedures used to treat aural haematoma in dogs were very similar,
177 using either a linear or curved incision to provide drainage and then mattress sutures alone or in
178 combination with stents to close dead space within the pinna. The use of stents was more commonly
179 described in the recurrent haematoma procedures compared to the initial surgical treatments,
180 probably reflecting the preference of different veterinarians who had previously tried needle
181 drainage or conservative management rather than modification of the surgical technique by those

182 who had already performed surgery. Stents are intended to prevent the sutures cutting through the
183 skin, but they can lead to pressure necrosis of underlying tissue and careful tensioning of sutures
184 should prevent iatrogenic injury. Newer custom designed commercially available products may be
185 under-represented compared to traditional techniques until they are more widely familiar, rather
186 than reflecting on their success.

187

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

194

195 **Conclusion**

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

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

276 (b)

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278 Figure 2. Procedures used by veterinary surgeons when surgery is chosen for initial treatment (a) or

279 for persistent aural haematoma (b)

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

282 haematoma

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