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## Canine tonsillar polyps: characteristics, classification and review of the pathogenesis

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Complete List of Authors:	Molin, Jéssica; University of Lleida School of Agricultural and Forestry Engineering, Department of Animal Science VILAFRANCA COMPTE, Dr Miquel; HISTOVET, Montserrat, 9 Suárez-Bonnet, Alejandro; The Royal Veterinary College, Pathobiology & Population Sciences Altimira, Jaume; HISTOVET, Ramírez, Gustavo; University of Lleida, Animal Science
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Manuscripts

1 **Canine tonsillar polyps: characteristics, classification and**  
2 **review of the pathogenesis**

3 Jéssica Molín, Miquel Vilafranca, Alejandro Suárez-Bonnet, Jaume Altimira,  
4 Gustavo A. Ramírez

5

6 Department of Animal Science, School of Agriculture, Food Science and  
7 Veterinary Medicine (ETSEA), University of Lleida, 25198 Lleida, Spain (JM,  
8 GAR)

9 Laboratorio de Diagnóstico Histopatológico Histovet, Sant Quirze del Vallès,  
10 Barcelona, Spain (MV, JA)

11 Department of Pathobiology and Population Sciences, The Royal Veterinary  
12 College, Hawkshead Lane, Hatfield, Hertfordshire AL9 7TA, UK. (ASB)

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16 Corresponding author: Jéssica Molín, DVM, MSc, PhD, DipIECVP, Department  
17 of Animal Science, School of Agriculture, Food Science and Veterinary Medicine  
18 (ETSEA), University of Lleida, 25198 Lleida, Spain. Phone +34 973702930. E-  
19 mail address: [jessica.molin@udl.cat](mailto:jessica.molin@udl.cat)

**20 Abstract**

21 Canine tonsillar polyps are uncommon. We describe 14 tonsillar polyps in dogs  
22 and review their classification and pathogenesis. All dogs were adult (3-13  
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37 Benign proliferative tonsillar lesions are infrequent in dogs. Only 10 canine  
38 tonsillar polyps and an epithelial cyst have been reported, among 3 publications  
39 and a conference proceeding.<sup>3,5,11,13</sup> Histologically, most of the lesions are  
40 composed of mature fibrovascular stroma with multifocal aggregates of  
41 lymphocytes and plasma cells, and have been defined as inflammatory  
42 polyps.<sup>11,20</sup> Predominance of dilated lymphatic vessels within a dense  
43 fibrovascular stroma have been described only rarely.<sup>3,13</sup>

44 Benign tonsillar polyps in humans are mostly considered hamartomatous  
45 growths containing vascular, connective, lymphoid and fat tissue in variable  
46 proportions.<sup>7,8,12</sup> As in dogs, human tonsillar polyps are infrequent but the real  
47 incidence is unknown.<sup>7,12</sup> Histologically, polyps are recommended to be  
48 classified according to the most prominent stromal component and, in contrast  
49 to dogs, different histotypes have been reported including lymphangiomas,  
50 lymphangiectatic, fibrous or fibrolipomatous, lymphoid, fibroepithelial.<sup>2,7,12,17</sup>

51 The objective of this report is to describe the clinicopathological characteristics  
52 of 14 tonsillar polyps in dogs, review their classification, and compare the  
53 canine lesion to known pathogenesis in humans.

54 Our records included 402 canine cases with tonsillar histopathology from 1995  
55 to 2020. From those, 14 were selected because the descriptions were  
56 consistent with tonsillar polyps. Samples had been fixed in 10% neutral-buffered  
57 formalin, processed routinely, and stained with hematoxylin and eosin.

58 Microscopic characteristics of each case were re-examined by two board-  
59 certified pathologists (JM, GAR). Vascularization, edema, and degree of  
60 inflammation were graded on a 0–3 scale (0, absent; 1, mild; 2, moderate; 3,  
61 marked). Vascular spaces, lymphoid, fibrous and fat tissue were graded on a 0–

62 4 scale based on percent (0, absent; 1, 1–25%; 2, 26–50%; 3, 51–75%; 4 >75%  
63 stroma). Clinical data and follow-up information were obtained through e-mail  
64 and telephone interviews with the referring clinicians.

65 Clinical and macroscopic data are shown in Table 1. Age of the dogs ranged  
66 from 3 to 13 years (mean 9.3). Females (10/14) were more affected than males  
67 (4/14). All patients presented with a unilateral, variably sized polyp emerging  
68 from the surface of palatine tonsil. Polyps were located on the right (6/14), left  
69 (4/14), or unreported (4/14). Most dogs were asymptomatic; only 4/12 (33%)  
70 cases showed clinical signs consisting of mouth bleeding (case 7), cough (case  
71 10), retching (case 10,14) and dyspnea (case 13). Follow-up information was  
72 available in 9/14 (64%) cases, none of which showed local recurrence after  
73 simple surgical excision.

74 Nine of 14 (67%) polyps were pedunculated and 5/14 (36%) were sessile. The  
75 total length of the polyps ranged from 1 cm to 3.8 cm (mean, 1.93 cm) and the  
76 diameter from 0.3 to 1.4 cm (mean, 0.69 cm). Polyps showed a smooth (12/14),  
77 papillary (1/14) or verrucous (1/14) surface. Cut section was white to yellow and  
78 varied from soft and spongy (9/14) to firm and fibrous (4/14) to gelatinous  
79 (1/14).

80 Polyps were categorized into different histological subtypes according to the  
81 main constituents of their stroma. Histologic characteristics of each case are  
82 shown in Supplemental Table S1.

83 Seven of 14 polyps (57%) were diagnosed as lymphangiomatous. Lesions  
84 showed a highly vascularized stroma with abundant dilated endothelial-lined  
85 cavities and interconnected vascular channels, compatible with lymphatic

86 vessels (Figs. 1, 2). Lymphatics were empty or filled by eosinophilic fluid, and  
87 were separated by hypocellular, dense fibrovascular tissue occupying <50% of  
88 the stroma (Fig. 2). In 2/14 lesions, 25-50% of the stroma was infiltrated by  
89 adipose tissue and were subclassified as lymphangioliomatous (Supplemental  
90 Fig. S1). Expanded subepithelial lymphoid follicles were multifocally present  
91 (Supplemental Fig. S2). Polyps were covered by stratified squamous epithelium  
92 with mild to moderate irregular hyperplasia (Supplemental Figs. S2-S4).  
93 Multifocally, the stroma elevated the surface forming small nodular projections  
94 and, in one case, causing a verrucous appearance (Supplemental Fig. S4).  
95 Acute necrotic changes including fibrinoid necrosis of blood vessel walls and  
96 intravascular fibrin thrombi were rarely seen (case 1; Supplemental Fig. S5),  
97 without associated clinical signs.

98 Four of 14 cases (29%) showed a predominantly fibrous stroma with numerous,  
99 slightly-dilated and non-anastomosing vessels. In 2 of the 4, lymphatics  
100 predominated and were categorized as lymphangiofibromatous (Supplemental  
101 Fig. S6). The other 2 of these 4 polyps showed a predominance of blood  
102 vessels and were classified as angiofibromatous (1/4) or angiofibrolipomatous  
103 (1/4) based on adipose tissue occupying more than 25% of the stroma (Figs. 3,  
104 4).

105 Two of the 14 cases (14%) were classified as lymphoid polyps. More than 80%  
106 of the stroma was occupied by lymphoid tissue organized in coalescing,  
107 variable-sized follicular structures with reactive germinal centers surrounding a  
108 fibrovascular core (Figs. 5, 6). The presence of reticular epithelium  
109 transmigrated by large numbers of lymphocytes was more abundant in  
110 lymphoid polyps than in other histological subtypes (Fig. 5 inset).

111 Finally, one of 14 cases (7%) was categorized as myxomatous (case 14). The  
112 stroma was occupied by severe hypocellular myxomatous edema containing  
113 few interspersed spindle cells without atypia on loose fibrovascular stroma  
114 (Figs. 7, 8). At the base of the polyp, the vascular density was increased (Fig.  
115 9). The surface epithelium showed moderate hyperplasia, intracellular and  
116 intercellular edema, and occasional intraepithelial vesicles (Fig. 7 inset).

117 All polyps showed a mild to moderate inflammation with multifocal infiltrates of  
118 lymphocytes and plasma cells, with occasional presence of neutrophils (Fig. 8  
119 and Supplemental Figs. S1, S6).

120 Ten cases of canine tonsillar polyps were previously reported<sup>3,11,13</sup> and 14 are  
121 described herein. Although tonsillar polyps mainly affect adult dogs, they can  
122 affect dogs as young as 3 years (case 9).<sup>3,11,13</sup> Human lymphangiomatous  
123 polyps are more frequent in young adults, while lymphoid polyps commonly  
124 affect children.<sup>2,7,8,12</sup> No sex predisposition has been reported for canine or  
125 human tonsillar polyps, except for the lymphoid subtype which is more common  
126 in males.<sup>2,7,8,11,12</sup> In dogs, females were more affected than males but the  
127 overall numbers were too few to determine a sex predilection. All tonsillar  
128 polyps reported in dogs were unilateral without side predilection.<sup>3,11,13</sup> In  
129 humans, most polyps are unilateral but bilateral involvement has been rarely  
130 observed.<sup>6-8,12</sup> Canine tonsillar polyps are mostly asymptomatic. Only 8/22  
131 (36%) dogs, including the 12 with clinical information in this series, showed  
132 clinical signs of lethargy, chronic dyspnea, coughing, gagging, retching or  
133 episodes of oral bleeding.<sup>3,11,13</sup> Human tonsillar polyps might be asymptomatic  
134 or associated with dysphagia, dyspnea, foreign body sensation, sore throat,  
135 tonsillitis and cough, depending on the size of the lesion.<sup>7,8,12</sup>

136 Canine and human tonsillar polyps can present as pedunculated or sessile  
137 masses with smooth or papillary surface.<sup>3,7,8,11-13</sup> Canine tonsillar polyps in this  
138 series were mostly pedunculated with smooth surface. This contrast with  
139 observations from the previously reported case series in which only 3/8 polyps  
140 were pedunculated.<sup>11</sup>

141 As in humans, the stroma of canine tonsillar polyps was composed by variable  
142 proportions of lymphatic and blood vessels, fibrous tissue, lymphoid tissue, and  
143 occasionally fat tissue, leading to different histomorphology that allow their  
144 classification into different histological subtypes.<sup>2,7,8,12</sup>

145 Lymphangiomatous polyps were the most common histological subtype in this  
146 case series. They show identical features to those previously reported in an  
147 adult dog and in humans.<sup>7,13</sup> These type of polyps have also been referred as  
148 tonsillar lymphangiomas by human pathologists.<sup>12</sup> However, tonsillar  
149 lymphangiomatous polyps have smaller lymphatic spaces and more fibrous and  
150 lymphoid stromal elements than lymphangiomas found elsewhere.<sup>12</sup> Canine  
151 lymphangiomas usually affect the skin of young dogs, and involvement of  
152 internal tissues is rare and mostly associated to a lymphangiomatosis syndrome  
153 with systemic involvement.<sup>16</sup>

154 The histomorphology of angiofibromatous polyps in our series is similar to those  
155 described by Lucke et al<sup>11</sup> as canine tonsillar inflammatory polyps, and to the  
156 stroma of canine and feline nasopharyngeal and middle ear polyps.<sup>9,15</sup> In  
157 contrast to tonsillar polyps, nasopharyngeal and middle ear polyps are usually  
158 partially covered by pseudostratified ciliated columnar epithelium and the  
159 stromal core and peduncle are less vascularized.<sup>9,15</sup> The main differential  
160 diagnosis considered for angiofibromatous and angiofibrolipomatous polyps



161 was angiofibroma. Due to the lack of infiltrative growth, the stromal fat  
162 infiltration, and the lower cellularity in these polyps when compared to canine  
163 nasal angiofibromas, this diagnosis was excluded.<sup>4</sup>

164 One polyp was classified as myxomatous. To the best of our knowledge, such  
165 histological appearance has not been described in human or canine tonsillar  
166 polyps. The highly edematous appearance of this polyp might be secondary to  
167 inflammation, as suggested for similar stromal changes in nasopharyngeal and  
168 laryngeal canine and feline polyps.<sup>9,18,19</sup>

169 The pathogenesis of benign tonsillar polyps is unclear. While an inflammatory  
170 origin has been suggested for canine lesions, the most accepted theory in  
171 human pathology considers these polyps as hamartomas.<sup>2,7,8,11,12,20</sup> This is  
172 further supported by the evidence of a disorganized distribution of fibronectin  
173 and collagens I and III within the stroma of tonsillar polyps regardless of their  
174 histomorphology.<sup>1</sup> Therefore, tonsillar hamartomas could present a variable  
175 histologic spectrum including polyps with fibrous/fibrovascular,  
176 lymphangiomatous, lymphoid and/or, more rarely, lipomatous  
177 appearances.<sup>2,7,8,12</sup> A second theory involves chronic inflammatory hyperplasia  
178 with irreversible lymphatic obstruction and lymphangiectasia, eventually causing  
179 mucosal prolapse and formation of a polyp.<sup>8,12</sup> Evidence against this  
180 explanation is that chronic tonsillitis occurs more commonly than polyps, and  
181 many patients with polyps lack a history of tonsillitis.<sup>7,8,12</sup> A clinical history of  
182 previous episodes of tonsillitis was not indicated in any of our cases or those  
183 previously reported.<sup>3,11,13</sup> Partial polyp torsion with subsequent  
184 lymphangiectasia and acute inflammatory and necrotic changes is possible in  
185 lesions with a long peduncle, as observed in our series (case 1).

186 As in humans, the pathogenesis of canine tonsillar polyps may involve a  
187 multistep process with an initial hamartomatous growth followed by secondary  
188 inflammatory and degenerative changes.<sup>1,12</sup> Secondary chronic inflammation in  
189 human tonsillar polyps causes stromal remodeling and lymphoid hyperplasia,  
190 occasionally producing lymphoid polyps.<sup>1,2,12</sup> These are characterized by a  
191 stroma composed predominantly of lymphoid tissue (>80%) organized in  
192 follicles around a fibrovascular core, similar to that observed in cases 12 and  
193 13.<sup>1,2</sup> To the best of our knowledge, tonsillar lymphoid polyps have not been  
194 previously described in veterinary medicine.

195 Fat tissue was present in 4 of the lesions and, when occupying >25% of the  
196 stroma, the term lipomatous was added to the morphological diagnosis.

197 Adipose tissue infiltration within some polyps probably reflects chronic  
198 degenerative and metaplastic stromal changes.<sup>7,10,14</sup>

199 In conclusion, canine tonsillar polyps are benign unilateral and usually  
200 asymptomatic lesions of adult dogs, with excellent response to surgical  
201 resection. They are composed of lymphatics, blood vessels, fibrous, lymphoid  
202 and fat tissue in variable proportions, producing different histomorphology. As in  
203 humans, a hamartomatous origin with superimposed inflammatory changes  
204 may be considered. We propose replacing the term inflammatory tonsillar polyp  
205 with morphological diagnoses based on the stromal characteristics.

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218 **References**

- 219 1. Barreto I, Costa AF, Martins MT, et al. Immunohistochemical study of stromal  
220 and vascular components of tonsillar polyps: high endothelial venules as  
221 participants of the polyp's lymphoid tissue. *Virchows Arch*. 2011;**459**(1):65–71.
- 222 2. Barreto I, Juliano P, Chagas C, et al. Lymphoid polyps of the palatine tonsil.  
223 *Int J Surg Pathol*. 2007;**15**(2):155–159.
- 224 3. Bauchet AL, Balme E, Thibault JL, et al. Lymphangiectatic Fibrous Polyp of  
225 the Tonsil in a Dog. *J Comp Path*. 2009;**141**(4):284.
- 226 4. Burgess KE, Green EM, Wood RD, et al. Angiofibroma of the nasal cavity in  
227 13 dogs. *Vet Comp Oncol*. 2011;**9**(4):304–309.
- 228 5. Degner DA, Bauer MS, Ehrhart EJ. Palatine tonsil cyst in a dog. *J Am Vet*  
229 *Med Assoc*. 1994;**204**(7):1041–1042.
- 230 6. Gan W, Xiang Y, He X, et al. A CARE-compliant article: Lymphangiomatous  
231 polyps of the palatine tonsils in a miner: A case report. *Medicine (Baltimore)*.  
232 2019;**98**(1):e14009.
- 233 7. Kardon DE, Wenig BM, Heffner DK, et al. Tonsillar lymphangiomatous  
234 polyps: a clinicopathologic series of 26 cases. *Mod Pathol*. 2000;**13**(10):1128–  
235 1133.
- 236 8. Kim KS. Review of Lymphangiomatous Polyp of the Palatine Tonsil. *J*  
237 *Craniofac Surg*. 2015;**26**(4):e369–370.
- 238 9. Lamb CR, Sibbing K, Priestnall SL. Pathologic Basis for Rim Enhancement  
239 Observed in Computed Tomographic Images of Feline Nasopharyngeal Polyps.  
240 *Vet Radiol Ultrasound*. 2016;**57**(2):130–136.

- 241 10. Lambor D, Kumar S, Kakodkar NS, et al. A Pedunculated Fibrolipomatous  
242 Polyp of Tonsil: A Rare Case Report. *International Journal of Otolaryngology*  
243 *and Head & Neck Surgery*. 2017;**6**(2):16–21.
- 244 11. Lucke VM, Pearson GR, Gregory SP, et al. Tonsillar polyps in the dog. *J*  
245 *Small Anim Pract*. 1988;**29**(6):373–379.
- 246 12. Mardekian S, Karp JK. Lymphangioma of the palatine tonsil. *Arch Pathol*  
247 *Lab Med*. 2013;**137**(12):1837–1842.
- 248 13. Miller AD, Alcaraz A, McDonough SP. Tonsillar lymphangiomatous polyp in  
249 an adult dog. *J Comp Pathol*. 2008;**138**(4):215–217.
- 250 14. Ohtsuki Y, Kurita N, Iguchi M, et al. Case Report: A pedunculated  
251 hamartomatous polyp of the palatine tonsil. *Biomed Res*. 2006;**17**(3):155–158.
- 252 15. Pratschke KM. Inflammatory polyps of the middle ear in 5 dogs. *Vet Surg*.  
253 2003;**32**(3):292–296.
- 254 16. Ramírez GA, Sánchez-Salguero X, Molín J. Primary cystic lymphangioma  
255 of the spleen in an adult dog. *J Comp Pathol*. 2020;**178**:22–26.
- 256 17. Singh M, Mundi DK, Kaur I, et al. Hamartomatous polyp of the tonsil: A case  
257 report. *Niger J Clin Pract*. 2017;**20**(6):774–776.
- 258 18. Smart L, Jandrey KE. Upper airway obstruction caused by a  
259 nasopharyngeal polyp and brachycephalic airway syndrome in a Chinese  
260 Shar-Pei puppy. *J Vet Emerg Crit Care*. 2008;**18**(4):393–398.
- 261 19. Sugimoto K, Kanda T, Mitsui I, et al. A laryngeal inflammatory polyp in a  
262 miniature dachshund. *Vet Med Sci*. 2020;**6**(3):342–347.
- 263 20. Uzal FA, Plattner BL, Hostetter JM. Alimentary system. In: Maxie MG, ed.  
264 *Jubb, Kennedy & Palmer's Pathology of Domestic Animals*. 6th ed. Vol 2. St.  
265 Louis, MO: Elsevier; 2016:19–20.

266 **Figure legends**

267 **Figures 1-4.** Polyps, tonsil, dog. **Figures 1-2.** Lymphangiomatous polyp, case  
268 No. 1. **Figure 1.** Pedunculated polyp with numerous dilated vascular cavities in  
269 the stroma. Large aggregates of lymphocytes are within the subepithelial space.  
270 Hematoxylin and eosin (HE). **Figure 2.** Dilated lymphatic vessels with  
271 occasional valves are present amid scant fibrous stroma. HE. **Figures 3-4.**  
272 Angiofibrolipomatous polyp, case No 8. Sessile polyp with abundant fibrous  
273 stroma that multifocally contains adipose tissue. Numerous congested blood  
274 vessels are concentrated in the stromal core. HE.

275

276 **Figures 5-9.** Polyps, tonsil, dog. **Figures 5-6.** Lymphoid polyp, case No. 13.  
277 **Figure 5.** Sessile polyp with stroma composed of large hyperplastic lymphoid  
278 follicles surrounding a fibrovascular core. Inset: the polyp is covered by stratified  
279 epithelium and tonsillar reticular epithelium transmigrated by lymphocytes. HE.  
280 **Figure 6.** Secondary antigen-polarized lymphoid follicles with expanded  
281 germinal centers surrounded by a thin mantle zone. Inset: germinal centers  
282 contain tingible-body macrophages. HE. **Figures 7-9.** Myxomatous polyp, case  
283 No. 14. **Figure 7.** Pedunculated polyp with severely edematous stroma and a  
284 fibrovascular pedicle. A transition line between the two areas is seen  
285 (arrowheads). Inset: Intraepithelial and subepithelial vesicles containing  
286 edema. HE. **Figure 8.** Edematous stroma contains small numbers of spindle  
287 cells and mild multifocal to diffuse mononuclear inflammatory infiltrates. HE.  
288 **Figure 9.** Fibrovascular pedicle with numerous congested blood vessels and  
289 empty lymphatic vessels at the base. HE.

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16 Corresponding author: Jéssica Molín, DVM, MSc, PhD, DiplECVP, Department  
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**Commented [JLC1]:** please state their initials, in parentheses.

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68 Clinical ~~data~~ and macroscopic ~~data features of individual cases~~ are shown in  
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 73 dogs were asymptomatic; ~~Only~~ 4/12 (33%) cases showed clinical signs  
 74 consisting of mouth bleeding (case 7), cough (case 10), retching (case 10,14)  
 75 and dyspnea (case 13). Follow-up information was available in 9/14 (64%)  
 76 cases, none of which showed local recurrence after simple surgical excision.

**Commented [JLC3]:** Table 1. Instead of revision (3 uses), I suggest "examination" or "checkup".

**Commented [JM4R4]:** The term revision has been replaced by examination in the R2 version of Table 1.

77 Nine of 14 (67%) polyps were pedunculated and 5/14 (36%) were sessile. The  
 78 total length of the polyps ranged from 1 cm to 3.8 cm (mean, 1.93 cm) and the  
 79 diameter from 0.3 to 1.4 cm (mean, 0.69 cm). Polyps showed a smooth (12/14),  
 80 papillary (1/14) or verrucous (1/14) surface. Cut section was white to yellow and  
 81 varied from soft and spongy (9/14) to firm and fibrous (4/14) ~~to gelatinous.~~ ~~In~~  
 82 ~~(1/14) case (case 14) a gelatinous appearance was noted.~~

83 Polyps were categorized into different histological subtypes according to the  
 84 main constituents of their stroma. Histologic characteristics of each case are  
 85 shown in Supplemental Table S1.

86 Seven of 14 polyps (57%) were diagnosed as lymphangiomatous. Lesions  
87 showed a highly vascularized stroma with abundant dilated endothelial-lined  
88 cavities and interconnected vascular channels, compatibles with lymphatic  
89 vessels (Figs. 1, 2). Lymphatics were empty or filled by eosinophilic fluid, and  
90 were separated by hypocellular, dense fibrovascular tissue occupying <50% of  
91 the stroma (Fig. 2). In 2/14 lesions, 25-50% of the stroma was infiltrated by  
92 adipose tissue and were subclassified as lymphangioliomatous (Supplemental  
93 Fig. S1). Expanded subepithelial lymphoid follicles were multifocally present  
94 (Supplemental Fig. S2). Polyps were covered by stratified squamous epithelium  
95 with mild to moderate irregular hyperplasia (Supplemental Figs. S2-S4).  
96 Multifocally, the stroma elevated the surface forming small nodular projections  
97 and, in one case, causing a verrucous appearance (Supplemental Fig. S4).  
98 Acute necrotic changes including fibrinoid necrosis of blood vessel walls and  
99 intravascular fibrin thrombi were rarely seen (case 1;) (Supplemental Fig. S5),  
100 without associated clinical signs.

101 Four of 14 cases (29%) showed a predominantly fibrous stroma with numerous,  
102 slightly-dilated and non-anastomosing vessels. In 2 of the 4/4 polyps,  
103 lymphatics predominated and were categorized as lymphangiofibromatous  
104 (Supplemental Fig. S6). The remaining other 2 of these /4 polyps showed a  
105 predominance of blood vessels and were classified as angiofibromatous (1/4) or  
106 angiofibrolipomatous (1/4), if based on adipose tissue occupying more than  
107 >25% of the stroma was infiltrated by adipose tissue (Figs. 3, 4).

108 Two of the 14 cases (14%) were classified as lymphoid polyps. More than 80%  
109 of the stroma was occupied by lymphoid tissue organized in coalescing,  
110 variable-sized follicular structures with reactive germinal centers surrounding a

111 fibrovascular core (Figs. 5, 6). The presence of reticular epithelium  
112 transmigrated by large numbers of lymphocytes was more abundant in  
113 lymphoid polyps than in other histological subtypes (Fig. 5 inset).

114 Finally, one of 14 cases (7%) was categorized as myxomatous (case 14). The  
115 stroma was occupied by severe hypocellular myxomatous edema containing  
116 few interspersed spindle cells without atypia on loose fibrovascular stroma  
117 (Figs. 7, 8). At the base of the polyp, the vascular density was increased (Fig.  
118 9). The surface epithelium showed moderate hyperplasia, intracellular and  
119 intercellular edema, and occasional intraepithelial vesicles (Fig. 7 inset).

120 All polyps showed a mild to moderate inflammation with multifocal infiltrates of  
121 lymphocytes and plasma cells, with occasional presence of neutrophils (Fig. 8  
122 and Supplemental Figs. S1, S6).

123 ~~Considering the 10~~Ten cases ~~of canine tonsillar polyps were~~ previously  
124 reported <sup>3,11,13</sup> and ~~the 14~~ are described herein, ~~there have been 24 canine~~  
125 ~~tonsillar polyps informed.~~<sup>3,11,13</sup> Although tonsillar polyps mainly affect adult  
126 dogs, they can affect ~~patients-dogs~~ as young as 3 ~~-years -old~~ (case 9).<sup>3,11,13</sup>  
127 Human lymphangiomatous polyps are more frequent in young adults, while  
128 lymphoid polyps commonly affect children.<sup>2,7,8,12</sup> No sex predisposition has been  
129 reported for canine or human tonsillar polyps, except for the lymphoid subtype  
130 which is more common in males.<sup>2,7,8,11,12</sup> ~~This report includes too few cases to~~  
131 ~~determine if there was a sex predilection-i~~n dogs, but females were more  
132 affected than males ~~but the overall numbers were too few to determine a sex~~  
133 ~~predilection~~. All tonsillar polyps reported in dogs ~~are-were~~ unilateral without side  
134 predilection.<sup>3,11,13</sup> In humans, most polyps are unilateral but bilateral  
135 involvement has been rarely observed.<sup>6-8,12</sup> Canine tonsillar polyps are mostly

b

136 asymptomatic. Only 8/22 (36.36%) ~~patients~~dogs, including the 12 with clinical  
137 information in this series, ~~have showed~~ed clinical signs of lethargy, chronic  
138 dyspnea, coughing, gagging, retching ~~and or~~ episodes of oral bleeding.<sup>3,11,13</sup>  
139 Human tonsillar polyps might be asymptomatic or associated with dysphagia,  
140 dyspnea, foreign body sensation, sore throat, tonsillitis and cough, depending  
141 on the size of the lesion.<sup>7,8,12</sup>

142 Canine and human tonsillar polyps can present as pedunculated or sessile  
143 masses with smooth or papillary surface.<sup>3,7,8,11-13</sup> Canine tonsillar polyps in this  
144 series were mostly pedunculated with smooth surface. This contrast with  
145 observations from the previously reported case series in which only 3/8 polyps  
146 were pedunculated.<sup>11</sup>

147 As in humans, the stroma of canine tonsillar polyps ~~is was~~ composed by  
148 variable proportions of lymphatic and blood vessels, fibrous tissue, lymphoid  
149 tissue, and occasionally fat tissue, leading to different histomorphology that  
150 ~~justify allow~~ their classification into different histological subtypes.<sup>2,7,8,12</sup>

151 Lymphangiomatous polyps were the most common histological subtype in this  
152 case series. They show identical features to those previously reported in an  
153 adult dog and in ~~people~~humans.<sup>7,13</sup> These type of polyps have also been  
154 referred as tonsillar lymphangiomas by human pathologists.<sup>12</sup> However, tonsillar  
155 lymphangiomatous polyps ~~show have not as large~~smaller lymphatic spaces and  
156 more fibrous and lymphoid stromal elements than lymphangiomas found  
157 elsewhere.<sup>12</sup> Canine lymphangiomas usually affect the skin of young dogs, and  
158 involvement of internal tissues is ~~very~~ rare and mostly associated to a  
159 lymphangiomatosis syndrome with systemic involvement.<sup>16</sup>

160 The histomorphology of angiofibromatous polyps in our series is similar to those  
161 described by Lucke et al<sup>11</sup> as canine tonsillar inflammatory polyps, and to the  
162 stroma of canine and feline nasopharyngeal and middle ear polyps.<sup>9,15</sup> In  
163 contrast to tonsillar polyps, ~~nasopharyngeal and middle ear polyps these~~ are  
164 usually partially covered by pseudostratified ciliated columnar epithelium and  
165 the stromal core and peduncle are less vascularized.<sup>9,15</sup> The main differential  
166 diagnosis considered for angiofibromatous and angiofibrolipomatous polyps  
167 was angiofibroma. Due to the lack of infiltrative growth, the stromal fat  
168 infiltration, and the lower cellularity in these polyps when compared to canine  
169 nasal angiofibromas, this diagnosis was excluded.<sup>4</sup>

170 One polyp was classified as myxomatous. To the best of our knowledge, such  
171 histological appearance has not been described in human or canine tonsillar  
172 polyps. The highly edematous appearance of this polyp might be secondary to  
173 inflammation, as suggested for similar stromal changes in nasopharyngeal and  
174 laryngeal canine and feline polyps.<sup>9,18,19</sup>

175 The pathogenesis of benign tonsillar polyps is unclear. While an inflammatory  
176 origin has been suggested for canine lesions, the most accepted theory in  
177 human pathology ~~defends-considers~~ these polyps ~~to be considered~~ as  
178 hamartomas.<sup>2,7,8,11,12,20</sup> This is further supported by the evidence of a  
179 disorganized ~~pattern-of~~ distribution of fibronectin and collagens I and III within  
180 the stroma of tonsillar polyps regardless of their histomorphology.<sup>1</sup> Therefore,  
181 tonsillar hamartomas could present a variable histologic spectrum including  
182 polyps with fibrous/fibrovascular, lymphangiomatous, lymphoid and/or, more  
183 rarely, lipomatous appearances.<sup>2,7,8,12</sup> A second theory involves chronic  
184 inflammatory hyperplasia with irreversible lymphatic obstruction and

185 lymphangiectasia, eventually causing mucosal prolapse and formation of a  
186 polyp.<sup>8,12</sup> Evidence against this explanation is that chronic tonsillitis occurs more  
187 commonly than polyps, and many patients with polyps lack a history of  
188 tonsillitis.<sup>7,8,12</sup> ~~None of our cases or those previously reported presented with A~~  
189 clinical history of previous episodes of tonsillitis was not indicated in any of our  
190 cases or those previously reported.<sup>3,11,13</sup> Partial polyp torsion with subsequent  
191 lymphangiectasia and acute inflammatory and necrotic changes is possible in  
192 lesions with a long peduncle, as observed in our series (case 1).

193 As in ~~humans beings~~, the pathogenesis of canine tonsillar polyps may involve a  
194 multistep process with an initial hamartomatous growth followed by secondary  
195 inflammatory and degenerative changes.<sup>1,12</sup>

196 Secondary chronic inflammation in human tonsillar polyps causes stromal  
197 remodeling and lymphoid hyperplasia, occasionally producing lymphoid  
198 polyps.<sup>1,2,12</sup> These are characterized by a stroma composed predominantly of  
199 lymphoid tissue (>80%) organized in follicles around a fibrovascular core,  
200 similar to that observed in cases 12 and 13.<sup>1,2</sup> To the best of our knowledge,  
201 tonsillar lymphoid polyps have not been previously described in veterinary  
202 medicine.

203 Fat tissue was present in 4 of the lesions and, when occupying >25% of the  
204 stroma, the term lipomatous was added to the morphological diagnosis.

205 Adipose tissue infiltration within some polyps probably reflects chronic  
206 degenerative and metaplastic stromal changes.<sup>7,10,14</sup>

207 In conclusion, canine tonsillar polyps are benign unilateral and usually  
208 asymptomatic lesions of adult dogs, with excellent response to surgical

209 resection. They are composed ~~by of~~ lymphatics, blood vessels, fibrous,  
210 lymphoid and fat tissue in variable proportions, producing different  
211 histomorphology. As in humans, a hamartomatous origin with superimposed  
212 inflammatory changes ~~should may~~ be considered ~~regarding the pathogenesis~~.  
213 We propose replacing the term inflammatory tonsillar polyp ~~to be replaced~~  
214 bywith morphological diagnoses based on the stromal characteristics.

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226



227 **References**

- 228 1. Barreto I, Costa AF, Martins MT, [Furuse C, de Araujo VC, Altemani A et al.](#)  
229 Immunohistochemical study of stromal and vascular components of tonsillar  
230 polyps: high endothelial venules as participants of the polyp's lymphoid tissue.  
231 *Virchows Arch.* 2011;**459**(1):-65—71.
- 232 2. Barreto I, Juliano P, Chagas C, [Altemani A et al.](#) Lymphoid polyps of the  
233 palatine tonsil. *Int J Surg Pathol.* 2007;**15**(2):-155—159.
- 234 3. Bauchet AL, Balme E, Thibault JL, [Fontaine JJ, Cordonnier N et al.](#)  
235 Lymphangiectatic Fibrous Polyp of the Tonsil in a Dog. *Journal of Comparative*  
236 *Pathology.* 2009;**141**(4):-284.
- 237 4. Burgess KE, Green EM, Wood RD, [Dubielzig R et al.](#) Angiofibroma of the  
238 nasal cavity in 13 dogs. *Vet Comp Oncol.* 2011;**9**(4):-304—309.
- 239 5. Degner DA, Bauer MS, Ehrhart EJ. Palatine tonsil cyst in a dog. *J Am Vet*  
240 *Med Assoc.* 1994;**204**(7):-1041—1042.
- 241 6. Gan W, Xiang Y, He X, et al. A CARE-compliant article: Lymphangiomatous  
242 polyps of the palatine tonsils in a miner: A case report. *Medicine (Baltimore).*  
243 2019;**98**(1):-e14009.
- 244 7. Kardon DE, Wenig BM, Heffner DK, [Thompson L et al.](#) Tonsillar  
245 lymphangiomatous polyps: a clinicopathologic series of 26 cases. *Mod Pathol.*  
246 2000;**13**(10):-1128—1133.
- 247 8. Kim KS. Review of Lymphangiomatous Polyp of the Palatine Tonsil. *J*  
248 *Craniofac Surg.* 2015;**26**(4):-e369—370.
- 249 9. Lamb CR, Sibbing K, Priestnall SL. Pathologic Basis for Rim Enhancement  
250 Observed in Computed Tomographic Images of Feline Nasopharyngeal Polyps.  
251 *Vet Radiol Ultrasound.* 2016;**57**(2):-130—136.

- 252 10. Lambor D, Kumar S, Kakodkar NS, [Sose-Set al.](#) A Pedunculated  
253 Fibrolipomatous Polyp of Tonsil: A Rare Case Report. *International Journal of*  
254 *Otolaryngology and Head & Neck Surgery*. 2017;**6**(2):-16—21.
- 255 11. Lucke VM, Pearson GR, Gregory SP, [Whitbread-TJet al.](#) Tonsillar polyps in  
256 the dog. *Journal of Small Animal Practice*. 1988;**29**(6):-373—379.
- 257 12. Mardekian S, Karp JK. Lymphangioma of the palatine tonsil. *Arch Pathol*  
258 *Lab Med*. 2013;**137**(12):-1837—1842.
- 259 13. Miller AD, Alcaraz A, McDonough SP. Tonsillar lymphangiomatous polyp in  
260 an adult dog. *J Comp Pathol*. 2008;**138**(4):-215—217.
- 261 14. Ohtsuki Y, Kurita N, Iguchi M, et al. Case Report: A pedunculated  
262 hamartomatous polyp of the palatine tonsil. *Biomed Res*. 2006;**17**(3):155—158.
- 263 15. Pratschke KM. Inflammatory polyps of the middle ear in 5 dogs. *Vet Surg*.  
264 2003;**32**(3):-292—296.
- 265 16. Ramírez GA, Sánchez-Salguero X, Molín J. Primary cystic lymphangioma  
266 of the spleen in an adult dog. *J Comp Pathol*. 2020;**178**:22—26.
- 267 17. Singh M, Mundi DK, Kaur I, [Kaur Aet al.](#) Hamartomatous polyp of the tonsil:  
268 A case report. *Niger J Clin Pract*. 2017;**20**(6):-774—776.
- 269 18. Smart L, Jandrey KE. Upper airway obstruction caused by a  
270 nasopharyngeal polyp and brachycephalic airway syndrome in a Chinese  
271 Shar-Pei puppy. *Journal of Veterinary Emergency and Critical Care*.  
272 2008;**18**(4):-393—398.
- 273 19. Sugimoto K, Kanda T, Mitsui I, [Miyabe M, Maeta-Net al.](#) A laryngeal  
274 inflammatory polyp in a miniature dachshund. *Vet Med Sci*. 2020;**6**(3):-342—  
275 347.

- 276 20. Uzal FA, Plattner BL, Hostetter JM. Alimentary system. In: Maxie MG, ed.  
277 *Jubb, Kennedy & Palmer's Pathology of Domestic Animals*. 6th ed. Vol 2. St.  
278 Louis, [Missouri](#): [Saunders-Elsevier](#); 2016:-19—20.

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279 **Figure legends**

280 **Figures 1-4.** Polyps, tonsil, dog. **Figures 1-2.** Lymphangiomatous polyp, case  
281 No. 1. **Figure 1.** Pedunculated polyp ~~with a stroma~~ with numerous dilated  
282 vascular cavities in the stroma. Large aggregates of lymphocytes are within the  
283 subepithelial space. Hematoxylin and eosin (HE). **Figure 2.** Dilated lymphatic  
284 vessels with occasional valves ~~on are present amid~~ scant fibrous stroma.  
285 HE. **Figures 3-4.** Angiofibrolipomatous polyp, case No 8. Sessile polyp with  
286 abundant fibrous stroma that multifocally ~~infiltrated by~~ contains adipose tissue.  
287 ~~and n~~ Numerous congested ed blood vessels are concentrated at in the stromal  
288 core. HE.

289  
290 **Figures 5-9.** Polyps, tonsil, dog. **Figures 5-6.** Lymphoid polyp, case No. 13.  
291 **Figure 5.** Sessile polyp with stroma composed of large hyperplastic lymphoid  
292 follicles surrounding a fibrovascular core. Inset: the polyp is covered by stratified  
293 epithelium and tonsillar reticular epithelium transmigrated by lymphocytes. HE.  
294 **Figure 6.** Secondary antigen-polarized lymphoid follicles with expanded  
295 germinal centers surrounded by a thin mantle zone. Inset: germinal centers  
296 contain tingible ~~body~~ macrophages. HE. **Figures 7-9.** Myxomatous polyp, case  
297 No. 14. **Figure 7.** Pedunculated polyp with severely ly edematous stroma and a  
298 fibrovascular pedicle. A transition line between ~~both the two~~ areas is seen  
299 (arrowheads). Inset: Intraepithelial and subepithelial vesicles containing  
300 edema. HE. **Figure 8.** Edematous stroma contains small numbers of spindle  
301 cells and mild multifocal to diffuse mononuclear inflammatory infiltrates. HE.  
302 ~~Inset: Intraepithelial and subepithelial vesicles containing edema.~~ **Figure 9.**

- 303 Fibrovascular pedicle with numerous congestive blood vessels and empty  
304 lymphatic vessels at the base. HE.

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**Table 1.** Clinical and macroscopic characteristics of canine tonsillar polyps

Case	Breed	Age	Sex	Type of polyp	Clinical signs	Side	Macroscopic appearance <sup>a</sup>	Outcome
1	Poodle	13 y	F	Lymphangiomatous	Incidental finding during intubation (n/s surgery)	R	2.8 x 1.4-0.45 cm, pedunculated, smooth surface	No recurrence nsd
2	Yorkshire Terrier	7 y	M	Lymphangiomatous	Incidental finding during annual examination	L	1 x 0.3 cm, pedunculated, smooth surface	No recurrence nsd
3	Catalan Sheepdog	11 y	F	Lymphangioliipomatous	Incidental finding n/s reason	R	1.4 x 0.8-0.6 cm, sessile, smooth surface	No recurrence after 7 mo.; death by unrelated causes
4	Scottish Terrier	10 y	F	Lymphangiomatous	Unknown	n/s	1.2 x 0.3-0.1, pedunculated, smooth surface	Unknown
5	Mongrel	10 y	M	Lymphangiomatous	Incidental finding during annual examination	R	2.4 x 0.4 cm, pedunculated, smooth surface	No recurrence 3 mo.; missing after that
6	Mongrel	9 y	F	Lymphangioliipomatous	Unknown	L	2.4x 1.1- 0.4 cm, pedunculated, smooth surface	Unknown
7	Fox Terrier	11 y	M	Lymphangiomatous	Recurrent episodes of oral bleeding	n/s	1.4 x 0.8-0.3 cm, pedunculated, verrucous surface	Unknown
8	Maltese	12 y	F	Angiofibrolipomatous	Incidental finding during intubation (dental cleaning)	R	3 x 1 cm., sessile, smooth surface	No recurrence after 8 mo.; no more follow-up
9	Labrador Retriever	3 y	F	Lymphangioliipomatous	Incidental finding during intubation (n/s surgery)	L	1.6 x 1, sessile with smooth surface	Unknown
10	Barbone	13 y	F	Angiofibromatous	Cough, retching	L	1 x 0.4-0.2 cm, pedunculated, papillary surface	No recurrence after 2 mo.; no more follow-up
11	Miniature Schnauzer	9 y	F	Lymphangioliipomatous	Incidental finding during annual examination	n/s	1.5 x 0.5-0.2 cm, pedunculated, smooth surface	No recurrence
12	Mongrel	7 y	F	Lymphoid	Incidental finding n/s reason	R	1.5 x 0.6 cm, sessile, smooth surface	No recurrence after 2 y; death by unrelated causes
13	Mongrel	7 y	F	Lymphoid	Progressive dyspnea 3 mo.	n/s	1.3 x 0.5 sessile, smooth surface	Unknown
14	Mongrel	8 y	M	Myxomatous	Retching	R	2.1 x 0.9-0.5 cm, pedunculated, smooth surface	No recurrence nsd

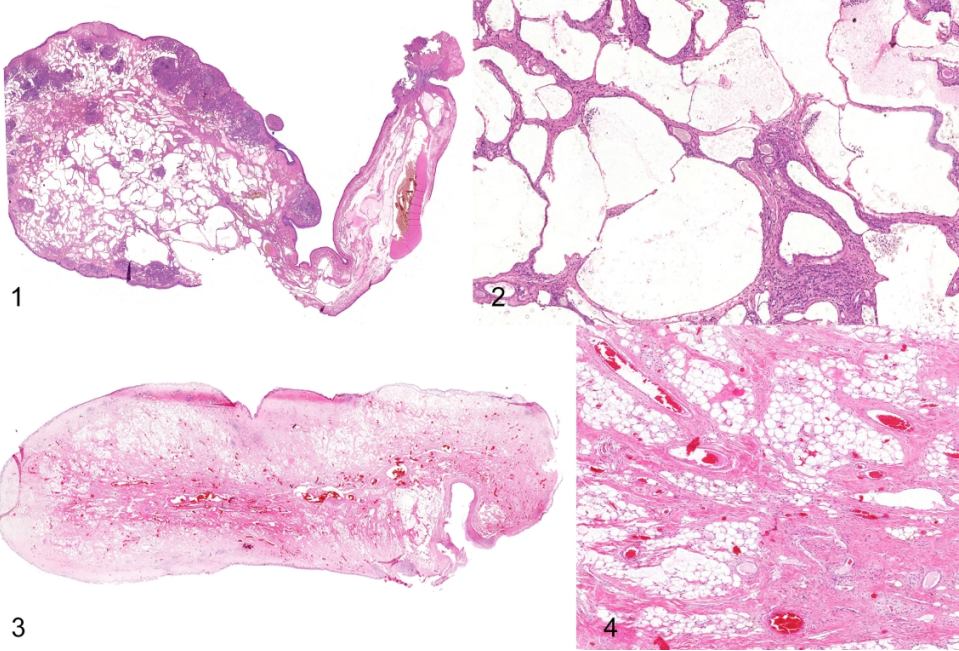
<sup>a</sup> Measures are expressed as total length of the polyp x diameter of the polyp – diameter of the pedicle. Abbreviations: M, male; F, female; R, right; L, left; n/s, not specified; n/a, not applicable; nsd, not specified duration.

**Table 1.** Clinical and macroscopic characteristics of canine tonsillar polyps

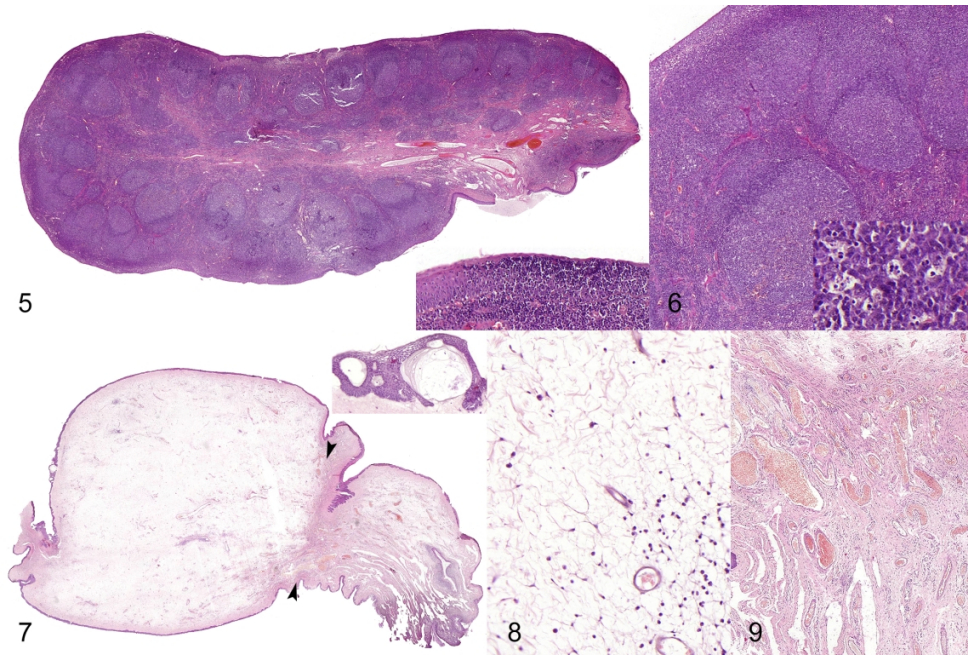
Case	Breed	Age	Sex	Type of polyp	Clinical signs	Side	Macroscopic appearance <sup>a</sup>	Outcome
1	Poodle	13 y	F	Lymphangiomas	Incidental finding during intubation (n/s surgery)	R	2.8 x 1.4-0.45 cm, pedunculated, smooth surface	No recurrence nsd
2	Yorkshire Terrier	7 y	M	Lymphangiomas	Incidental finding during annual <del>revision</del> examination	L	1 x 0.3 cm, pedunculated, smooth surface	No recurrence nsd
3	Catalan Sheepdog	11 y	F	Lymphangioliipomas	Incidental finding n/s reason	R	1.4 x 0.8-0.6 cm, sessile, smooth surface	No recurrence after 7 mo.; death by unrelated causes
4	Scottish Terrier	10 y	F	Lymphangiomas	Unknown	n/s	1.2 x0.3-0.1, pedunculated, smooth surface	Unknown
5	Mongrel	10 y	M	Lymphangiomas	Incidental finding during annual <del>revision</del> examination	R	2.4 x 0.4 cm, pedunculated, smooth surface	No recurrence 3 mo.; missing after that
6	Mongrel	9 y	F	Lymphangioliipomas	Unknown	L	2.4x 1.1- 0.4 cm, pedunculated, smooth surface	Unknown
7	Fox Terrier	11 y	M	Lymphangiomas	Recurrent episodes of oral bleeding	n/s	1.4 x 0.8-0.3 cm, pedunculated, verrucous surface	Unknown
8	Maltese	12 y	F	Angiofibrolipomas	Incidental finding during intubation (dental cleaning)	R	3 x 1 cm., sessile, smooth surface	No recurrence after 8 mo.; no more follow-up
9	Labrador Retriever	3 y	F	Lymphangiofibromas	Incidental finding during intubation (n/s surgery)	L	1.6 x 1, sessile with smooth surface	Unknown
10	Barbone	13 y	F	Angiofibromas	Cough, retching	L	1 x 0.4-0.2 cm, pedunculated, papillary surface	No recurrence after 2 mo.; no more follow-up
11	Miniature Schnauzer	9 y	F	Lymphangiofibromas	Incidental finding during annual <del>revision</del> examination	n/s	1.5 x 0.5-0.2 cm, pedunculated, smooth surface	No recurrence
12	Mongrel	7 y	F	Lymphoid	Incidental finding n/s reason	R	1.5 x 0.6 cm, sessile, smooth surface	No recurrence after 2 y; death by unrelated causes
13	Mongrel	7 y	F	Lymphoid	Progressive dyspnea 3 mo.	n/s	1.3 x 0.5 sessile, smooth surface	Unknown
14	Mongrel	8 y	M	Myxomas	Retching	R	2.1 x 0.9-0.5 cm, pedunculated, smooth surface	No recurrence nsd

<sup>a</sup> Measures are expressed as total length of the polyp x diameter of the polyp – diameter of the pedicle. Abbreviations: M, male; F, female; R, right; L, left; n/s, not specified; n/a, not applicable; nsd, not specified duration.

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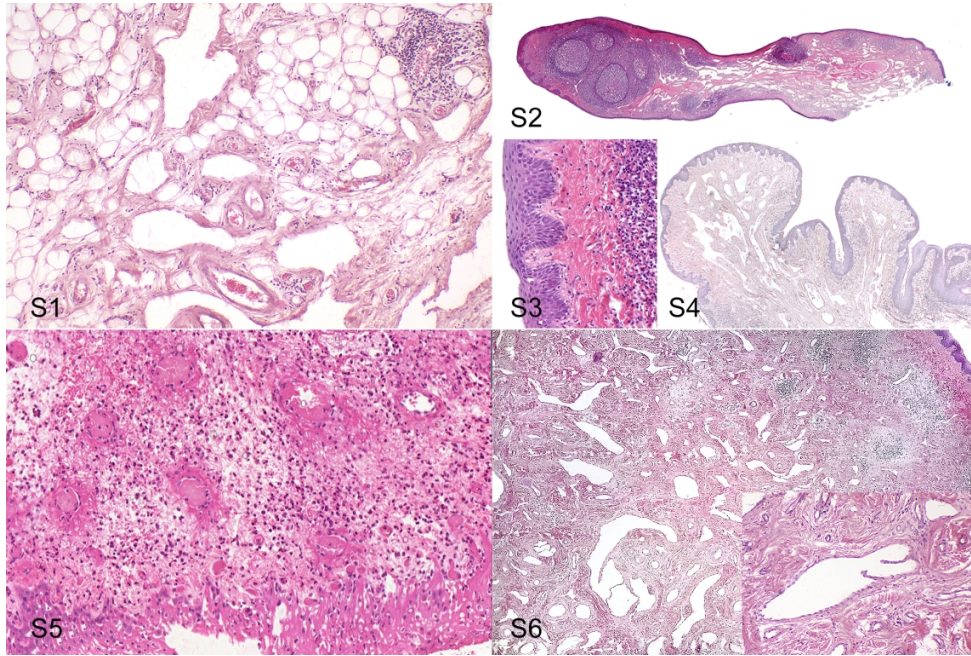




**Supplemental Table 1.** Histologic characteristics of canine tonsillar polyps

Case	Vessel density	Vessel type	Vascular spaces	Fibrous tissue	Fat	Lymphoid tissue	Edema	Inflammation		Diagnosis	
								Degree	Distribution		
1	3	lymphatic >> blood	4	1	0	1	1	2	MF	L <sub>1</sub> , P, N	Lymphangiomas
2	3	lymphatic >> blood	3	1	0	2	0	1,5	MF to D	L <sub>1</sub> , P	Lymphangiomas
3	3	lymphatic >> blood	3	1	2	1	2	1,5	MF	L <sub>1</sub> , P > N	Lymphangioliomatous
4	3	lymphatic >> blood	3	2	0	1	1	1,5	MF	L <sub>1</sub> , P	Lymphangiomas
5	3	lymphatic >> blood	4	1	0	1	1	1,5	MF	L <sub>1</sub> , P	Lymphangiomas
6	3	lymphatic >> blood	3	1	2	0	1	1,5	MF	L <sub>1</sub> , P	Lymphangioliomatous
7	3	lymphatic >> blood	3	2	0	1	1	1,5	MF	L <sub>1</sub> , P	Lymphangiomas
8	2	blood > lymphatic	1	3	2	0	1	1,5	MF	L <sub>1</sub> , P	Angiofibrolipomatous
9	3	lymphatic > blood	2	3	0	0	1	2	MF to D	L <sub>1</sub> , P	Lymphangioliomatous
10	2	blood > lymphatic	1	3	1	1	0	1	MF	L <sub>1</sub> , P	Angiofibromatous
11	2	Lymphatic > blood	2	3	0	1	0	2	MF	L <sub>1</sub> , P	Lymphangioliomatous
12	2	lymphatics & blood	1	1	0	4	0	2	D	L <sub>1</sub> , P	Lymphoid
13	1	lymphatics & blood	1	1	0	4	2	1	D	L <sub>1</sub> , P	Lymphoid
14	2	blood > lymphatic	2	3	0	0	3	1	MF to D	L <sub>1</sub> , P > N, H	Myxomatous

Abbreviations: D, diffuse; H, histiocytes; L, lymphocytes; MF, multifocal; N, neutrophils; P, plasma cells. Vascularization, edema, and degree of inflammation were graded on a 0–3 scale (0, absent; 1, mild; 2, moderate; 3, marked). Vascular spaces, lymphoid, fibrous and fat tissue were graded on a 0–4 scale based on percent (0, absent; 1, 1–25%; 2, 26–50%; 3, 51–75%; 4 >75% stroma).



- 1 **Supplemental Figures S1-6.** Polyps, tonsil, dog. **Figure S1.**
- 2 Lymphangioliomatous polyp, case No. 6. The stroma is severely infiltrated by
- 3 adipose tissue with empty dilated lymphatic vessels, few blood vessels and
- 4 multifocal small lymphoplasmacytic aggregates. HE. **Figures S2, S3.**
- 5 Lymphangiomatous polyp, case No. 2. **Figure S2.** Pedunculate polyp with
- 6 fibrovascular pedicle and subepithelial lymphoid hyperplasia. Secondary
- 7 hyperplastic follicles show expanded germinal centers surrounded by a thin
- 8 mantle zone and antigen-related polarity. HE. **Figure S3.** Polyp covered by
- 9 irregular hyperplastic stratified epithelium separated from the stromal core by a
- 10 band of fibrous tissue. HE. **Figure S4.** Lymphangiomatous polyp, case 7. The
- 11 surface is multifocally elevated producing a verrucous appearance. HE. **Figure**
- 12 **S5.** Lymphangiomatous polyp, case 1. Acute necrosis at the base of the polyp
- 13 with fibrinoid necrosis of blood vessel walls. HE. **Figure S6.**
- 14 Lymphangiofibromatous polyp, case No. 9. The stroma shows abundant fibrous
- 15 tissue with numerous lymphatic vessels. There are multifocal aggregates of
- 16 inflammatory cells. Inset: detail of lymphatic vessels with valves, lined by
- 17 flattened endothelium. HE