Lipoma in dogs: how common are they and what breeds are affected?

Lipomas are often clinically unremarkable but can be alarming to owners. Although perceived as common in dogs, no studies have specifically investigated risk factors associated with their occurrence. Here, Dan O'Neill MVB BSc (hons) GPCert (SAP) GPCert (FelP) GPCert (Derm) GPCert (B&PS) MSc (VetEpi) FRCVS, pathobiology and population sciences, The Royal Veterinary College, reviews a study, which explored anonymised electronic patient records of dogs attending practices participating in VetCompass to report the prevalence and risk factors for primary-care veterinary diagnosis of lipoma

Figure 1: Lipoma in a dog. Photo: Lynda Rutherford.

Lipomas (Figure 1) are masses of mesenchymal origin, comprising of adipocytes.[1-3] Although subcutaneous lipomas are often clinically asymptomatic[4], they can cause deleterious consequences for the patients and anxiety for the owners if they become sizable or interfere with locomotion.[1,4,5] Lipomas of the dermis and subcutaneous tissues are reported to be common in older dogs[1] and were the third most common disorder of purebred dogs in the UK in an owner-reported survey.[6] Lipomas were the 12th most commonly reported disorder in dogs in the south of England with a prevalence of 3.5% reported from a sample of 3,884 dogs under primary veterinary care.[7] Fatty tumours were reported as the most common tumour diagnosed by cytology in Dutch Golden Retrievers.[8] Lipomas were the most common benign tumour (24%) identified in the Danish Cancer Registry[9] and were the second most common tumour recorded in insured dogs in the UK with an incidence rate of 337 per 100,000 dogs per year.[10] Despite the evidence showing relatively frequent occurrence in dogs, there is very little published evidence on risk factors for lipomas. Advancing age, overweight dogs and females have been suggested as having increased risk.[11] Dobermann Pinscher and Labrador Retriever have also been reported as predisposed breeds.[12]

Primary-care veterinary clinical data is now recognised as a valuable research resource that benefit from contemporaneous recording of medical records at the time of the clinical event, and from the recording of cohort data over time and at a veterinary level of precision.[13,14] This study aimed to fill the information gap on the epidemiology of lipoma by estimating the prevalence of lipoma, and evaluating demographic risk factors for lipoma in the dog population under primary veterinary care in the UK.

THE DATA

The VetCompass Programme harvests anonymised clinical record data that primary-care veterinary practices already record[15] for epidemiological research.[7] Information collected included patient demographic (species, breed, date of birth, sex, neuter status, colour, insurance status and bodyweight) and clinical information (free-form text clinical notes, VeNom summary diagnosis terms[16] and treatment, with relevant dates) data fields. To date, 1,500 (30%) of UK vet practices collaborate within VetCompass, sharing clinical data on 10 million animals and making this the world's largest university-based database of clinical heath records for companion animal research.

The study included dogs under veterinary care within the VetCompass database for a one-year period from January 1, 2013 to December 31, 2013. Dogs 'under veterinary care' were defined as any dog with either at least one electronic patient record (EPR) recorded from January 1 to December 31, 2013 or, alternatively, at least one EPR both before and after 2013. Case-inclusion criteria required that a final diagnosis of lipoma (or synonym) was recorded in the EPR for a mass at any body location that was present during the 2013 study period. Breed included individual breeds represented by over 4,000 dogs in the overall study or with ≥15 lipoma cases, a grouped category of all remaining purebreds and a general grouping of crossbred dogs. Sex-neuter described the status recorded at the final EPR. Insurance variable described whether a dog was insured at any point during the study period. Age (years) was calculated for all dogs at the final date of the study period (December 31, 2013). Bodyweight relative to bree-mean variable characterised the adult bodyweight of individual dogs as either below or equal/above the mean adult bodyweight for their breed and sex within the overall study population. This variable allowed the effect of adult bodyweight to be assessed within each breed/sex combination.

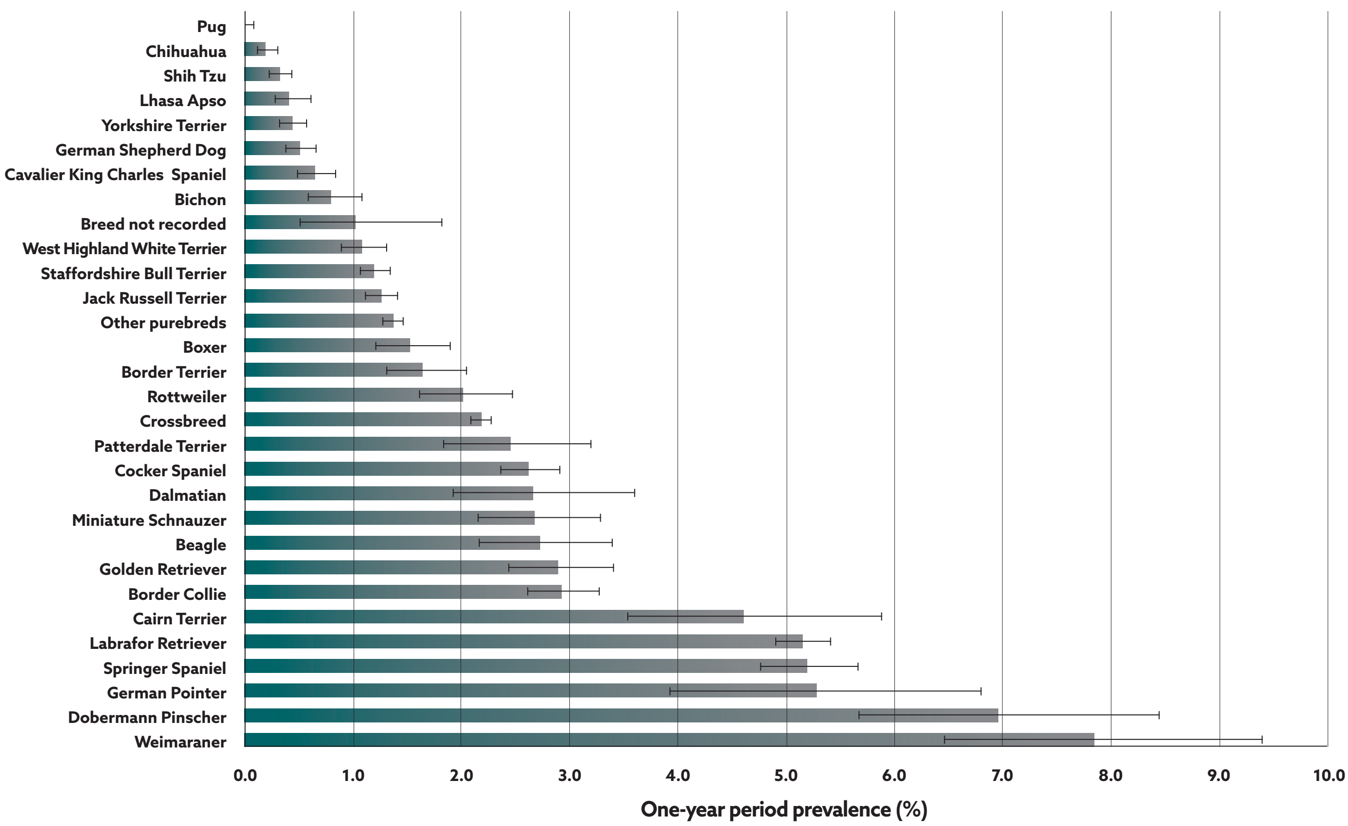
The one-year period prevalence with 95% confidence intervals (CI) described the probability of evidence in the clinical records that confirmed the presence of lipoma at any time during the one-year 2013 study period. Multivariable logistic regression modelling was used to evaluate univariable associations between risk factors (purebred, breed, Kennel Club breed group, adult bodyweight, bodyweight relative to breed/sex mean, age, sex-neuter and insurance) and diagnosis of lipoma during 2013. Statistical significance was set at $P < 0.05$.

THE RESULTS

The denominator population comprised 384,284 dogs under veterinary care at 215 clinics in the UK during 2013. A random sample of 36.5% of the dogs were checked to confirm 2,765 lipoma cases. After accounting for the subsampling protocol, the estimated one-year period prevalence for lipoma diagnosis in dogs overall was 1.94% (95% CI: 1.87-2.01). The breeds with the highest lipoma prevalence were Weimaraner (7.84%), Dobermann Pinscher (6.96%), German Pointer (5.23%), Springer Spaniel (5.19%), and Labrador Retriever (5.15%) (Figure 2).

Dogs with lipoma had a median adult bodyweight of 26.00kg (IQR: 16.80-35.20) compared with 16.50kg (IQR: 9.00-28.00) for non-cases. The median age dogs with lipoma was 10.02 years (IQR: 8.25-12.04) compared with 4.18 years (IQR: 1.80-7.59) for non-cases. The most commonly affected breeds were Labrador Retriever (545, 19.71% of all confirmed cases),

Figure 2: Lipoma prevalence in dog breeds in the UK



Springer Spaniel (182, 6.58%), Cocker Spaniel (130, 4.70%) and Staffordshire Bull Terrier (116, 4.20%), along with crossbred dogs (757, 27.38%).

After accounting for the effects of the other variables evaluated, eight breeds showed increased odds of lipoma compared with crossbred dogs. The breeds with the highest odds included the Dobermann Pinscher (OR: 3.55), Weimaraner (OR: 3.16), Labrador Retriever (OR: 2.19) and Springer Spaniel (OR: 2.15). There were 11 breeds with reduced odds of lipoma compared with crossbreds. Individual dogs with an adult bodyweight that was equal or higher than their breed/sex mean had 1.96 times the odds of lipoma compared with dogs that weighed below their breed/sex mean. Advancing age was strongly associated with increasing odds of lipoma. Compared with dogs aged 3.0 to <6.0 years, dogs aged 9.0 to <2.0 years had 17.52 times the odds of lipoma. Neutered males (OR: 1.99) and neutered females (OR: 1.62) had higher odds than entire females. Insured dogs had 1.78 times the odds of lipoma compared with uninsured dogs. Purebred dogs had 1.16 times the odds compared with crossbred dogs. Of the seven Kennel Club breed groups, only Gundogs (OR: 2.08) showed higher odds of lipoma compared with dogs of breeds that are not recognised by the Kennel Club, while the Toy, Utility, Terrier and Pastoral groups all had reduced odds. The odds of lipoma increased as adult bodyweight increased (Table 1).

DISCUSSION

This study based on veterinary clinical records estimated a one-year period prevalence of 1.94% of lipoma across all dog types in the UK. This is lower than the results of an owner questionnaire study evaluating pedigree dogs in the UK registered with The Kennel Club (KC) that reported a 4.3% lipoma prevalence.[6] The questionnaire study relied on owners recall of previous conditions and included conditions that the owners 'diagnosed' themselves without necessarily including veterinary input so the results may have influenced by some misclassification and recall bias effects.[17] However, the results did single out lipoma as the most common owner-recalled disorder in pedigree dogs and suggests that owners are highly conscious of lipoma masses and retain recall for their occurrence over long periods.In consequence, however benign that lipomas may behave clinically, it is likely that owners find these masses as highly noteworthy and even alarming, and therefore, veterinarians should be especially explicit in their explanations of the significance of these masses to clients.

The current study focused specific interest in breed-risk factors and provided strong evidence of breed predilections for lipoma. After accounting for other confounding factors, eight breeds showed predisposition compared with crossbreds:

Table 1: Final breed multivariable logistic regression model for risk factors associated with diagnosis of lipoma in dogs attending primary-care veterinary practices in the VetCompass Programme in the UK. *CI confidence interval.

Variable	Category	Odds ratio	95% CI*	P-value
Breed	Crossbreed	1.00	-	
	Dobermann Pinscher	3.55	2.49-5.06	< 0.001
	Weimaraner	3.16	2.26-4.42	< 0.001
	Labrador Retriever	2.19	1.96-2.46	< 0.001
	Springer Spaniel	2.15	1.82-2.54	< 0.001
	Beagle	2.03	1.39-2.97	< 0.001
	German Pointer	2.03	1.27-3.25	0.003
	Miniature Schnauzer	1.52	1.07-2.18	0.021
	Cairn Terrier	1.44	0.93-2.22	0.100
	Cocker Spaniel	1.26	1.04-1.53	0.016
	Patterdale Terrier	1.25	0.79-1.99	0.340
	Rottweiler	1.09	0.76-1.55	0.636
	Border Collie	1.04	0.85-1.27	0.715
	Pug	1.00	-	
	Dalmatian	0.95	0.56-1.59	0.842
	Golden Retriever	0.83	0.63-1.10	0.209
	Breed not recorded	0.72	0.27-1.97	0.525
	Other purebreds	0.70	0.61-0.80	0.000
	Border Terrier	0.70	0.48-1.02	0.060
	Boxer	0.61	0.42-0.89	0.010
	Staffordshire Bull Terrier	0.60	0.49-0.73	< 0.001
	Jack Russell Terrier	0.49	0.40-0.60	< 0.001
	Bichon	0.45	0.28-0.75	0.002
	West Highland White Terrier	0.30	0.22-0.41	< 0.001
	Cavalier King Charles Spaniel	0.29	0.18-0.44	< 0.001
	Chihuahua	0.26	0.13-0.56	< 0.001
	Shih-tzu	0.24	0.14-0.40	< 0.001
	German Shepherd Dog	0.21	0.14-0.33	< 0.001
	Lhasa Apso	0.20	0.11-0.39	< 0.001
	Yorkshire Terrier	0.17	0.11-0.26	< 0.001
Bodyweight relative to breed mean	Lower	1.00	-	
	Equal/Higher	1.97	1.81-2.14	< 0.001
	Unrecorded	0.53	0.43-0.64	< 0.001

Age (years)	<3.0 years	0.18	0.12-0.28	< 0.001
	3.0 - <6.0 years	1.00	-	
	6.0 - <9.0 years	7.56	6.33-9.04	< 0.001
	9.0 - <12.0 years	17.52	14.71-20.85	< 0.001
	> or = 12.0 years	18.34	15.3-21.98	< 0.001
	No age available	3.45	1.84-6.45	< 0.001
Sex-Neuter	Female-Entire	1.00	-	
	Female-Neutered	1.62	1.37-1.91	< 0.001
	Female-Unknown	1.41	1.16-1.72	0.001
	Male-Entire	0.79	0.65-0.97	0.025
	Male-Neutered	1.99	1.69-2.36	< 0.001
	Male-Unknown	1.43	1.18-1.74	< 0.001
	Unknown-Unknown	0.82	0.11-6.04	0.844
Insurance	Uninsured	1.00	-	
	Insured	1.78	1.53-2.07	< 0.001
	Unknown	1.18	1.02-1.36	0.027
Purebred status	Crossbred	Base		
	Purebred	1.16	1.07-1.26	0.001
Kennel Club Breed Group	Breed not KC-recog-nised	Base		
	Toy	0.28	0.22-0.36	< 0.001
	Utility	0.57	0.47-0.69	< 0.001
	Terrier	0.65	0.56-0.75	< 0.001
	Gundog	2.08	1.90-2.28	< 0.001
	Hound	0.86	0.69-1.08	0.187
	Pastoral	0.78	0.66-0.92	0.004
	Working	1.12	0.93-1.36	0.233
Adult (> 18 months) bodyweight (kg)	< 10.0	Base		
	10.0-19.9	2.85	2.43-3.34	< 0.001
	20.0-29.9	4.00	3.41-4.68	< 0.001
	30.0-39.9	5.62	4.79-6.59	< 0.001
	≥ 40.0	5.85	4.90-6.97	< 0.001
	Unrecorded	1.14	0.90-1.44	0.265

Table 1

Dobermann Pinscher, Weimaraner, Labrador Retriever, Springer Spaniel, Beagle, German Pointer, Miniature Schnauzer and Cocker Spaniel. It is noteworthy that five of the eight predisposed breeds are classified in the Kennel Club Gundog Group: Weimaraner, Labrador Retriever, Springer Spaniel, German Pointer, and Cocker Spaniel. Indeed, the Gundog Group was the only Kennel Club group with increased odds of lipoma, showing 2.08 times the odds compared with dogs that were not breed-recognised by the Kennel Club. The Gundog Group is divided into four categories (Retrievers; Spaniels; Hunt/Point/Retrieve; Pointers/Setters) and includes dogs that were originally trained to find live game and/or to retrieve game that had been shot and wounded.[18] Such breeds may have been selected to work in wintry adverse weather conditions, spending extended periods stationary to avoid scaring the game whilst also retaining high athletic ability on sudden request. It is possible that these dual working demands selected for specific adipose characteristics; for example, with differing propositions of isoforms of adipose uncoupling proteins or ratio of brown to white fat.[19-21] The Kennel Club describes the Gundog Group as good companion animals with temperaments ideal as all-round family dogs, suggesting that the majority of current generations of Gundogs are non-working but are instead owned as family pets.[18] It may be that the original adipose selection processes as working animals combined with the more sedentary and highly nourished life of the modern pet dog combine to expose an increased tendency to lipoma. It is also noteworthy that many of the predisposed breeds share a similar body conformation: medium-to-large body size, barrel chest and tapered abdomen and a smooth hair coat.[22] These features may facilitate identification of subcutaneous masses meaning that lipomas at these locations are easier to recognise in these breeds and therefore contribute to recognition bias in these breeds. To date in the veterinary literature, the majority of breed-focussed disease studies have reported only positive predisposition to disease. This approach supports the identification of breeds with increased risk of disease that may undergo breed health reforms to try to breed away from some risk attributes.[23] It is also worth considering setting an alternative research goal that instead identifies breeds that are negatively predisposed to disease (ie. protected). Greater understanding of why certain breeds or dog types do not get disease may offer as much, if not more, welfare progress than tunnel-vision focus on the predilected breeds.[12] The current study embraced this second approach and identified 21 breeds with lower lipoma odds than crossbreds: Yorkshire Terrier, Lhasa Apso, German Shepherd Dog, Shih-tzu, Chihuahua, Cavalier King Charles Spaniel, West Highland White Terrier, Bichon, Jack Russell Terrier, Staffordshire Bull Terrier and Boxer.

These protected breeds do not include a single Gundog Group breed and have noticeably different body conformation to the predisposed breeds, tending to be smaller in bodysize and to have less pronounced proportional difference between the thorax and abdomen. Further research the genetics of adipose, and differential fat function and accumulation across the predisposed and protected dog breeds identified in the current study is warranted and may lead to substantial new discovery of lipoma pathogenetic pathways.

Body condition score data were not available in the current study so no conclusive inference can be drawn from these results on associations between obesity and lipoma. However, data were available that characterised the adult bodyweight of individual dogs as either below or equal/above the mean adult bodyweight for their breed and sex within the overall study population. This variable allowed the effect of low versus high adult bodyweight to be assessed after taking into account breed and sex. Among other reasons, a high bodyweight could reflect enhanced muscular mass, a large body frame or overweight/obesity. Dogs weighing at or above the mean for their breed and sex had 1.97 times the odds of diagnosis with lipoma. This supports the study hypothesis and suggests value in future exploration of lipoma association with obesity/overweight since the latter is a modifiable risk factor. This approach is also supported by published evidence of predisposition to obesity in some of the breeds that were also identified with high odds of lipoma in the current study including Cocker Spaniel[24] and Labrador Retrievers.[25] This study also identified a substantial and strong trend towards increasing odds of lipoma as adult bodyweight increased. This may reflect a true increase in odds of cellular metaplasia or neoplasia with increasing bodyweight. Osteosarcoma in dogs has similarly been linked to increasing bodyweight, although the biological mechanisms may be different for the different neoplasms.[26]

Advancing age has previously been identified as a risk factor for neoplasia in general.[26,27] It is possible that the same is true for risk of lipoma development. The current study reports the median age of lipomas cases was 10.02 years compared with the median age of 4.18 years for non-lipoma dogs. The odds of lipoma also increased markedly as dogs aged, with dogs aged nine-12 years having 17.52 times the odds compared with dogs aged less than three years. There is a strong case to be made that lipoma should be included as one of the accepted common diseases of aging in dogs.[28] Risk factors for lipoma development in people are reported to be similar to the findings of our study in dogs although there is also a paucity of literature on the occurrence of lipomas in people. In humans, the incidence of lipomas is increased in patients with obesity, hyperlipidemia, and diabetes mellitus.[29]

The influences of sex hormones on tumour development is complex; neuter status has been reported with differing effects on different tumour types and to influence the risk of developing both genital and non-genital neoplasia.[30] For example non-ovariectomised bitches have been reported at increased risk of developing mammary carcinoma and castrated male dogs at increased risk of prostatic carcinoma.[9,10, 30-34]

However, Rottweilers undergoing early gonadectomy (before 12 months of age) were reported at increased risk of osteosarcoma.[30,35,36] There is little prior evidence on the effects of sex and neuter status on the risk of lipoma. The current study identified reduced risk of lipoma in entire females and entire males compared with neutered females and neutered males, even after taking age into account. This could indicate some protective effects of female and male sex hormones. However, post-neutering changes in fat distribution and decreased energy requirements have been demonstrated and the effects of neutering on lipoma risk may be mediated by obesity as a confounder rather than directly.[37]

Insured dogs had 1.78 times greater odds of lipoma diagnosis compared with uninsured dogs. This association is likely to reflect increased diagnostic recognition mediated by owner and financial factors rather than any intrinsic increased disease risk in insured dogs. Relaxation on financial constraints to presentation for veterinary care, diagnostic procedures and surgical management through insurance has similarly been shown to increase diagnostic probability in many other conditions.[38-43]

This study was limited by the use of externally recorded clinical data which may have led to some disease status misclassification. This study may have underrepresented lipoma because true cases that were not presented for veterinary care during 2013 were not included as cases. Alternatively, lipoma could be over-represented because the study did not require laboratory confirmation of lipoma cases; although the characteristic presenting phenotype of lipoma cases suggests that diagnosis based on clinical examination alone is likely to have a high positive predictive value.[44]

CONCLUSIONS

Lipoma is confirmed as a common clinical diagnosis with a one-year prevalence of 1.94%. Strong breed associations for both lipoma predisposition and protection were identified that can assist with breed health reforms as well as contributing to the basic scientific understanding of lipoma development. Heavier, older, neutered and insured dogs also had higher odds of diagnosis. Lipoma detection should be included as a routine part of veterinary clinical exanimation, especially in breeds identified as high-risk here.

AUTHOR AND SOURCE

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READER QUESTIONS AND ANSWERS

1. WHICH CELL TYPES COMPRISE LIPOMAS?

A. Adipocytes
B. Lymphocytes
C. Leucocytes
D. Kupffer cells
E. Melanocytes

2) THE CLINICAL RECORDS OF HOW MANY ANIMALS ARE CURRENTLY WITHIN VETCOMPASS?

A. 10,000
B. 100,000
C. 1,000,000
D. 10,000,000
E. 100,000,000

3) WHAT WAS THE OVERALL ONE-YEAR PERIOD PREVALENCE FOR LIPOMA DIAGNOSIS IN DOGS?

A. 0.04%
B. 0.94%
C. 1.94%
D. 2.94%
E. 4.94%

4) WHICH BREED HAD THE HIGHEST WITHIN-BREED PREVALENCE OF LIPOMA?

A. Weimaraner
B. Dobermann Pinscher
C. German Pointer
D. Springer Spaniel
E. Labrador Retriever

5) AFTER ACCOUNTING FOR OTHER FACTORS SUCH AS AGE, SEX, NEUTER, INSURANCE AND BODYWEIGHT, WHICH BREED HAD THE HIGHEST ODDS OF LIPOMA?

A. Weimaraner
B. Dobermann Pinscher
C. German Pointer
D. Springer Spaniel
E. Labrador Retriever

ANSWERS: 1A, 2D, 3C, 4A, 5B.