

CONFORMATIONAL EYELID DISORDERS IN DOG BREEDS

Natural eyelid conformation is essential for normal function and health of the ocular surface. However, many modern dog types are deliberately bred for abnormal eyelid conformation associated with severe health and welfare issues. In this article, Dr Dan O'Neill MVB BSc(hons) GPCert(SAP) GPCert(FelP) GPCert(Derm) GPCert(B&PS) PGCertVetEd FHEA MSc(VetEpi) PhD FRCVS, Professor of Companion Animal Epidemiology, The Royal Veterinary College, presents an overview of the prevalence, demographic risk factors, and clinical management for conformational eyelid disorders in dogs under UK primary veterinary care within the VetCompass Programme during 2019

Natural eyelid conformation is essential for good function and health of the ocular surface¹. The most important conformational eyelid disorders are entropion, i.e., inversion of the eyelid margin, and ectropion, i.e., eversion of the eyelid margin, or combinations of both^{1,2}. The severity of entropion and ectropion may be influenced by several factors including the length of the palpebral fissure, conformation of the skull, the orbital anatomy, sex, excessive facial skin folds, and heavy ears²⁻⁴. Entropion often accompanies ectropion in macroblepharon when the lateral portion of overly long and sagging ectropic eyelid margins invert^{1,2}. Entropion and/or ectropion are presumed to be inherited polygenically in several dog breeds^{1-3, 5}.

Both entropion and ectropion are considered as disorders that threaten the welfare and retention of eyesight of affected individuals, due to the discomfort and inflammation associated with the hair contact on the densely innervated ocular surface and also from painful corneal ulceration

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ranging from superficial ulcers to perforation of the globe with the risk of loss of vision or loss of the globe^{1,2, 6-10}.

There has been dramatically rising demand over the past two decades for some breeds defined by their extreme conformation, especially brachycephaly, leading to the so-called 'brachycephalic crisis'¹¹. The International Collaborative on Extreme Conformations in Dogs (ICECDogs) defines extreme conformation in dogs as "a physical appearance that has been so significantly altered by humankind away from the ancestral natural canine appearance that affected dogs commonly suffer from poor health and welfare, with negative impacts on their quality and quantity of life"¹².

This study aimed to report the prevalence, breed and breed-related risk factors, and commonly-used clinical management approaches in dogs under UK veterinary primary care using anonymised veterinary clinical data from the VetCompass Programme¹³.

Methods

This cohort study population included 2,250,417 dogs

KEY FINDINGS

The annual prevalence for overall conformational eyelid disorder was 0.36 per cent (95 per cent CI: 0.35-0.37). Breeds with the highest annual prevalence were Shar-Pei (15.49 per cent, 95 per cent CI 14.08-17.00), Chow Chow (9.55 per cent, 95 per cent CI 7.88-11.43), Neapolitan Mastiff (9.45 per cent, 95 per cent CI 4.83-16.33), Clumber Spaniel (6.34 per cent, 3.22-11.09), Saint Bernard (6.10 per cent, 95 per cent CI 4.37-8.24) and English Bulldog (4.92 per cent, 95 per cent CI 4.48-5.39). Surgical management was carried out for 414/2275 (18.20 per cent) of the incident (2019) entropion cases and 12/305 (3.93 per cent) of the incident (2019) ectropion cases.

Normalisation of conformation-related health issues in certain high profile dog breeds have been discussed as a canine welfare priority for over half a century. The current results suggest that substantial work remains to be done to ensure good innate health for all dogs.

under primary veterinary care at clinics participating in the VetCompass Programme during 2019. Ethics approval was obtained from the RVC Ethics and Welfare Committee (reference SR2018-1652). Conformational eyelid disorder cases had a final diagnosis of entropion or ectropion (or synonym) at any date from January 1, 2019 to December 31, 2019. Case-finding involved initial screening of all study dogs for candidate conformational eyelid disorder cases using search terms of the clinical notes such as entrop, entropion~2, holtz. The clinical notes of a random sample of candidate animals were manually reviewed and additional clinical management information extracted for confirmed conformational eyelid disorder cases.

Dogs were categorised by breed, ear carriage (erect, e.g., German Shepherd Dog; semi-erect, e.g., Rough Collie; v-shaped drop, e.g., Hungarian Vizsla; pendulous, e.g., Basset Hound; and unspecified), coat length (short, medium, long, uncategorised), skull shape (dolichocephalic, mesocephalic, brachycephalic, uncategorised), brachycephalic severity (mild, moderate and severe), spaniel type (spaniel type purebred, non-spaniel type purebred, spaniel type designer crossbred, non-spaniel designer crossbred, general crossbred) and Kennel Club breed group (Gundog, Hound, Pastoral, Terrier, Toy, Utility, Working, non-Kennel Club recognised)^{11, 14-17}. Adult bodyweight defined the median of all bodyweight (kg) values recorded for each dog after reaching 18 months old. Age (years) was defined for each dog on

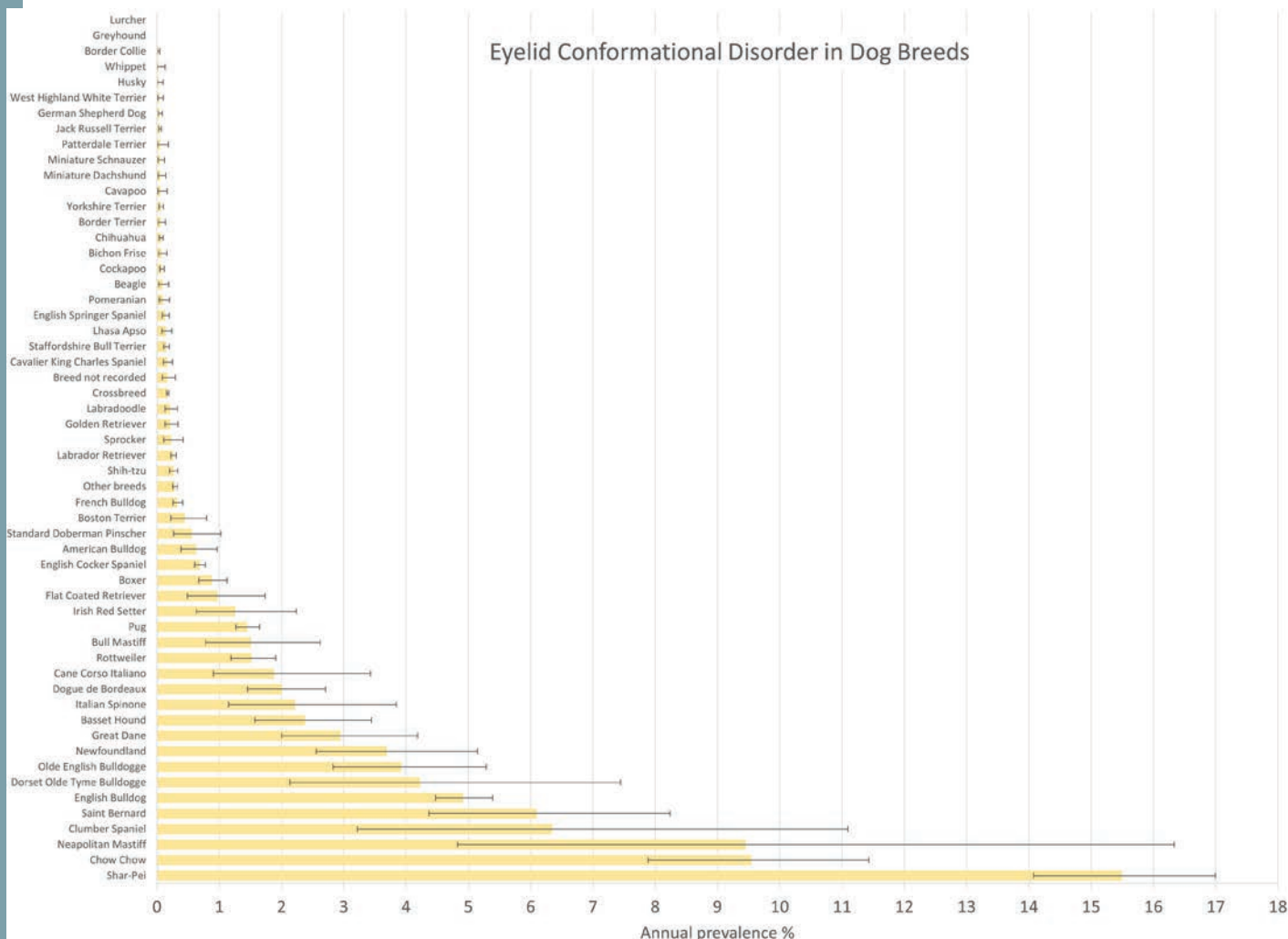


Figure 1: Annual prevalence (per cent) of conformational eyelid disorder in dog breeds under primary veterinary care in the VetCompass Programme in the UK in 2019. The horizontal bars represent 95 per cent confidence intervals.

December 31, 2019. Results for clinical management were reported descriptively. Risk factor analysis used multivariable binary logistic regression modelling. Statistical significance was set at $P < 0.05$.

Result

Descriptive results - conformational eyelid disorders overall

Text searches of the 2,250,417 dogs yielded 13,423 candidate cases of conformational eyelid disorder with some evidence of entropion and/or ectropion in 2019. Manual checking of a random sample of 5,000/13,423 candidate cases confirmed 3,029 conformational eyelid disorder cases during 2019. After accounting for subsampling, the annual prevalence for conformational eyelid disorder in dogs overall was 0.36 per cent (95 per cent CI: 0.35-0.37). Breeds with the highest annual prevalence for conformational eyelid disorder overall were Shar-Pei (15.49 per cent, 95 per cent CI 14.08-17.00), Chow Chow (9.55 per cent, 95 per cent CI 7.88-11.43), Neapolitan Mastiff (9.45 per cent, 95 per cent CI 4.83-16.33), Clumber Spaniel (6.34 per cent, 3.22-11.09), Saint Bernard (6.10 per cent, 95 per cent CI 4.37-8.24), and English Bulldog (4.92 per cent, 95 per cent CI 4.48-5.39) (see Figure 1).

Risk factor analysis

Risk factor results - conformational eyelid disorders overall

After accounting for the effects of the other variables evaluated in the multivariable modelling, 27 breeds showed increased odds ratio of conformational eyelid disorder compared with general crossbred dogs. The breeds with the highest odds ratios included Shar-Pei (odds ratio [OR] 107.38, 95 per cent CI 92.51-124.64, $P < 0.001$), Chow Chow (OR 60.05, 95 per cent CI 48.06-75.01, $P < 0.001$), and Neapolitan Mastiff (OR 58.7, 95 per cent CI 31.77-108.46, $P < 0.001$). Fifteen breeds showed reduced odds ratios of conformational eyelid disorder compared with general crossbreds. The breeds with the lowest odds ratios included: Border Collie (OR 0.05, 95 per cent CI 0.01-0.21, $P < 0.001$), Whippet (OR 0.12, 95 per cent CI 0.02-0.83, $P = 0.032$), and Husky (OR 0.18, 95 per cent CI 0.04-0.70, $P = 0.014$). No cases were detected in the Greyhound or Lurcher. (Table 1, page 565). Compared with general crossbred dogs, purebred dogs had 2.60 times higher odds ratio (95 per cent CI 2.32-2.91, P -value < 0.001) of conformational eyelid disorder. Kennel Club recognised breeds had 2.47 times the odds ratio compared to breeds not recognised by the Kennel Club (95 per cent CI 2.24-2.71, $P < 0.001$). Three Kennel Club breed

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Variable	Case No. (per cent)	Non-case No. (per cent)	Odds Ratio	95 per cent CI*	Category P-value	Variable P-value
Breed						< 0.001
Crossbreed	350 (11.55)	534,753 (23.9)	Reference category			
Shar-Pei	377 (12.45)	5,244 (0.23)	107.38	92.51-124.64	< 0.001	
Chow Chow	106 (3.50)	2,373 (0.11)	60.05	48.06-75.01	< 0.001	
Neapolitan Mastiff	11 (0.36)	263 (0.01)	58.70	31.77-108.46	< 0.001	
Saint Bernard	39 (1.29)	1,356 (0.06)	38.85	27.75-54.37	< 0.001	
Clumber Spaniel	11 (0.36)	501 (0.02)	33.43	18.20-61.40	< 0.001	
English Bulldog	433 (14.30)	21,427 (0.96)	26.87	23.28-31.02	< 0.001	
Newfoundland	33 (1.09)	2,067 (0.09)	23.26	16.23-33.35	< 0.001	
Dorset Olde Tyme Bulldogge	11 (0.36)	654 (0.03)	22.51	12.28-41.28	< 0.001	
Italian Spinone	12 (0.40)	930 (0.04)	19.32	10.82-34.50	< 0.001	
Olde English Bulldogge	41 (1.35)	2,926 (0.13)	18.25	13.15-25.33	< 0.001	
Great Dane	30 (0.99)	2,525 (0.11)	16.90	11.61-24.6	< 0.001	
Basset Hound	27 (0.89)	3,827 (0.17)	11.97	8.08-17.74	< 0.001	
Dogue de Bordeaux	42 (1.39)	5,003 (0.22)	11.76	8.52-16.23	< 0.001	
Bull Mastiff	12 (0.40)	1,768 (0.08)	10.67	5.98-19.02	< 0.001	
Irish Red Setter	11 (0.36)	2,121 (0.09)	8.21	4.50-15.00	< 0.001	
Pug	229 (7.56)	39,659 (1.77)	8.05	6.81-9.53	< 0.001	
Rottweiler	71 (2.34)	12,938 (0.58)	8.05	6.23-10.40	< 0.001	
Cane Corso Italiano	10 (0.33)	1,788 (0.08)	7.02	3.73-13.20	< 0.001	
Flat Coated Retriever	11 (0.36)	2,640 (0.12)	6.24	3.42-11.39	< 0.001	
Boxer	61 (2.01)	17,316 (0.77)	5.57	4.24-7.31	< 0.001	
English Cocker Spaniel	244 (8.06)	95,761 (4.28)	3.82	3.24-4.50	< 0.001	
American Bulldog	20 (0.66)	8,541 (0.38)	3.16	2.01-4.96	< 0.001	
Boston Terrier	11 (0.36)	5,426 (0.24)	2.74	1.50-5.00	0.001	
Standard Doberman Pinscher	10 (0.33)	5,691 (0.25)	2.50	1.33-4.70	0.004	
Sprocker	10 (0.33)	9,301 (0.42)	1.57	0.84-2.94	0.162	
Other breeds	238 (7.86)	229,252 (10.25)	1.56	1.32-1.84	< 0.001	
Shih-tzu	65 (2.15)	67,018 (3.00)	1.51	1.16-1.97	0.002	
Labrador Retriever	141 (4.66)	153,501 (6.86)	1.44	1.18-1.75	< 0.001	
French Bulldog	75 (2.48)	66,531 (2.97)	1.40	1.09-1.80	0.009	
Breed not recorded	11 (0.36)	13,252 (0.59)	1.29	0.66-2.51	0.462	
Labradoodle	19 (0.63)	21,697 (0.97)	1.21	0.75-1.94	0.434	
Cavalier King Charles Spaniel	23 (0.76)	35,139 (1.57)	1.07	0.70-1.63	0.753	
Golden Retriever	19 (0.63)	27,331 (1.22)	0.99	0.62-1.60	0.981	
Lhasa Apso	14 (0.46)	24,462 (1.09)	0.96	0.56-1.63	0.874	
Staffordshire Bull Terrier	43 (1.42)	93,613 (4.18)	0.77	0.56-1.06	0.110	
English Springer Spaniel	25 (0.83)	51,647 (2.31)	0.75	0.49-1.13	0.170	
Pomeranian	7 (0.23)	14,798 (0.66)	0.67	0.32-1.41	0.290	
Beagle	6 (0.20)	20,167 (0.9)	0.44	0.20-1.0	0.049	
Yorkshire Terrier	14 (0.46)	53,175 (2.38)	0.44	0.26-0.76	0.003	
Border Terrier	6 (0.20)	24,656 (1.10)	0.41	0.18-0.91	0.029	
Bichon Frise	6 (0.20)	25,113 (1.12)	0.40	0.18-0.89	0.025	
Chihuahua	22 (0.73)	80,493 (3.60)	0.40	0.26-0.61	< 0.001	
Miniature Schnauzer	5 (0.17)	21,115 (0.94)	0.36	0.15-0.87	0.023	
Cockapoo	21 (0.69)	72,822 (3.26)	0.35	0.23-0.56	< 0.001	
Jack Russell Terrier	20 (0.66)	101,182 (4.52)	0.35	0.22-0.55	< 0.001	
Patterdale Terrier	2 (0.07)	10,739 (0.48)	0.30	0.08-1.21	0.092	
Cavapoo	3 (0.10)	14,112 (0.63)	0.29	0.09-0.89	0.031	
German Shepherd Dog	8 (0.26)	47,347 (2.12)	0.25	0.12-0.5	< 0.001	
Miniature Dachshund	4 (0.13)	24,780 (1.11)	0.22	0.08-0.59	0.003	
West Highland White Terrier	4 (0.13)	35,768 (1.60)	0.21	0.08-0.55	0.002	
Husky	2 (0.07)	17,311 (0.77)	0.18	0.04-0.70	0.014	
Whippet	1 (0.03)	12,750 (0.57)	0.12	0.02-0.83	0.032	
Border Collie	2 (0.07)	61,751 (2.76)	0.05	0.01-0.21	< 0.001	
Greyhound	0 (0.00)	12,630 (0.56)	N/A			
Lurcher	0 (0.00)	16,043 (0.72)	N/A			

Table 1: Breed risk factors for conformational eyelid disorder cases overall during 2019 in dogs under primary veterinary care in the VetCompass Programme in the UK after accounting for confounding using multivariable logistic regression results. Column percentages shown in brackets. P-values < 0.050 are shown in red. *CI confidence interval.

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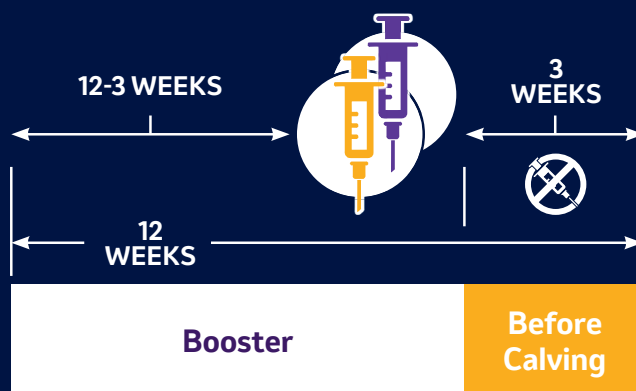
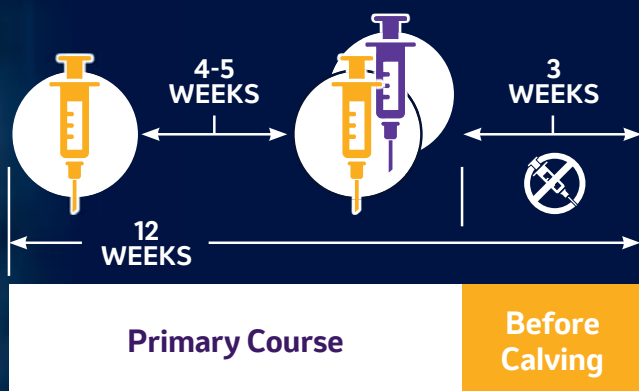
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Risk factor	Case No. (per cent)	Non-case No. (per cent)	Odds ratio	95 per cent CI*	Category P-value	Variable P-value
Breed purity						
General crossbred	350 (11.55)	534,753 (23.90)	Reference category	~		< 0.001
Designer crossbreed	62 (2.05)	148,843 (6.65)	0.51	0.38-0.67	< 0.001	
Purebred	2,606 (86.03)	1,540,146 (68.85)	2.60	2.32-2.91	< 0.001	
Kennel Club recognised breed						< 0.001
Not Kennel Club recognised breed	520 (17.17)	723,548 (32.34)	Reference category	~		
Kennel Club recognised breed	2,498 (82.47)	1,500,194 (67.06)	2.47	2.24-2.71	< 0.001	
Kennel Club Breed Group						< 0.001
Not Kennel Club recognised breed			Reference category	~		
Working	345 (11.39)	76,252 (3.41)	6.34	5.53-7.26	< 0.001	
Utility	1,135 (37.47)	260,200 (11.63)	5.84	5.26-6.48	< 0.001	
Gundog	523 (17.27)	369,932 (16.54)	2.06	1.82-2.33	< 0.001	
Toy	318 (10.50)	277,400 (12.40)	1.65	1.43-1.90	< 0.001	
Hound	63 (2.08)	97,174 (4.34)	0.90	0.69-1.17	0.426	
Terrier	93 (3.07)	292,014 (13.05)	0.54	0.43-0.67	< 0.001	
Pastoral	21 (0.69)	127,222 (5.69)	0.24	0.16-0.37	< 0.001	
Skull conformation						
Mesocephalic	1,349 (44.54)	963,465 (43.07)	Reference category	~		< 0.001
Brachycephalic	1,114 (36.78)	391,118 (17.48)	1.74	1.61-1.89	< 0.001	
Dolichocephalic	143 (4.72)	185,563 (8.30)	0.50	0.42-0.59	< 0.001	
Brachycephalic severity						
Mild	103 (9.16)	46,839 (11.58)	Reference category	~		< 0.001
Moderate	149 (13.24)	134,524 (33.27)	0.47	0.36-0.60	< 0.001	
Severe	862 (76.62)	209,755 (51.87)	1.67	1.36-2.06	< 0.001	
Median adult bodyweight (kg)						
<10kg	299 (15.15)	532,907 (34.76)	Reference category	~		< 0.001
10.0- < 15.0kg	258 (13.08)	289,068 (18.86)	1.52	1.28-1.79	< 0.001	
15.0- < 20.0kg	227 (11.51)	186,499 (12.17)	2.16	1.82-2.57	< 0.001	
20.0- < 25.0kg	297 (15.05)	158,029 (10.31)	3.57	3.04-4.19	< 0.001	
25.0- < 30.0kg	352 (17.84)	139,523 (9.10)	4.67	4.00-5.46	< 0.001	
30.0- < 40.0kg	318 (16.12)	177,601 (11.59)	3.37	2.88-3.95	< 0.001	
40.0- < 50.0kg	98 (4.97)	38,148 (2.49)	4.82	3.84-6.06	< 0.001	
50.0- < 60.0kg	62 (3.14)	7,514 (0.49)	13.97	10.61-18.39	< 0.001	
≥ 60kg	62 (3.14)	3,616 (0.24)	28.41	21.55-37.45	< 0.001	
Ear carriage						
Erect	306 (10.15)	378,005 (17.03)	Reference category	~		< 0.001
Semi-erect	1,206 (39.99)	429,511 (19.35)	3.97	3.50-4.51	< 0.001	
V-shaped (drop)	465 (15.42)	303,414 (13.67)	2.08	1.80-2.40	< 0.001	
Pendulous	627 (20.79)	425,413 (19.16)	1.96	1.71-2.24	< 0.001	
General crossbred	412 (13.66)	683,596 (30.79)	0.75	0.65-0.88	< 0.001	
Coat length						< 0.001
Short	1,856 (61.99)	790,795 (37.05)	1.74	1.58-1.90	< 0.001	
Medium	610 (20.37)	474,022 (22.21)	Reference category	~		
Long	116 (3.87)	186,269 (8.73)	0.49	0.40-0.60	< 0.001	
General crossbred dogs	412 (13.76)	683,596 (32.02)	0.43	0.38-0.48	< 0.001	
Spaniel type						< 0.001
General crossbred	350 (11.60)	534,753 (24.05)	Reference category	~		
Non-spaniel type purebred	2,282 (75.61)	1,339,624 (60.24)	2.61	2.33-2.92	< 0.001	
Spaniel type purebred	324 (10.74)	200,522 (9.02)	2.53	2.17-2.94	< 0.001	
Non-spaniel designer crossbred	28 (0.93)	50,504 (2.27)	0.76	0.51-1.12	0.166	
Spaniel type designer crossbred	34 (1.13)	98,339 (4.42)	0.40	0.28-0.57	< 0.001	

Table 2: Breed-related risk factors for conformational eyelid disorder cases overall during 2019 in dogs under primary veterinary care in the VetCompass Programme in the UK after accounting for confounding using multivariable logistic regression results. Column percentages shown in brackets. P-values < 0.050 are shown in red. *CI confidence interval.

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groups (Working, Utility, and Gundog) showed higher odds ratio compared to breeds that were not recognised by the Kennel Club, while two breed groups showed lower odds ratio (Pastoral and Terrier). Breeds with brachycephalic skull conformation (OR 1.74, 95 per cent CI 1.61-1.89, P -value < 0.001) had higher odds ratio compared with breeds with mesocephalic skull conformation, while breeds with a dolichocephalic skull conformation had reduced odds ratio (OR 0.50, 95 per cent CI 0.42-0.49, P -value < 0.001). Compared to breeds with mild brachycephaly, breeds with moderate brachycephaly showed reduced odds ratio while breeds with severe brachycephaly showed increased odds ratio. There was a strong trend towards increasing odds ratio as the adult bodyweight increased. Breeds with erect ear carriage had the lowest odds ratio of conformational eyelid disorder. Compared with breeds with medium length coats, breeds with short coat had higher odds ratio and breeds with long coat had reduced odds ratio. Spaniel breeds overall had higher odds ratio of conformational eyelid disorder compared with crossbreed dogs (Table 2, page 568).

Entropion

The 3,029 confirmed conformational eyelid disorder cases included 2,752 (90.86 per cent) entropion diagnoses. There were 67/3,029 (2.21 per cent) cases with both entropion and ectropion diagnoses. The annual prevalence for entropion in dogs overall was 0.33 per cent (95 per cent CI: 0.32-0.34). Breeds with the highest annual prevalence for entropion were Shar-Pei (15.41 per cent, 95 per cent CI 14.00-16.91), Chow Chow (9.28 per cent, 95 per cent CI 7.64-11.14), Neapolitan Mastiff (6.88 per cent, 95 per cent CI 3.02-13.14), Clumber Spaniel (6.34 per cent, 95 per cent CI 3.22-11.09), Saint Bernard (5.00 per cent, 95 per cent CI 3.44-6.99), and English Bulldog (4.65 per cent, 95 per cent CI 4.22-5.11).

Ectropion

Of the 3,029 confirmed conformational eyelid disorder cases, 344 (11.36 per cent) had an ectropion diagnosis. The annual prevalence for entropion in dogs overall was 0.04 per cent (95 per cent CI: 0.04-0.05). Breeds with the highest annual prevalence for ectropion were Neapolitan Mastiff (4.30 per cent, 95 per cent CI 1.41-9.77), Saint Bernard (1.72 per cent, 95 per cent CI 0.86-3.05), Basset Hound (1.59 per cent, 95 per cent CI 0.94-2.49), and Great Dane (1.47 per cent, 95 per cent CI 0.83-2.42).

Clinical management

Entropion

The median age at first recorded diagnosis with entropion was 2.02 years (IQR 0.69-5.15, range 0.02-16.99). Among 1,540 (67.69 per cent) entropion cases with at least one clinical sign recorded, the most common clinical signs were ocular discharge ($n = 735$, 47.73 per cent), epiphora (426, 27.79 per cent), blepharospasm (353, 22.92 per cent). At least one other ocular condition was recorded as comorbid with entropion in 1,019 (44.79 per cent) cases. Of these, the most common were conjunctivitis (414, 40.63 per cent), corneal ulceration (278, 27.28 per cent), and trichiasis (104, 10.21 per cent). Information on the clinical management plan at first diagnosis of entropion was recorded in 1906 (83.78 per cent) cases. Of these, the most common plans included medical care (1,133, 59.44 per cent) and surgery (1,098, 57.61 per cent).

There was evidence in the available clinical records that surgical management was carried out for 414/2,275 (18.20 per cent) of the entropion cases. Of the 216 (52.17 per cent) surgical entropion cases with information available, the surgical methods used included Celsus-Hotz (86, 39.81 per cent), stay sutures (83, 38.43 per cent), and wedge resection (28, 12.96 per cent).

Ectropion

Among 303 of the 344 ectropion cases overall with age data available, the median age at first recorded diagnosis in all available EHRs was 2.15 years (IQR 0.69-6.90, range 0.16-14.94). Among 167 (65.75 per cent) of ectropion cases with at least one clinical sign recorded, the most common clinical signs were ocular discharge ($n = 87$, 52.10 per cent), conjunctival redness/hyperemia (46, 27.54 per cent), and epiphora (25, 14.97 per cent). At least one other ocular condition was recorded as comorbid with ectropion in 117 (38.36 per cent) cases. Of these, the most common were conjunctivitis (55, 31.07 per cent), diamond eye (17, 9.60 per cent), and corneal ulceration (16, 9.04 per cent). Information on the clinical management plan at first diagnosis of ectropion was recorded in 201 (65.90 per cent) cases. Of these, the most common plans included medical care ($n = 121$, 60.20 per cent) and surgery (65, 32.34 per cent) (S7 Table). There was evidence in the available clinical records that surgical management was carried out for 12/305 (3.93 per cent) of the ectropion cases. Of the eight (66.67 per cent) surgical ectropion cases with information available, the surgical methods used included wedge resection ($n = 6$, 75.00 per cent), Celsus-Hotz (2, 25.00 per cent), Stades forced granulation procedure (1, 12.50 per cent), and tarsorrhaphy (1, 12.50 per cent).

Discussion

In the current study, the annual prevalence of entropion diagnosis (0.33 per cent) was almost tenfold higher in comparison to ectropion (0.04 per cent). Of the conformational eyelid disorder cases with an accompanying clinical sign recorded, a striking 27 per cent of dogs with entropion and 9 per cent of ectropion cases were co-morbidly diagnosed with concurrent corneal ulceration, a painful and potentially globe-threatening condition that suggests a high welfare cost from conformational eyelid disorder⁹.

Shar Pei, Chow Chow, and Neapolitan Mastiff showed the highest breed annual prevalence for a conformational eyelid disorder overall. The breed-related odds ratios reported in the current study for conformational eyelid disorders were highly polarised, with odds ratios for many breeds either very high or very low in comparison to crossbreed dogs. The phenotype of the Husky is widely considered to have remained similar to the ancestral natural canine appearance¹⁸ and it is, therefore, noteworthy that the Husky featured among the breeds with the lowest odds ratio of conformational eyelid disorders in the current study. This supports the proposition for a close connection between conformational eyelid disorders and, indeed, other conformation-related disorders carrying severe impact on the welfare of the dog with common unnatural phenotypes such as brachycephaly or excessive skin folds selected by humanity during the invention of dog breeds¹⁹. It is also

interesting to note that several breeds that also retain a more natural canine conformation, e.g., Greyhound, Border Collie, Whippet, had significantly lower odds ratio of conformational eyelid disorders than crossbreds.

Concurring with the current results showing concerning high odds ratios for conformational eyelid disorders in the Shar Pei (OR 107.38) and Chow Chow (OR 60.05), the US ACVO Blue Book 2022 states that the frequency and form of entropion in Shar-Pei and Chow Chow is a particularly severe problem that has been recognised for decades. The UK Kennel Club breed standards state for every breed that “absolute soundness is essential” and that “breeders and judges should at all times be careful to avoid obvious conditions or exaggerations which would be detrimental in any way to the health, welfare, or soundness of this breed”²⁰. This suggests that breeders, judges, and, indeed, the wider dog-acquiring public are normalising and celebrating this extreme conformation as a desirable phenotype in dogs. Given that the current legislation for commercial dog breeding in England states that “...no dog may be kept for breeding if it can reasonably be expected, on the basis of its genotype, phenotype or state of health that breeding from it could have a detrimental effect on its health or welfare or the health or welfare of its offspring”²¹, the current results suggest that many dogs in England are bred in breach of current legislation in several breeds.

The current data show brachycephalic dogs overall with an increased odds ratio for entropion (OR 1.83). This odds ratio was further exaggerated in the subset of those severely brachycephalic breeds. Previously, the probability of corneal ulceration has been strongly linked to the brachycephalic conformation and the existence of a nasal fold^{22,23}, which are commonly interlinked conformational qualities in severely brachycephalic breeds such as Pekingese, Pug, Shih Tzu, and English Bulldog^{2, 22, 24-26}. The popularity of brachycephalic breeds continues to grow; in 2019, 18 per cent of the dogs in UK were estimated to be brachycephalic, and 54 per cent of these severely brachycephalic¹¹. With such a demographic shift, the conditions connected to conformation in these breeds and potential for pain and suffering associated with them cannot be over-emphasised. Clinical diagnosis of conformational eyelid abnormality is usually straightforward for primary care practitioners but achieving the optimal surgical therapy necessary for some of the more complex cases may require specialist care². However, the current data confirm that many cases of conformational eyelid disorder are managed completely under primary care, either with or without surgical therapy. Therefore, some previous studies based solely on referral data may have underestimated the overall prevalence of conformational eyelid disorders or may show referral bias towards the more complicated cases and associated breeds^{7,10, 27}. On the other hand, even despite the large prevalence recorded, the current data may still have heavily underestimated the true prevalence. This is because normalisation of conformational eyelid disorders as “normal for breed” based on currently published breeding standards and breed norms may have led many owners and veterinarians to fail to include true cases not presenting with marked or disabling level of severity.

The impact of pain associated with conformational eyelid disorders is a key welfare issue. In the current study, a

notable 27 per cent of dogs with entropion and 9 per cent of dogs with ectropion were co-morbidly diagnosed with corneal ulceration. Unless surgically managed, conformational eyelid disorders are typically chronic in nature and it is reasonable to assume that most of these dogs suffer from chronic pain, which in turn has been associated with changes in behavior, learning, and performance²⁸.

In conclusion

Over six decades ago in 1963, S.F.J Hodgman talked about presumed hereditary defects in pedigree dogs and stated that “all the legislation in the world will not alone overcome this problem. There is no royal road to success, it is only attained by knowledge, perseverance, hard work and the courageous acceptance of many disappointments”²⁹. The current results highlight that serious welfare issues of conformational eyelid disorders still exist in certain dog breeds and provide further evidence for brachycephalism and excessive skin fold as predisposing factors. Overall, it seems that there is still a long way to travel on the road to ensuring good innate health for all dogs.

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READER QUESTIONS AND ANSWERS

1. WHAT IS THE PRESUMED INHERITANCE PATTERN FOR ENTROPION AND/OR ECTROPION IN DOGS?

- A. Random occurrence
- B. Non-inherited
- C. Monogenic inheritance
- D. Polygenic inheritance
- E. The 'mastiff' gene

2. WHY IS EXTREME CONFORMATION IN DOGS CALLED 'EXTREME'?

- A. They are extremely popular on social media
- B. They are extremely cute to the public
- C. They lead to extremely high profits for breeders
- D. They give an extremely high chance of winning in dog shows
- E. They are extremely different from the natural dog conformation

3. WHICH DOG BREED HAS THE HIGHEST PREDISPOSITION TO CONFORMATIONAL EYELID DISORDERS?

- A. Shar-Pei
- B. Chow Chow
- C. Neapolitan Mastiff
- D. Labrador Retriever
- E. English Bulldog

4. WHAT PERCENTAGE OF ENTROPION CASES WERE COMORBIDLY DIAGNOSED WITH CORNEAL ULCERATION?

- A. 7.28 per cent
- B. 17.28 per cent
- C. 27.28 per cent
- D. 37.28 per cent
- E. 47.28 per cent

5. COMPARED TO MESOCEPHALIC DOGS, WHAT WAS THE RISK OF CONFORMATIONAL EYELID DISORDERS FOR BRACHYCEPHALIC DOGS?

- A. Lower
- B. The same
- C. Higher
- D. Zero risk in both types of dogs
- E. Not reported in the paper

ANSWERS: 1D; 2E; 3A; 4C; 5C.