

Classification of Cleft Lip and Palate in Animals

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Summary

In clinical work, as in research, there is a need for a systematic classification of cleft lip and palate. The American Cleft Palate Association (ACPA) classification, which is based on the embryology of the face, fulfills most of the requirements. This paper reports on an investigation into the applicability of the ACPA classification in clefts found in dogs. The investigation shows that although the ACPA classification can be applied to dogs with cleft palates, it does not describe adequately three features found in dogs with clefts. A modification of the ACPA classification is suggested which will allow it to be used in dogs and possibly other experimental animals. The same modifications would allow a fuller description of clefts of the hard palate in humans.

Introduction

The classification of Veau (9), published in 1927, found ready acceptance because of its clinical orientation and although it does not define clefts of the lip and palate anterior to the incisive canal adequately it is still frequently used in clinical practice. A classification of cleft lip and palate, which is acceptable to workers in the research as well as the clinical fields, would facilitate communication which is essential for the recording of fundamental information. For this reason the embryology of the face has formed the basis for a number of classifications of facial clefts (3, 4, 7, 8, 10). In 1971 Berlin (1) reviewed the subject and concluded that the classification of the American Cleft Palate Association (ACPA) which was published in its original form in 1960 (5, 6) was the most acceptable. To test the applicability of the ACPA classification in experimental animals, it was used to classify clefts of lip and palate found in a sample of dogs.

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Materials and Methods

The 35 specimens used in this investigation consisted of 19 Boxers, 7 Bulldogs, 2 Chihuahuas, 1 Pekinese, 1 Dachshund, 1 Bull Mastiff, 1 Bull Terrier and 3 Collies. Twenty seven of the animals were sacrificed one to three days after birth and the skulls were prepared either as wet or dried specimens. The other eight pups were reared for various lengths of time ranging from five to nine years. All but four of the animals in this series were the progeny of achondroplastic breeds and except for the Dachshund all the achondroplastics were short snouted dogs.

Findings

The facial clefts observed in the thirty five dogs were classified according to the ACPA system (Table 1). Two of the animals had clefts which involved the pre-palate only while there were seven dogs with clefts of the palate (post-palate) only. Twenty six specimens had combinations of clefts of the pre- and post-palates. Thirteen animals which had complete bilateral clefts of lip and palate formed the largest individual group of all the types seen in the sample.

Discussion

Our sample of clefts is too small to permit a valid evaluation of the incidence of the various types of clefts in dogs as a certain degree of bias is unavoidable. It is inevitable that the preference for certain breeds of dogs will vary with different population groups and therefore our sample is in this respect selected. Furthermore, even though the findings show such a high incidence of clefts of the soft palate, these could occur without any outward sign, and unless the deterioration in health and subsequent death of an animal prompts an intra-oral examination and the discovery of such a cleft, it may remain undetected. In addition partial clefts of the lip, especially in short snouted dogs with their full, creased faces, are often not noticed and since they have no feeding problem they are reared normally by the mother. The lack of isolated clefts of the lip and soft palate in our sample may therefore not be significant. However, the absence of median clefts in this sample is probably significant because the presence of such a cleft of the maxilla is unlikely to be missed by the owners or veterinary surgeons.

The ACPA classification is applicable to clefts found in dogs but fails to demonstrate three important characteristics. Two of these characteristics, which differ markedly from those of their human counterparts, are the symmetry of the maxilla and the degree of protrusion of the premaxilla. The affected maxilla of the dogs, even in those with extensive clefts involving the lip and palate, exhibit a marked degree of symmetry and there is little or no evidence of protrusion of the premaxilla as occurs in humans. (Figure 1). The asymmetry which is evident on the dried skulls, shown

TABLE 1. American Cleft Palate Association classification of clefts of the pre-palate.

<i>clefts of the pre-palate</i>	<i>extent</i>		
	$\frac{1}{3}$	$\frac{2}{3}$	$\frac{3}{3}$
cleft lip			
unilateral			
right			7
left			5
bilateral			
right			16
left			16
			(Total: 28)
clefts of alveolar process			
unilateral			
right			7
left			5
bilateral			
right			16
left			16
median			0
			(Total: 28)
clefts of post-palate			
soft palate			33
hard palate			33
			(Total: 33)

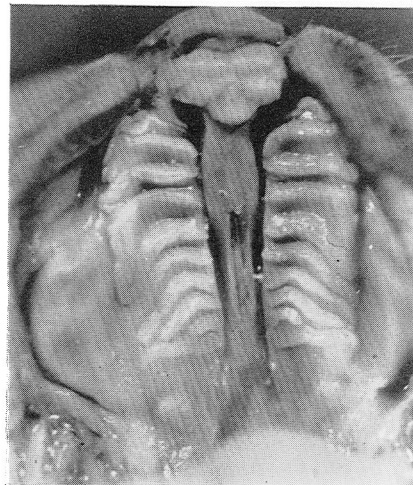


FIGURE 1. Specimen of a complete bilateral cleft of the pre- and post-palate showing the symmetry of the maxillary arch and the lack of protrusion of the pre-palate.

in Figures 2 and 3, is due to distortion which occurred during the preparation. The third characteristic of the clefts in this series which was not evident from the ACPA classification was the subdivision of the clefts of the hard palate. A similar difficulty has been experienced when the ACPA classification has been applied to human clefts. The latter findings and

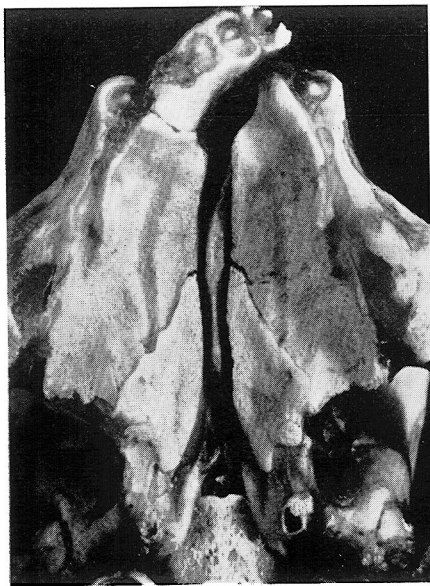


FIGURE 2. Dry specimen showing unilateral cleft of the pre-palate and complete bilateral cleft of the post-palate.

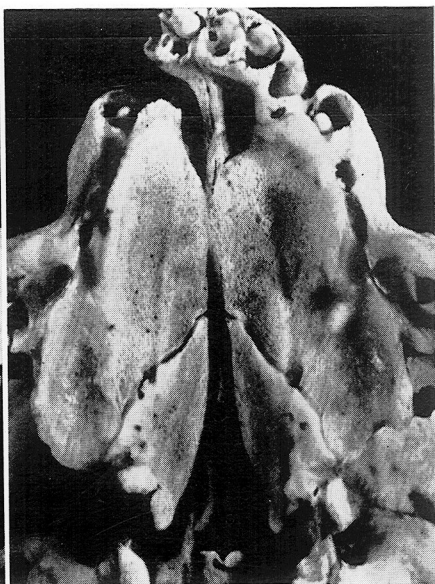


FIGURE 3. Dry specimen illustrating unilateral cleft of the pre-palate and bilateral cleft of the posterior two thirds of the post-palate.

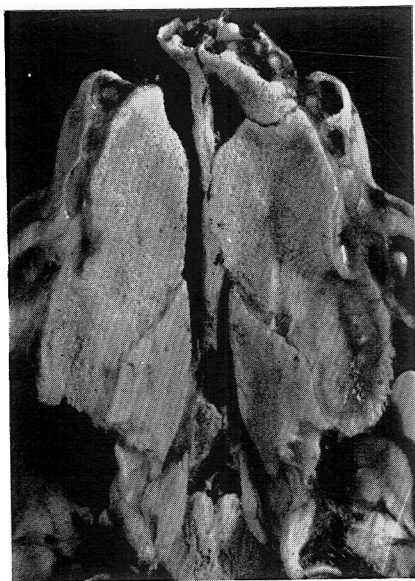


FIGURE 4. Dry specimen showing a complete unilateral cleft of the right side and a partial cleft of the post-palate on the left.

TABLE 2. Suggested classification of clefts of the hard palate.

<i>clefts of the palate</i>	$\frac{1}{3}$	<i>extent</i> $\frac{2}{3}$	$\frac{3}{3}$
cleft soft palate	0	0	33
cleft hard palate			
unilateral			
right	0	0	0
left	0	0	0
bilateral			
right	2	1	30
left	5	1	27
median	0	0	0

the supporting histological evidence, prompted Dreyer et al (2) to propose a modified concept of the embryology of the secondary palate. This work suggests that there is a stage in the development where the palatal processes lie adjacent to the lower end of the nasal septum and that at this time there are three primitive sutures in the hard palate. One midline suture between the bony plates formed at the lower end of the nasal septum and two lateral sutures between these plates and the palatal shelves. The nature of the clefts of the hard palates of the dogs in this series could be accounted for if the bony secondary palate is derived from three embryological processes. The ACPA classification makes provision for a failure of the union of the palatal processes of the maxilla with that of the premaxilla, which is recorded as a unilateral cleft of the prepalate. However, the unilateral cleft of the secondary palate which would therefore extend between the lower end of the nasal septum and the palatal process on the one side is not catered for in the ACPA classification. Neither does the ACPA classification make provision for the recording of complete bilateral clefts of the post-palate (Figure 1), or complete bilateral clefts of the post-palate associated with a unilateral cleft of the pre-palate (Figure 2), or of a combination of unilateral and partial bilateral clefts (Figure 3), or of a combination of a complete unilateral and a partial cleft of the post-palate of the opposite side. (Figure 4)

Conclusions

The classification of ACPA is applicable to clefts in dogs and can be used to evaluate the incidence and nature of the clefts found in these animals. It does not, however, adequately demonstrate morphological differences between human and dog clefts and our findings suggest that the section of the ACPA classification dealing with clefts of the hard post-palate, be modified so that these clefts may be recorded in a manner similar to that used for clefts of the pre-palate.

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