Cleft Palate in a Dog

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This paper will present a brief description of the interdisciplinary treatment of a posterior medial cleft of the hard and soft palate in a Beagle and a discussion of the possibilities which might result from the production of a pure strain of cleft palate dogs.

It is hoped that presentation of this material will stimulate clinicians concerned with the treatment and rehabilitation of cleft palate patients to utilize inbred animals (such as dogs) for the development of new surgical and orthodontic techniques. Such inbred laboratory animals would also provide a source of biological material for intensive genetic and biochemical research projects to establish prophylactic techniques as a means of decreasing the incidence of cleft palate and other associated anomalies.

There is relatively little in the literature regarding cleft palate in dogs. The incidence of cleft palate in Beagles and other mesocephalic dogs is considered to be lower than in brachycephalic dogs (*3*). Calnan (*1*) proposed a classification of clefts in dogs based on the classification for man arranged by Kernahan and Stark (*5*). Conventional surgical veterinary treatment consists of paring the lateral surfaces of the cleft and making a simple closure as briefly described by Munson (*7*). Munson suggested early surgical closure with best results obtained when the cleft is narrow. Hofmeyer (*4*) reported the use of an autograft from the uvula for closure of a posterior medial cleft in an 18-month-old Dachshund and an adult tomcat.

Clinical Data

Our interest in canine cleft palate was aroused when a five-week-old Beagle pup appeared at the UCLA Center for the Health Sciences in late 1962. The pup was found to be in good health, slightly smaller than the average Beagle of five weeks, and had no anomalies other than a posterior medial cleft of the hard and soft palate (Figure 1). The cleft

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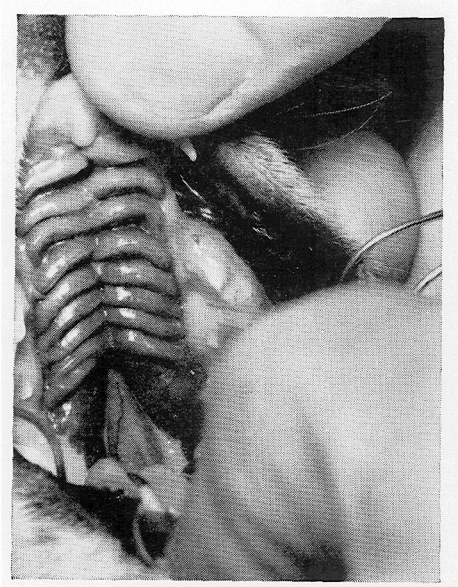

FIGURE 1. Cleft Palate at age 5 weeks.

extended from the region of the incisive papilla posteriorly and included the soft palate. Dental casts were initiated at the time of the first examination and were maintained during the course of observation (Figure 2). Radiographs of the skull and torso revealed no other skeletal anomalies or defects.

The owner reported that the new-born pup was fed a commercial bitch's milk substitute (Esbilac by Borden) diluted with cow's milk and water. The pup's head was held high and a medicine dropper filled with milk was placed as far back in the mouth as possible and then droplets of milk could be swallowed by the pup before any excess could accumulate. Within a short period of time the flow rate was increased and a funnel and valve attached to the dropper system. At four weeks of age the pup was fed a cereal (Pablum) twice a day by licking the food which slowly oozed from an overhead dish. When food did get into the cleft, the pup usually 'sneezed it out'. Periodically, a dampened cotton-tipped applicator was used to clean the cleft of any excess food deposits. The food had to be soft enough to preclude chewing, yet thick enough to prevent a backwash into the defect. By eight weeks the pup was feeding from a bowl placed at head level.

Dental casts of the pup's maxilla were made from impressions taken periodically from five weeks to 13 months of age. The pup was anesthesized with intravenous pentobarbital in order to take the impressions. An alginate imprint was made. Casts were poured and shimmed with a double thickness of base-plate wax with additional shimming around the canine teeth. This shimming was covered with 0.003 inch tinfoil and an

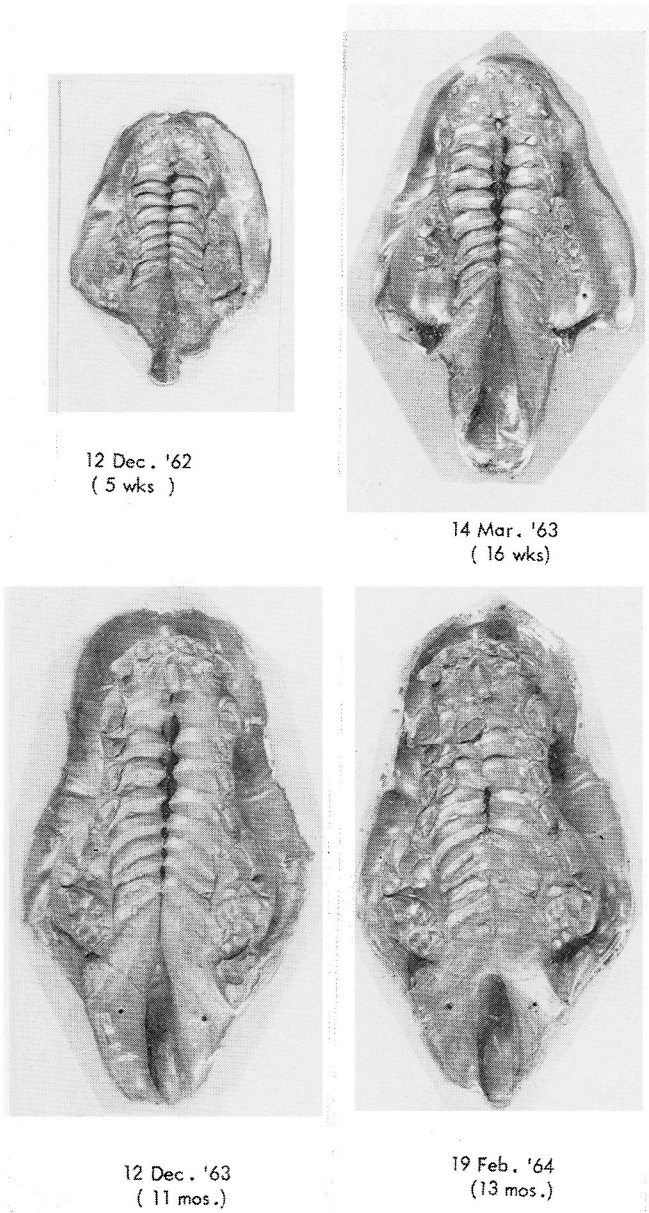

FIGURE 2. Silver-plated casts of the cleft palate at ages 5 weeks, 16 weeks, 11 months, and 13 months.

acrylic tray formed over the cast. When the tray material became hot during the setting process, it was lifted off the cast and the shim stripped away from the tray. The tray was trimmed, fitted in the mouth of the pup with the pup positioned on its back, and checked for over-extension. It was then removed and painted with a thiokol rubber adhesive material.

Next, a maxillary imprint was taken with a heavy bodied thiokol rubber material. From this impression the cast was poured, separated, and silver-plated. It should be noted that while taking the imprint the borders of the cleft in velar area widened as the tongue was drawn out of the mouth to insure the pup an adequate airway.

Between five and 16 weeks of age the cleft of the hard palate widened appreciably in spite of the fact that the ratio of length to the width of the hard palate remained the same (Figure 2). Between 16 weeks and 11 months the cleft gradually narrowed as the snout grew longer.

The development of the soft palate was not documented because the soft tissue was distorted by forward retraction of the tongue while registering the maxillary imprints. Growth was considered complete at the age of 12 months and the cleft was surgically closed. The oral and nasal mucosa were approximated in the midline using a modified von Langenbeck procedure.

At a one-month post-operative re-examination a defect in closure of the fourth and fifth transverse palatine ridges of the palate was apparent (Figure 2). This defect was judged to be the result of the pup chewing a blunt object; otherwise, healing of the remaining suture line was uneventful.

The pup now laps water from a bowl placed on the floor without raising its head to swallow. Solid food is eaten if broken into small pieces. The pup tends to 'snort' the food into its mouth, swallow, and then clear its passages by additional 'snorts'. It has learned to distinguish and select particles of optimum size and will deliberately break its food to this size by biting and pawing at it. To our knowledge, the pup has normal occlusion. There is no radiographic or physical evidence of any other defects.

With the above data in mind and complemented by the data (Figure 3) available on the animal treated in this report (the propositus), there is a good degree of probability that a pure strain of cleft palate Beagles could be obtained. It is of interest to note that the pup's sire mated to an unrelated bitch recently produced another male pup with posterior medial cleft palate. Since that time another cleft palate Beagle pup whose ancestry is related to the same breeding line has been born. These data are now undergoing further study.

Discussion

In 1961, Fogh-Andersen (*2*) stated the possibility that the frequency of cleft lip and palate will increase in future years because of the growing number of affected individuals being kept alive who have a good chance of bringing offspring into the world. Bearing Fogh-Andersen's statement in mind, investigators interested in treating cleft palate should also begin to think about ways of preventing cleft palates. Genetic and clinical human studies in cleft lip and palate are very expensive and require many years to complete. Selected cooperative subjects who would

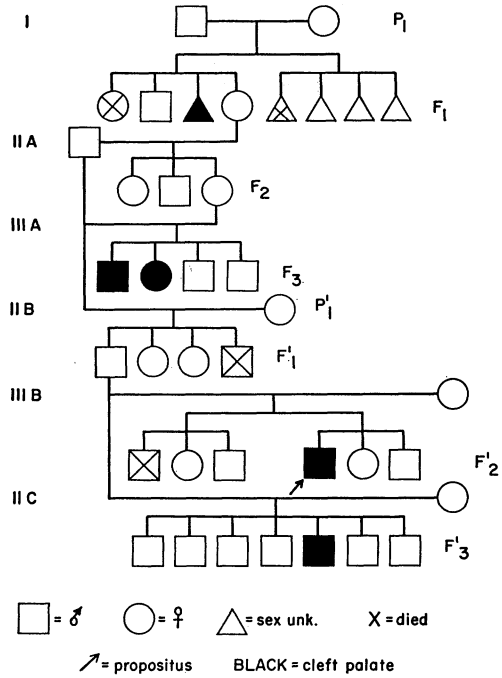

FIGURE 3. Lineage of the Beagle pup (propositus) described in this paper.

be used for experimental procedures are not readily available. Therefore, the laboratory animal must become a source of data for experimental cleft palate investigations. To date, rodents have been useful in studying the influence of teratogenic agents; however, they are not desirable for clinical studies in surgery, prosthetics, or orthodontics because of their small size (*6*). Morphologically, primates may be more suitable, but husbandry practices are expensive in terms of cost, space, and manpower. Also, their mouths and associated structures are difficult to examine routinely.

The dog makes an ideal experimental animal for cleft palate research because it affords personnel interested in improving clinical procedures in dentistry and surgery the opportunity to work with an adequate amount of caraniofacial tissue. At the same time, complementary basic science experiments in genetics and biochemistry can be pursued without great expense for animal maintainence while providing adequate experimental material.

It is our intention, if funds become available, to breed Beagles which are known to have one or more recessive genes associated with cleft palate and produce a pure strain of animals with cleft palates. These animals would then be available for interested cleft palate groups.

Studies could then be initiated to investigate the basis of the asym-

metry of the manifestation of the cleft palate trait, i.e., the number of genes controlling the trait, position effect, penetrance, and chromosome loss.

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