Acrylic Beak Repair

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It is essential to understand the anatomic and physiologic influences affecting beak growth in order to understand the dynamics of beak repair and restoration.

The ramphotheca, the horny covering of the psittacine beak, is a keratinized thickening of the corneum of epidermis[1]. The ramphotheca is very hard and rigid, in some species it is leathery and flexible[1]. The ramphotheca of the rostrum maxillare is called the rhinotheca and of the rostrum mandibulare, the gnathotheca[2].

The cornified keratin layer of the upper beak grows from the dermis which covers the premaxilla. There is a vascular layer between the ramphotheca and the dermis. The ramphotheca grows in sheets away from the dermis in a cranioventral plain. The growth rate varies with the various anatomical surfaces as well as the normal wear resulting from demands placed upon the specific growth areas. As the keratin sheets migrate outward and towards the beak tip, normal beak function will chip off the outermost layers as it approaches the tip and margins of the beak. It is not clearly understood what controls beak growth rate nor why some areas of the ramphotheca grow faster than others.

The keratin of the lower beak (gnathotheca) grows towards the margins of the beak at a more rapid rate than that of its upper counterpart; however, there is an even contact surface of the mandibular beak in most species. Subsequently, it wears more uniformly than the maxillary beak. The growth rate of immature adolescence is more rapid than that of adult birds.

Consideration of the growth rate and direction is necessary in determining the potential ejection time of an implant due to growth contour changes. Clipsham[3] indicated that complete replacement of the ramphotheca averages about 6 months. Replacement of corneum in non-psittacine species appears to be much slower. Birds which exert great beak pressure and have more functional beaks appear to exhibit more rapid keratin replacement.

Histologically, the germinative layer has epidermal papillae that interdigitate with the dermal papilla[4,] and if damaged, the ramphotheca will not regenerate keratin. Each papilla has a capillary close to the basal surface of the epidermis.

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In crushing type injuries, areas of dermal destruction can cause uneven patterns of keratin replacement and growth rate.

Materials

The vast majority of abnormalities employ the use of a Cyanoacrylate used as a bonding agent to restore the injured beak to as close to normal function and appearance as possible until the injury heals with a new keratin layer. In injuries and deformities in which there is loss of structure with no hope of regeneration, prosthetics are applied to restore function and appearance.

The technique for mixing Cyano-Veneer for color matching is uncomplicated and requires only a little artistic skill. The colors included in the Ellman Cyano-Repair Kit[1] are shade 62 white and clear powder shades. The Stain Kit shades are yellow, grey, pink and blue. The color shade necessary to develop the correct color match should be mixed with the white shade powder using a flat toothpick or a dental plastic filling instrument. Small quantities of the color shade should be mixed with 3 to 5 times the amount of the shade 62 Cyano-Veneer powder to attain a matching color with the beak to which it is being applied.

Preparing the Beak

To prepare the beak for the acrylic, clear away all debris from around the margins and within the defect. Wash the surface of the beak with alcohol and allow to dry. If a large area is to be repaired, the margins of the lesions should be lightly sanded to etch the beak's surface for better bonding.

Color Matching

Small quantities of the colored pigmented powder are mixed with shaded white powder to develop the best color match to the beak being repaired. Mix only small amounts until the desired color is achieved. This color will be much lighter in color than the final product. Place two drops of Cyanodent Fast liquid on a waxed pad and, with a toothpick or filing instrument, carry small amounts of the mixed powder over to the liquid and mix quickly. This mixture should be the consistency of heavy syrup. The color change of the mixture is significantly darker than the powder mix. Cyano-Veneer retarder will slow down the "curing" process and allow more time to work with the repair.

Bonding the Defect

Mix small quantities of the Color Mix powder with Cyanodent Fast liquid and

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[1] **Temp-Plus, Ellman International, Hewlett, NY**

gradually build up the repair until bonding is complete. The amount of bonding material applied should be slightly elevated above the surface of the beak so that the sanding and finishing process will have a smooth surface.

A large lesion cannot be repaired without a support bridging. A piece of nylon mesh Cyano-Splint-Grid cut to approximately 8-10 mm larger than the opening of the defect is bonded to the beak on either end with Cyanodent Fast. The Cyano Veneer is then applied incorporating the mesh to repair the defect.

Finishing

Using a fine emery sanding disk, carefully smooth down the surface of the repair until it is level with the beak. Sand out all lines and ruts until totally smooth. The area should be wiped with a damp paper towel to remove all residue. If a gloss finish is desired, apply a drop of Cyano-Veneer Quick-Set and allow to Cyano-Repair Kit, Ellman International, Hewlett, NY. dry. Quick-Set is an accelerator and not a Cyano acrylate.
For beak replacement in large birds, the use of Cyano-Veneer as a prosthetic is expensive and difficult to work with because only small amounts can be mixed at a time. A temporary dental bridge acrylic Temp-Plus* is an iso-butyl methacrylate which will harden in approximately 5 to 10 minutes, will not shrink, is inexpensive and is carvable. Temp-Plus can be colored to any desired color by adding Cyanodent stain Kit-Shades. After mixing and while curing Temp-Plus will heat up to about 108-110 degrees Fahrenheit and will cool quickly as it hardens. During the curing process, this product will become "claylike" in consistency before it hardens and can be molded into any desirable shape.

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References

1. Lucas AM., Stettenheim PR. Avian Anatomy Integument Part I, Agriculture Handbook 362, US Govt., Printing Office Washington DC, 1972.

2. Thomas AL.,(ed) "A New Dictionary of Birds" Nelson, London, 1964.

3. Clipsham R. "Surgical beak Restoration and Correction" *Proceedings Annual Conference AAV*, 1989, pp 164-76.

4. Lucas AM, Stettenheim PR. Avian Anatomy Integument Part II, Agriculture Handbook 362, US Govt., Printing Office Washington DC, 1972 pp 58-88.