# Acrylic Beak Repair

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

The ramphotheca, the horny covering of the beak, is a keratinised thickening of the corneum of the epidermis (Lucas and Stettenheim, 1972a). The ramphotheca is usually very hard and rigid, but in some species such as ducks, it is leathery and flexible (Lucas and Stettenheim, 1972a). The ramphotheca of the *rostrum maxillare* is called the rhinotheca and of the *rostrum mandibulare,* the gnathotheca (Thomas, 1964).

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 outwards and towards the beak tip, normal beak function will chip off the outermost layers as it approaches the tip 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 craniodorsally 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 the implant due to contour changes. Clipsham (1989) 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 (Lucas and Stettenheim, 1972b). Each papilla has a capillary close to the basal surface of the epidermis.

If damaged, the ramphotheca will not regenerate keratin. In crushing type injuries, areas of dermal destruction can cause uneven patterns of keratin replacement and growth rate.

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 colour matching is uncomplicated and requires only a little artistic skill. The colours included in the Ellman CyanoRepair Kit† are shade 62 White, and clear powder shades. The Stain Kit-shades are yellow, grey, pink and blue. The colour shade necessary to develop the correct colour match should be mixed with the white shade powder using a flat toothpick or a dental plastic filling instrument.

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† **Available from: The Lyppard Group, branches in each State**

Small quantities of the colour shade should be mixed with 3-5 times the amount of the shade 62 Cyano-Veneer powder to attain a matching colour 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 of 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 lesion should be lightly sanded to etch the beak's surface for better bonding.

Ophthalmic ointment should be placed in the bird's eyes to prevent scleral irritation from the acrylic fumes.

**Colour Matching**

Small quantities of coloured pigmented powder are mixed with clear or shaded white powder to develop the best colour match to the beak being repaired. Combinations of coloured pigmented powder will give different colours as well as different shades. Mix only small amounts until the desired colour is achieved. This colour will be much lighter than the final cured product. Place one drop of Cyanodent-Fast liquid on a waxed pad. With a toothpick or filling 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 colour 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 if desired.

**Bonding the Defect**

Mix small quantities of the Colour Mix powder with Cyanodent Fast liquid and 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 defect cannot be repaired without a support bridging. A piece of the 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 dry. Quick-Set is an accelerator and not a Cyano acrylate. By adding Quick-Set to the completed repair the curing process will be accelerated and the repair will harden more rapidly. There is no thermal reaction with Cyano-Veneer.

For beak replacement in larger 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 5-10 minutes, will not shrink, is inexpensive, and is carvable. Temp-Plus can be coloured to any desired colour by adding Cyanodent stain Kit-Shades. After mixing and while curing, Temp-Plus will heat up to about 42-43°C and will cool quickly as it hardens. During the curing process, this product will become claylike in consistency before it hardens and can be moulded into any desirable shape.

When making a prosthesis a perfect fit between contact surfaces is necessary, this can be accomplished by careful preparation of the beak stump surface and compression of the clay like Temp-Plus over the beak stump, forming an impression on the contact surface of the prosthesis.

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The dynamics of beak pressure must be understood in order to attach and add support to the prosthesis. The greatest support structure must be placed at the point which is closest to the biting surface and the pivotal fulcrum.

Light curing acrylics have been used successfully for beak repair and prosthesis; however, colour matching is much more difficult and an expensive light curing apparatus is required.

For small defect repairs anaesthesia is not required.

There is nothing more gratifying to the veterinarian than the response of a client when a bird they have presented with a horrible disfiguring beak defect is returned to them within a half hour and they are unable to see where the defect had been.

**References**

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