## Title

Use of a rhinothecal orthosis to correct mandibular prognathism in a Galah (*Eolophus roseicapilla*)

## Introduction

Mandibular prognathism and lateral beak deformity ("scissor beak") are common beak malocclusions in young psittacine species. Any species of parrot can be affected, however in captivity cockatoo species seem especially prone to mandibular prognathism while macaw species are prone to lateral beak deformities.[1] A definitive etiology has not been proven. Incubation factors (such as inappropriate position within the egg or inappropriate incubation temperature), genetic influences, trauma, nutritional deficiencies, improper hand-feeding technique, and idiopathic congenital deformities have all been suggested as potential causes.[1] The breeder referenced in this case summary mentioned that, in their breeding collection, the incidence of mild congenital deformities (beak malocclusions, toe deformities) subjectively seemed to increase in offspring of parents near the end of their reproductive capacity.

## Treatment/Management/Prognosis

Without treatment, beak malocclusions can cause problems throughout the life of the bird. Depending on severity, these complications can range from an increased frequency of beak trims to difficulty prehending and crushing food. A sever malocclusion can also interfere with preening and foraging.

Young chicks grow rapidly. This provides a brief window of opportunity when the developing bones are responding rapidly to physiologic pressures. In accordance with Wolff's law, bones, including the bones of the upper and lower beak, are constantly adapting based on the loads under which they are placed. Because of this, correction of a malocclusion is theoretically achievable at any stage of life. However, interventions during the rapid growth

period are less invasive and more likely to be successful than interventions in an adult bird. For example, in some mild cases of lateral deviation, applying gentle manual opposing pressure for a short duration several times daily while a bird is growing can improve or resolve malocclusion.

While pinning and tension techniques have been described for correction of beak deformities, they have a high potential for failure and complications. This is due to the anchor points of the pins being unable to withstand the high forces put upon them by the beak during normal use. While still indicated at times in adult birds[2], in young birds these techniques have now been mostly discarded in favor of acrylic orthoses. (Note: in the literature these are sometimes erroneously referred to as “prostheses”. In this summary, the term orthoses will be used, as prostheses are defined as devices that replace a missing body part. Orthoses are devices that correct alignment or otherwise assist existing body parts.)

Acrylic orthoses can be placed on either the upper or lower beak. For correction of mandibular prognathism, an acrylic extension is placed over the keratin of the rhinotheca extending rostrally past the point of the rhinotheca to provide appropriate pressure to the gnathotheca during use and direct it caudal to the rhinotheca. For lateral deviations, use of an acrylic ramp has been described. This is built onto the gnathotheca as an extension with a central grove to direct the rhinotheca into a more anatomically correct position.[2] With either technique the keratin of the beak is first cleaned, then roughened with a rotary tool or hand file to help the acrylic bind to the keratin. (Once cured, acrylics have no adhesive properties. They bind by locking into place.) Use of a variety of acrylic composites has been described for these procedures. It is important to select an acrylic whose curing reaction is minimally to non-exothermic to prevent thermal injury to the beak during setting.

Overall, the prognosis for correction of beak deformities is good with timely intervention. Owners should be warned that the goal with treatment is to improve function, not guarantee perfection. Timely rechecks are essential as bone structure and occlusion in a growing bird can change in as little as a few days. Ability to eat should be monitored closely with any beak

intervention. Finally, spontaneous detachment of the orthosis may occur during treatment. This does not adversely affect the outcome if the patient is brought back in for assessment and replacement in a timely manner.

If multiple offspring are affected, counseling on appropriate husbandry and breeding measures (including hand-feeding techniques and pair selection) should be provided as well. (A discussion on the merits and ethics of hand-rearing is beyond the scope of this summary.)

**Case history and presentation**

A 3.5-week-old Galah (*Eolophus roseicapilla*) chick presented for evaluation of a beak malocclusion. The malocclusion was presumed to be congenital as opposed to acquired as it was apparent at hatch. The owner had extensive experience breeding parrots and hand-rearing/feeding was her standard protocol for cockatoo chicks. None of the other hand reared chicks were affected. A primary genetic cause was considered unlikely as two same-clutch siblings, and past and future clutches from the same breeding pair were not affected. All chicks were fed Kaytee Exact Hand Feeding Formula[a] for parrots. The current feeding frequency was once every 5 hours. This owner's preferred hand feeding style was syringe/gavage feeding with a shortened red rubber feeding tube. No issues with crop motility or episodes of aspiration were reported.

On presentation the chick was bright, alert, and responsive. Body and flight feathers were still encased in keratin ("pin feathers") which was normal for age. Weight was 212g with a body condition score (BCS) of 3/5 (with 3 being ideal). Heart rate was 280bpm. Respiratory rate and effort were subjectively within normal limits; however, an accurate count was unable to be obtained due to active vocalization by the patient. Wings, legs, and ambulation were within normal limits for its age (still standing on its hocks). There was no sign of angular limb deformities or other musculoskeletal abnormalities. It had a strong feeding response. (The feeding response in neonatal parrots is characterized by a strong rhythmic thrusting of the head

and beak that is stimulated by touching on either side of the beak. This mimics the motion used to feed from a regurgitating parrot and can be an indicator of overall vitality in a young patient. Its clinical significance is similar to assessment of the suckle response in a young mammal.) Eyes, ears, nares, and oral cavity were clean, clear and free of discharge. There was noted mandibular prognathism with the distal tip of the rhinotheca occluding inside the gnathotheca (Figure 1). The remainder of the physical exam was within normal limits for its age.

**Case management and outcome**

After discussion with the owner, application of a rhinothecal extension/temporary orthosis was determined to be the best treatment choice for this patient. While some practitioners have placed these successfully in conscious patients, due to this patient's small size, the novelty of the procedure (this was the first beak orthosis placed by the author) and novel acrylic, it was elected to place the patient under a brief anesthesia to reduce stress during creation/application of the rhinothecal extension.

Anesthesia was induced approximately 2 hours after the patient's last feeding to ensure that the crop was empty, however the patient was not fasted for an extended period of time due to its young age and concerns for hypoglycemia. The patient was induced with isoflurane[b] gas anesthesia and maintained on gas anesthesia administered via 2.5mm non-cuffed endotracheal tube for placement of the orthosis. Total anesthesia time was 15 minutes. Immediately upon full recovery the patient was hand fed a small meal to help prevent hypoglycemia and to confirm that the orthosis did not interfere with feeding. Recovery from anesthesia was uneventful.

Placement of the orthosis was as follows: a rotary tool[c] was used to roughen the keratin on the surface of the rhinotheca. FastFix[d] orthopedic putty was used to form an extension over the rhinotheca. A thin layer was placed over the surface of the rhinotheca, covering it in its entirety. Care was taken to "wrap" the putty over the edge of the tomia to help secure it into

place. The putty was then extended rostrally beyond the tip of the rhinotheca to prevent the gnathotheca from being able to protrude past the tip of the rhinotheca (Figure 2). FastFix[d] putty was selected due to its availability, light weight, and low curing temperature compared with other acrylics. While a cold cure or light cure acrylic would perhaps have been ideal, they were not available at time of presentation and acquisition time may have surpassed the window of opportunity for timely intervention in this patient.

The patient was discharged and scheduled for weekly rechecks. The owner was instructed to continue hand feeding as normal and monitor the orthosis for any signs of loosening or detachment.

The orthosis came off spontaneously the night before the scheduled 1 week recheck. On exam the mandibular prognathism was improved but not yet fully resolved and the rhinotheca had developed a mild left lateral deviation. The rhinothecal orthosis was replaced in a similar manner to the previous application. This orthosis was slightly wider with a ventral groove to help confine the gnathotheca and prevent it from sliding out laterally (Figure 3).

At day 13 the second orthosis was removed. The cranial-caudal occlusion was now normal with complete resolution of the mandibular prognathism (Figure 4). There was a very mild remaining left lateral deviation of the rhinotheca however overall occlusion was considered adequate (Figure 5). While gnathothecal orthoses have been described to correct “scissor beak” deviations of the rhinotheca, due to the mild nature of this malocclusion the owner elected to apply minimally invasive manual corrective methods at home. The owner was instructed to hand feed from the left-hand side and apply gentle pressure counter to the malocclusion to encourage appropriate alignment of the beak for the duration of hand feeding. The chick did well post procedure and weaned normally before being sold to a new owner.

## References


1. Schnellbacher RW, Steves AG, Mitchell MA, et al. Use of a dental composite to correct beak deviation in psittacine species. J Exot Pet Med 2010;19.4:290-297
2. Speer B, Powers LV. Anatomy and disorders of the beak and oral cavity of birds. Vet Clin N Am - Exot Anim Pract 2016;19.3:707-736

**Lab data/imaging**

**Figure 1:** Mandibular prognathism at presentation

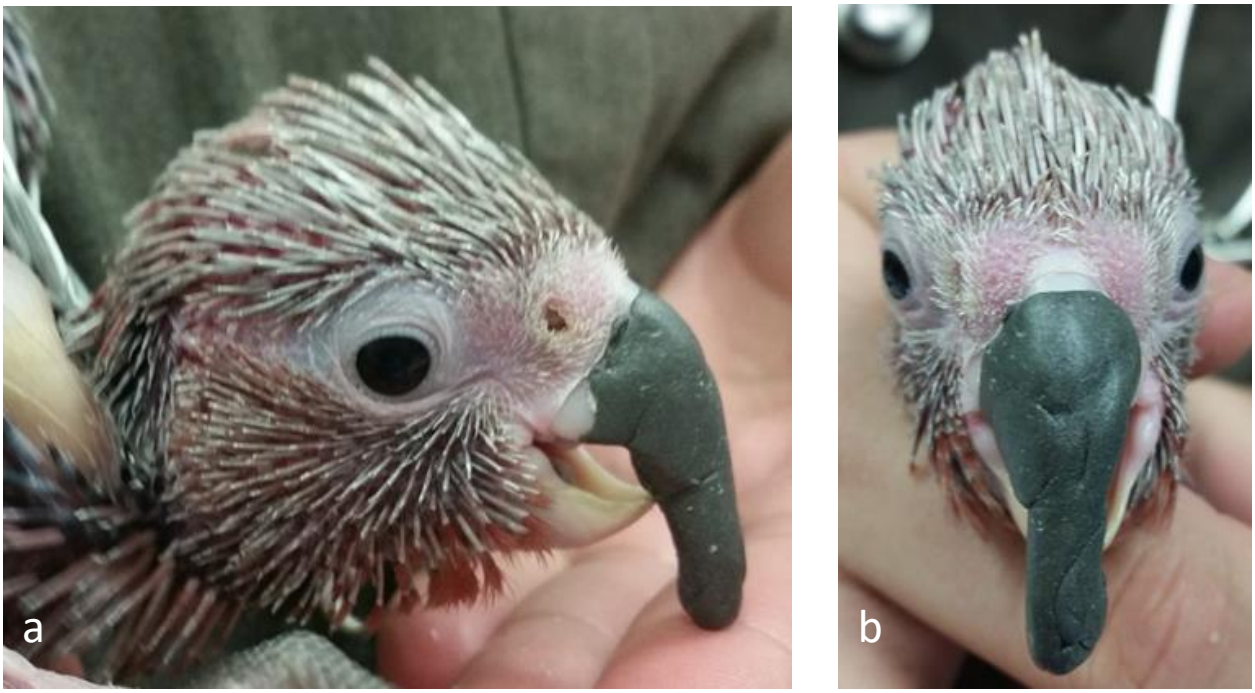


**Figure 2:** Rhinothecal orthosis from side (a) and front (b)

**Figure 3:** Replacement orthosis placed on day 7

**Figure 4:** Normal rostral-caudal occlusion and removal of orthosis at day 13


**Figure 5:** Mild acquired left lateral deviation of the rhinotheca (exaggerated somewhat by the obliquity of the photo).

**Endnotes**

[a]Kaytee Exact Hand Feeding Formula, Central Garden & Pet Company, Boise, ID

[b]Isoflurane, Isospire, Dechra Veterinary Products, Overland Park, KS

[c]Dremel 3000-1/25H Variable-Speed Tool with Dremel 952 Aluminum Oxide Grinding Stone, Racine, WI

[d]FastFix, Securos Surgical, MWI, Boise, ID