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Retained Caseous Yolk Sac in a Burmese Python (*Python molurus bivittatus*)

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ABSTRACT: Retained yolk sacs are common in the domestic chicken and account for considerable morbidity and mortality during late embryonic development and within the first 10 days of life. What is believed to be the first recorded instance of a retained caseous yolk sac and its successful surgical removal from a Burmese python (*Python molurus bivittatus*) is reported. The snake experienced no post-operative complications and continues to be well 16 mo following surgery.

Key words: Burmese python, caseous yolk sac, case report, *Python molurus*, reptile, retention, surgery.

In oviparous reptiles, during late embryonic development the anterior and posterior intestinal portals approach each other to form an enclosed gut loop, which together with the yolk sac is withdrawn into the body cavity near the time of hatching (Ferguson, 1985). Similarly, unabsorbed yolk is withdrawn into the body cavity of the domestic chicken before hatching, and is absorbed into the vascular system of the sac and possibly directly into the intestine via the yolk duct by 5 to 6 days after hatching (Bierer, 1950). Yolk contamination by bacteria in the chicken can cause embryonic mortality late in incubation or "mushy chick" disease (Harry, 1957; Reid et al., 1961). The most common route of infection is by shell penetration after fecal contamination; however, ovarian infection or salpingitis also has been postulated (Gross, 1984). Some chicks die at or shortly after hatching, or there may be no mortality, only a retained infected yolk and reduced weight gain. The only visible lesion is a small caseous retained yolk sac at the yolk stalk or umbilicus, or free in the body cavity (Gross, 1964). Bacterial contaminants implicated in the above are *Proteus* sp., *Bacillus* sp., *Enterococcus* sp., and particularly *Escherichia coli* (Gross, 1964, 1984). The yolk is transformed from a normal greenish-yellow translucent viscid material to a yellow-brown turbid fluid or to a granular or solid refractive yellow caseous mass (Harry, 1957; Gross, 1984). Any inflammatory reaction is mild, and consists of vacuolated macrophages and giant cells forming a thin margin next to the yolk material, surrounded in turn by fibroblasts and degenerate and normal heterophils and macrophages (Gross, 1964, 1984).

A 9-day-old, 75 g, 53 cm captive bred Burmese python (*Python molurus bivittatus*) of unknown sex was examined on 23 June 1989 at a pet store (Reptiles Unlimited, Willow Grove, Pennsylvania 19090, USA) by one of us (MSB) for a coelomic distension centered around the umbilicus. This animal was representative of several individuals from a single clutch with similar distensions. The breeder of these snakes routinely destroys affected animals because of "egg yolk impactions," a condition which is claimed to be not conducive for life. Palpation of the snake indicated the presence of an oblong, firm, somewhat mobile internal mass that tapered at both ends. It could not be ascertained by digital examination if the mass was within the lumen of the gastrointestinal tract. A radiograph of the caudal portion of the snake taken at the Veterinary Hospital of the University of Pennsylvania (3850 Spruce Street, Philadelphia, Pennsylvania 19140, USA) on 26 June 1989 demonstrated an 11 cm oblong soft tissue mass in the region of the umbilicus (Fig. 1). The kidneys were not seen. The mass extended bilaterally to the body wall, and gas-filled structures, probably represent-

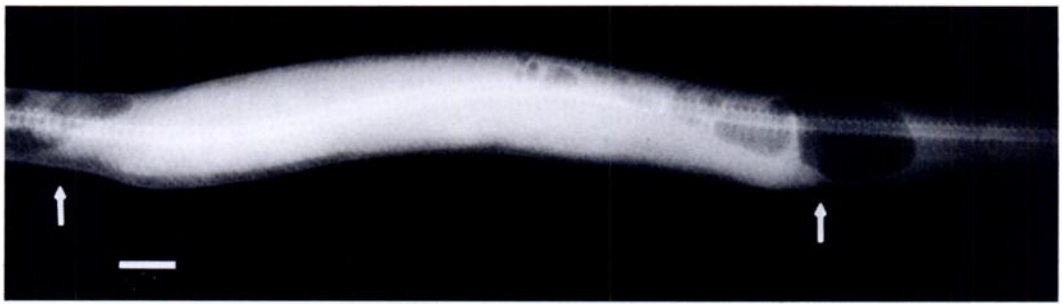

FIGURE 1. Dorsoventral radiograph of the caudal body of a Burmese python demonstrating an ovoid soft tissue mass cranial to the cloaca in the region of the umbilicus. Arrows delineate the cranial and caudal margin of the mass. Bar = 1 cm.

ing large intestinal loops, were seen caudal to the mass. The origin of the mass could not be determined.

Following intramuscular administration of 88 mg/kg ketamine hydrochloride (Fort Dodge Laboratories, Inc., Fort Dodge, Iowa 50501, USA) a paramedian incision at the junction of the lateral scales and ventral scutes was made at the cranial aspect of the mass. Blunt dissection through the pleuroperitoneum allowed visualization of the tip of the mass through the surgical site. By squeezing the body wall of the snake at the caudal aspect of the mass, it was expressed in its entirety. Grossly, the tapered mass was yellow-brown, 10.5 cm in length, up to 3.5 cm in diameter, and was "imprinted" in its surface with the contours of both the kidneys, ureters and the alimentary tract. The mass was flexible yet firm to the touch. Some creamy-white deposits were noted on its surface. A section was preserved in 10% buffered formalin, and the remainder frozen. Following the removal of the mass, the snake's coelomic cavity was closed with simple interrupted sutures of 4-0 polyglactin 910 (Ethicon, Inc., Somerset, New Jersey 08873, USA) and the skin closed with 3-0 monofilament nylon (Ethicon, Inc., Somerset, New Jersey 08873, USA) in a simple horizontal mattress pattern, with slight eversion of the skin edges. No prophylactic antibiotics were administered. Recovery from anesthesia was uneventful and complete in 2 days. Feeding commenced following the shedding of the skin. Skin sutures were removed at 8 wk and the snake continues to be well 16 mo following surgery.

Histologic examination of the mass showed it to be composed of globular eosinophilic material compatible with yolk (Fig. 2). Along the perimeter there was a

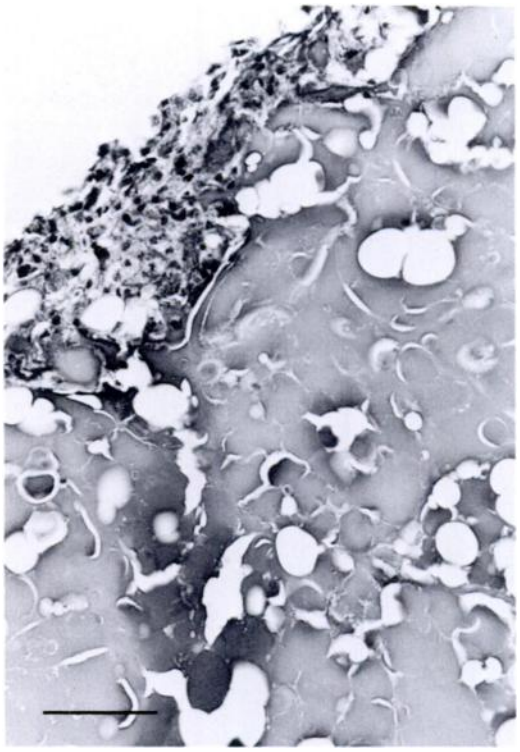

FIGURE 2. High power photomicrograph of yolk material surgically removed from a Burmese python with a rim of macrophages. H&E. Bar = 200 μm.

thin rim of macrophages with rare heterophils. A few bacterial rods were seen scattered throughout the yolk.

Although egg yolk retention is common in the chicken, a computer assisted review of the literature failed to produce any references on its occurrence in reptiles. Of 20,746 chicks followed during their first 10 days of life, 31% of deaths were due to unabsorbed yolk sacs (Watts and Rac, 1958). Of a clutch of nine Burmese pythons that died in late embryonic development examined by one of us (MSB), seven were noted to have retained caseous yolk sacs and the remaining two had what appeared to be yellow-brown liquid yolk in the coelomic cavity. Low temperatures are known to increase the incidence of this infection in the chicken (Gross, 1984). Snake eggs are routinely incubated at low or ambient temperatures in materials such as moist vermiculite. Reptile eggs are rarely, if ever, washed or fumigated before being artificially incubated; this increases the risk of bacterial contamination by shell penetration if the eggs are maintained in an unsanitary environment. Compounding the problem, incubation periods for reptile eggs may be very long (>60 days), and contaminated eggs may remain undetected within an incubation container. Retained yolk sacs, infected or uninfected, may be a cause of considerable morbidity and mortality in young reptiles that are propagated under artificial conditions. We believe this is the first report of egg yolk retention in snakes and that it may be a common but overlooked condition of captive and wild oviparous reptiles.

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