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Case study **OPEN ACCESS**

Ultrasound-guided egg aspiration in Komodo dragons (*Varanus komodoensis*) with chronic egg retention

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Abstract

Background Komodo dragon (*Varanus komodoensis*), the world's largest lizard, is endemic to the Indonesian Lesser Sunda Islands. In captivity, egg retention (dystocia) can occur because of suboptimal environmental conditions, poor nutrition, stress, or reproductive abnormalities.

Objective This case study aimed to describe the successful application of ultrasound-guided aspiration for the treatment of chronic egg retention in captive Komodo dragon.

Case A 17-year-old female Komodo dragon was diagnosed as having chronic egg retention. A retained egg was identified in the reproductive tract for seven months without clinical signs or reproductive behavior. Ultrasound imaging revealed an egg measuring 12 cm × 5 cm, positioned longitudinally.

Treatment Ultrasound-guided aspiration was performed to facilitate the expulsion. The dragon was anesthetized with intravenous medetomidine (0.05 mg/kg) and ketamine (5 mg/kg), and anesthesia was maintained using 3 L/min oxygen. The animal remained in left lateral recumbency throughout the procedure. Ultrasound-guided aspiration was performed using MyLab™ Sigma - Esaote with an SP2730 Phased Array Probe and an 18-gauge, 10 cm sterile needle. The aspiration procedure reduced the egg size to 10 cm × 3 cm, and within 10 h, Komodo successfully expelled it. Seven months after treatment, normal reproductive cycling resumed, as indicated by follicular development.

Conclusion This case highlights the efficacy of ultrasound-guided aspiration in managing egg retention in Komodo dragons and ensuring reproductive recovery.

Keywords egg retention | Komodo dragon | reproductive recovery | ultrasound-guided aspiration | *Varanus komodoensis*

Introduction

The Komodo dragon (*Varanus komodoensis*), the largest extant lizard species, is classified as vulnerable and endemic to five islands in Indonesia. Between 2003 and 2012, a total of 925 Komodo dragons were identified and monitored on the islands of Rinca, Gili Motang, and Nusa Kode (Purwandana *et al.*, 2014). Captive conservation programs play a crucial role in supporting the long-term survival of this species. However, reproductive challenges, particularly egg retention (dystocia), remain a major concern for managed populations.

In reptiles, egg retention or dystocia can arise from a variety of causes, including suboptimal environmental conditions, improper husbandry practices, nutritional imbalances, and anatomical abnormalities of the reproductive tract (Mitchell & Tully, 2009; Stahl & Donoghue, 2010). A previous study reported that the incidence rates of dystocia in reptiles range from 5% to 15%, depending on the species and hus-

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bandry parameters (Divers & Mader, 2005). If left untreated, dystocia may result in significant morbidity, estimated at 10–20%, and can lead to severe health complications or mortality (Hernandez-Divers & Stahl, 2009). Despite its potential severity, data on the prevalence and consequences of dystocia in Komodo dragons remain scarce, and reproductive disorders in this species are poorly documented.

Conventional treatment strategies, including hormonal induction and surgical intervention, carry inherent risks such as infection, trauma to reproductive tissues, and prolonged recovery. Recently, minimally invasive techniques such as ultrasound-guided egg aspiration have emerged as viable alternatives. Successful application of egg aspiration has been reported in various reptile species, including Burmese pythons (*Python bivittatus*) (Anderson *et al*., 2022), green iguanas (*Iguana iguana*) (Hernandez-Divers & Stahl, 2009), and leopard geckos (*Eublepharis macularius*) (Vetere *et al*., 2023). Although potential complications, such as coelomic contamination, hemorrhage, or incomplete egg evacuation, have been described (Urbanová & Halán, 2016), they can be minimized through meticulous techniques and appropriate case selection.

Given the paucity of published data on reproductive disorders in Komodo dragons, this case report offers novel insights into the clinical management of dystocia. This study aimed to document the successful use of ultrasound-guided aspiration to manage chronic egg retention in a captive Komodo dragon and to discuss the clinical outcomes, associated risks, and potential implications for future reproductive management in conservation settings.

Case

This procedure was conducted in Taman Safari Indonesia, a zoological facility in Bogor, West Java, Indonesia, which is dedicated to the conservation and research of endangered wildlife species. The intervention took place at the facility's on-site veterinary hospital in November 2023, with follow-up monitoring conducted over a seven-month period.

The subject was a 17-year-old adult female Komodo dragon (*Varanus komodoensis*) weighing approximately 45 kg with a known history of reproductive activity (**Figure 1A**). Chronic egg retention was suspected based on findings from routine transabdominal ultrasound screenings conducted as part of reproductive monitoring of female Komodo dragons housed at the facility.

Treatment

Anesthesia and animal preparation

General anesthesia was induced prior to the intervention to ensure procedural safety and minimize stress (**Figure 1**). Anesthesia was achieved via the intravenous administration of medetomidine (Medetin®, 1 mg/mL, Virbac, France) at a dosage of 0.05 mg/kg and ketamine (Ketamil®, 100 mg/mL, Troy Laboratories, Australia) at 5 mg/kg. Anesthesia was maintained using medical-grade oxygen, delivered at a flow rate of 3 L/min through a face mask connected to a portable oxygen tank (Oxymed, Indonesia). The animal was placed in left lateral recumbency to provide optimal acoustic access to the coelomic cavity and reproductive tract during ultrasonographic assessment (**Figure 1B**).

Ultrasound examination and egg aspiration procedure

Ultrasound imaging was performed using a MyLab™ Sigma unit (Esaote, Italy) equipped with an SP2730 phased-array transducer. Sonographic evaluation confirmed the presence of a retained egg, including its position and dimensions, within the reproductive tract. The egg increased in size when measured on the day of the aspiration procedure compared to four months before the aspiration (**Figure 2**).

Under continuous real-time ultrasound guidance, a sterile 18-gauge, 10 cm single-use aspiration needle (Supra®, Germany) connected via a three-way stopcock (Discofix®, B. Braun, Germany) was carefully introduced into the egg structure (**Figure 1C**). The contents were slowly aspirated (**Figure1D**) to reduce intra-egg pressure and volume, facilitating subsequent natural expulsion, while minimizing the risk of

Figure 1 Adult female *Varanus komodoensis* and orientation of ultrasound-guided egg aspiration. (A) Adult female Komodo dragon; (B) Positioning in left lateral recumbency to allow ultrasound access; (C) Orientation of retained egg using ultrasound; (D) Ultrasound-guided egg aspiration procedure.

Figure 2 Ultrasonographic images showing increase in egg size: (A) Four months before the aspiration procedure; (B) On the day of the aspiration procedure.

coelomic contamination or tissue trauma.

Post-procedural monitoring

Following aspiration, the Komodo dragon was intensively monitored for signs of distress, adverse reactions, and complications. Clinical parameters assessed included respiratory rate, anesthetic recovery quality, appetite, behavior, and any signs of reproductive activity or discharge. Post-procedure follow-up continued over a seven-month observation period to evaluate reproductive tract recovery, overall health status, and the potential recurrence of dystocia or other reproductive abnormalities.

Results

The ultrasound-guided aspiration procedure was successfully completed without intraoperative or postoperative complications. Within 10 h of intervention, the retained eggs were spontaneously expelled. Upon measurement, the expelled egg was approximately 10 cm in length and 3 cm in width (**Figure 3**). The female Komodo dragon recovered uneventfully from anesthesia, with no signs of respiratory distress, prolonged sedation, or behavioral abnormalities.

Post-expulsion ultrasonographic evaluation confirmed the absence of additional retained eggs. The reproductive tract appeared to be normal in structure and echogenicity. Over the seven-month follow-up period, the animals demonstrated no adverse health effects. Normal feeding behavior resumed within 24 h, and signs of reproductive cycling, such as follicular development, were observed during routine monitoring. No recurrence of egg retention was observed during the observation period.

Discussion

The findings of this case study are consistent with those of previous reports, supporting the effectiveness of ultrasound-guided aspiration for the management of egg retention in reptiles. This technique has been successfully applied to various reptile species including Burmese pythons (*Python bivittatus*), green iguanas (*Iguana iguana*), and leopard geckos (*Eublepharis macularius*) (Anderson *et al.*, 2022; Hernandez-Divers & Stahl, 2009; Vetere *et al.*, 2023). Compared to surgical intervention, ultrasound-guided aspiration presents a lower risk of complications, such as infection, prolonged recovery time, and reproductive tract damage.

This case highlights the importance of early diagnosis and targeted intervention in the management of reproductive disorders in *Varanus komodoensis*. Ultrasonography plays a pivotal role in enabling the accurate localization and real-time assessment of retained eggs (Govendan *et al.*, 2019), pivotal role in enabling the accurate localization and real-time assessment of retained eggs (Govendan *et al.*, 2019), thereby facilitating a minimally invasive aspiration procedure.

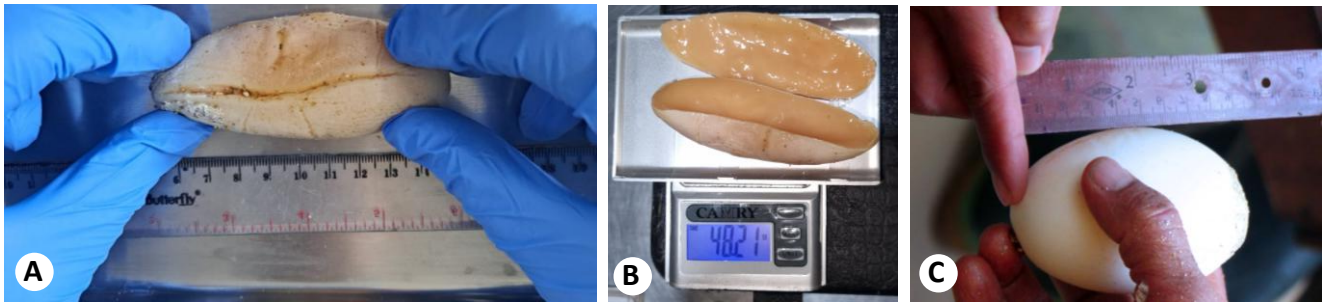

Figure 3 Post-aspiration and expulsion egg measurement: (A) Dimensions of the expelled egg following aspiration (10 cm × 3 cm); (B) Post-expulsion egg weight (48.21 g); (C) Reference measurement of a normal, fertile egg from the same individual during a previous breeding season (9.4 cm × 6.1 cm).

It is likely that the relief of intraoviductal pressure and reduction of localized inflammation contributed to the successful expulsion of the egg within 10 h post-intervention. The absence of post-procedural complications and the resumption of normal reproductive indicators, such as follicular development and behavioral signs of cycling, suggests that fertility was preserved following the procedure.

The main advantage of this procedure includes its minimally invasive nature, reduced recovery time, and avoidance of surgical risk such as haemorrhage, infection and long-term tissue damage. Compared to surgical salpingotomy or hormonal induction, both of which have been documented with variable success and higher risk profiles in reptiles (Stahl & Donoghue, 2010; Mitchell & Tully, 2009), ultrasound-guided aspiration offers a viable and practical alternative, particularly when performed by experienced personnel under controlled conditions.

Nevertheless, this study has limitations, most notably its reliance on a single case. Although the outcome was favorable, broader studies involving multiple individuals across different zoological institutions are necessary to validate the reproducibility and safety of this method. Additionally, ultrasound-guided aspiration may not be suitable for all cases of dystocia, particularly those involving multiple adherents or heavily calcified eggs, where surgical intervention may be necessary.

No major procedural difficulties were encountered during this case, although careful restraint and precision in needle placement (**Figure 1C, 1D**) were critical to avoid oviductal injury. successful outcomes are highly dependent on appropriate patient restraint, precise ultrasound interpretation, and careful needle placement to avoid iatrogenic injury to the oviduct or surrounding coelomic structures (Urbanová & Halán, 2016). Future studies should evaluate this method across a broader sample of Komodo dragons in different institutional settings to validate its efficacy and define case selection criteria.

Despite its limitations, this study contributes to a growing body of evidence supporting minimally invasive approaches for the reproductive management of reptiles. Furthermore, it highlights the critical importance of routine reproductive health monitoring in captive *Varanus komodoensis* populations, allowing the early identification of reproductive pathologies before they progress to life-threatening stages (Divers & Mader, 2005; Bertocchi *et al.*, 2018).

These findings indicated that ultrasound-guided aspiration is a feasible and minimally invasive technique for managing chronic egg retention in *Varanus komodoensis*. This case supports the use of aspiration as a viable alternative to surgical intervention, particularly in zoological settings, where preserving reproductive function and minimizing procedural risks are priorities.

Conclusion

Ultrasound-guided aspiration is a safe and effective method for managing chronic egg retention in Komodo dragons (*Varanus komodoensis*). As a minimally invasive alternative to traditional surgical interventions, this technique reduces procedural risks while supporting the long-term reproductive health and welfare of the affected individuals. This case highlights the clinical value of ultrasound-guided approaches in the reproductive management of captive reptiles. Further studies involving a wider range of reptilian species and institutional settings are warranted to establish standardized protocols and assess the broader applicability of this method in conservation and zoological medicine.

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Specimen collection This study was conducted in accordance with the ethical statement of Taman Safari Indonesia's animal welfare statement. All the procedures adhered to Indonesian wildlife conservation laws (UU No. 5, 1990; PP No. 7, 1999). Collection and handling of *Varanus komodoensis* complied with CITES Appendix I regulations to ensure minimal stress and humane treatment of the subject.

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Conflict of interest The authors declare no conflicts of interest. This study was conducted with full scientific integrity and no competing financial or personal relationships influenced the findings or conclusions.

Author contribution BHM: Conceptualization, investigation, analysis, writing-original draft, writing-review & editing; AW: Investigation; TBH: Conceptualization, supervision.

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