



## NOTE

Wildlife Science

# Single-incision, prefemoral bilateral oophorosalingectomy without coelioscopy in an Indian star tortoise (*Geochelone elegans*) with follicular stasis

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**ABSTRACT.** A female Indian star tortoise (*Geochelone elegans*) was evaluated for anorexia and suspected coelomic masses. Clinical examination indicated follicular stasis. The tortoise was anesthetized and placed in dorsal left lateral recumbency for a right prefemoral approach. The ovaries and oviducts were exposed through the right prefemoral incision. The ovarian vasculature, the mesovarium, the oviduct, mesosalpinx and associated vasculature were ligated and transected. Bilateral oophorosalingectomy was performed through the incision, without coelioscopy. Since then, the same procedure has been performed in five other tortoises, and all recovered well. These results suggest that bilateral oophorosalingectomy, performed through a prefemoral incision, without coelioscopy, is a safe and practical approach for treating follicular stasis in tortoises.

**KEY WORDS:** follicular stasis, *Geochelone elegans*, oophorosalingectomy, prefemoral approach, tortoise

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Follicular stasis, along with other reproductive disorders, is a common disease in female chelonians in captivity [1, 3, 6, 8, 9, 12, 15]. As drug treatments have not yet been established for follicular stasis in chelonians, treatment is predominantly surgical [12]. Coelomic surgeries on chelonians have traditionally been achieved through central plastron osteotomy [4, 11], but this technique is associated with prolonged healing times [10]. As an alternative to central plastron osteotomy, coeliotomy via the prefemoral region has been recommended [2, 14]. In this approach, the coelioscope is used for assistance. The main procedures carried out using this approach are oophorosalingectomy and oophorectomy, and the method has been reported to be safe [5, 7, 10]. Oophorosalingectomy with bilateral incision of the prefemoral regions, without using a coelioscope, has also been reported in turtles [13]. This highly versatile method can be used by many clinicians who do not have ready access to coelioscopic equipment.

In the present report, we describe bilateral oophorosalingectomy performed in an Indian star tortoise (*Geochelone elegans*) from the right prefemoral region only, without coelioscopy, to reduce invasiveness by having a single surgical field.

A two-year-old female Indian star tortoise, weighing 766 g, was referred to our veterinary hospital for evaluation of anorexia and suspected masses in the coelom, by means of sequential ultrasonography. During the initial physical examination, visual observation revealed intermittent open-mouth breathing. Analysis of blood drawn from the left jugular vein showed that plasma biochemistry and hematology findings were unremarkable. Coelomic ultrasonography from the prefemoral region revealed a number of follicles. Computed tomography revealed lung compression due to these follicles. Based on these results, follicular stasis was diagnosed.

Two days after the initial evaluation, bilateral oophorosalingectomy was performed. Anesthesia was induced with alphaxalone (20 mg/kg, intramuscular) (Alfaxan<sup>®</sup>, 10 mg/ml; Meiji Seika, Jurox Pty., Ltd., Rutherford, Australia). A 2.0-mm uncuffed endotracheal tube was intubated and maintained with 1.5–2.5% isoflurane in oxygen (2 l/min). Positive-pressure ventilation (respiratory rate, 4 breaths/min; peak inspiratory pressure, 10 mmHg) was provided through an electric pressure-cycle ventilator (Compos X veterinary ventilator; Metran Co., Ltd., Kawaguchi, Japan). The right jugular vein was then secured with a 24-G indwelling needle, and continuous intravenous infusion of acetated Ringer's solution (Solacet F; Terumo Co., Tokyo, Japan) was started at 5 ml/hr. The tortoise was placed in a dorsal left lateral recumbent position. To expose the prefemoral region maximally, both hind legs were extended caudally. The right hind leg, right prefemoral region, and surrounding plastron, bridge and carapace were aseptically prepared for surgery and surgically draped.

A vertical, craniocaudal skin incision was made in the right prefemoral region, and the subcutaneous fat was excised to expose the

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**Fig. 1.** Photograph of the bilateral ovarian follicles and oviduct, which were exposed through prefemoral incision, without coelioscopy.

**Table 1.** Species, age, weight, induction time, surgery time, recovery time and diagnosis of tortoises that underwent bilateral oophorosalphin-gectomy through a prefemoral incision without coelioscopy

Species	Age (years)	Weight (g)	Induction time (min)	Surgery time (min)	Recovery time (min)	Diagnosis
Red-footed tortoise ( <i>Chelonoidis carbonaria</i> )	20	6,400	35	85	75	Follicular stasis, Retained eggs
Indian star tortoise ( <i>Geochelone elegans</i> )	16	1,370	21	53	25	Follicular stasis
Indian star tortoise ( <i>Geochelone elegans</i> )	2	775	25	65	30	Follicular stasis, Bladder stone
Russian tortoise ( <i>Agrionemys horsfieldii</i> )	6	1,100	20	45	15	Follicular stasis
Russian tortoise ( <i>Agrionemys horsfieldii</i> )	3	1,500	15	50	14	Follicular stasis

The dose of alfaxalone and the isoflurane concentration used in these tortoises were almost the same as in the presented case.

abdominal muscles. The oblique and transverse abdominal muscles were incised. The coelomic viscera were visualized by cutting through the coelomic membrane. The right ovarian follicles were identified, with careful handling of the ovarian interfollicular connective tissue, and carefully exposed with the aid of a spatula after the ovarian and mesovarian vasculatures was treated with 4/0 polydioxanone (PDSaSuture; Ethicon, Johnson & Johnson Co., Ltd., Tokyo, Japan). The right oviduct was exposed after the mesosalpinx and associated vasculature were treated with 4/0 polydioxanone, and bipolar radiosurgery. To improve the visibility of the left coelom, the urine in the bladder was removed, to deflate the bladder, by puncturing using a butterfly needle (22 gauge, 19 mm). By manually gripping the proximal part of the oviduct on the right side and tugging gently, the left oviduct branching from the cloaca was visualized. The proximal region of the oviduct on the left side was towed using an ovariohysterectomy hook, and blood vessels of the mesovarium and mesosalpinx and associated vasculature were treated. Thereafter, the left ovarian follicles and oviduct were exposed outside the body cavity (Fig. 1). The oviducts were ligated and transected.

The coelomic membrane was closed with a simple continuous pattern with 4/0 polydioxanone. The oblique and transverse abdominal muscles were then closed in turn, with 4/0 polydioxanone, using mattress sutures. The skin was sutured using a simple interrupted pattern with 4/0 polyamide suture.

Surgery time was 41 min. Positive-pressure ventilation was provided until spontaneous respiration resumed. Post-operative computed tomography showed improvement of the compressed lung. The tortoise was treated with ceftazidime (20 mg/kg, intramuscularly) every 72 hr for 18 days. No postoperative complications were identified. Appetite returned to normal within 3 days after surgery. Skin sutures were removed 3 weeks after surgery. The tortoise was healthy at the time of final follow-up,

12 months after surgery.

In addition to this case, this procedure has been performed on another five adult female tortoises. The species, age, weight, induction time, surgery time, recovery time and diagnosis for each tortoise are shown in Table 1. In two cases, surgery time was prolonged, as retained eggs and bladder stones were also treated, respectively. All five tortoises were healthy at the time of final follow-up, 12 months after surgery.

This experience with all six of these tortoises indicates that a single-incision, prefemoral bilateral oophorosalingectomy, without coelioscopy, can be applied safely in tortoises of three species, weighing between 755 and 6,400 g. Since this method involved a similar surgery time as required for endoscopic surgery, as reported previously [10], this is a practical and highly versatile method for treating follicular stasis. Actually, retained eggs and bladder stone could be transected by the single prefemoral approach. In this approach, it is considered difficult to visualize the contralateral ovary [10], but with this method, it was possible to see it after emptying the bladder.

Establishing this method may enable oophorosalingectomy on tortoises with the use of general surgical instruments, without requiring power-driven tools for cutting through the carapace, coelioscopic equipment or other expensive special instruments.

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