A CLINICIAN'S APPROACH TO DYSTOCIAS OF MEDITERRANEAN TORTOISES (*Testudo* spp)

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Abstract: Reproductive problems in tortoises are not uncommon. This paper describes the reproductive physiology, clinical presentation and diagnosis of dystocia in the *Testudo* species. Medical stabilization and conservative treatment is advocated in favor of surgery, but where necessary the anesthetic and transplastron surgical approach is described.

Key words: Chelonia, tortoise, *Testudo,* dystocia, egg-binding, oxytocin, anesthesia, transplastron, salpingotomy, ovariosalpingectomy

INTRODUCTION

Our understanding of reptile reproductive physiology still remains in its infancy, but several modern texts are now available to the clinician[1,2,3]. Reptiles tend to become sexually mature as a consequence of size and less importantly age, and therefore in captivity many reptiles become reproductively active at a earlier age than their wild counterparts. The temperate/subtropical *Testudo* species are stimulated to reproduce by hibernation (or at least a period of cooler dormancy), but increasing photoperiod and social grouping may well exert influences. In a suitable environment the female will enter a cycle of vitellogenesis and folliculogenesis under the hormonal control of estrogen[1]. The ovaries become active and follicles develop into yolk-like ova. In the wild, environmental, behavioral and social cues coupled with hormonal influences result in successful ovulation with the ova passing into the oviducts or shell glands for fertilization, shelling and further embryonic development. In the case of *Testudo* tortoises, courtship by the male includes butting the female's carapace and biting her limbs which may act to induce hormonal changes. In captivity, many females are kept singly, with an incompatible male or within an inappropriate social group and, for reasons largely unknown or poorly understood, the normal process of egg deposition fails to take place.

CASE INVESTIGATION

History And Clinical Signs

The very first step is to confirm that you are dealing with a female! Male tortoises have longer tails and the cloacal opening extends past the caudal carapace. Female tortoises have shorter tails. The characteristic dome of the male plastron is not as well conserved in the *Testudo* tortoises as it is in many of the desert species.

The environmental cues responsible for reproduction often leads to affected tortoises being presented from late spring through to late autumn. The history can be variable but usually includes a period of hypophagia or anorexia. The owner may not have seen any signs of courtship or copulation, indeed the female may not have been in contact with a male for many years, if at all. The female may have been previously hyperactive (nest site searching) or lethargic (debilitation). One or more shelled eggs may have been passed but deposited in an inappropriate site.

Tortoises that have been anorexic for several weeks may experience some weight loss, but beware of an apparent normal or increased weight due to the presence of eggs. Coelomic palpation is hindered by the shell, however, palpating the inguinal or femoral fossae while rocking the vertically held tortoise may reveal the presence of eggs. Sunken eyes, decreased skin elasticity and lethargy are often present and should alert the clinician to the possibility of dehydration.

Medical Stabilization

The first objective must be to stabilize a severely compromised patient. A heparinized blood sample, most easily collected from the dorsal (coccygeal) tail vein or right jugular is clinically very valuable and should be taken prior to any treatment. A minimum clinicopathological data base includes packed cell volume, semi-quantitative assessment of the buffy coat and blood smear (although a complete blood count (CBC) is preferred), total protein, albumin, globulin, calcium, phosphorus and uric acid. These tests should be well within the realms of any in-house practice laboratory and may reveal a life-threatening problem that needs medical attention long before surgery can even be contemplated. In many cases these reptiles are in a state of severe dehydration but fortunately uric acid levels are often low to moderately elevated as a result of the anorexia and reduced protein intake. Fluid therapy using 0.18% saline 4% glucose is recommended. Fluids (warmed to 28-30°C) are easily administered by intracoelomic injection but in severely compromised individuals fluids are best delivered via the intravenous (right jugular vein) or intraosseous (shell or distal tibia) routes. Rehydration is achieved at 20-30 ml/kg/d. The tortoise must be hospitalized and maintained at the species-specific preferred optimum temperature zone (POTZ), typically 25-30°C. Antibiotics, allopurinol and other medications may be employed as clinically indicated but fluid therapy and a suitable environment remain most important.

A good quality dorsoventral radiograph is always indicated. The eggs (usually 4-12 in number) occupy a central to caudal position within the coelomic cavity. They are normally circular in shape and possess a thin, calcified shell. The author has not experienced pre-ovulatory follicular stasis in Chelonia.

The shelled eggs are located within the shell glands but normal laying at term fails to occur because of a variety of reasons including - lack of a suitable nesting site (temperature, humidity, nest material, seclusion), excessive disturbance by the owner, competition for nesting sites (overcrowding), stress of transportation, metabolic disturbances (particularly involving calcium), systemic or localized infections of the shell glands, oviducts or cloaca and obstructions due to abnormal eggs or cloacal prolapse. Old eggs tend to have a thicker shell while broken eggs will be obvious by the sharp fragments of shell, but beware of gravel or grit within the gastrointestinal tract. Abnormal eggs may be over (or under) sized, or two or more eggs may be fused together.

If there is no indication of infection, obstruction, abnormal or broken eggs as determined by radiography, digital palpation and direct visualization of the cloaca, and a limited hematological and biochemical assessment, then conservative treatment should be attempted. Provision of a suitable environment (often an escape proof garden or large vivarium) and nesting site (loose sandy soil in

a warm, sunny position) may well be all that is required to persuade the tortoise to produce eggs naturally. If shell gland inertia is suspected then treatment using oxytocin is indicated. Oxytocin can be administered at a dose of 1-5 IU/kg i.m. repeated after 60-120 min. In the author's experience, a single intramuscular injection of oxytocin at 1-2 IU/kg is usually sufficient to induce laying in the vast majority of cases. If refractory, an intraosseous infusion of oxytocin at 1-5 IU/kg over 4-8 hr may be more successful. Arginine vasotocin at 0.01-0.1 μg/kg i.v. is considered more efficacious than oxytocin[1]. Parenteral calcium therapy is not necessary unless hypocalcemia has been confirmed.

A word of warning: If a tortoise has normal eggs and shows no signs of disease do not be in a hurry to medicate or operate. The eggs may simply not be ready to be laid and a good environment with suitable nesting sites and a little time may be all that is required. Cases involving abnormal or broken eggs, cloacal prolapse, infection of the cloaca, shell glands or oviducts will warrant surgery. Refractory medical cases should only be considered surgical if the tortoise is well past the expected laying time and medically deteriorating.

Anesthetic And Surgical Technique

Once the patient's hydration status has been returned to normal (as determined by serial packed cell volume) surgery can proceed. Premedication using anticholinergics, phenothiazines and benzodiazepines have been advocated but their importance is questionable[4]. Preoperative antibiotics, for example 20-40 mg/kg ceftazidime (Fortum, 500 mg, Glaxo), i.m. is advisable. The rate of fluid administration can be increased to 5 ml/kg/hr during anesthesia, surgery and the immediate postoperative period.

Anesthesia is induced with 12-15 mg/kg propofol (Rapinovet, 10 mg/ml, Mallinckrodt Veterinary Ltd.), i.v. or i.o. followed by intubation and maintenance on oxygen and 2-4% isoflurane (Isoflo, Mallinckrodt Veterinary Ltd.). It is vital than the preferred body temperature of 25-30°C is maintained before, during and after surgery. The use of a low wattage heat mat or water bed to maintain a core preferred body temperature is recommended. The subject is connected to an ECG or pulse oximeter (cloacal/esophageal).

In those species with large inguinal fossae including the large land tortoises and many species of terrapin and turtle, an inguinal soft tissue approach will provide sufficient access for egg removal and prevent the need for major shell surgery[5]. Unfortunately, the *Testudo* species possess a relatively small inguinal fossae making access by this route more difficult.

With the anesthetized tortoise in dorsal recumbency the whole of the plastron is scrubbed using povidone-iodine and then wiped with surgical spirit. A window is cut into the plastron using a Dremel circular saw or an oscillating sector cutter, making sure that any functional plastron hinges are avoided. It is important that the clinician makes the plastron window large enough to operate through as it is very difficult to subsequently enlarge the incision. Sterile saline can be used to flush away bone dust and reduce local heat while cutting. Once the plastron has been cut and all the bony attachments freed, the tortoise is admitted to a sterile operating theater. The tortoise is maintained in dorsal recumbency and a sterile plastic adhesive drape is positioned over the plastron. A scalpel can then be used to follow the bone saw incision, enabling a window to be cut in the drape. Using a periosteal elevator the plastron window is carefully elevated and the soft tissue attachments are dissected free facilitating the removal of the plastron segment which should then be placed into sterile saline. In Chelonia there are paired ventral abdominal veins, and the celiotomy incision is made between these vessels to gain access to the coelomic cavity. Care is needed not to incise the pericardium which lies ventral to the plastron and is often at the cranial extent of the coelomic incision.

In cases of simple dystocia due to enlarged or abnormal eggs, single or multiple salpingotomy incisions can be made in the shell gland and the eggs removed. The shell gland of tortoises is significantly thicker than it is in squamates and the author prefers to close salpingotomy incisions with a layer of simple interrupted sutures followed by a continuous inverting pattern. Polyglactin 910 (Vicryl, 3/0-5/0) is preferred for all internal sutures. In cases of severe reproductive disease (salpingitis, egg peritonitis) or when preservation of breeding capability is not required, it is usually advisable to perform a complete ovariosalpingectomy. Radiosurgery and vascular clips make surgery substantially easier and shorter in duration.

The coelomic membrane is closed in a simple continuous or interrupted pattern. The bone segment is replaced and secured using autoclaved fiberglass patches and epoxy resin. In large tortoises, it may be advisable to anchor the plastron segment using wire sutures at each corner.

Fluid therapy should continue until the tortoise starts to eat, usually within 24-72 hr. Post operative analgesics should always be considered and the author prefers 2-4 mg/kg carprofen (Zenecarp, 50 mg/ml, C-Vet) i.m. The shell segment may take many months or years to heal and it is usual to leave the fiberglass dressing permanently in place. Sterility is therefore vital. Tortoises are not hibernated during the winter following surgery.

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