PROCEEDINGS OF THE

NORTH AMERICAN VETERINARY CONFERENCE

VOLUME 20

JANUARY 7-11, 2006

ORLANDO, FLORIDA

SMALL ANIMAL EDITION

REPTILE OBSTETRICS

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Breeding reptiles for fun and/or profit is becoming commonplace for reptile enthusiasts. Complications with laying eggs or giving birth to young is a common sequelae of breeding reptiles. Veterinarians treating reptiles in practice will often be presented with reptiles with dystocia. Dystocia in reptiles can be multifactorial and may be the result of inappropriate nesting sites, stress, dehydration, malnutrition, obesity, salpingitis, malformed eggs and abnormal reproductive anatomy (DeNardo, 1996). This paper will discuss the general clinical presentation and commonly used medical and surgical options for the treatment of dystocia in snakes, lizards and chelonians.

SNAKES

Dystocia is seen more commonly in the egg-laying (oviparous) snakes than in the live-bearing (ovoviviparous) snakes. *Oviparous snakes* include pythons, colubrids (rat snakes, king snakes, milk snakes, hognose snakes, green snakes) and elapids (cobras, coral snakes, etc.). *Ovoviviparous snakes* include boas, colubrids (garter snakes, water snakes, ring-neck snakes), rattlesnakes, copperheads, and other vipers (gaboon, tree, eyelash)

Historical Presentation

Oviparous snakes: the snake may have laid a clutch of eggs and the owner notes what appears to be eggs still in the snake. Or the snake has not laid any eggs but is past her due date and the owner can see or feel eggs in the snake.

Ovoviviparous snakes: owner may present the snake knowing the snake has been bred, noting that it appears gravid but is well past its due date. Or the snake may have produced an abnormally small clutch size and the owner is concerned there are still babies present. Often with live-bearing snakes owners may not be aware they are gravid and may present them for anorexia or another problem.

Clinical Assessment

Oviparous snakes: often-retained eggs are palpable on physical examination. They may be distributed unevenly throughout the lower 1/3 of the body or they may be “bunched up” at the cloaca. The eggs may be misshapen on palpation, they may be free to move up and down, or they may be immobile. Use caution when palpating not to force eggs to move. The oviduct is extremely fragile and may tear easily. Radiology or ultrasonography can be used to confirm egg numbers, abnormalities, and comparative egg size but may not be necessary, as eggs are usually readily palpable.

Ovoviviparous Snakes. It is much more difficult to palpate developing fetuses in live-bearing snakes and radiology and/or ultrasonography may be necessary for confirmation. Ultrasound can be very useful in determining whether fetuses are alive. In late gestation snakes can be seen moving (in a tight coil) and a heartbeat may be seen. Sometimes determining a true dystocia versus a normal pregnancy is difficult in live-bearing snakes.

Treatment

Medical. There tends to be a small window of opportunity when oxytocin will be effective. If used for a (non-obstructive) dystocia where some portion of the eggs (fetuses) have been laid or obvious nesting or straining is occurring, the oxytocin is best initiated within 48-72 hours of such activity. A dose range of 5-20 IU/kg IM is used by this author starting with the lower end of the dose range and increasing the dose on subsequent doses if no response is initiated. Dosing can be repeated in 6-12 hours. If 2-3 doses have been given with no response then medical therapy will likely not be effective. Arginine vasotocin, which is the natural reptile oxytocin-equivalent hormone, is likely a more useful drug but it is available only as a research drug at this time.

Egg Manipulation. Using general anesthesia with propofol (Rapinovet 10mg/ml; Mallinckrodt Veterinary) at 5-10 mg/kg IV (tail vein or intracardiac) and/or isoflurane eggs sometimes can be gently manipulated toward the cloaca and removed. Another technique is to gently move the retained egg to the cloaca. The egg can then be visualized through the cloaca and may be aspirated. Often the deflated egg will then be easily manipulated out (and the procedure can be repeated for the next egg) or the snake can be allowed to try to pass the deflated egg on its own. Oxytocin can also be used to accelerate the passing of the deflated egg.

If the egg cannot be manipulated to the cloaca, then percutaneous aspiration can be performed. The egg is isolated against the lateral body wall and the area is sterily prepped and a 20-gauge needle is inserted between the first and second row of lateral scales and into the egg. The contents of the egg are aspirated into the syringe using caution to avoid any leakage of egg material into the coelomic cavity. The snake will usually pass the egg within 12-24 hours of aspiration. Subsequent eggs behind the first may also have to be aspirated in turn or they may pass on their own after the first egg is removed. Eggs retained more than several days may not be successfully aspirated as the egg contents may solidify. These eggs will have to be surgically removed.

Surgery. Surgery may be necessary if medical therapy, egg manipulation and/or ovocentesis has failed. After anesthetizing with propofol and/or isoflurane as described above, an incision is made between the first and second row of lateral scales over the retained egg or fetuses. The oviduct is isolated and incised to remove the egg or fetuses. If there is more than one egg or fetus they may be able to be removed from the same incision. However, if they are adhered higher up in the oviduct or in the opposite oviduct multiple incisions may have to be made. The oviduct is closed with a simple continuous pattern using a fine absorbable suture (i.e. 4.0-5.0 PDS).

The coelom is closed with an absorbable suture and the skin with a non-absorbable suture in an everting pattern.

LIZARDS

Dystocia is seen more commonly in the egg-laying (oviparous) lizards than in the live-bearing (ovoviviparous) lizards. Oviparous lizards include iguanas, dragons, monitors, gila monsters, beaded lizards, anolis, tropical chameleons, many small skinks, uromastyx lizards, most geckos. Ovoviviparous lizards include large skinks such as the bluetongue skink, prehensile tail skink and montane chameleons such as the Jackson's chameleon.

Historical Presentation

Owners may or may not be aware that their lizards are reproductively active. Often lizards may develop mature follicles on their ovaries and/or actually ovulate and produce infertile ova without a mate being introduced. Owners often describe their pet lizard as becoming restless in their cage, pacing and climbing, likely looking for potential nesting sites. They may dig in planters or in the substrate in their environment. Appetite and water intake may be greatly reduced or gone.

Owners that are attempting to breed their lizards may present a lizard because the lizard has laid a clutch of eggs but still appears to be have retained some eggs. Or the lizard has not laid any eggs yet (and showing similar signs as above) but is past her due date and the owner can see or feel eggs in the lizard.

For ovoviviparous lizards the owner may bring the lizard in knowing she has been bred, noting that she appears gravid but is well past her due date. Or the lizard may have produced an abnormally small clutch size and the owner is concerned there are still babies retained.

Clinical Assessment

It is important to differentiate between pre-ovulatory egg stasis and post-ovulatory egg stasis when lizards are presented to the clinician because treatment for the two syndromes may differ. With both situations weight loss over the tail base and rear limbs may be noticeable, but they will still have a very full appearance to the abdomen.

Preovulatory Egg Stasis. In captivity, one common scenario is for the ovarian follicles to become static. They may reach a large ovulatory size but still not be ovulated or resorbed. This is known as preovulatory egg stasis. It is unclear why this occurs, but it may be related to inappropriate environmental cues. Generally, the ova will be palpable or very obvious against the body wall of the abdomen. Differentiating ovarian follicles from oviductal eggs can be challenging. It is contraindicated to use oxytocin in lizards with preovulatory egg stasis. Prior to any use of oxytocin, the clinician **must** be certain the eggs are in the oviduct.

Postovulatory Egg Stasis. This condition occurs when the ovarian follicles are ovulated into the oviduct, but the eggs are not laid or only a portion of the eggs are laid.

Differentiating Pre vs. Postovulatory Egg Stasis. On palpation, ovarian follicles tend to be more dorsal and spherical and not as mobile as oviductal eggs, which are usually more oblong and ventral/caudal in the abdomen. Radiographs may help to differentiate the two as the ovarian follicles are usually not calcified and are more spherical and dorsal in their location. Ultrasonography can also be useful to differentiate between the two.

Treatment

Medical Management. If the eggs are preovulatory or postovulatory and the lizard is normal on assessment, then a nest box can be provided and the lizard may be sent home on NeoCalglucon at 1ml/kg PO BID for 21 days. Surgery can also be pursued at this time if the owner prefers. Postovulatory egg-bound lizards with calcified eggs may present with clinical signs of hypocalcemia, including paresis, tremors, and seizures. These patients are typically critical and must be aggressively treated with fluid therapy and initially calcium at 100 mg/kg IM every 6 hours until signs of hypocalcemia resolve.

Medical therapy can be initiated in postovulatory cases to induce oviposition. Calcium at 100 mg/kg IM can be given every 6-12 hours followed by oxytocin (approximately one hour after calcium) at 5-20 IU/kg IM. The higher dose range is used if there is no response to the lower dose. A nest box should be provided after oxytocin injections. If some but not all eggs are laid, dosing can be repeated. If the eggs are not laid within 48 hours, surgery is recommended (Mader 1996).

Surgical Management. Anesthesia is initiated with propofol at 10 mg/kg IV into the tail vein (Divers 1996) followed by intubation and isoflurane. A standard paramedian approach is used by the author to avoid the large ventral midline venous sinus. A large incision for allowing good access and visualization of the gonads is recommended. Caution should be used in entering the coelomic cavity to avoid damaging the potentially large bladder (iguanas), the major blood vessels leading to the paired abdominal fat pads, or the ovarian follicles, if the lizard is in a preovulatory stasis situation. The bladder, fat pads, and intestines should be gently retracted out of the way to expose the paired ovaries located dorsally in the mid coelomic cavity.

Surgical Management of Preovulatory Stasis. If the lizard is in a preovulatory stasis, the large paired ovaries-- which resemble a cluster of yellow grapes -- will be readily apparent. In the preovulatory egg stasis the surgeon should proceed by removing one of the large ovaries. The left ovary is attached to a branch of the renal vein. The left adrenal gland is located between the left ovary and renal vein. The adrenal gland is pink in color, elongated, and is parallel to the ovary. It is important not to remove or damage this organ while ligating the vessels to the ovary. In the preovulatory stasis, the ovary is very large and the vascular supply is easy to expose and ligate.

The vessels are double ligated with suture or vascular clamps. The vessels are then incised between ligatures, laid gently back into the dorsal coelomic cavity and observed for any hemorrhage. The right ovary is attached directly to the vena cava. The right adrenal gland is located on the opposite side of the vena cava than the right ovary, so it is unlikely to be damaged by ligation of the right ovary. The right and left oviducts should be identified but it is not necessary to remove them if both the right and left ovary are removed in the preovulatory egg stasis situation.

Surgical Management of Postovulatory Egg Stasis. In the postovulatory egg stasis the oviducts are filled with oviductal eggs and will easily be identified upon entering the abdomen. One oviduct at a time is gently exteriorized from the cranial end (fimbria) to the caudal extent where the oviduct enters the urodeum.

If the lizard is to be maintained for *future breeding* a *salpingotomy* is performed. An incision in the oviduct is made between eggs and warmed saline is infused into the oviduct to allow the eggs to begin to move freely within the oviduct to increase the number of eggs that can be manipulated through the oviduct incision. Several incisions may need to be made in each oviduct to successfully remove all of the eggs from the oviducts. The oviduct incisions are closed with a simple continuous pattern using fine absorbable suture (ex. 4.0-5.0 PDS).

If the lizard is a pet (i.e. green iguana) and the owner is not planning to breed the lizard in the future a *ovariosalpingectomy* should be performed. For an ovariosalpingectomy the fimbria is ligated with suture or a vascular clamp and groups of vessels are ligated together by creating windows in the mesosalpinx and ligating them with monofilament absorbable suture or vascular clamps (Bennett 1996). The caudal end of the oviduct is double ligated with a circumferential and a transfixing suture as close as possible to its junction with the urodeum. The procedure is repeated on the opposite oviduct.

Now, both oviducts and all eggs are removed. This empties the coelomic cavity considerably and allows access to the small inactive ovaries, generally 1-3 inches in length (in the green iguana). The ovaries are held tightly to their vascular supply by a transparent capsule. Caution should be taken when elevating the ovaries because the capsule and vessels may tear and bleed substantially. Windows are made in the capsule material between the vessels with a pair of blunt-blunt scissors and vascular clips or suture is used to ligate the vessels. It is best to ligate all vessels and then go back and cut through them all at the same time to remove the ovary. It is also important not to leave any ovarian tissue attached to the ligated vessels.

It is necessary to remove both ovaries in postovulatory cases (except if performing a salpingotomy) as the lizard may ovulate in the future, which could lead to ectopic ova in the coelomic cavity (Mader 1996). Closure is routine by gently pulling the musculature of the coelom together with a continuous monofilament absorbable suture. The skin (the true holding layer) is closed with an interrupted horizontal mattress suture pattern. Non-absorbable suture (3.0 nylon) or staples can be used to create an everting pattern. Suture removal is recommended in 6 weeks.

CHELONIANS

All chelonians are egg layers and dystocia is a common clinical presentation.

Historical Presentation

The owner may present the chelonian patient because they know the turtle has been bred, it has been digging and is restless, and may be well past its due date. Or the chelonian may have produced an abnormally small clutch size and the owner is concerned there are more eggs. Often turtle owners may not be aware they are gravid and may present them for anorexia, depression, straining or another problem.

Clinical Assessment

Sometimes eggs are palpable on the physical examination in small chelonians. The turtle is held upright with head pointing to the ceiling and a finger is placed anteriorly into the inguinal fossa. The turtle is gently rocked back and forth and an egg may be balloted against the finger. The technique is not as useful for identifying how many eggs are present, and it is not useful for larger chelonians, as their powerful legs will crush the finger of the clinician.

Generally radiology is used to confirm the presence and numbers of eggs, any abnormalities in the eggs and comparative egg size. Also the size of the pelvic inlet and any retained eggs may be compared on the radiographs. It may be difficult to tell if eggs present are truly “retained.” If eggs appear abnormal in shape or appear too large to possibly pass through the pelvic inlet, or other eggs have passed except those remaining then attempts to remove eggs should likely be initiated.

Treatment

Medical. If radiographs indicate retained eggs are normal in size and shape then medical therapy with oxytocin can be initiated. Generally chelonians respond to much lower doses of oxytocin and there is a much wider window of time when oxytocin can induce oviposition. Calcium at 100 mg/kg IM can be given every 6-12 hours followed by oxytocin (approximately one hour after calcium) at 1-10 IU/kg IM for 2-3 doses. The higher dose range is used if there is no response to an initial lower dose. If some but not all eggs are laid dosing can be repeated.

Surgery. If oxytocin is ineffective or eggs are malformed or too large, then surgery may have to be pursued. A plastral approach is a very invasive and healing time is extensive. Although this procedure may have to be performed in some situations a much less invasive procedure for egg removal through a pre-femoral approach is described.

Pre-femoral Coeliotomy. The pre-femoral surgical approach can be used to access the coelomic cavity in chelonians without invading the plastron. Eggs may have

to be aspirated or imploded to allow passage through the pre-femoral incision. But the less invasive procedure results in a much more rapid healing time for the chelonian patient.

The chelonian patient is anesthetized (typically with propofol at 12 mg/kg IV followed by intubation and isoflurane) and placed in dorsal recumbency. The rear limb is pulled back and secured in place caudally. Surgical retractors or rabbit adjustable dental retractors can be used to increase the opening of the pre-femoral space. The area is then aseptically prepared and draped. An incision is made in the skin midway between the carapace and plastron in a craniocaudal direction within the fossa. The underlying thin musculature is then bluntly dissected to reveal the coelomic membrane. The membrane is carefully incised and the coelom is entered. Placing stay sutures in the incision layers can be useful to help identify them for proper closure.

Once the coelom has been entered an endoscope can be used to assess the entire coelom. A spay hook works well to retrieve the oviduct. The oviduct is then gently retracted into the small pre-femoral window for inspection. Typically, the oviduct with egg is brought to the incision but cannot pass through. Thus an incision is made in the oviduct and the egg is aspirated to collapse it or grasped and broken apart. Caution must be used to avoid leakage of egg contents into the coelomic cavity. The oviduct is then closed in one layer with a simple interrupted absorbable suture. The coelom and muscle layers are closed in a simple, interrupted, pattern with absorbable suture. The skin is closed with a non-absorbable suture in an everting pattern such as a horizontal mattress. Sutures are removed in 6-8 weeks.

References available from the author upon request.