Rounds Notes
Animal Health Department
Medical Rounds
"medicine for all"
NATIONAL MARINE LIFE CENTER
Caring for Stranded Marine Animals
Veterinary Research Department
Under the microscope
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Rounds Notes is a report on the health of animals at the National Marine Life Center from Sea Rogers Williams VMD for the staff, volunteers, and community of the center including professionals involved the captive care of similar species, the views expressed are not necessarily that of NMLC. Information in Rounds Notes should be considered confidential and used solely to benefit the health of aquatic animals everywhere.

December 2, 2009 *Rounds Notes* **24**: 57- 60 (2009)

Clinical Update: Coming apart at the seems

I'd tie this up, but the sutures are the problem

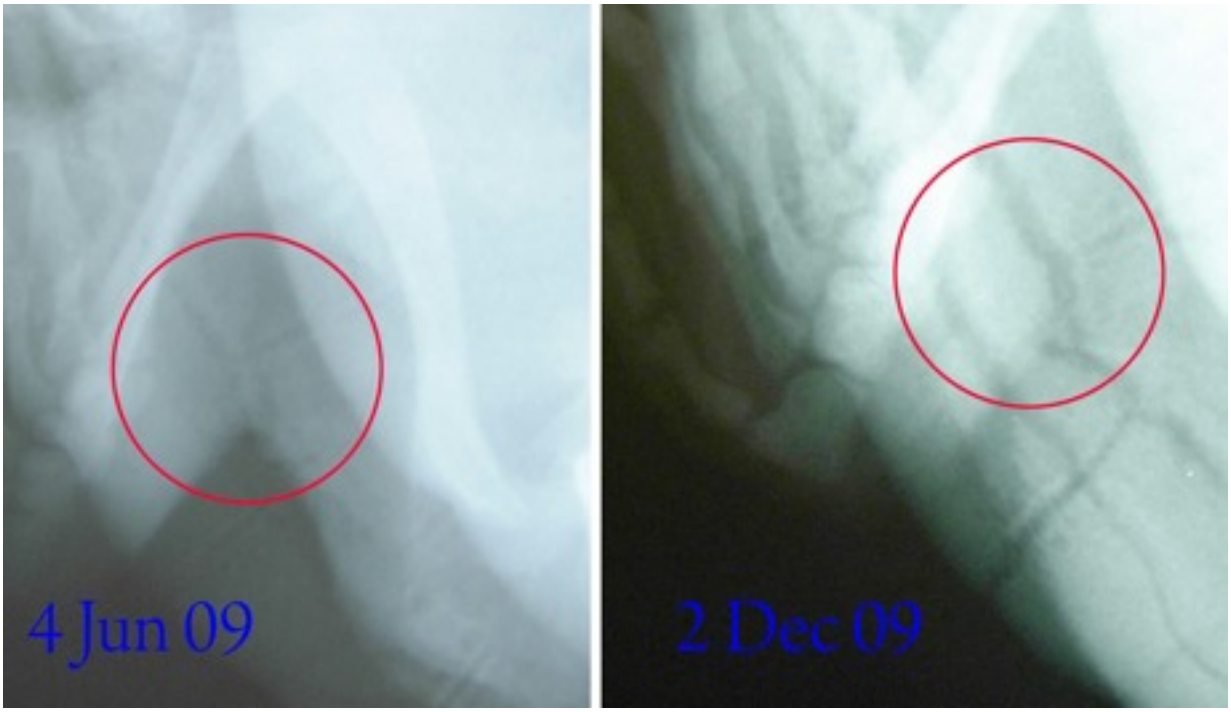
Patty's condition has taken a turn for the worse with the bones of the shell (carapace) staring to come apart at their junction (suture line). The shell of terrapins consists of the outer keratin layer, the epithelium, and the bones of the shell. The margins of the outer scutes overlap the margins of the bones (joined at sutures lines like the bones of our skull) to provide strength. Over 80% of Patty's shell has lost the keratin cover along with the epithelium which resulted in exposing the dermal bone beneath, which results in avascular necrosis (loss of blood supply and without blood, oxygen and nutrients the tissues die) (Mader 2006). With treatment the epithelium has started to regenerate, but this thin layer (likely a few cell layers thick) has no strength to support the shell. The sutures have also been exposed to the water which may have contributed to their weakness. Normally the water tight keratin proves an excellent barrier to protect the bone. A shell membrane deep to the bones can form a sort of pseudoshell(Mader 2006) protecting the body cavity but the mechanism for this is poorly understood and can not easily be imaged for evaluated.

What does this mean for Patty ?

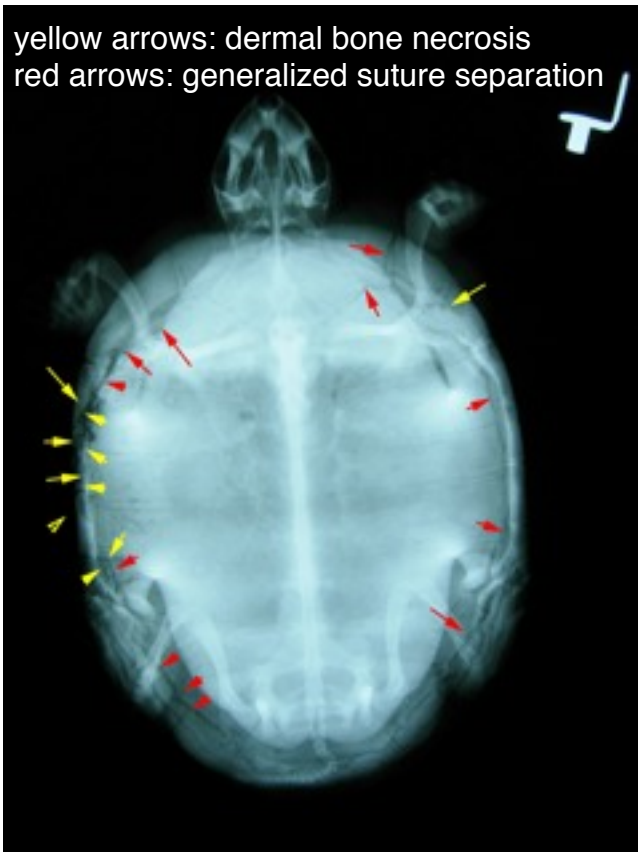
If she loses a boney plate from the shell, water and bacteria may be able to work their way into the body cavity and the muscles and lining of the lungs. This will subject the tissues to osmotic stresses in addition to the bacterial contamination. If confined to a single marginal scute, with medical management a turtle may be able to survive this type of injury, but if the condition is generalized, a domino effect will cascade over the animal with each new area of exposure leading to an escalating level of exposure, which at some point will become un-repairable.

What's cause this manifestation of shell disease in Patty ?
The simple answer is that I'm not sure. I do have some ideas.

Direct thermal insult caused by the freezing episode could have damaged the bone, the epithelium and the the blood supply to the shell. At first there is no evidence of a problem, but once the turtle is stabilized, warmed, and starts to grow we see the consequences of the original injury. Late effect injuries in humans that have suffered frost-bite is not uncommon and associated with microvascular injury to the bone (Hakstian 1972). Another consideration is "shell rot' or **Septicemic Cutaneous Ulcerative Disease** (SCUD). SCUD is more common in aquatic and soft shelled turtles and often accompanied by systemic signs such as anorexia and lethargy(Mader 2006), neither of which is seen in Patty. Also cultures of coelomic fluid and hemolymph have failed to reveal septicemia. **Renal failure** has been implicated in the complete sloughing of scutes(Nash), and I have suspected kidney disease in Patty for a long time, but the diagnosis of chronic renal failure in reptiles is not simple and may require a renal biopsy with is both invasive and



dangerous. The generalized tissue edema and coelomic fluid could all be related to acities with renal failure, which likely would indicate an end-stage condition. The evidence for renal disease



in Patty consists of: sloughing scutes, tissue edema, retained urine (I'm not sure how this ties in but was an unusual finding of the CT), hemolymph expansion, and a presenting complaint which could result in direct tissue damage with vascular compromise and low blood flow to the kidney. While this is far from a proven case, accessing renal function in reptiles is, as I've said, hard.

Of course what were really interested in is how to fix this. Fractures (breaks of the bone) either thru trauma or underling bone pathology are treated in the following ways: 1)stabilization the the body's anatomy, this works great in turtle and other animals were we can relay on the non-damaged skeleton to provide support. If a mammal fractures the fibula but the larger and stronger tibia is not damaged, the tibia can provide all the suport we need to healing. The turtle shell makes and effective box, and if one section is damaged, the other walls of the box can and do provide support.

2) stabilization by external co-adaptation
    1) this can be a sling, if your patient is compliant, or a cast, if the area is something that can be encircled, like the forearm of a person.
    2) or a more invasive pin attachment (K&E) device to hold the bones were we want them.
3) stabilization by internal reduction held in place by. . .
    1) wires
    2) pins
    3) screws
    4) plates

What bones really need to heal is stabilization at the fracture site (the more movement the slower the healing) and a good blood supply. Provide an non-moving site, freedom from infection, and a good blood supply and most fractures will heal.

But what's going on with Patty. This condition of suture failure appears to me to be more metabolic condition and failure of the bone integrity, not a fracture at all. Radiographs taken today show progression of the osteonecrosis (death of bone) and separation of the scutes in a more generalized pattern. Our best chance to save Patty is to address the underline cause and get as much information on her current condition as possible. We will consider shell biopsies for culture and histopathology and may still need to consider coelomtomy and renal biopsy.

Terrapins, Cooters, and Turtles, oh my . . .:

Diamondback hatchings eat, and Cooter grow.

All of the little diamondback hatchling are eating and we will monitor their growth, while the red -belled cooters appear very comfortable and have no trouble eating everything we put into the tank (remember to watch your fingers).

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