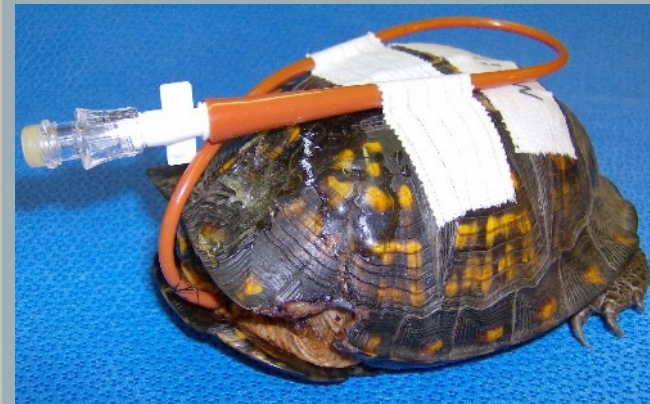


TURTLE SHELL REPAIR – WRNC 2024





TURTLE RESCUE TEAM

- NCSU-CVM TRT has treated over 6,000 turtles since 1996. Total 2023 caseload was 758
- Approximately 2/3 are vehicular trauma patients.
- Even seriously injured turtles can survive to be successfully released.



WHAT IS A SHELL?

- Bone
- Skin
- Keratin
- Spine
- Nerve endings
- Blood Vessels
- Carapace
 - Scutes
- Plastron
- Bridge



COMPONENTS TO TRAUMA THERAPY

- *Analgesia*
- Fluid therapy
- Antimicrobial therapy
- Wound management/
Bandaging
- Shell repair



ANALGESIA / SEDATION

Analgesia (Pain Control)

- Opioids

- Strongest, requires a veterinarian

- NSAIDs

- **Ketoprofen:** 2 mg/kg IM q48 hours, up to 14 days
- **Ketorolac:** 0.25 mg/kg IM q24 hours, up to 3-5 days.
 - (Better pain control. Can either discontinue or switch to Ketoprofen)
- **Meloxicam:** No evidence of efficacy in the species we commonly see

Sedation often required for coelomic breach, snapping turtles, severe trauma (work with vet on dosing or refer)

FLUIDS

- Indications: dehydration, fluid/blood loss, unable to soak due to injuries
- LRS 1-2% of body weight (BW) under the skin (subcutaneous) every 24-72hours
- Example: 500g turtle x 1% BW (500g x 0.01) = 5mL of fluids



- Possible alternative methods:
- Incline soaking
 - Cloacal fluid administration

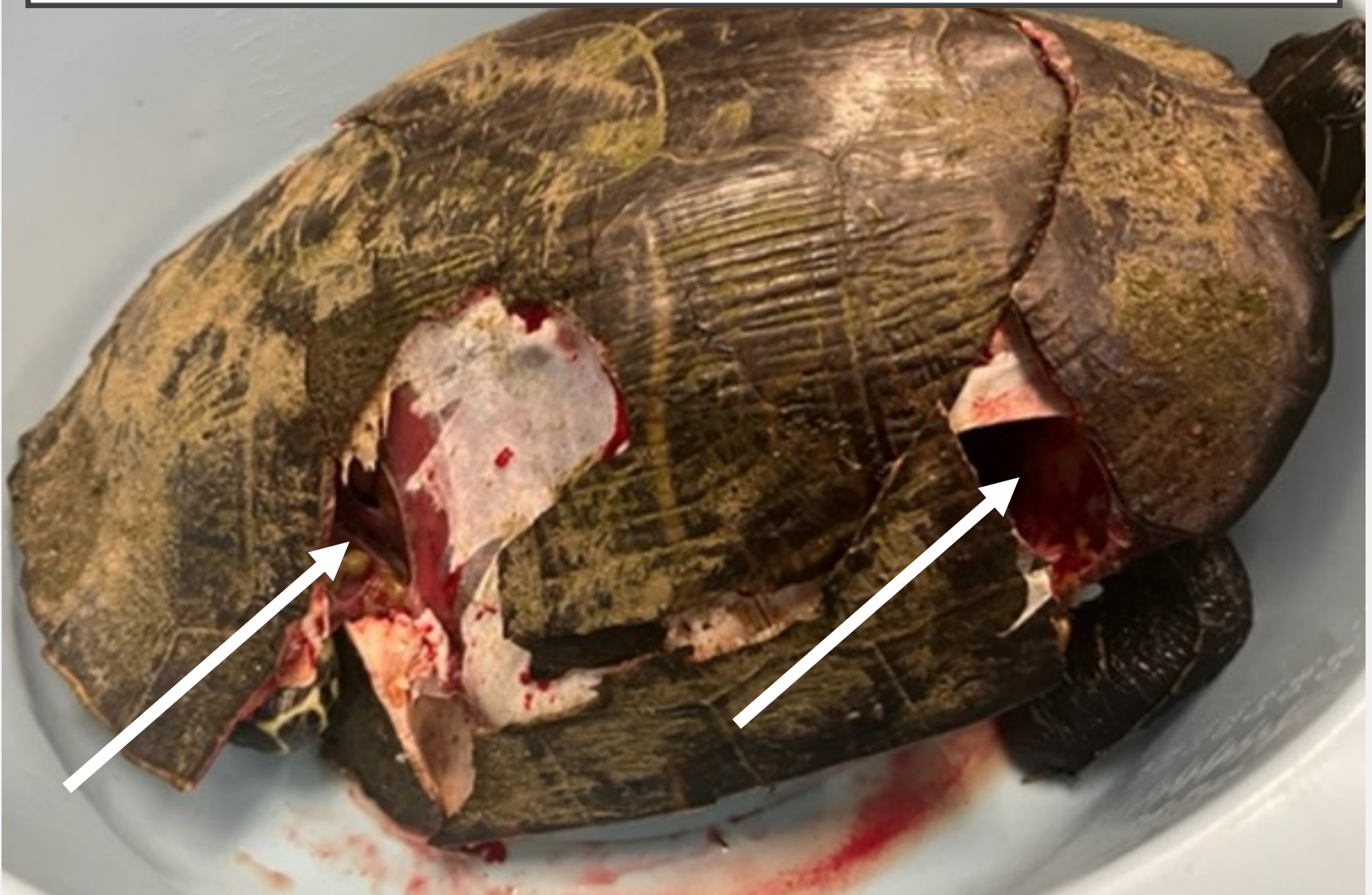
IS THE COELOM BREACHED?

- Can be difficult to determine
- Greatly decreases chance of survival
- Definitive Signs:
 - Coelomic membrane has hole
 - Looks “deep”
 - See any lungs/organs
 - CAREFULLY flush with sterile saline at an angle to allow drainage and monitor for “bubbling”
- Consider referral depending on your resources!

Intact Coelomic Membrane



EXAMPLES OF BREACHES



**EXAMPLES OF BREACHES
NOT ALWAYS OBVIOUS!**



MANAGING BREACHES

- Carefully clean/flush to remove dirt/debris without flushing them deeper into the coelom
- **ANTIBIOTICS!**
 - **Ceftazidime** 20 mg/kg IM q5 days x 4 doses
- Bandage/Cover
- **DRY DOCK**
 - Aquatic turtles will need SC fluid support and/or soaking of non-breached areas
- **Consider referral** depending on your resources



WHEN NOT TO REPAIR

- Fracture is stable
- Shell embedded into coelom!



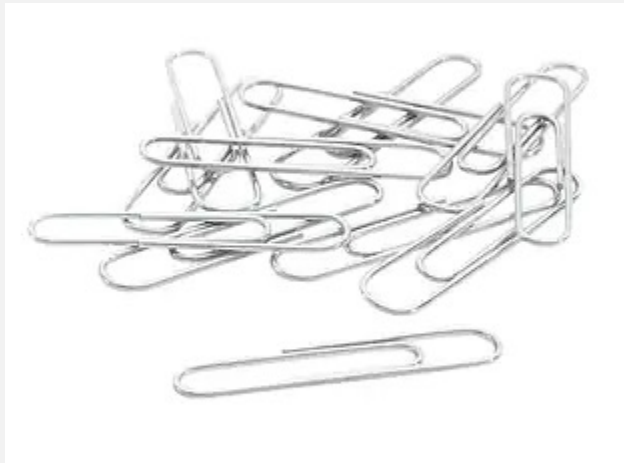
SUPPLIES YOU NEED

- Fabric “Bra” Hooks (“Hook and eye closure”)
- Needle nose pliers or hemostats
- Wire cutters
- Wire
- Super Glue
- Baking Soda
- Epoxy Putty
- Scrub (Betadine, Sterile Saline)



OTHER SUPPLIES (HELPFUL BUT NOT REQUIRED)

- Me-Fix tape
- Adherent dressing (Tegaderm)
- Non-adherent dressing (Telfa)
- Zip Ties
- Paper Clips
- Drill or Dremel with small bit
- Beeswax



SHELL REPAIR STEPS:

Provide pain control, antibiotics, supportive care, or sedation as needed prior to beginning repair.

1. Remove dirt/debris
2. Clean edges with betadine & saline
3. Reduce (appose/put back into place)
4. Attach
 1. There are many non-invasive methods available
 2. Repairs may require creativity
 3. It's an art not a science!

Me-Fix Adhesive Tape or VetWrap



Alicia Cawfield



- Least stable
- Temporary
- Vet wrap as a pressure bandage to control hemorrhage.

FABRIC BRA HOOKS



- Most common method
- Very stable and provides good apposition/strength

WIRE THROUGH MARGINAL SCUTES

- Very stable; used to stabilize fractures that extend to the edge of the shell (marginal scutes)
- Supplies:
 - Drill
 - Wire
 - Epoxy



PAPERCLIPS

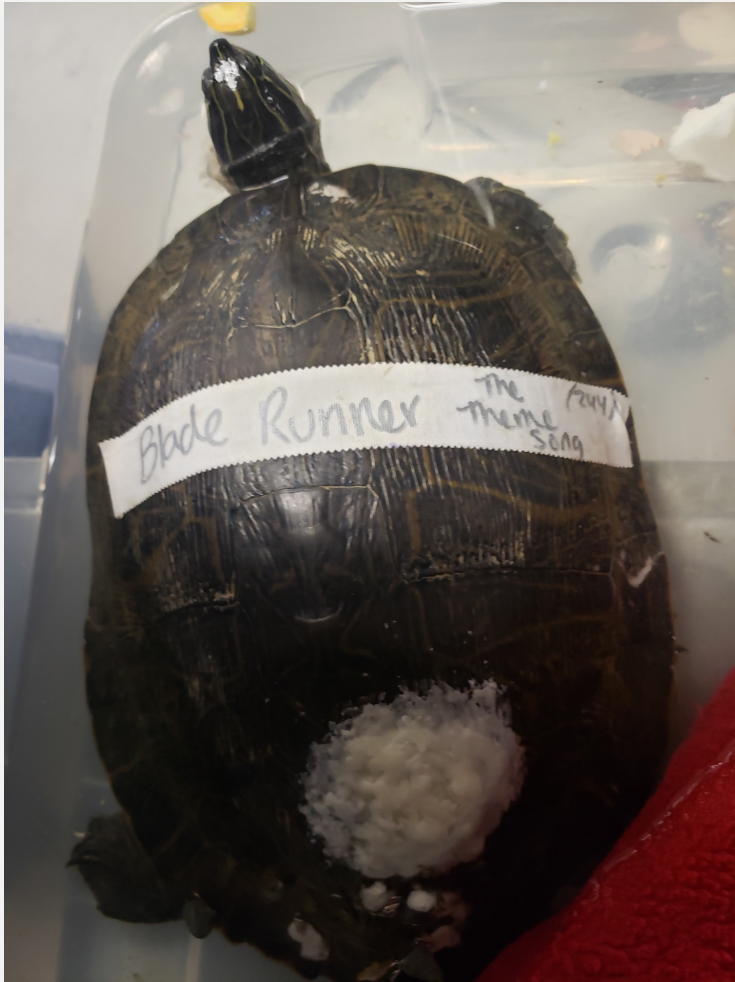


- Less stable, tend to fall off
- Useful for bridge, plastron

ZIP TIES



BEESWAX



- Indications: cover fractures / holes in shell so turtles can go into water sooner
- Will often fall off
- If interested, email us for our protocol

ADVANCED REPAIR

The Monty Method



Negative Pressure Wound Therapy



WHEN CAN THEY BE RELEASED?

- Once the fracture has a tissue seal and palpates stable
- DON'T release patients with hardware! Always remove hardware prior to release.
- Healing time varies significantly (severity of injury, how closely pieces are apposed, age of injury before repair, etc)
- Reptiles generally take longer to heal than mammals
- Our rules of thumb
 - Minor fracture – AT LEAST 2 months
 - Major fracture/breach – AT LEAST 3-4 months
 - Gently palpate – if you can manipulate, leave hardware on longer
 - After removal, may need to replace

Need help with a case? Have questions? Call us!

919-397-9675

For a copy of this presentation, or non-urgent questions (protocols, etc)

turtle-rescue-team@ncsu.edu



Photos in this lecture courtesy of Dr. Gregory Lewbart, Bayli Wellman, Rachel Carpenter, and Erin Perry