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ED Outline
Injected Poisons – Jellyfish

I. Etiology/ Pathophysiology
    a. Etiology: Jellyfish stings are caused by direct contact with tentacle and/or body.
        i. Jellyfish can sting in the water, on the beach, and if dead.
            1. Nematocytes are still active even if dead.
    b. Over 9,000 species of Cnidaria (jellyfish) exist.
        i. Basic anatomy consists of several tentacles and a body (also called a bell).
        ii. Tentacles are covered in thousands of cells exclusive to jellyfish, called nematocytes - contain stinging organelles called nematocysts.
            1. Some species also have nematocytes on the body.
        iii. Physical and chemical stimuli result in nematocytes discharging a hollow barb outward.
            1. Penetrates allowing venom/toxin to infiltrate
            2. Nematocysts remain lodged in victim after stung.
                a. Note: caution with site to prevent further discharge of nematocysts.
    c. Severity of the reaction depends on:
        i. Species of jellyfish encountered, number of nematocysts discharged, length of exposure, body part involved, and victim's reaction to venom
    d. After a jellyfish sting, dermal eruptions develop.
        i. Due to injected toxins/venom and innate immune system mechanisms.
        ii. Venom isn't fully understood, but various components cause adverse reactions.
        iii. Toxins in the venom are subdivided into four different types:
            1. Enzymes (phospholipase A2, metalloproteases), pore-forming toxins, neurotoxins, and nonprotein bioactive components (serotonin and histamine)
                i. Each species has a unique concoction of toxins (and resulting stings).
                b. Phospholipase A induces inflammation to the site.
                c. Metalloproteases prevent hemostasis
                    i. Results in tissue edema with necrosis and blister formation
                d. Serotonin and histamine lead to vasodilation and pain.
        iv. Immune mediated response results in edema, pain, urticaria, and erythema.
        v. Most stings appear with raised erythematous or urticarial lesions that follow distribution of where tentacle and/or bell made contact.
            1. Present with immediate pain and irritation.
                a. Usually self-limiting, skin lesions disappear in hours-days.
        vi. May result in systemic symptoms including neurological, gastrointestinal (nausea/vomiting), or allergic responses if toxin enters systemic circulation.
            1. Dependent on species

vii. Species including: *Physalia phyalis*, *Physalia utriculus*, *Chironex fleckeri*, and *Carukina barnesi* have unique sting characteristics.
1. The *Physalia phyalis* species result in immediate and painful rash with ranging severity.
a. From erythematous urticarial linear beaded plaques to vesiculobullous eruptions
i. A "frosted" appearance can occur due to superficial necrosis.
2. The *Physalia utriculus* (also known as bluebottle) inhabits the Atlantic and Indo-Pacific Oceans.
a. Causes immediate pain, skin lesions last hours to days.
i. Lesions can reappear years later.
3. The *Carukina barnesi* species are one of the most dangerous.
a. A type of box jellyfish.
b. Inhabit deep parts of the ocean.
i. Affect divers
1. Can wash ashore and injury beachgoers
ii. Can cause condition known as Irukandji syndrome
1. Symptoms can be delayed up to 30 minutes.
2. Severe generalized pain (lower back, chest), headache, tachycardia, hypertension, anxiety, diaphoresis, and/or cardiopulmonary decomposition.
a. Need rapid care
4. *Chironex fleckeri* can cause cardiotoxicity.
a. Due to increased Na+ permeability in cardiac tissue.
b. Results in cardiovascular collapse (including cardiac arrest and cardiogenic pulmonary edema).
i. Effects on animals include: conduction delays, ventricular tachycardiac, and coronary artery vasoconstriction
c. Can cause delayed hypersensitivity reaction (7-14 days post sting) with an itchy maculopapular rash.

II. On-scene Treatment
a. Prevent drowning and further stinging.
i. Remove from water.
b. Assess airway, breathing, and circulation and provide care as needed.
c. First aid treatments:
i. Tentacles can be removed with gloved hands, tweezers, or sand/seawater.
1. Ensure minimal site agitation.
2. Do not rub the site.

ii. Site should be covered in a solution that will prevent discharge from remaining nematocysts.
    1. Prevents worsening pain and minimizes venom load
    2. Topical therapies include:
        a. Vinegar – cessation of nematocyst discharge in 30 seconds.
        b. Sea water
        c. Other topical solutions: methylated spirits, ethanol, isopropyl alcohol, sodium bicarbonate, shaving cream, and sand
        d. Stingose (aqueous solution of 20% aluminum sulfate and 1.1% surfactant) is a commercial solution.
            i. Utilized for pain relief as well.
    3. Misconceptions:
        a. Urine should not be used.
        b. Freshwater should be avoided.
            i. Increases nematocyst discharge
        c. Pressure immobilization
            i. Increases nematocyst discharge

d. Removal of the Nematocyst:
    i. Hard materials including credit cards (or driver's license) can remove nematocyst by scaping skin.
        1. Important to remove of the nematocyst so venom isn't being continuously released.
        2. Do this after applying a solution – prevents further discharge.

e. When to Seek Emergency Care:
    i. Mostly treated beachside, clients seek ED care for severe pain usually.
        1. Most present without symptoms of systemic infection.
    ii. Seek emergency care for:
        1. Persistent pain even with at home antihistamine use and ice/heat
        2. Systemic signs and symptoms that indicate allergic response (tachycardia, hypertension, SOB, difficulty breathing, angioedema)
        3. Development of necrosis on involved extremity.
        4. Skin lesions that do not disappear within expected time frame (varies according to jellyfish species).
        5. Impaired sensation and/or movement of involved extremity.
        6. If open wound is present.
        7. If there are symptoms of Irukandji syndrome or stung by known dangerous species (such as *Carukina barnesi*).
            a. Symptoms: tachycardia, hypertension, anxiety, diaphoresis, cardiopulmonary decomposition, and/or severe generalized pain

III. ED Treatment

a. Most stings are managed at home independently.
    i. If severe enough ED intervention and care is necessary.
b. Establish IV access.
    i. Rehydration therapy started as appropriate.
c. If not previously done:
    i. Prevent further nematocysts discharge.
        1. Utilize solutions discussed above.
    ii. Ensure tentacles and nematocysts are removed.
d. Pain management is a priority.
    i. Manage with:
        1. Saline solution irrigation
        2. Topical lidocaine
        3. Topical corticosteroids
            a. Decreasing inflammation can help with pain.
        4. Analgesics (oral and IV)
            a. Including acetaminophen, NSAIDS, opiates
        5. Nonpharmacological pain relief options:
            a. Hot water immersion (HWI) at 45 degrees C for 20 minutes
                i. Denatures the venom components.
            b. Ice (depending on causative species)
e. Control systemic effects if present.
    i. Provide antihistamines, corticosteroids, and anti-hypertensive drugs (depending on symptoms).
    ii. If Irukandji syndrome develops
        1. Nitroglycerin - first line treatment for hypertension related to this syndrome.
            a. Phentolamine is another option.
        2. Benzodiazepines
            a. Adjunctive therapy for hypertension related to Irukandji syndrome.
    iii. If an anaphylactic reaction occurs:
        1. Administer epinephrine.
        2. Provide other meds/treatments for adequate oxygenation and circulation.
f. If stung by box jellyfish or *Chironex fleckeri*:
    i. Antivenom is an option.
g. If the site is open:
    i. Antibiotic prophylaxis (usually topical) to prevent infection
h. Prevention of complications: Tetanus
    i. Tetanus prophylaxis with injury if client is not current with vaccination.

IV. Role of the ED Nurse
a. Establish IV access.

b. Assess the site for severity.
    i. Edema, erythema, open wounds, imprint of jellyfish tentacle, urticaria, rash, etc.
        1. Utilize methods to track edema (circle current edema if appropriate).
c. Assess for signs of an allergic reaction.
    i. Provide immediate care for stabilization as needed.
d. Assess for systemic signs and symptoms.
    i. Monitor cardiac function (EKG, UO, AP, BP, etc.)
    ii. Monitor pulmonary function (SpO2, RR, breath sounds, etc.)
        1. Monitor VS and overall wellness in general.
e. Assess pain level.
    i. Provide pain relief with pharmacologic and nonpharmacologic options.
f. Assess for muscle spasms, nausea, fever, etc.
g. Assess geographical location where the sting occurred.
    i. Assists with identifying the causative species of jellyfish.
        1. Dedicates further treatment
            a. Example: administering antivenom for box jellyfish sting.
    ii. Assess for signs/symptoms of Irukandji syndrome.
h. Provide education and handouts for discharge including:
    i. Medication therapy, home care for sting, future prevention, when to return to ED

V. Discharge/Prevention Instructions
a. Prevention: Avoid areas where jellyfish inhabit.
        1. If in a region where jellyfish inhabit ocean, visit pools.
    ii. Create information and warnings for known jellyfish sites.
        1. Local observations and climate analyses assess for fluctuations in species.
    iii. Utilizing protective clothing and goggles.
        1. Fully body lycra “stinger suit” for high-risk zones
    iv. Sunscreen lotions that contain jellyfish sting inhibitors.
        1. Lessen severity of sting
    v. Educate local costal residents and managers on:
        1. Prevention
        2. First aid treatments
b. Discharge:
    i. Continue pharmacological therapy as instructed
        1. Antihistamines, topical creams, analgesics, etc.
    ii. Utilize nonpharmacological pain relive options (such as HWI) as instructed.
    iii. Avoid re-exposure
    iv. If open wound is present:

1. Monitor for signs of infection.
2. Maintain a clean and dry site.

v. Instructions for return to ED if:
    1. Systemic symptoms worsen
        a. Tachycardia, hypertension, diaphoresis, etc.
    2. New onset symptoms
    3. If the skin lesion shows no improvement or worsens.
        a. Development of necrosis

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