Optimizing Gallstone Management: Insights into Percutaneous Stone Removal Techniques

Presenter: Aliah McCalla, B.Eng – Medical Student, MS3, Central Michigan University
Author/Co-author: Pete Nesbitt, DO – Interventional Radiology Resident, Henry Ford Hospital
Author/Co-author: Shehbaz Shaikh, MD – Interventional Radiology Faculty, Henry Ford Health

Learning objectives:

- Recognize the role of percutaneous cholecystostomy tube (PCT) placement in high-risk acute cholecystitis patients.
- Understand the significance of pre-procedural abdominal CT imaging in tailoring gallstone removal procedures/device selection.
- Identify the techniques and devices used in gallstone removal, emphasizing the concept of combining approaches for safe and effective stone removal

Background:

The primary treatment for acute cholecystitis is cholecystectomy, but some high-risk patients may require PCT placement to alleviate the pressure behind the obstruction and drain bile temporarily. However, these tubes can lead to complications and may become permanent, especially if the patient is a poor surgical candidate at baseline. Lithotripsy, among other techniques, offers an alternative treatment to break up and remove the stones to facilitate tube removal, reducing complications and morbidity. Our poster presents an algorithm for gallstone removal in patients with PCTs and discusses some of the complications that can arise when using these devices.

Brief Clinical Findings/Procedural Details:

A traditional pre-procedural assessment is used to determine a patient's suitability for stone removal. In addition to this traditional workup, abdominal CT imaging is essential to assess gallstone characteristics and plan the intervention path based on patient anatomy. After the characterization of the gallstone, an algorithmic approach can be used, with different approaches based on the number, size, and density of the stones for the appropriate next step. This will include devices such as disposable cholangioscope with electrohydraulic lithotripsy (EHL), nephoscope with dual-energy lithotripter, basket removal and irrigation with large sheath removal. While these devices have their own characteristics that make them advantageous, the ultimate best way for removal of the gallstones is a combination of the devices to create the optimal size and shape of the stone for removal from the patient.

Additionally, as no procedure is without its complications, some complications can be minimized using the aforementioned pre-procedural evaluation. Regardless, complications do arise, including the well know risks such as biliary colic, leakage of bile, and infection such as bacteremia. Somewhat unique to stone removal is dislodgment of the stone into the common bile duct, resulting in choledocholithiasis, which may require additional interventions to manage.

Conclusion:
In conclusion, chronic cholecystectomy tubes can significantly impact a patient's quality of life, emphasizing the need for alternative solutions when surgery is not an option. Lithotripsy offers a promising approach to help remove these tubes, relieving patients of this burden. It's important to recognize that the best treatment strategy may not be one-size-fits-all; instead, it often involves a combination of multiple techniques working together to safely remove the stones.

1. Learning Objectives
    a. Understand the burden of having a cholecystostomy tube
    b. Treatment options for acute cholecystic
    c. Different options for removal of stones
2. Background

The primary treatment for acute cholecystitis is a cholecystectomy, which can be performed as an open procedure or laparoscopically, with the latter being the preferred minimally invasive approach. However, patients may be deemed too high-risk for surgery due to underlying medical conditions, making the best option for treatment a percutaneous cholecystotomy tube placement which involves insertion of a tube through the skin and into the gallbladder to drain bile and relieve inflammation until the patient's overall health improves, allowing for a safer surgical intervention.

Once placed, these tubes can be burdensome to the patients they are meant to help. This can lead to an increased risk of infection, irritation, dislodgment, and general difficulty with activities of daily living. Many of these risk factors may never improve, leading to permanence of the ‘temporary’ tube unless there is a way to remove the obstructing stone.

Litotripsy, an intervention that uses shock waves to typically fragment radiolucent kidney stones is an alternative treatment to address these patients' gallstones and finally remove their tubes. Furthermore, it has been found to reduce surgical complications, length of hospital stays, costs, and patient recovery time. In this educational poster, we will present an algorithm for lithotripsy as an effective means of removing the necessity for permanent tubes in the treatment of cholecystitis.

3. Clinical Findings/Procedure Details

An in-depth patient pre-procedural workup is imperative to ensure the patients are appropriate candidates for lithotripsy. This workup should include a medication review, basic blood work (e.g. CBC, CMB, with liver enzymes and renal function) and pertinent patient medical history including coagulation studies with PT/INR and platelet count to assess the patient’s risk of clotting complications such as prolonged bleeding. In situations where a patient presents with a low platelet count, correction with platelet transfusion may be appropriate before proceeding with the procedure. Confirmation of negative underlying biliary sepsis should be confirmed prior to patients undergoing the procedure. In instances where a patient presents with biliary sepsis treatment can occur once the sepsis is treated.

Additionally, in patients presenting with liver dysfunction and ascites, prophylactic paracentesis should be performed.

Pre-procedural imaging such as an abdominal CT is necessary to review the size, number, quality, and density of the calculi. After this initial assessment is performed, a plan for the path of the patient's intervention should be determined in accordance with the patient's anatomy. Physical examination of the patient post-CT review should also be completed to assess for any additional anatomical considerations which may be hard to appreciate via the CT imaging.

No procedure has absolutely no risk of complication. In the case of gallstone lithotripsy complications can be minimized through the use of the aforementioned pre-procedural evaluation. Regardless, it is important to appreciate biliary colic (reported in 35% of treated patients), leakage of bile, and infection such as bacteremia and/or tract/tube infection as potential complications. Additionally, patients may develop choledocholithiasis or experience damage to surrounding anatomical structures.

a. Preprocedural workup
    i. Review of pertinent patient medical history including:
        1. Coagulation studies with (PT/INR)
        2. Platelet count and correction, if time permits
        3. Treatment of any underlying biliary sepsis
        4. Liver dysfunction and prophylactic pericentesis in cases where patients associated ascities
    ii. Typical bloodwork, med review
    ii. Preprocedural CT to assess for:
        1. Size
        2. Number
        3. Density, radiolucent calculi shown to be more conducent to treatment
        4. Surrounding structures/path
    iii. Post-imaging physical patient examination
        1. Review of patients anatomy in accordance with pre-procedural imagaing to ensure a safe percutaneous route is identified and colonic interposition can be avoided
b. Potential complications
    i. Billary colic-reported in 35% of treated patients
    ii. Leakage of bile
    ii. Infection -chocystitis, cholangitis, common bile duct obstruction and pancreatitis are infrequent
        1. Bacteremia
        2. Tract/tube infection
    iii. Choledocholithiasis
    iv. Damage to surrounding structures

c. Procedure
    i. Clinic findings/procedures details/algorithm
        1. Type of devices
        2. Algorithm
        3. Can get all the stones out in one session.
d. Post procedure
    i. Antibiotics
    ii. Pain
    iii. Capping trial for 2-4 weeks, then if asymptomatic, can DC the tube

Post Procedure

Once the intervention is complete, patients should be monitored for a few hours to ensure stability prior to discharge. Patients should be given antibiotics to help reduce potential infection and be assessed for level of pain.

4. Conclusion and/or Teaching Points
    a. Chronic chole with a tube can be very debilitating for patients
    b. Lithotripsy provides a path for patents to have their tube removed
    c. Best treatment is not a one fits all but a combination of multiple techniques in conjunction
        i. No one technique is best for every patient
    d. The best way to clear the stone is to keep the stone as large as it can be and safely removed.

- How to approach
- Use of trilogy lithotripser.
    - Paper froma momnoth or two agon
        - Shockpulse
            - Urilogic device
    - One extra thing it does
        - Deveilve the ballistic energy, then suction into the probe tip then a ultrasound that dissolves the stone into powerder
            - Shortens the procedures time by 30-40 for kidney stones.
    - How to use..
- Clinic findings/procedures details/algorithm
    - Algorithm
        - Multiple tiny stones
        - 1-2mm stone
            - EHL
        - Clacified stone and larger
            - Trilogy lithotripser
                - Then if managemeble, EHL

- Other techniques
    - Can also use a basket, and pull and break it up and then irrigate it out.

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