Intraoperative Cholangiogram (IOC)

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Indications

Definition

- Intraoperative Fluoroscopic X-Ray Imaging with Contrast Through the Bile Ducts
- Goals: [1]
    - Identify Bile Duct Stones
    - Clarify Biliary Anatomy
    - Prevent Bile Duct Injuries

Indications [2]

- Choledocholithiasis Diagnosed Preoperatively
- Concern for Possible Choledocholithiasis
    - Jaundice
    - Gallstone Pancreatitis
    - Elevated Liver Function Tests
    - Dilated Common Bile Duct > 5-7 mm
    - Dilated Cystic Duct > 3 mm
    - Multiple Small Stones in the Gallbladder
    - Presumed Choledocholithiasis that Passed (Marginal Improvement in Labs)
- Need to Delineate Unclear Ductal Anatomy
- Concern for Possible Bile Duct Injury or Leak
    - Allows Earlier Recognition of Injury
    - Prevents Complete CBD Transection (Does Not Prevent Injury)

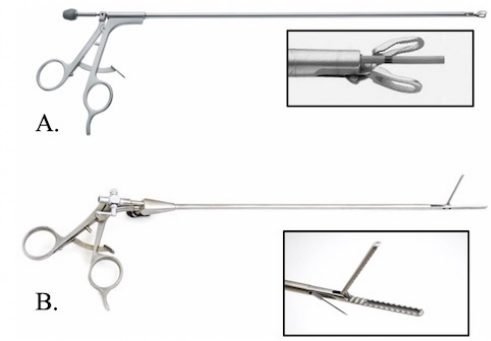
Routine vs Selective Use [3,4]

- Routine Use is Controversial – Evidence is Insufficient
    - Currently Considered Not Mandatory, Although Practice May Improve Outcomes in More Challenging Cases
- Should Be Used Liberally Regardless
- Likelihood of Finding an Unsuspected Stone: 3-7% [5]

Technique

Clamps

- *Olsen Clamp* – Clamp onto the Cystic Duct with a Blunt Catheter Extending Out of the Center of the Clamp
- *Kumar Clamp* – Clamp onto the Infundibulum with a Sharp 19 ga Needle Extending Out of the Side of the Clamp
- *No Evidence to Suggest that Any Technique is Superior to the Another



Cholangiocatheter: (A) Olsen Clamp, (B) Kumar Clamp [6]

Olsen Clamp Technique

- Obtain the Critical View of Safety as Normal
- Place a Clip Proximally Across the Junction of the Gallbladder Infundibulum & Cystic Duct
    - Prevents Reflux of Contrast into the Gallbladder
- Make a Transverse Incision (Ductotomy) Through Cystic Duct
    - Large Enough to Accommodate the Catheter but Not a Total Transection
- Milk Duct Contents Back Through the Ductotomy
- Introduce Cholangiocatheter Through the Clamp into the Ductotomy
    - Clamp Around the Ductotomy While the Catheter is Inside
- Inject Contrast Under Continuous Fluoroscopic Visualization
- Intervention as Indicated
- Close Ductal Stump
    - Generally Recommended to Use an Endoloop (Not Clips) to Minimize the Chance of Leak
- Complete Cholecystectomy

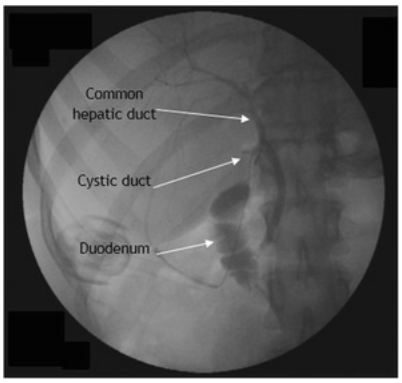
Kumar Clamp Technique

- Dissect the Gallbladder to Clear Around the Neck
- Milk the Cystic Duct Toward the Gallbladder
- Clamp the Gallbladder Neck with the Kumar Clamp

- Pass the Cholangiocatheter with Needle Through the Clamp and Penetrate the Gallbladder Wall
- Inject Contrast Under Continuous Fluoroscopic Visualization
- Intervention as Indicated
- Complete Cholecystectomy

Requirements for an Appropriate Cholangiogram [2]

- Correct Biliary Anatomy
- Free Flow into the Duodenum
- No Evidence of Filling Defects
- Retrograde Filling of the Right and Left Hepatic Ducts

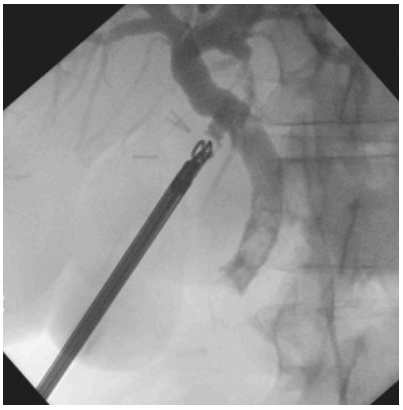


Appropriate Visualization on IOC [7]

Management of Findings

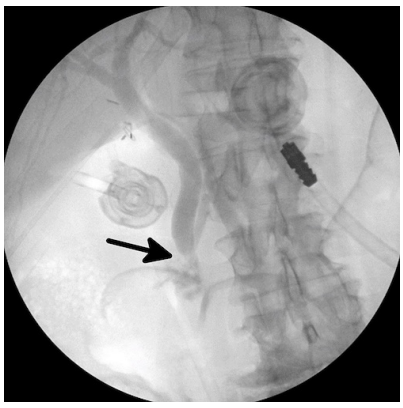
Choledocholithiasis

- Findings: Filling Defect or No Drainage into the Duodenum
- Initial Approach: Flush
  - Give Glucagon (1.0 mg)
  - Wait 2 Minutes
  - Flush with 100-200 cc Saline
  - Repeat Cholangiogram to Evaluate Clearance
  - *Can Repeat A Second Time if Needed
- Options if Fails:
  - Common Bile Duct Exploration
    - *See Common Bile Duct Exploration (CBDE)
  - Postoperative ERCP


IOC with Filling Defects – Concerning for Choledocholithiasis [8]

Common Hepatic Duct Injury

- Findings: Common Bile Duct Fills with No Retrograde Filling of the Common Hepatic Duct
  - Similar Image Seen if Cholangiocatheter is Just Advanced Too Far into the Common Bile Duct
- Initial Steps: Position in Trendelenburg, Partially Retract the Cholangiocatheter, and Reimage
- Options if Reimaging Still Fails to See the CHD:
  - Convert to an Open Procedure to Better Visualize Anatomy and Evaluate for Injury
  - Damage Control – Close and Transfer to a Higher Level of Care


IOC with Obstruction at the Ampulla – Concerning for Choledocholithiasis [9]

Extraluminal Contrast with No Ductal Filling

- Catheter Possibly Dislodged
- Reevaluate Placement

References

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