MDCT of Gallbladder Cancer

Gory Ballester Ortiz, MD
Director, Diagnostic Radiology Residency Program
Councilor, ACR PR Chapter

Nov 7, 2014
Disclosures

- Nothing to disclose.
OUTLINE

• Objectives
• Background
• Clinical presentation
• Imaging
• Protocol and technique
• Imaging findings
• Staging
• Differential diagnosis
• Treatment
• Conclusion
OBJECTIVES

1. To review the epidemiology, risk factors and clinical features of gallbladder carcinoma.

2. To describe MDCT protocol to evaluate patients with gallbladder carcinoma.

3. To review the staging of gallbladder carcinoma.

4. To demonstrate the usefulness of MDCT for evaluation of patients with gallbladder carcinoma.
Most common malignancy of the biliary tree.

5th most common GI cancer (after colon, pancreas, stomach, liver, and esophagus).

60% located in the GB fundus; body (30%) and neck (10%).
Women are 2-6 times more commonly affected than men.

Older population; > 65 years.

Highest number of cases in Chile and Bolivia.
  Others are Japan, India, and Israel.
Risk factors

- Cholelithiasis (cholesterol stones): most common risk factor.
- Other risk factors:
  - obesity, high-carbohydrate diet, alcohol use, smoking
- Less common risk factors
  - Congenital biliary cysts, infectious factors (Salmonella typhi), primary sclerosing cholangitis (PSC), genetic factors.
Pathophysiology:

- **Chronic irritation** of the gallbladder mucosa by stones.
  - Gallstones in 74% to 92% of patients with GB CA.

- **Stepwise progression** from dysplasia to carcinoma
  - Chronic inflammation - eventual repetitive epithelial repair - epithelial dysplasia - carcinoma in situ - invasive carcinoma
    - 5 to 15 years of progression.

Most GB tumors are **adenocarcinomas** (85%).
GB CA: Clinical Presentation
Clinical Presentation

- Usually insidious.
  - Early-stage is typically diagnosed incidentally on pathologic review of cholecystectomy specimens.

- Early clinical presentation:
  - RUQ pain and symptoms indistinguishable from cholecystitis.

- Other presenting symptoms:
  - Chronic abdominal pain, anorexia, unintentional weight loss, jaundice, hepatomegaly, and palpable mass.
    - Poor prognostic signs and usually indicate advanced disease.
Clinical Presentation

• Bowel obstruction and fistulous communication may occur.

• Left supraclavicular and periumbilical adenopathy
  • Signs of advanced disease.

• Labs:
  • ↑ bilirubin, transaminase, and γ-glutamyl transpeptidase in advanced cases, which present with obstructive jaundice.
  • CA19-9 and CA125 serum markers can be elevated.
    • Not recommended for screening.

• Mean survival rate: 6 months

• 5-year survival rate: 5% for nonresected GB CA.
• Main role of imaging in GB CA:
  • Size and location of the primary mass
  • Extent of disease
  • Relationship to adjacent organs
  • Depth of hepatic parenchymal invasion and liver metastases
  • Regional and distant nodal metastases
  • Distant metastases
Protocol and Technique

Surgical staging

- 150 ml of IV iodinated contrast at 5 ml/sec.

- Contrast bolus tracking
  - Monitoring the aorta at the level of the celiac artery until 100 HU; this takes roughly 20 seconds.

- Multiphasic liver protocol
  - Precontrast
  - Late arterial phase: obtained 13 sec after threshold
  - Portal venous phase: obtained 60 sec after threshold
  - Delayed phase: obtained 90 sec after threshold
Nonsurgical staging

- Advanced GB CA **does not** require a multiphase study.

- Pre-contrast scan through the liver and kidneys
  - 5-mm collimation acquisition reconstructed at 2.5-mm intervals.
  - Evaluated to detect fatty infiltration of the liver, calcifications, and calcified gallstones.

- Post-contrast scan from the diaphragm to the ischial tuberosities after a **60-second delay**.

- IV injection: 100-150cc of at 3 ml/sec.
5 subtypes of GB CA (based on gross morphologic appearance)

- Papillary (best prognosis)
- Nodular
- Filling
- Flat
- Massive (most common)
Papillary Gallbladder Carcinoma
Flat Gallbladder Carcinoma
Massive Gallbladder Carcinoma
GB CA: Staging
American Joint Committee on Cancer (AJCC) for GB CA:

- **T1:**
  - **T1a:** Tumor invades the lamina propria.
  - **T1b:** Tumor invades the muscle layer.

- **T2:** Tumor invades the perimuscular connective tissue but does not extend beyond the serosa.

- **T3:** Tumor perforates the serosa and directly invades the liver (<2 cm) or 1 other adjacent organ or structure
  - Such as the bile duct, colon, duodenum, or pancreas.

- **T4:** Tumor invades the liver (>2 cm), main PV or HA or multiple (2 or more) adjacent organs and structures.
• MDCT not very useful for T-staging except to discriminate between T3 and T4 tumors.
  • Limited contrast resolution.
  • MPR will improve the accuracy of T staging of GB CA.

• MDCT sensitivity for advanced disease (T4):
  • Approaching 100%

• MDCT sensitivity for T3 disease:
  • 65% to 79%
GB CA Staging – Primary Tumor (T)

- Direct extension to adjacent organs
  - Most common method of tumor spread.
  - GB wall has a thin single muscle layer and a narrow lamina propria.
  - Liver is the organ most commonly involved (65% of cases).
  - Tumors of the GB fundus and body have a propensity to invade segments IVb and V at an early stage.
Invasive Gallbladder Carcinoma – T4
Advanced Gallbladder Carcinoma
GB CA Staging – Primary Tumor (T)

• Tumor extension to adjacent organs, bile ducts, or vessels
  • Disruption of fat planes between the tumor and the adjacent structures.
  • Bile duct and the PV are commonly involved by direct tumor extension.

• Biliary dilatation secondary to GB CA
  • Tumor spread along the cystic duct.
  • Extrinsic mass effect from tumor infiltration.
  • Enlarged nodes causing mass-effect.
Gallbladder Carcinoma: Vascular Invasion
Vascular Information

• MDCT imaging criteria to determine vascular invasion:
  • Occlusion
  • Irregular luminal narrowing
  • Loss of the fat plane between the tumor and the vessel wall with tumor encasing > 180 degrees of vessel circumference.

• PV and HA invasion:
  • Extremely important for proper staging and surgical planning of hepatobiliary cancers.
  • Encasement or occlusion of the main PV or HA, or involvement of the PV contralateral to the 1ry tumor, constitutes criteria for irresectability in most institutions.
Vascular Information

• MDCT is accurate for the **preoperative vascular evaluation** of patients with hepatobiliary neoplasms.

• Variant vascular anatomy
  • Recognition and adequate description is **crucial**.
  • Major role in **determining resectability**.

• Most common vascular variants
  • Replaced right HA from the SMA
  • Accessory right HA
  • CHA replaced from the SMA
  • Replaced left HA from the left gastric artery
  • Main PV trifurcation
Replaced Right Hepatic Artery from Superior Mesenteric Artery
Accessory Right Hepatic Artery from Superior Mesenteric Artery
Accessory Right Hepatic Artery from Common Hepatic Artery
Replaced Left Hepatic Artery from Left Gastric Artery
Colon and duodenum involvement

- Infiltration of the normal low-density pericolonic fat by soft tissue with obliteration of vessels.

- Wall thickening with possible luminal narrowing.
  - Eventual obstruction may occur.
Gallbladder Carcinoma: Duodenal Invasion
Gallbladder Carcinoma: Colonic Invasion
The prevalence of lymphatic metastases in GB CA exceeds 70% in some series.

- **N1**: Cystic, pericholedochal, periportal, HA, PV and hepatoduodenal node.

- **N2**: Celiac, superior mesenteric, peripancreatic, pericaval, paraortic nodes.
GB CA Staging – Nodal Disease (N)

- MDCT detection of metastatic adenopathy will assist in the staging.
  - Based on size and internal imaging features of the nodes.
  - Nodes > 1 cm in short axis likely malignant.
  - Nodes with a low attenuation center indicating central necrosis also likely to harbor metastatic disease.

- MDCT in the detection of positive nodes
  - 36% for N1 nodes; 47% for N2 nodes.
  - High specificity for N1 and N2 nodal stations.
Lymphatic Spread: N1
Lymphatic Spread: N1
Lymphatic Spread: N2
Metastatic Disease (M)

- **Hematogenous metastases** of GB CA
  - Most commonly to the liver.
    - Multifocal areas of low attenuation in relation to the adjacent hepatic parenchyma, usually with a peripheral rim of contrast enhancement.
  - Metastases to lungs, bones, kidneys, adrenals, and brain occur less frequently.

- **Peritoneal spread** of GB CA (common)
  - Discrete nodules and fat stranding of the low-attenuation peritoneal fat
  - Detection may be challenging
Hematogenous Metastases
Peritoneal Metastases
GB CA: Differential Diagnosis
DDx: Cholelithiasis and GB CA
DDx: Adenomyomatosis
DDx: Gallbladder Polyps
GB CA: Treatment
Treatment Response and Recurrence

• Careful assessment after therapy
  • For residual disease.
  • Any evidence of complications.

• **Seroma:** Nonenhancing fluid collection at the resection margin.
  • Normal finding following surgery.
  • Should progressively decrease in size on serial follow-up examinations.
  • Decreases in size after 3-6 months but may never completely disappear.
  • If a catheter is left in the surgical bed, small pockets of air may be present.
Treatment Response and Recurrence

- Abscess
  - Increasing amounts of fluid and gas.
  - Thick rim of peripheral enhancement.
  - Progressive stranding of the adjacent fat.

- Abscess versus postoperative seroma or hematoma
  - Correlation with clinical suspicion.
  - Can be challenging during the perioperative period.
Post Surgical Abscess
Treatment Response and Recurrence

• Normal postsurgical findings
  • Infiltration of the peritoneal fat in the operative bed.
  • Focal areas of fat necrosis.
  • Should not be misinterpreted as recurrent disease.
Treatment Response and Recurrence

- Peritoneal metastasis
  - Soft tissue attenuation that increases in size 3-6 months following surgery.
  - To be followed closely on subsequent imaging studies.
  - Careful attention to:
    - Resection margin in the liver
    - Tract of previous drainage catheters
    - Laparoscopic ports tracts
    - Abdominal wall wound
Recurrent Gallbladder Carcinoma
Recurrent Gallbladder Carcinoma
CONCLUSIONS

• MDCT has had a major impact on the pre- and post-operative assessment of GB CA.
  • Accurate technique to determine resectability of GB CA.
    • vascular invasion, adjacent organ invasion, peritoneal involvement and metastases

• Knowing the imaging features and patterns of spread of disease is also crucial for proper diagnosis, staging, and early detection as well.
REFERENCES

REFERENCES


Save the Date

• Congreso anual SRPR-ACR 2015
  • Mayo 1-3, 2015
  • Wyndham Grand Riomar Beach Resort & Spa, Rio Grande
  • Neuro, MSK, Torax, Cuerpo, IR
  • Todas las charlas en español.
    • info@socrad.com
    • socrad@serrrayserra.com
    • www.socrad.com
THANK YOU!

Questions???

goryballester@gmail.com
gory.ballester@upr.edu