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Key Words

Gallbladder wall thickening, CT, MRI, gallbladder carcinoma, cholecystitis, adenomyomatosis

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Benign versus Malignant Gallbladder Wall Thickening: Cross-Sectional Imaging Insights

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ABSTRACT

Gallbladder wall thickening is a frequently encountered imaging finding with both benign and malignant etiologies. Accurate differentiation is essential due to significant differences in management and prognosis. This study synthesizes computed tomography (CT) and magnetic resonance imaging (MRI) features that aid in distinguishing benign from malignant gallbladder wall thickening. Key parameters analyzed include mural pattern, enhancement characteristics, intramural cysts, diffusion restriction, and extramural findings. Statistical evaluation demonstrates characteristic imaging patterns.

INTRODUCTION

Gallbladder wall thickening, defined as mural thickness exceeding 3 mm, may result from a broad spectrum of etiologies. While acute cholecystitis and adenomyomatosis are common benign causes, gallbladder carcinoma represents the most frequent malignant etiology. Systemic conditions such as cirrhosis and congestive heart failure can also produce smooth, diffuse wall thickening^[1,2,6,7].

Cross-sectional imaging, particularly CT and MRI, provides high diagnostic accuracy by characterizing mural morphology, enhancement patterns, and associated findings^[2,3,5].

Aim:

- To evaluate CT and MRI features that differentiate benign from malignant gallbladder wall thickening.
- Objectives:
- To describe CT/MRI features of benign gallbladder wall thickening
- To describe CT/MRI features of malignant gallbladder wall thickening
- To identify key differentiating imaging features

Table 2: Distribution of Benign and Malignant Etiologies

Etiology	Cases (n)
Acute cholecystitis	20
Adenomyomatosis	12
Systemic causes	6
Gallbladder carcinoma	16
Metastasis	4
Lymphoma	2

Table 3: Comparison of CT and MRI Features in Benign vs Malignant Gallbladder Wall Thickening

Feature	Benign	Malignant
Pattern of thickening	Diffuse, symmetric	Focal, asymmetric
Enhancement pattern	Layered, uniform	Irregular, heterogeneous
Mural stratification	Preserved	Disrupted
Intramural cysts	Present (adenomyomatosis)	Absent
Diffusion restriction	Absent or mild	Present (marked)
Extramural findings	Pericholecystic edema	Hepatic invasion, lymphadenopathy

MATERIALS AND METHODS

This retrospective observational study included 60 patients with gallbladder wall thickening. All underwent contrast-enhanced CT and MRI including T1, T2, DWI, and post-contrast sequences.

Parameters assessed included mural thickness, symmetry, enhancement, stratification, intramural cysts, diffusion restriction, and extramural spread. Diagnosis was confirmed by histopathology or follow-up^[2,5].

RESULTS

A total of 60 patients with gallbladder wall thickening were included. There was a slight male predominance (56.7%) with a mean age of 52.3 years (Table 1). Benign etiologies accounted for 38 (63.3%) cases, whereas malignant etiologies accounted for 22 (36.7%) cases (Table 2, Figure 8). Acute cholecystitis was the commonest benign etiology and gallbladder

Table 1: Patient Demographics

Parameter	Number (n=60)	Percentage
Males	34	56.7
Females	26	43.3
Mean Age	52.3 years	-

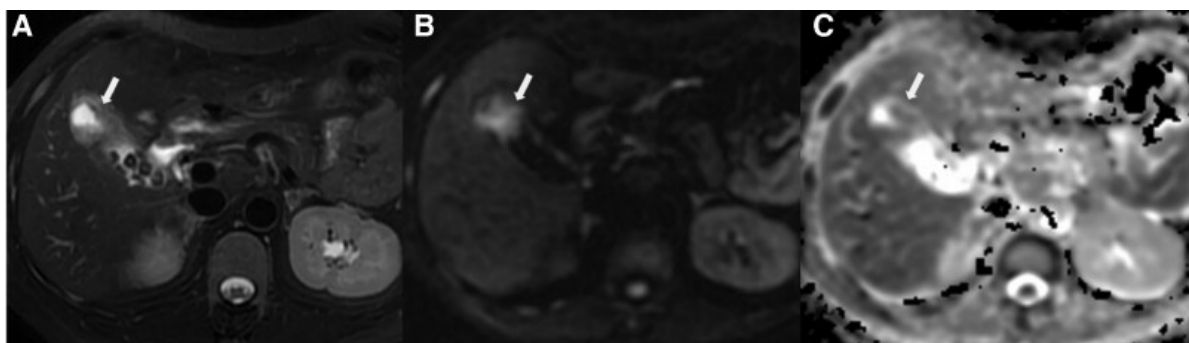


Figure 1(a-c): Moderately to poorly differentiated gallbladder adenocarcinoma in a 59-year-old female, (a) T2WI fat-sat shows focal fundal wall thickening without layered appearance and papillary growth, (b) DWI demonstrates localized hyperintensity, (c) ADC map shows corresponding hypointensity, confirming non-layered thickening

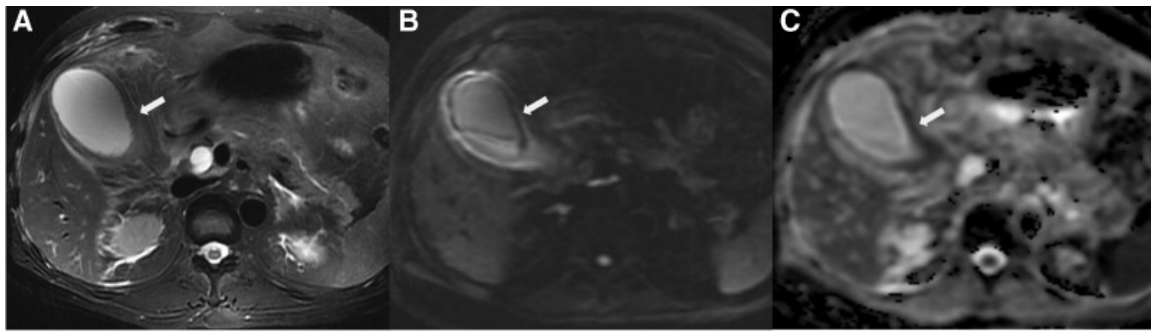


Figure 2(a-c): Acute gangrenous cholecystitis in a 53-year-old male, (a) T2WI fat-sat shows diffuse wall without hypointensity layering, with papillary change from mucosal irregularity, (b) DWI demonstrates diffuse hyperintensity with layered pattern, (c) ADC map shows corresponding layered hypointensity in the gallbladder neck

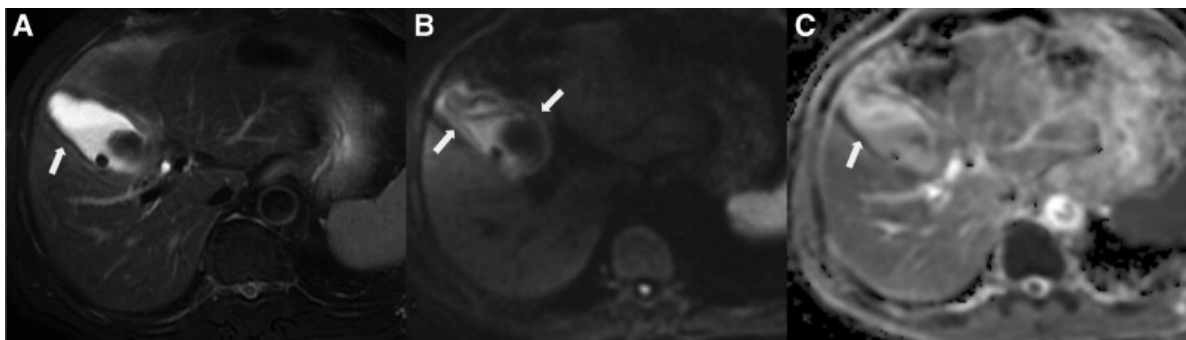


Figure 3(a-c): Xanthogranulomatous cholecystitis (XGC) in a 60-year-old male, (a) T2WI fat-sat shows diffuse gallbladder wall thickening without layered appearance, with inner margin hypointensity and no papillary growth, (b) DWI demonstrates diffuse hyperintensity with layered appearance, (c) ADC map reveals inner margin hypointensity

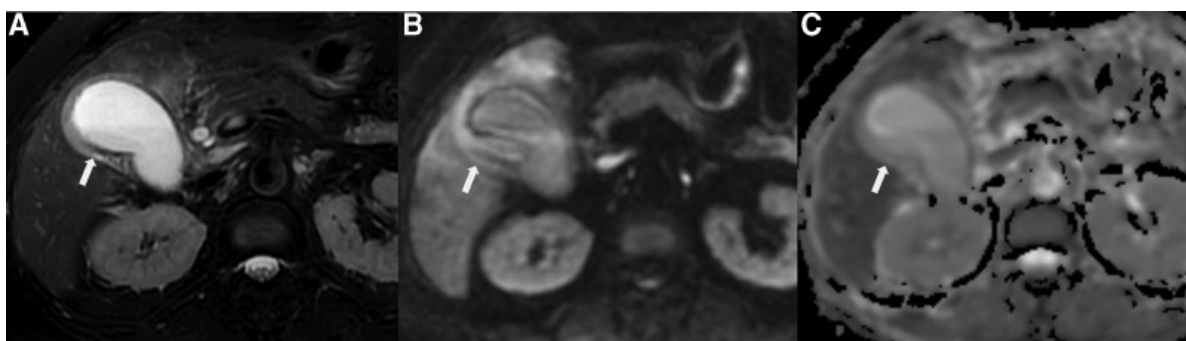


Figure 4(a-c): Acute-on-chronic cholecystitis in a 69-year-old female, (a) T2WI fat-sat shows diffuse gallbladder wall thickening with layered appearance; inner wall hypointensity and outer wall hyperintensity are seen, without papillary change, (b) DWI demonstrates diffuse hyperintensity with layered appearance, (c) ADC map clearly depicts the layered hypointense pattern

carcinoma was the commonest malignant lesion (Figure 9). Benign lesions demonstrated diffuse symmetric wall thickening with preserved mural stratification, whereas malignant lesions showed focal

asymmetric thickening, heterogeneous enhancement, diffusion restriction and extramural invasion (Table 3). Representative cases are shown in Figures 1–7.



Figure 5(a-b): Gallbladder carcinoma (wall-thickening type) with hepatic infiltration in a 70 years male, (a) Axial CECT shows focal fundal wall thickening infiltrating the adjacent liver parenchyma, (b) Axial CECT abdomen demonstrates diffuse heterogeneous circumferential gallbladder wall thickening with liver invasion

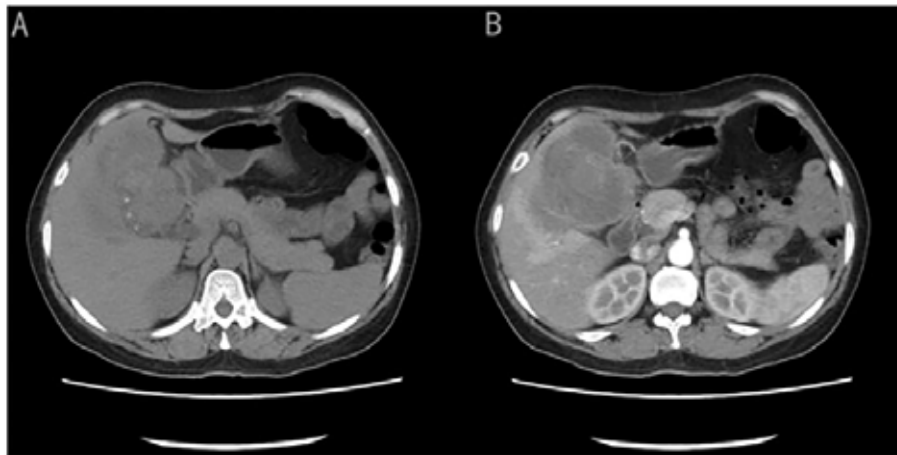


Figure 6(a-b): Gallbladder carcinoma presenting as a mass lesion in a 68 years male, (a) Axial CT shows an irregular gallbladder with a mixed hypodense mass, (b) Contrast-enhanced CT showing heterogeneous enhancement of the mass



Figure 7: Pancreatitis with secondary gallbladder involvement in a 56-year-old male. Contrast-enhanced CT shows peripancreatic inflammatory changes and secondary gallbladder wall thickening due to adjacent inflammation

Proportion of Benign vs Malignant Etiologies

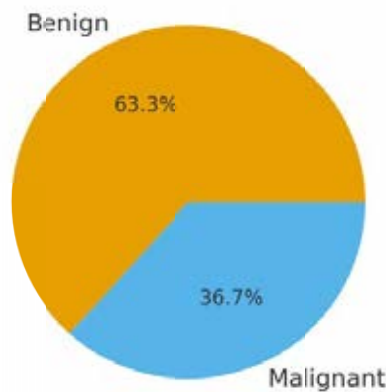


Figure 8: Pie chart showing proportion of benign versus malignant gallbladder wall thickening cases

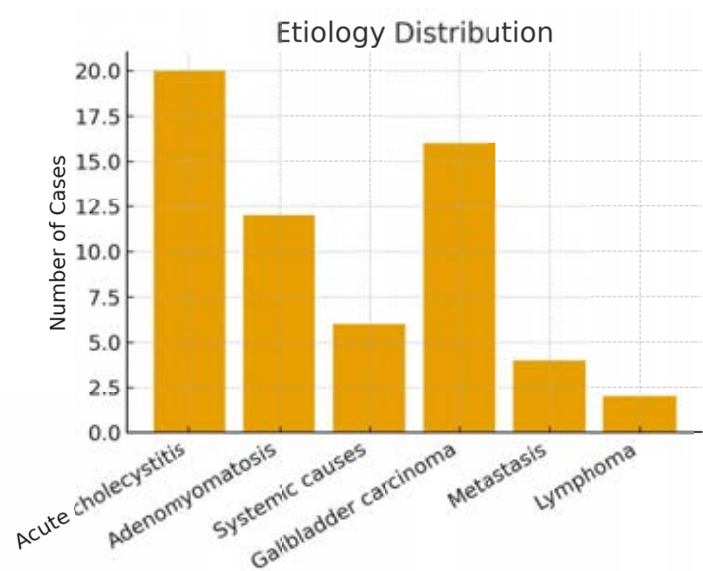


Figure 9: Bar chart showing distribution of specific benign and malignant etiologies

DISCUSSION

Benign thickening typically shows preserved mural stratification, smooth contours, and layered enhancement. Adenomyomatosis demonstrates intramural cysts. Malignant thickening is usually focal, irregular, with heterogeneous enhancement and loss of layering. Diffusion restriction and extramural invasion favor malignancy, though inflammation can mimic these findings^[2-5,10].

CONCLUSION

CT and MRI are essential in differentiating benign from malignant gallbladder wall thickening. Systematic evaluation improves diagnostic accuracy and guides appropriate management^[2,3,5,9].

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