IMMUNOHISTOCHEMICAL CHARACTERISTICS OF CD68, Ki-67 AND VEGF EXPRESSION IN CHRONIC CALCULOUS CHOLECYSTITIS IN OBESE PATIENTS

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ARTICLE INFO

Received: 8th May 2026
Accepted: 11th May 2026
Online: 20th May 2026

KEYWORDS

ABSTRACT

The growing prevalence of obesity has become a major challenge for modern healthcare systems worldwide. Excess adipose tissue is now recognized not only as an energy storage organ but also as an active endocrine structure involved in chronic inflammatory reactions. Obesity significantly contributes to the development of hepatobiliary diseases, including gallstone formation and chronic calculous cholecystitis. Altered lipid metabolism, bile supersaturation with cholesterol, and impaired gallbladder motility create favorable conditions for persistent inflammatory injury within the gallbladder wall.

Introduction

Continuous inflammation causes progressive tissue remodeling accompanied by fibrosis, epithelial degeneration, vascular impairment, and stromal alterations. In recent years, immunohistochemical methods have provided new opportunities for investigating cellular and molecular mechanisms underlying chronic inflammatory disorders. Among the most informative biomarkers, CD68 reflects macrophage accumulation, Ki-67 indicates proliferative activity, and VEGF demonstrates angiogenic potential within affected tissues. Evaluation of these markers may clarify the relationship between obesity and structural damage of the gallbladder.

Aim of the study

To investigate morphological and immunohistochemical alterations of the gallbladder wall in chronic calculous cholecystitis associated with obesity through the assessment of CD68, Ki-67, and VEGF expression.

Materials and methods

The study was based on gallbladder specimens obtained from 45 patients diagnosed with chronic calculous cholecystitis who underwent planned cholecystectomy. According to body mass index (BMI), the patients were categorized into three groups: individuals with normal body weight, patients with grade I–II obesity, and patients with grade III obesity.

Routine histopathological examination was performed using hematoxylin-eosin and Masson's trichrome staining. Special attention was paid to inflammatory infiltration, connective tissue proliferation, vascular abnormalities, and epithelial integrity. Immunohistochemical staining was conducted with monoclonal antibodies against CD68, Ki-67, and VEGF. The intensity of staining and percentage of positive cells were analyzed semi-quantitatively.

Results

Morphological examination demonstrated that obesity was associated with more severe structural changes in the gallbladder wall. Patients with advanced obesity exhibited extensive inflammatory infiltration, diffuse fibrosis, edema of stromal tissues, and microvascular disturbances. Degenerative changes of the muscular layer were observed more frequently in obese individuals compared with patients of normal body weight.

High CD68 expression was predominantly identified in macrophage-rich inflammatory infiltrates, indicating increased activation of immune-inflammatory mechanisms. The number of CD68-positive cells markedly increased in patients with severe obesity, suggesting enhanced chronic inflammatory activity.

Ki-67 immunoreactivity was mainly localized in epithelial cells of the mucosal layer. Increased proliferative activity was detected in obese patients, reflecting accelerated regenerative processes in response to persistent tissue damage and chronic inflammation.

VEGF expression was strongly pronounced in endothelial and stromal cells in patients with grade III obesity. Enhanced VEGF activity indicated active angiogenesis and adaptive vascular remodeling associated with tissue hypoxia. Increased vascular density in affected areas additionally confirmed activation of angiogenic pathways.

Correlation analysis revealed a direct relationship between obesity severity and the level of immunohistochemical marker expression. These findings suggest that obesity substantially influences the progression and morphological severity of chronic calculous cholecystitis.

Conclusion

Chronic calculous cholecystitis in obese patients is characterized by intensified inflammatory infiltration, enhanced epithelial proliferation, and active angiogenesis within the gallbladder wall. Elevated expression of CD68, Ki-67, and VEGF reflects the severity of pathological remodeling processes and may serve as a valuable diagnostic tool in morphological evaluation of the disease. Immunohistochemical assessment of these markers improves understanding of the pathogenetic mechanisms associated with obesity-related gallbladder pathology.

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