Alqalam Journal of Medical and Applied Sciences. 2026;9(1):306-311
https://doi.org/10.54361/ajmas.269148

Case series

Hepatic Steatosis and Cirrhosis in Bariatric Surgery Patients: Intraoperative Decision-Making and Postoperative Outcomes

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Abstract
The global increase in morbid obesity has been accompanied by a rising prevalence of non-alcoholic fatty liver disease (NAFLD), which may progress silently to non-alcoholic steatohepatitis, advanced fibrosis, and cirrhosis. Bariatric surgery is the most effective treatment for obesity-related metabolic disease; however, malabsorptive procedures such as Roux-en-Y gastric bypass may confer increased perioperative risk in patients with impaired hepatic reserve. To report a series of bariatric surgery candidates in whom advanced fatty liver disease or cirrhosis was unexpectedly identified intraoperatively and to highlight the subsequent surgical decision-making process favoring safer operative alternatives. This case series includes three female patients aged 43 to 52 years with body mass indices ranging from 38 to 44 kg/m² who were scheduled for Roux-en-Y gastric bypass. Preoperative laboratory, radiological, and endoscopic evaluations were normal or demonstrated only minimal abnormalities. In all cases, intraoperative inspection revealed macroscopic features suggestive of advanced fatty liver disease or cirrhosis, prompting immediate intraoperative liver biopsy for histopathological confirmation. Histopathological analysis confirmed advanced hepatic pathology in all three patients. Consequently, the planned Roux-en-Y gastric bypass procedures were abandoned and converted to sleeve gastrectomy to reduce operative stress, avoid malabsorption, and minimize the risk of hepatic decompensation. Postoperative recovery was uneventful in all cases, with satisfactory early weight loss and no evidence of short-term hepatic deterioration. Sleeve gastrectomy represents a safer and effective bariatric option for patients with incidentally discovered cirrhosis or advanced fatty liver disease. This case series underscores the limitations of standard preoperative screening and highlights the critical importance of intraoperative liver assessment and biopsy in guiding individualized surgical decision-making.
Keywords. Bariatric Surgery, NAFLD, Liver Cirrhosis, Sleeve Gastrectomy.

Introduction

Non-Alcoholic Fatty Liver Disease (NAFLD) has emerged as the most prevalent chronic liver disease worldwide, paralleling the global rise in obesity, metabolic syndrome, and type 2 diabetes mellitus (T2DM) [1,2]. It represents a spectrum ranging from simple steatosis to the more progressive and clinically significant form, Non-Alcoholic Steatohepatitis (NASH), characterized by hepatocellular injury, inflammation, and varying degrees of fibrosis [3]. Over time, NASH may progress to advanced fibrosis, cirrhosis, portal hypertension, and hepatocellular carcinoma, making it one of the leading indications for liver transplantation in many countries [4,5]. A critical challenge in clinical practice is the *silent nature* of NAFLD progression. Many patients maintain normal liver enzymes and normal liver ultrasound, despite harboring significant fibrosis or cirrhosis [6,7. This diagnostic gap is even more concerning in the bariatric surgery population, as individuals with morbid obesity are at particularly high risk for advanced fatty liver disease. Several studies report that up to 10–20% of bariatric candidates have undetected significant fibrosis, while NASH may be present in 30–40%, despite unremarkable preoperative laboratory and imaging findings [8,9]. These hidden hepatic abnormalities pose important perioperative considerations. Roux-en-Y Gastric Bypass (RYGB)—although highly effective for weight loss and metabolic improvement—may carry a higher risk in patients with compensated cirrhosis, particularly due to possible portal hypertension, impaired hepatic regeneration, increased anastomotic complications, and postoperative decompensation [11,12]. Current guidelines, therefore, recommend careful patient selection and avoidance of malabsorptive procedures when cirrhosis is present. In contrast, Sleeve Gastrectomy (SG) is generally considered safer in the setting of impaired hepatic reserve because it avoids bypassing the intestine, preserves endoscopic access, and imposes minimal risk of nutrient malabsorption [13,14].

In daily bariatric practice, surgeons often rely on preoperative liver function tests and ultrasound scans as initial screening tools. However, both have limited sensitivity for detecting fibrosis or early cirrhosis [15,16. Consequently, unexpected intraoperative findings—such as nodular liver surface, firm consistency, or signs of portal hypertension—may necessitate immediate reassessment of the planned surgical procedure. Intraoperative liver biopsy remains the gold standard for confirming NASH or fibrosis when suspicion arises during surgery [17]. This case series describes three female bariatric candidates in whom advanced fatty liver disease, bridging fibrosis, or cirrhosis were unexpectedly discovered intraoperatively, despite reassuring preoperative evaluations. Their management required real-time modification of the operative plan to a safer, liver-appropriate bariatric procedure. The series emphasises the limitations of routine non-invasive assessments in morbidly obese patients and highlights the importance of intraoperative clinical judgment, multidisciplinary decision-making, and biopsy-guided surgical planning.

***Received**: 28-11-2025 - **Accepted**: 26-01-2026 - **Published**: 31-01-2026*

https://doi.org/10.54361/ajmas.269148

Case Presentations

Case 1: Incidental Early Cirrhosis Identified During Planned Bariatric Surgery

A 52-year-old woman with morbid obesity, reflected by a body mass index of 44 kg/m² and a body weight of 120 kg, presented for evaluation before bariatric surgery. She had no known chronic medical illnesses. Her past surgical history was notable for a previous Cesarean section and cosmetic liposuction. The patient reported a high consumption of sweets but denied any symptoms suggestive of underlying liver disease, including jaundice, abdominal distension, fatigue, or gastrointestinal bleeding. Preoperative assessment included routine laboratory and imaging investigations. Liver function tests were within normal limits, and abdominal ultrasonography did not reveal any abnormalities. Upper gastrointestinal endoscopy demonstrated normal findings, and there were no clinical signs indicating hepatic dysfunction. Based on her obesity profile and the absence of contraindications, Roux-en-Y gastric bypass was selected as the planned bariatric procedure.

During laparoscopic exploration, unexpected abnormalities of the liver were identified. The liver appeared firm, pale, and nodular, with an irregular surface highly suggestive of early cirrhosis. In light of these unanticipated intraoperative findings, the planned Roux-en-Y gastric bypass was aborted to avoid potential complications. An intraoperative wedge biopsy of the liver was obtained to establish a definitive diagnosis.

Given the concern for underlying liver disease and the increased risks associated with malabsorptive bariatric procedures in cirrhotic patients, the surgical strategy was modified. A sleeve gastrectomy was performed as a safer restrictive alternative, aiming to minimize operative risk while still achieving effective weight reduction.

Histopathological examination of the liver biopsy revealed multiple nodules with more than 80% macrovesicular steatosis and prominent hepatocellular ballooning, predominantly affecting zone 3 of the hepatic lobule. Intracellular infiltrates were present, consisting of polymorphonuclear cells and chronic inflammatory infiltrates, along with mild portal inflammation. Significant architectural distortion consistent with cirrhosis was observed. Masson's trichrome staining was employed to further evaluate the extent of hepatic fibrosis. The postoperative course was uneventful, and the patient did not develop signs of hepatic decompensation. Early follow-up demonstrated satisfactory initial weight loss, and liver function tests remained stable.

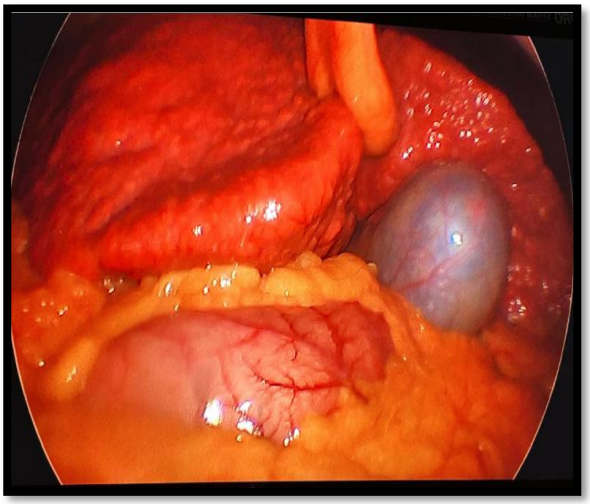

Figure 1. ***Intraoperative image showing a liver with nodular, cirrhotic appearance in Case 1.***

Case 2: Severe GERD and Hiatal Hernia with Intraoperative Discovery of Cirrhosis

A 50-year-old woman with obesity, characterized by a body mass index of 38 kg/m² and a body weight of 100 kg, presented for bariatric surgery evaluation with a primary complaint of moderate-to-severe gastroesophageal reflux disease. Her past medical history was significant for a prior gynecological myomectomy. The patient reported a dietary pattern rich in sweets and initially expressed a preference for sleeve gastrectomy as the bariatric procedure of choice.

Preoperative assessment revealed mildly elevated liver enzyme levels on laboratory testing. Radiological investigations did not demonstrate significant abnormalities, while abdominal ultrasonography showed evidence of grade 2–3 hepatic steatosis. Upper gastrointestinal endoscopy identified a large grade 3 hiatal hernia, consistent with the patient's severe reflux symptoms. In view of the severity of gastroesophageal reflux disease and the presence of a large hiatal hernia, Roux-en-Y gastric bypass combined with hiatal hernia repair was planned, as this procedure is generally considered the most effective bariatric option for reflux control. During laparoscopic exploration, unexpected liver abnormalities were observed. The liver appeared nodular with a cirrhotic morphology that was inconsistent with the findings of the preoperative evaluation. In response to these intraoperative findings, a liver biopsy was obtained for histopathological confirmation, as illustrated in (Figure 2). Given the increased perioperative risk associated with

Received*: 28-11-2025 -* ***Accepted****: 26-01-2026 -* ***Published****: 31-01-2026*

malabsorptive procedures in patients with cirrhosis, the original surgical plan was reconsidered. The hiatal hernia repair was completed successfully; however, the planned Roux-en-Y gastric bypass was abandoned. Instead, a sleeve gastrectomy was performed as a safer alternative.

Histopathological examination of the liver biopsy confirmed the presence of cirrhosis, correlating with the macroscopic intraoperative findings. The postoperative course was uneventful, with no complications observed. The patient achieved satisfactory early weight loss, and follow-up assessments demonstrated stable liver function without evidence of hepatic decompensation or progression of liver disease.

Figure 2. ***Intraoperative image demonstrating the cirrhotic liver appearance observed in Case 2, identified during laparoscopic entry before proceeding with hiatal hernia repair and Sleeve Gastrectomy.***

Case 3: Advanced Fatty Liver Disease / Fibrosis in a Patient with Long-Standing Diabetes

A 43-year-old woman with morbid obesity, reflected by a body mass index of 40 kg/m² and a body weight of 110 kg, was evaluated for bariatric surgery. Her medical history was significant for long-standing type 2 diabetes mellitus of 15 years' duration, for which she was receiving insulin therapy. Her surgical history included a previous Cesarean section and appendectomy. There were no reported symptoms suggestive of advanced liver disease at the time of presentation. Preoperative evaluation included routine laboratory investigations, which were within normal limits. Radiological assessment did not report evidence of hepatic steatosis or cirrhosis, and upper gastrointestinal endoscopy revealed no abnormalities. Additionally, there were no clinical indicators suggestive of advanced liver pathology during the preoperative assessment. Based on her obesity profile and metabolic status, Roux-en-Y gastric bypass was selected as the planned bariatric procedure.

During laparoscopic exploration, unexpected liver abnormalities were encountered. The liver was markedly enlarged, pale, and coarse in texture, with macroscopic features suggestive of advanced fatty liver disease and possible early cirrhosis. In light of these findings, an intraoperative liver biopsy was obtained for histopathological assessment, as illustrated in (Figure 3). Following intraoperative evaluation, the surgical findings and potential risks were discussed with the patient's family. Given the concern regarding hepatic vulnerability and the increased risk associated with malabsorptive bariatric procedures in the presence of significant liver disease, a decision was made, with family consent, to modify the operative plan. The initially planned Roux-en-Y gastric bypass was abandoned, and a sleeve gastrectomy was performed as a safer alternative.

Histopathological examination of the liver biopsy demonstrated extensive macrovesicular steatosis accompanied by mild fibrosis. The fibrotic changes were characterized as F1 perisinusoidal fibrosis predominantly affecting zone 3 (centrilobular region). Masson's trichrome staining was employed to further delineate the extent and pattern of fibrosis. The postoperative course was uneventful. The patient achieved satisfactory early weight loss and demonstrated improvement in glycemic control during follow-up. No short-term progression of liver pathology or evidence of hepatic decompensation was observed.

Received*: 28-11-2025 -* ***Accepted****: 26-01-2026 -* ***Published****: 31-01-2026*

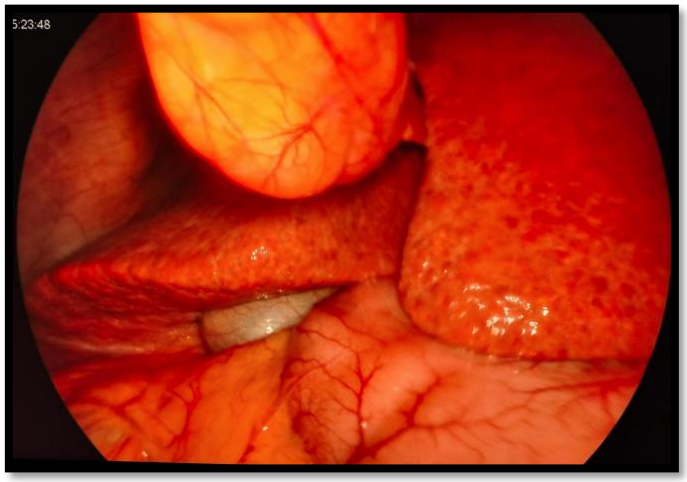

Figure 3. Intraoperative appearance of the liver in Case 3. shows the markedly enlarged, pale, and coarse liver surface observed during surgery in Case 3. The irregular texture and discoloration are consistent with advanced fatty liver disease and significant fibrosis.

Discussion

Obesity is closely associated with the development and progression of Non-Alcoholic Fatty Liver Disease (NAFLD), Non-Alcoholic Steatohepatitis (NASH), fibrosis, and cirrhosis [18,19]. Up to 90% of patients with morbid obesity exhibit hepatic steatosis, with 20–30% demonstrating NASH or significant fibrosis, often despite normal liver enzymes or imaging [20,21]. This case series highlights the silent nature of advanced liver disease in bariatric surgery candidates and underscores the importance of intraoperative assessment, liver biopsy, and flexibility in surgical planning.

In all three cases, preoperative evaluations—including liver function tests, abdominal ultrasonography, and endoscopy—failed to detect advanced liver pathology. In Case 1, the patient had normal labs and imaging; in Case 2, only mild enzyme elevations and fatty liver on ultrasound were noted; and in Case 3, all preoperative tests were unremarkable despite long-standing diabetes. These findings emphasize the limited sensitivity of conventional preoperative investigations and the necessity for heightened clinical suspicion, particularly in patients with obesity, metabolic syndrome, or diabetes [22,23]. Intraoperative visualization and biopsy remain the gold standard for diagnosis when liver morphology appears abnormal [24]. The progression of NAFLD to fibrosis and cirrhosis is influenced by metabolic comorbidities, insulin resistance, and chronic inflammation [25,26]. The presence of long-standing type 2 diabetes in Case 3 likely contributed to the severity of hepatic fibrosis, consistent with studies identifying diabetes as an independent predictor of NAFLD progression [27].

Bariatric surgery is recognized as the most effective long-term treatment for obesity-related liver disease. Weight reduction via surgery can improve steatosis, reduce hepatic inflammation, and even reverse fibrosis [28,29]. All three patients in this series achieved satisfactory postoperative weight loss without hepatic decompensation, highlighting the efficacy and safety of metabolic surgery when appropriately adapted.

Procedure selection is critical when advanced liver disease is encountered. Roux-en-Y gastric bypass (RYGB) is highly effective for metabolic improvement and reflux control but carries increased perioperative risk in cirrhotic patients, including anastomotic leaks, bleeding, portal hypertension complications, and impaired hepatic reserve [30,31]. Sleeve Gastrectomy (SG) is technically simpler, avoids intestinal anastomoses, preserves gastrointestinal continuity, allows postoperative endoscopic access, and imposes lower physiological stress on the liver [32,30]. In all three cases, intraoperative detection of cirrhosis or advanced fatty liver prompted conversion from RYGB to SG, resulting in safe outcomes and avoidance of potential complications associated with malabsorptive procedures.

Ethical Considerations and Patient Consent

Written informed consent was obtained from the patient for publication of this case report and any accompanying clinical data. Patient anonymity was preserved, and no identifying information has been disclosed. This case report was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. As this report presents clinical cases without experimental intervention, formal approval from an institutional ethics committee was not required. All clinical procedures were part of routine standard care.

Clinical Implications

This case series highlights several important clinical implications relevant to the management of bariatric surgery candidates. Non-alcoholic fatty liver disease and non-alcoholic steatohepatitis may progress silently to advanced fibrosis or cirrhosis, even in patients who demonstrate normal laboratory findings and

Received*: 28-11-2025 -* ***Accepted****: 26-01-2026 -* ***Published****: 31-01-2026*

unremarkable preoperative imaging studies [18,21]. These observations underscore the limitations of routine preoperative liver function tests and abdominal ultrasonography, which appear insufficient for the reliable detection of advanced liver disease in this patient population [22,23]. Consequently, careful intraoperative inspection of the liver remains a critical component of bariatric surgery, and the performance of an intraoperative liver biopsy is essential when abnormal hepatic morphology is encountered [24]. In patients found to have incidental cirrhosis or significant hepatic fibrosis, sleeve gastrectomy emerges as the safest bariatric surgical option, offering effective weight reduction while minimizing the risks associated with malabsorptive procedures [16–23]. Early recognition of underlying liver pathology and the implementation of individualized surgical planning are therefore crucial to reduce operative risk and optimize both short- and long-term patient outcomes.

Conclusion

Occult advanced liver disease represents a significant clinical challenge among candidates for bariatric surgery, as it frequently escapes detection during standard preoperative evaluation. This case series demonstrates that the intraoperative identification of cirrhosis or advanced fatty liver disease should prompt immediate reassessment and modification of the planned surgical approach. In such circumstances, sleeve gastrectomy provides a safer alternative to Roux-en-Y gastric bypass by reducing operative stress and lowering the risk of postoperative hepatic decompensation in patients with compromised hepatic reserve. Collectively, these cases emphasize the importance of enhanced preoperative risk assessment, vigilant intraoperative evaluation, and individualized surgical decision-making to ensure optimal safety and durable metabolic benefits in bariatric patients with advanced liver disease.

Conflict of interest. Nil

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Received: *28-11-2025* - ***Accepted***: *26-01-2026* - ***Published***: *31-01-2026*

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Received*: 28-11-2025 -* ***Accepted****: 26-01-2026 -* ***Published****: 31-01-2026*