

## The Role of Laparoscopy in Multifocal Nodular Steatosis: A Case Report and Literature Review

Ausania F, Harrison B, Haugk B, Manas DM

Ausania F, Harrison B, Haugk B, Manas DM, HPB Surgery, Freeman Hospital, High Heaton, Newcastle upon Tyne, NE77DN, the United Kingdom

Correspondence to: Fabio Ausania, MD, HPB Surgery, Freeman Hospital, High Heaton, Newcastle Upon Tyne, NE12JE, the United Kingdom. [f.ausania@gmail.com](mailto:f.ausania@gmail.com)

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### ABSTRACT

Multifocal Nodular Steatosis (MNS) is a rare pattern of hepatic steatosis that is often mistaken for malignant disease. MR imaging can allow differentiation from malignancy in most cases. However, it is not always possible to exclude alternate diagnoses with absolute certainty based solely on imaging. This case highlights the limitations of imaging in the diagnosis of MNS and the importance of laparoscopic biopsy. Laparoscopic biopsy is a safe procedure that can quickly provide key information for the formulation of an accurate diagnosis and appropriate management.

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**Key words:** Laparoscopy; Liver malignancy; Steatosis

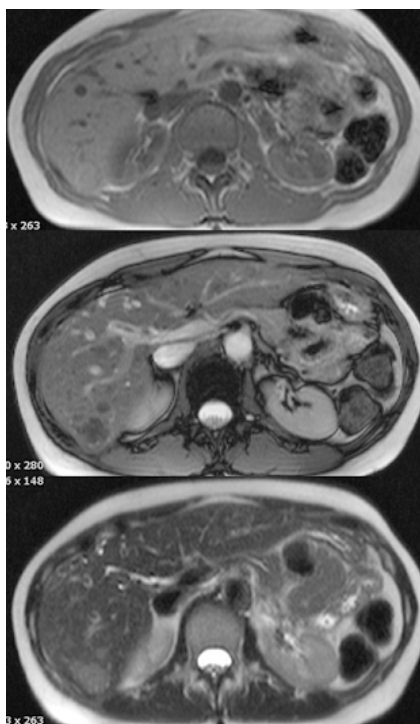
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### CASE REPORT

A 59 year old lady was investigated for non-specific upper abdominal pain. She had no personal or family history of liver disease, dyslipidemia, diabetes and obesity.

She had a history of cholecystectomy for gallstones and Irritable Bowel Syndrome, for which she took mebeverine. She also had a history Rheumatoid Arthritis that had been treated with paracetamol, naproxen and methotrexate for the previous 10 months. Liver function tests were normal. An ultrasound scan of her liver revealed multiple

hyperechoic lesions, the largest of which was approximately 2.3×5.1 cm. Contrast enhanced CT showed multiple small hypodense lesions in both lobes of the liver and tumour markers (CEA, CA19.9 and AFP) were not raised. A contrast enhanced MRI scan was performed: as with other imaging modalities, multiple focal rounded lesions were seen within the liver (Figure1). The lesions appeared to be Multifocal Nodular Steatosis (MNS), however, since hypervascularity would be unusual in pure focal fatty infiltration an alternate diagnosis, such as adenomata, could not definitively be excluded. Laparoscopic biopsies were taken to confirm the diagnosis and exclude malignancy. Biopsies revealed mixed macro and micro steatosis, with no evidence of malignancy. The diagnosis of Multifocal Nodular Steatosis was made.



**figure 1** MRI showed fat content of the lesions, with loss of signal on out-of-phase imaging. The majority of lesions showed isointensity or slight hyperintensity to background liver on in-phase imaging. Post-gadolinium, some of the lesions showed hypervascularity. By the second post-Gadolinium image, the lesions were seen as low signal compared to background with wash-out in some of the hypervascular foci to below background level.

## DISCUSSION

Hepatic steatosis is a common finding in the general population. It can be diffuse or focal, for example around the gallbladder, falciform ligament, the subcapsular region or around the porta hepatis. It is seldom multifocal<sup>[1,2,3]</sup>. MNS describes a rare pattern of fatty infiltration of the liver, in which there are multiple well-defined circumscribed lesions. MNS is a radiological diagnosis, based on the appearance of the liver at imaging. It mimics malignant disease, and is often confused for hepatocellular carcinoma (HCC) and metastases<sup>[4,5,6]</sup>. A focal fat deposit resembling malignancy was first described by Simon in 1934 in the American Journal of Pathology<sup>[7]</sup>. However, since the invention and introduction of ultrasound and CT scanning to hospital practice in the 1960s and 70s, there have been many more described cases. The earliest case description of multifocal fatty infiltration was in 1980<sup>[8]</sup>. Since then there have been well over one hundred reports. MNS has previously been described on a background of chronic liver disease, in association with other malignancies and in association with Metabolic Syndrome<sup>[9,10]</sup>. Less commonly, it has been described in conjunction with drugs known to cause hepatic steatosis, porphyrias and a vaccine<sup>[9]</sup>.

There is no outlined treatment for MNS. Many cases describe spontaneous resolution with time<sup>[11,12,13]</sup>. One case describes resolution with Rosiglitazone<sup>[14]</sup>. It may be that some patients benefit from similar interventions to treating diffuse hepatic steatosis - ie lifestyle modification, weight loss and control of blood glucose levels<sup>[15]</sup>. However, at this stage there is a lack of evidence for any specific treatment of MNS. There is also currently no description of the natural history of MNS<sup>[14]</sup>. The prognosis for hepatic steatosis is good, when there is gradual weight loss and alcohol abstinence<sup>[16]</sup>. Prognosis has not been described specifically for MNS, though there is no reason to believe from the literature to date that it is different from diffuse steatosis.

This case illustrates the typical appearance of MNS on imaging. Ultrasound scanning typically shows multiple circumscribed or oval lesions that are hyperechoic. CT reveals these same images to have low attenuation. This can be indistinguishable from malignancy<sup>[3,4,17]</sup>. Correct diagnosis can be made by accurate detection of microscopic fat in the lesions, associated with a lack of associated enhancing soft tissue<sup>[18]</sup>. This is usually possible with MR imaging<sup>[2,4,5,18]</sup>. Identification of MNS at MR imaging is based on a combination of weightings, for example fat-suppressed axial T2-W1 weighting fast-spin-echo and gadolinium enhancement; or in-phase and opposed-phase GRE imaging<sup>[4,5,18]</sup>. These reliably allow differentiation from metastases<sup>[4,5,14]</sup>. Recently contrast-enhanced ultrasound has been shown to improve differentiation between benign and malignant focal liver lesions<sup>[19]</sup>, although in this case it was not performed because not available at the moment. These imaging characteristics are taken in conjunction with low tumour marker levels, for example alphafeto protein (AFP).

However, a small HCC may show the same characteristics as MNS on imaging, and may also exhibit low levels of AFP, making differentiation difficult<sup>[3,4,18]</sup>. Diffuse fatty changes are seen in around one third of small HCCs<sup>[4,18]</sup>. Infiltrative HCCs may exert little mass effect, show little evidence of necrosis and have the same degree of enhancement as normal liver parenchyma<sup>[2]</sup>. The rare Langerhans-cell histiocytosis even appears identical to MNS on all forms of imaging<sup>[18]</sup>. Though correct diagnosis can usually be made from MR imaging, imaging can lack specificity and false negative rates are common<sup>[20]</sup>.

Indeed in over half of cases reported in literature, biopsy was used to confirm diagnosis (table 1), and in at least one described case a lesion thought to be fatty infiltration later on at repeat imaging was diagnosed as malignancy<sup>[21]</sup>. Cases of MNS not confirmed by biopsy were confirmed by serial scanning, over several months. One case reports that it was 9 months before fatty liver changes seen at imaging

resolved<sup>[22]</sup>.

Biopsy has been shown to provide additional information that contributes to final diagnosis<sup>[23,24]</sup>. In spite of advances in serological testing, liver biopsy has been shown to affect clinical management, even where a clinical diagnosis was established<sup>[25]</sup>.

Complication rate from biopsy is extremely low. When compared to percutaneous biopsy, laparoscopic biopsy allows sampling under direct visualization, reducing the risk of hitting a major vessel and cause bleeding<sup>[25,20]</sup>. In addition, direct visualisation of the liver can add valuable information to liver biopsy<sup>[26,27,28]</sup>.

## CONCLUSION

Though it is possible to have a high index of suspicion of MNS from imaging, it is not always possible to accurately diagnose this by

**Table 1** cases of MNS reported in literature and diagnostic pathway.

| Reference                                   | N of cases | N of cases with tissue diagnosis | How remaining cases were diagnosed |
|---|------------|----------------------------------|------------------------------------|
| Hashimoto H <i>et al</i> <sup>[13]</sup>    | 6          | 1                                | Serial scanning                    |
| Fujikawa K <i>et al</i> <sup>[29]</sup>     | 1          | 1                                | n/a                                |
| Bashir <i>et al</i> <sup>[30]</sup>         | 1          | 1                                | n/a                                |
| Rampal P <i>et al</i> <sup>[12]</sup>       | 6          | 6                                | n/a                                |
| Chong VF <i>et al</i> <sup>[31]</sup>       | 5          | n/a                              | n/a                                |
| Spelle L <i>et al</i> <sup>[32]</sup>       | 13         | 1                                | MRI scanning.                      |
| Yoshikawa J <i>et al</i> <sup>[33]</sup>    | 5          | 5                                | n/a                                |
| Kawashima A <i>et al</i> <sup>[34]</sup>    | 1          | 0                                | Serial scanning                    |
| Kawamori Y <i>et al</i> <sup>[35]</sup>     | 1          | 1                                | n/a                                |
| Scott WW Jr <i>et al</i> <sup>[21]</sup>    | 5          | 1                                | Serial scanning                    |
| Scriven F <i>et al</i> <sup>[36]</sup>      | 4          | n/a                              | n/a                                |
| Capelle J <i>et al</i> <sup>[37]</sup>      | 1          | 1                                | n/a                                |
| Shim D <i>et al</i> <sup>[9]</sup>          | 1          | 1                                | n/a                                |
| Berkelhammer C <i>et al</i> <sup>[14]</sup> | 1          | 1                                | n/a                                |
| Brawer MK <i>et al</i> <sup>[38]</sup>      | 10         | 10                               | n/a                                |
| Ingraham B <i>et al</i> <sup>[18]</sup>     | 1          | 0                                | Serial scanning.                   |
| Tom Y <i>et al</i> <sup>[39]</sup>          | 2          | 0                                | on imaging.                        |
| Yates S <i>et al</i> <sup>[40]</sup>        | 1          | 1                                | n/a                                |
| Tenca M <i>et al</i> <sup>[41]</sup>        | 1          | 1                                | n/a                                |
| Kemper J <i>et al</i> <sup>[5]</sup>        | 2          | 2                                | n/a                                |
| Marmorale <i>et al</i> <sup>[42]</sup>      | 1          | 1                                | n/a                                |
| Wang C <i>et al</i> <sup>[43]</sup>         | 1          | 1                                | n/a                                |
| Paulson B <i>et al</i> <sup>[44]</sup>      | 1          | 1                                | n/a                                |
| Lwakatare Y <i>et al</i> <sup>[45]</sup>    | 1          | 1                                | n/a                                |
| Clain S <i>et al</i> <sup>[46]</sup>        | 2          | 2                                | n/a                                |
| Chevallier B <i>et al</i> <sup>[22]</sup>   | 1          | 1                                | n/a                                |

imaging alone. Mistakes can be made and deliverance of the correct treatment is delayed. There are almost no accounts of patients who were initially mistakenly and diagnosed with MNS based on imaging, who were later found to be suffering from malignancy. It would be interesting to have this data to view the potential risk of making diagnosis of MNS by imaging alone. In conditions such as HCC, it is important to diagnose and treat early. There is the danger that an important window of opportunity for early intervention is missed if biopsy is not undertaken, and progression of disease is picked up on serial scanning after several months. Laparoscopic biopsy is safe, adds valuable information and is of key importance in the accurate diagnosis and treatment of patients with MNS. Laparoscopic biopsy should be performed in all patients in whom MNS is suspected.

## REFERENCES

- 1 Karcaaltincaba M, Akhan O. Imaging of hepatic steatosis and fatty sparing. *Eur J Radiol* 2007; **61**: 33-43
- 2 Hamer OW, Aguirre DA, Casola G, Lavine JE, Woenckhaus M, Sirlin CB. Fatty liver: imaging patterns and pitfalls. *Radiographics* 2006; **26**: 1637-1653
- 3 Patton HM, Lavine JE. Focal Fatty liver: more than just a radiographic curiosity? *Gastroenterol Hepatol (N Y)* 2007; **3**:

- 199-200
- 4 Prasad SR, Wang H, Rosas H, Menias CO, Narra VR, Middleton WD, Heiken JP. Fat-containing lesions of the liver: radiologic-pathologic correlation. *Radiographics* 2005; **25**: 321-331
  - 5 Kemper J, Jung G, Poll LW, Jonkmanns C, Lüthen R, Moedder U. CT and MRI findings of multifocal hepatic steatosis mimicking malignancy. *Abdom Imaging* 2002; **27**: 708-710
  - 6 Kröncke TJ, Taupitz M, Kivelitz D, Scheer I, Daberkow U, Rudolph B, Hamm B. Multifocal nodular fatty infiltration of the liver mimicking metastatic disease on CT: imaging findings and diagnosis using MR imaging. *Eur Radiol* 2000; **10**: 1095-1100
  - 7 Simon MA. Focal Fat Infiltration in the Liver. *Am J Pathol* 1934; **10**: 799-804
  - 8 Scott WW, Sanders RC, Siegelman SS. Irregular fatty infiltration of the liver: diagnostic dilemmas. *AJR Am J Roentgenol* 1980; **135**: 67-71
  - 9 Shim M, Durazo F. Multinodular fatty liver after herpes-zoster vaccine: case report and review of the literature. *Ann Hepatol* 2008; **7**: 382-385
  - 10 Ichikawa T, Oh-I S, Kaira K, Kakizaki S, Sato K, Takagi H, Mori M. Education and imaging. Hepatobiliary and pancreatic: multifocal nodular hepatic steatosis associated with the metabolic syndrome. *J Gastroenterol Hepatol* 2007; **22**: 1693
  - 11 Kawashima A, Suehiro S, Murayama S, Russell WJ. Focal fatty infiltration of the liver mimicking a tumor: sonographic and CT features. *J Comput Assist Tomogr* 1986; **10**: 329-331
  - 12 Rampal P, Desmorat H, Bruneton JN, Saint-Paul MC, Rampal A, Mouiel J, Serres JJ. Irregular hepatic steatosis. Clinical and imaging study of 6 cases. *Gastroenterol Clin Biol* 1986; **10**: 43-48
  - 13 Hashimoto H, Nakatsuka H, Tsubakimoto M, Ogawa R, Kashihara T, Murata K, Nakamura K, Tamaoka K, Onoyama Y. Multifocal fatty infiltration of the liver: report of six cases. *Nihon Igaku Hoshasen Gakkai Zasshi* 1990; **50**: 1063-1067
  - 14 Berkelhammer C, Cuadros H, Blumstein A, Mesleh G, Patel M. Multifocal nodular nonalcoholic steatohepatitis: resolution with rosiglitazone. *Gastroenterol Hepatol (N Y)* 2007; **3**: 196-198
  - 15 <http://bestpractice.bmj.com/best-practice/monograph/796/treatment/step-by-step.html>
  - 16 Bhala N, Usherwood T, George J. Non-alcoholic fatty liver disease. *BMJ* 2009; **339**: b2474
  - 17 Heilmaier C, Lutz AM, Bolog N, Weishaupt D, Seifert B, Willmann JK. Focal liver lesions: detection and characterization at double-contrast liver MR Imaging with ferucarbotran and gadobutrol versus single-contrast liver MR imaging. *Radiology* 2009; **253**: 724-733
  - 18 Multiple echogenic liver masses from Multiple Nodular Steatosis in a 55 year old male with hepatitis C. C Ingraham, P Bhargava, J Otjen, JR Medverd, S Vaidya. *Radiology Case Reports* 2010; **5**: 399
  - 19 Anaye A, Perrenoud G, Rognin N, Arditi M, Mercier L, Frinking P, Ruffieux C, Peetrons P, Meulli R, Meuwly JY. Differentiation of focal liver lesions: usefulness of parametric imaging with contrast-enhanced US. *Radiology* 2011; **261**: 300-310
  - 20 Haydon GH, Hayes PC. Diagnostic laparoscopy by physicians: we should do it. *QJM* 1997; **90**: 297-304
  - 21 Scott WW, Sanders RC, Siegelman SS. Irregular fatty infiltration of the liver: diagnostic dilemmas. *AJR Am J Roentgenol* 1980; **135**: 67-71
  - 22 Chevallier P, Bahadoran P, Buckley MJ, Hebuterne X, Diaine B, Chevallier A, Coussement A. Hepatic multinodular focal fatty metamorphosis in acquired porphyria cutanea tarda. Sonographic, CT, and MRI features. *Clin Imaging* 1998; **22**: 418-421
  - 23 Jalan R, Harrison DJ, Dillon JF, Elton RA, Finlayson ND, Hayes PC. Laparoscopy and histology in the diagnosis of chronic liver disease. *QJM* 1995; **88**: 559-564
  - 24 Goodman ZD. Grading and staging systems for inflammation and fibrosis in chronic liver diseases. *J Hepatol* 2007; **47**: 598-607
  - 25 Spycher C, Zimmermann A, Reichen J. The diagnostic value of liver biopsy. *BMC Gastroenterol* 2001; **1**: 12
  - 26 Crantock LR, Dillon JF, Hayes PC. Diagnostic laparoscopy and liver disease: experience of 200 cases. *Aust N Z J Med* 1994; **24**: 258-262
  - 27 Jalan R, Harrison DJ, Dillon JF, Elton RA, Finlayson ND, Hayes PC. Laparoscopy and histology in the diagnosis of chronic liver disease. *QJM* 1995; **88**: 559-564
  - 28 Clinical Hepatology: Principles and Practice of Hepatobiliary Diseases, Volume 1 By Henryk Danczygier. 497-501.
  - 29 Fujikawa K, Shiraki K, Ito T, Takase K, Nakano T. Focal spared area in fatty liver mimicking a tumor. *Hepatogastroenterology* ; **49**: 1253-1254
  - 30 Bashir Y. Focal fatty infiltration of the liver mimicking metastatic disease. *Postgrad Med J* 1990; **66**: 290-291
  - 31 Chong VF, Fan YF. Ultrasonographic hepatic pseudolesions: normal parenchyma mimicking mass lesions in fatty liver. *Clin Radiol* 1994; **49**: 326-329
  - 32 Spelle L, Soyer P, Rondeau Y, Gouhiri M, Scherrer A, Rymer R. Nontumorous hepatic pseudolesion around the falciform ligament: prevalence on gadolinium chelate-enhanced MR examination. *AJR Am J Roentgenol* 1997; **169**: 795-799
  - 33 Yoshikawa J, Matsui O, Takashima T, Sugiura H, Katayama K, Nishida Y, Tsuji M. Focal fatty change of the liver adjacent to the falciform ligament: CT and sonographic findings in five surgically confirmed cases. *AJR Am J Roentgenol* 1987; **149**: 491-494
  - 34 Kawashima A, Suehiro S, Murayama S, Russell WJ. Focal fatty infiltration of the liver mimicking a tumor: sonographic and CT features. *J Comput Assist Tomogr* ; **10**: 329-331
  - 35 Kawamori Y, Matsui O, Takahashi S, Kadoya M, Takashima T, Miyayama S. Focal hepatic fatty infiltration in the posterior edge of the medial segment associated with aberrant gastric venous drainage: CT, US, and MR findings. *J Comput Assist Tomogr* ; **20**: 356-359
  - 36 Scriven MW, Shandall A, Fitzgerald EJ, Puntis MC. Hepatic 'pseudotumours': an important diagnostic pitfall. *Ann R Coll Surg Engl* 1993; **75**: 43-45
  - 37 Capelle J, Leclère J. Multinodular hepatic steatosis. Ultrasonic and x-ray computed tomographic aspects. Apropos of a case. *J Radiol* 1987; **68**: 109-111
  - 38 Brawer MK, Austin GE, Lewin KJ. Focal fatty change of the liver, a hitherto poorly recognized entity. *Gastroenterology* 1980; **78**: 247-252
  - 39 Tom WW, Yeh BM, Cheng JC, Qayyum A, Joe B, Coakley FV. Hepatic pseudotumor due to nodular fatty sparing: the diagnostic role of opposed-phase MRI. *AJR Am J Roentgenol* 2004; **183**: 721-724
  - 40 Focal fatty infiltration of the liver simulating metastatic disease. CK Yates, RA Streight. *Radiology* 1986; **159**: 83-84.
  - 41 Tenca A, Massironi S, Colli A, Basilisco G, Conte D. "Pseudotumoral" hepatic pattern in acute alcoholic hepatitis: a case report. *World J Gastroenterol* 2009; **15**: 4070-4074
  - 42 Marmorale C, Romiti M, Bearzi I, Giovagnoni A, Landi E. Traumatic rupture of nodular focal fatty infiltration of the liver: case report. *Ann Ital Chir* 1993; **74**: 217-221
  - 43 Wang SS, Chiang JH, Tsai YT, Lee SD, Lin HC, Chou YH, Lee FY, Wang JS, Lo KJ. Focal hepatic fatty infiltration as a cause of pseudotumors: ultrasonographic patterns and clinical differentiation. *J Clin Ultrasound* 1990; **18**: 401-409
  - 44 Paulson EK, Baker ME, Spritzer CE, Leder RA, Gulliver DJ, Meyers WC. Focal fatty infiltration: a cause of nontumorous defects in the left hepatic lobe during CT arterial portography. *J Comput Assist Tomogr* 1980; **17**: 590-595
  - 45 Lwakatare F, Yamashita Y, Nakayama M, Takahashi M. SPIO-enhanced MR imaging of focal fatty liver lesions. *Abdom Imaging* 2004; **26**: 157-160
  - 46 Clain JE, Stephens DH, Charboneau JW. Ultrasonography and computed tomography in focal fatty liver. Report of two cases with special emphasis on changing appearances over time. *Gastroenterology* 1984; **87**: 948-952

**Peer reviewer:** Eva Intagliata, MD, Department of Surgery, University of Catania, casella postale 226, Augusta, 96011, Italy.