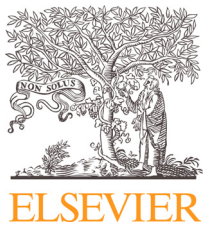
Radiology Case Reports 19 (2024) 1514–1518



Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/radcr

Case Report

Focal coagulative necrosis of the liver in a patient with sustained virologic response to anti-hepatitis C virus therapy ☆

Akito Furuta[a], *Shoji Oura*[b,*], *Hiroshi Shintani*[b], *Naoki Kataoka*[b], *Hiroto Tanaka*[a], *Seigo Takamatsu*[a], *Wataru Ono*[a]

[a] *Department of Gastroenterology, Kishiwada Tokushukai Hospital, Kishiwada-city, Osaka, Japan*
[b] *Department of Surgery, Kishiwada Tokushukai Hospital, 4-27-1, Kamori-cho, Kishiwada-city, Osaka, 596-8522, Japan*

ARTICLE INFO

Article history:
Received 6 December 2023
Revised 8 January 2024
Accepted 10 January 2024

Key words:
Focal coagulative necrosis of the liver
Plasma cell
Sustained virologic response

ABSTRACT

A 69-year-old woman with chronic hepatitis C virus (HCV) infection was referred to our hospital due to liver enzyme abnormalities. Four years after anti-HCV therapy, the patient with sustained virologic response and no clinical symptoms developed an oval hepatic mass with mixed high and low internal echoes near the portal vein on ultrasound. Magnetic resonance imaging (MRI) of the liver lesion showed a slightly hypo intense pattern on T1-weighted images, a hyper intense pattern both on T2- and diffusion-weighted images, a slight rim enhancement pattern with no intra-lesional enhancement up to the late phase, and a very low intense pattern on hepatobiliary phase images. Positron emission tomography/computed tomography (PET / CT) showed no areas of avid radiotracer uptake in the liver. No tumor markers showed abnormally high values. All these images and laboratory findings led us to the assessment of the liver lesion as a non-neoplastic disorder. However, due to the patient's strong preference to get both definitive diagnosis and cure of the lesion, the patient underwent laparoscopic partial hepatectomy. Pathological study showed 2 necrotic areas surrounded by multiple lymph follicles, epithelioid cells, lymphocytes, collagen fibers, and plasma cells, leading to the diagnosis of focal coagulative necrosis of the liver (FCNL). Physicians should note that FCNL can occur without any symptoms and can be diagnosed at least as a non-neoplastic disorder with combined MRI and PET/CT analysis.

☆ Competing Interests: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

* Corresponding author.
E-mail address: shouji.oura@tokushukai.jp (S. Oura).

https://doi.org/10.1016/j.radcr.2024.01.035

Introduction

Up around the end of the 20th century, it was extremely difficult to well-control chronic viral hepatitis [1]. However, the advent of nucleoside analogs and interferon-free direct acting antivirals (DAAs) has dramatically changed the therapeutic strategy of the chronic hepatitis B virus (HBV)- and hepatitis C virus (HCV)-positive patients [2,3]. In short, favorable disease control of chronic HBV-positive patients has highly come to be obtained with some kind of nucleoside analog therapy. In addition, almost all HCV-positive patients have come to show sustained virologic response (SVR) to DAA therapy [4,5].

It is well known that chronic viral hepatitis patients with SVR much less often develop HCC than those without SVR but still need careful monitoring of their livers. Therefore, because both of the marked increase of chronic viral hepatitis patients with SVR and the improvements in the resolution of various image modalities, the chances of detecting small liver lesions have considerably increased in recent years. Early detection of a liver lesion itself is good for patients but often annoys physicians to correctly diagnose the liver lesion due to its small size. We herein report a case of focal coagulative necrosis of the liver (FCNL) properly diagnosed as a non-neoplastic lesion with combined image analysis.

Case report

A 69-year-old woman with chronic HCV infection was referred to our hospital due to liver enzyme abnormalities. Under the diagnosis of serotype group 1 chronic hepatitis C, the patient received elbasvir and grazoprevir therapy [6] for 3 months. After the confirmation of complete virologic response to the anti-viral therapy, the patient with SVR and no symptoms had been followed up semiannually using abdominal ultrasound and blood tests. Abdominal ultrasonography showed an oval mass with mixed high and low internal echoes (Fig. 1) near the portal vein in the liver segment 8 four years after the anti-viral therapy. Magnetic resonance imaging (MRI) of the liver lesion using gadoxetic acid showed a slightly hypo intense pattern on T1-weighted images (Fig. 2A), a hyper intense pattern both on T2- and diffusion-weighted images (Figs. 2B and C), a slight rim enhancement pattern (Fig. 2D) with no intra-lesional enhancement up to the late phase (Fig. 2E), and a very low intense pattern on hepatobiliary phase images (Fig. 2F). Positron emission tomography (PET) / computed tomography (CT) showed no areas of avid radiotracer uptake in the liver (Fig. 3). All the CEA, CA19-9, AFP, and PIVKA II levels were within normal limits. These images and laboratory findings led us to the assessment of the liver lesion as a non-neoplastic disorder. The patient, however, strongly hoped to get both definitive diagnosis and cure of the lesion even though being not neoplastic. The patient, therefore, underwent laparoscopic partial hepatectomy. The cross section of the resected tumor was yellowish white (Fig. 4A). Pathological study showed 2 necrotic areas surrounded by multiple lymph follicles (Fig. 4B), epithelioid cells, lymphocytes, collagen fibers, and plasma cells [7](Figs. 4C and D), leading to the diagnosis of FCNL. The patient recovered well and has been followed up without any events on an outpatient basis for 6 months.

Discussion

Ultrasound examination is very useful for periodic image evaluation of the liver because it allows detailed evaluation of arbitrary cross-sectional planes of the liver with no radiation exposure. In fact, the liver lesion was initially detected by an ultrasound examination in this case. The differences in acoustic impedance due to histological heterogeneity, that is, different cell densities, among areas within the target lesion should have generated back scattering, having led to a mosaic pattern with mixed high and low internal echoes. Conversely, similarities in acoustic impedance due to cellular homogeneity among inflammatory cells encircling the lesion

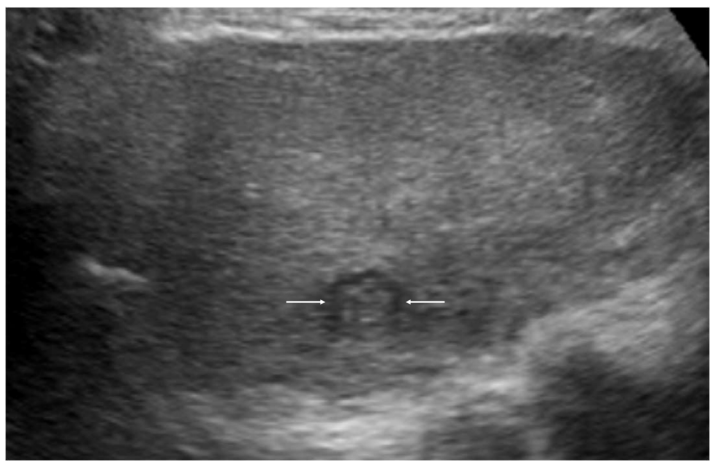


Fig. 1 – Ultrasonographic findings. Ultrasonography showed an oval lesion with heterogenous internal echoes encircled by low ring-like boarders (arrows).

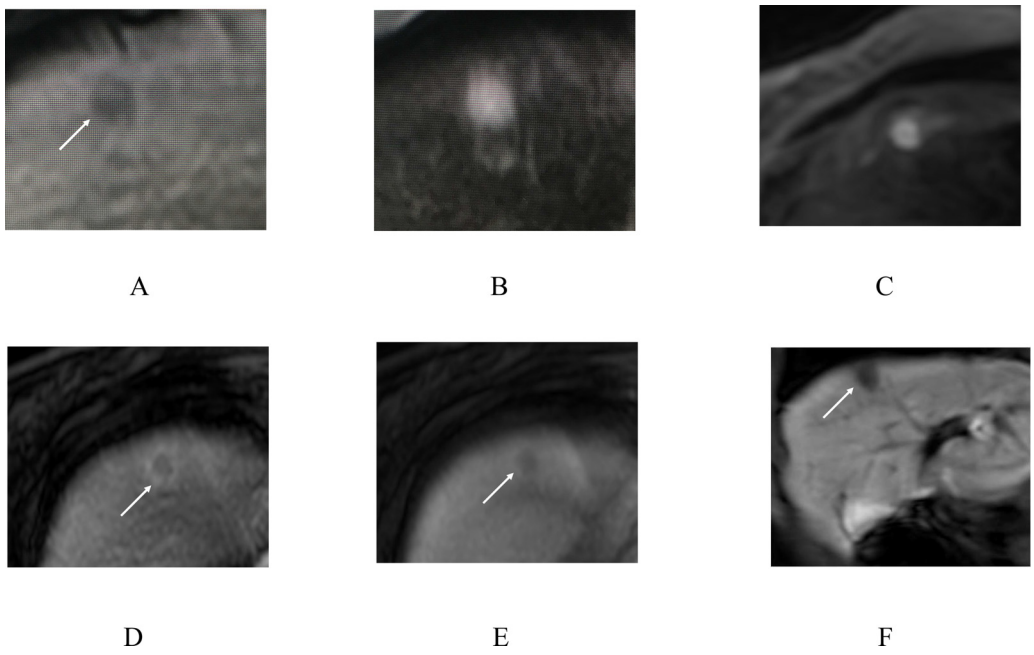


Fig. 2 – Magnetic resonance image findings. (A) T1-weighted images of the lesion showed a slightly hypo intense pattern (arrow). (B) T2- weighted images of the lesion showed a hyper intense pattern. (C) Diffusion-weighted images also showed a hyper intense pattern. (D) Dynamic study showed a slight rim enhancement pattern on early phase images (arrow). (E) Dynamic study showed a washout pattern of the weak rim enhancement on late phase images without any intra-lesional enhancement (arrow). (F) Hepatobiliary phase images showed a hypo intense pattern (arrow).

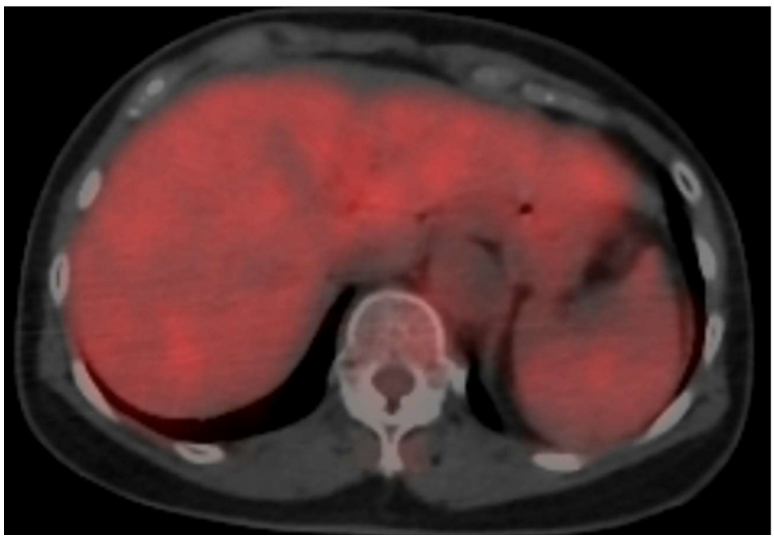


Fig. 3 – Positron emission tomography/computed tomography (PET / CT) findings. PET / CT showed no avid radiotracer uptake in the liver.

had presumably led to the formation of ring-shape low echoic boarders around the lesion. These ultrasonographic findings highly resembled to those of HCC and annoyed us to correctly rule out the possibility of HCC in this case.

MRI can well suggest the pathological components of the target lesion using T1- and T2-weighted images and intensity images on arterial, portal, and hepatobiliary phases. MRI showed rim enhancement without intra-lesional enhancement up to the late phase and a hypo intense pattern on hepatobiliary phase images in this case. These findings highly suggested the absence of tumor cells and normal hepatic cells at least in the major part, that is, encompassed by the rim

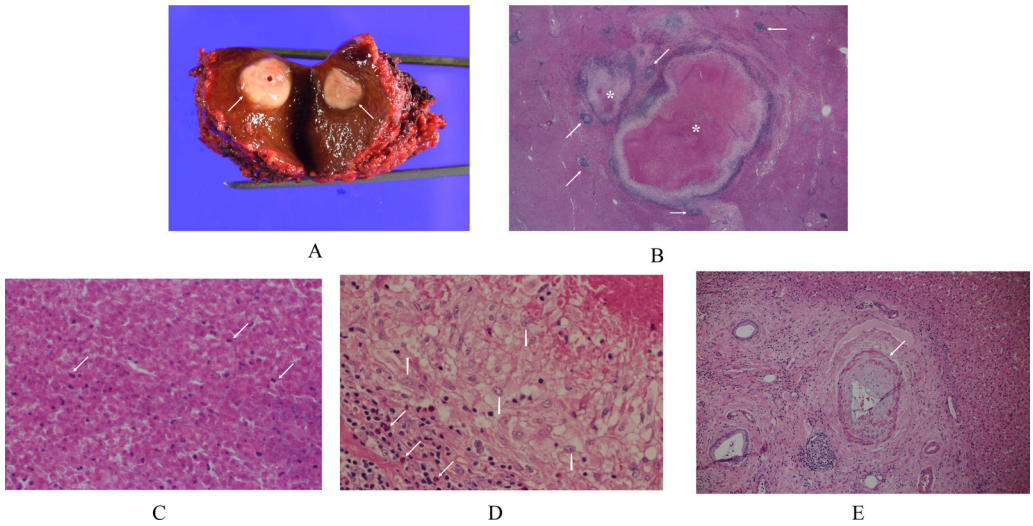


Fig. 4 – Pathological findings. (A) The bisected specimen showed an oval yellowish-white lesion (arrows). (B) Magnified view showed 2 necrotic areas (asterisks) and multiple small lymph follicles (arrows). (C) Magnified view of the central part of the lesion showed necrotic tissue and multiple neutrophils (arrows). (D) Magnified view of the peripheral part of the lesion showed multiple epithelioid cells (arrowheads) and plasma cells (arrows). (E) Hepatic arterial thickening (arrow) was observed adjacent to the larger necrotic lesion.

enhancement, of the lesion. Rim enhancement itself should have been caused by the inflammatory cells surrounding the lesion. The hyper intense pattern on T2-weighted images suggested the lesion to be at least somewhat edematous. All these findings can highly suggest the lesion composed of completely damaged hepatocellular cells, that is, some kind of necrosis or apoptosis.

PET/CT can depict almost all malignant tumors 10mm or larger in size as avid FDG uptake areas. Because the target lesion was small as approximately 10mm in size in this case, we cannot negate the possible solid tumor with abundant collagen fiber or with massive mucus through PET/ CT evaluation. However, a solid tumor either with abundant collagen fiber or with massive mucus should have had a plateau or persistent pattern on time-signal intensity images of MRI. We, therefore, can exclude the diagnosis of a small solid tumor with the combined MRI and PET/CT analysis.

Thickening of the hepatic arterial wall on pathological evaluation (Fig. 4E) might bring us to the assumption of liver ischemia due to hepatic arterial stenosis or occlusion. However, it is difficult to imagine that arterial wall thickening observed in this case could cause hepatic ischemia. Furthermore, in the case of coagulative necrosis due to hepatic artery ischemia, the ischemic lesion should be overwhelmingly wedge-shaped. It, therefore, is extremely unlikely that this disorder occurred due to hepatic artery ischemia.

In an animal model, Raczynski et al. [8] reported that enteric infection with Citrobacter rodentium, that is, equivalent to Escherichia coli in humans, can induce coagulative liver necrosis mainly through focal thrombotic ischemic injury to the liver, leading to the high occurrence rate of it mainly around portal veins. In this case, the lesion was located not in the vicinity of the major bile duct but in the area adjacent to the portal vein. It is naturally unknown what type of bacteria or viruses contributed to the development of this lesion. In addition, this patient had not shown any infection-related symptoms during the 4-year follow-up period. However, the presence of a lot of plasma cells around the coagulative necrosis areas strongly suggests some kind of infectious event in the liver.

Image findings of FCNL closely resemble those of a pathological condition in which the viability of the lesion has disappeared, leading to no reports of its occurrence other than after local therapy such as RFA [9] and surgery to date. FCNL is a small asymptomatic lesion with no definitive imaging findings that actively suggest malignancy and, therefore, has rarely been a candidate for surgery. In addition, the difficulty in identifying the cause of FCNL should have led to the lack of reports on it to date.

Conclusion

Diagnostic physicians should note that FCNL can develop without any infection-induced symptoms and it can be differentiated from small HCC with combined MRI and PET/CT analysis.

Author contribution

AF designed the concept of this study. SO drafted the manuscript. HS and NK operated the patient. HT, ST, and WO made preoperative image analyses.

Patient consent

Written informed consent was obtained from the patient for the publication of this case report and any accompanying images.

REFERENCES

[1] Liaw YF, Leung N, Guan R, Lau GK, Merican I, McCaughan G, et al. Asian-Pacific consensus statement on the management of chronic hepatitis B: a 2005 update. Liver Int 2005;25(3):472–89.

[2] Chan HL, Fung S, Seto WK, Chuang WL, Chen CY, Kim HJ, et al. Tenofovir alafenamide versus tenofovir disoproxil fumarate for the treatment of HBeAg-positive chronic hepatitis B virus infection: a randomised, double-blind, phase 3, non-inferiority trial. Lancet Gastroenterol Hepatol 2016;1(3):185–95.

[3] Simmons B, Saleem J, Hill A, Riley RD, Cooke GS. Risk of late relapse or reinfection with hepatitis C virus after achieving a sustained virological response: a systematic review and meta-analysis. Clin Infect Dis 2016;62(6):683–94.

[4] Kowdley KV, Nelson DR, Lalezari JP, Box T, Gitlin N, Poleynard G, et al. On-treatment HCV RNA as a predictor of sustained virological response in HCV genotype 3-infected patients treated with daclatasvir and sofosbuvir. Liver Int 2016;36(11):1611–18.

[5] Bachofner JA, Valli PV, Kröger A, Bergamin I, Künzler P, Baserga A, et al. Direct antiviral agent treatment of chronic hepatitis C results in rapid regression of transient elastography and fibrosis markers fibrosis-4 score and aspartate aminotransferase-platelet ratio index. Liver Int 2017;37(3):369–76.

[6] Al-Salama ZT, Deeks ED. Elbasvir/Grazoprevir: a review in chronic HCV genotypes 1 and 4. Drugs 2017;77(8):911–21.

[7] Suan D, Sundling C, Brink R. Plasma cell and memory B cell differentiation from the germinal center. Curr Opin Immunol 2017;45:97–102.

[8] Raczynski AR, Muthupalani S, Schlieper K, Fox JG, Tannenbaum SR, Schauer DB. Enteric infection with citrobacter rodentium induces coagulative liver necrosis and hepatic inflammation prior to peak infection and colonic disease. PLoS One 2012;7(3):e33099.

[9] Curley SA. Radiofrequency ablation of malignant liver tumors. Oncologists 2001;6(1):14–23.