Annals of Clinical Case Reports

Case Report
Published: 11 Oct, 2021

CEUS in the Screening of Neuroendocrine Pancreatic Tumors

Adriana Gomotirceanu[1], Adina Sabau[1], Aliz Tunyogi[1], Florin Gomotirceanu[1], Cristian Nicolae Chirila[2], Paula Maria Chirila[2] and Mirela Liana Gliga[2]*

[1]*Department of Internal Medicine and Ultrasonography, Topmed Medical Center, Romania*

[2]*"George Emil Palade" University of Medicine, Pharmacy, Science and Technology Targu Mures, Romania*

Abstract

We present the case of a 53 years old female patient, who came in our department complaining of minor symptoms, accusing an atypical pain in the epigastric area. The abdominal ultrasound showed an intensely hypoechoic and well delimited solid mass located in the pancreatic head, measuring less than 2 cm. The lesion had the characteristics of a neuroendocrine tumor after contrast administration, with an intense enhancement during the arterial phase and a more rapid washout during the late phase compared to the rest of the parenchyma. The patient was addressed to an echo-endoscopy service where an ultrasound-guided fine needle biopsy was performed, with the pathology report confirming the diagnosis of a low grade neuroendocrine tumor. The next step was the surgical removal of the tumor (total enucleation). The patient was supervised by an oncologist for 2 years, through clinical exam, MRI, evaluation of serum markers and CEUS every 6 months. She is now declared cured.

Keywords: Pancreatic neuroendocrine tumors; Contrast-Enhanced Ultrasound (CEUS)

Introduction

Neuroendocrine tumors are relatively rare neoplasms. However, the incidence has been increasing over the last decades [1]. They may originate anywhere throughout the body, but the most frequent sites are the gastrointestinal tract, pancreas and lung [2]. Most of them are asymptomatic, the reason why they may remain undetected for several years and the final diagnosis is frequently established when there is already a mass effect or the patient becomes metastatic. Many of these tumors are benign, but still have the potential to become malignant. They can be frequently missed, especially when there are no current screening programs available [3]. Pancreatic neuroendocrine tumors may be functioning or nonfunctioning. When there is a carcinoid syndrome involved, symptoms require immediate medical attention. But when it comes to asymptomatic or mildly symptomatic patients, detecting these lesions may become challenging. Even though CT scans, MRI and endoscopic ultrasound are the main imaging procedures recommended for evaluating pancreatic lesions, Contrast-Enhanced Ultrasound (CEUS) may become an alternative and accessible tool for detecting abnormal masses in the pancreas. Ultrasound is the first and most common imaging technique used during a routine medical examination. Using a specific contrast, the US can provide some details regarding the vascular phases and global enhancement of the pancreas, so that neuroendocrine tumor can be detected properly.

Case Presentation

A 53-year-old female patient presented on the 23rd of January 2019 in our medical service (Topmed Medical Center, Internal Medicine and Ultrasound Department from Targu Mures, Romania) accusing a particular pain like a sensation of "pins and needles" in the epigastric region, lasting for a very short period of time (a few seconds) and appearing twice a week, with no connection to her meals or bowel movements. Her personal medical history revealed a *Helicobacter pylori* infection treated several years ago and an active asthma under treatment with Symbicort and Ventolin inhaler. We performed an ultrasound using a VOLUSON 3 E8 device (produced by General Electric Medical System Kretztechnik GmbH Tiefenbach 15, Austria), with a 4D abdominal transducer, 3 Mhz to 5 Mhz frequency band, 1.3 MHz Doppler color frequency, Gain 60-70, Filter 5, TIS 1.2. During the investigation we discovered a normal sized pancreas (head: 30.1 mm, body: 13.8 mm, tail: 24 mm), with a solid mass in the pancreatic head. The lesion was intensely hypoechoic, almost transonic, measuring 18.7 mm/12 mm/10.4 mm in the transverse, anteroposterior and craniocaudal planes.

OPEN ACCESS

Correspondence:
Adriana Gomotirceanu, Department of Internal Medicine and Ultrasonography, Topmed Medical Center, Targu Mures, Romania,
E-mail: adriana@topmed.ro

Received Date: *10 Sep 2021*
Accepted Date: *07 Oct 2021*
Published Date: *11 Oct 2021*

Citation:
Gomotirceanu A, Sabau A, Tunyogi A, Gomotirceanu F, Nicolae Chirila C, Maria Chirila P, et al. CEUS in the Screening of Neuroendocrine Pancreatic Tumors. Ann Clin Case Rep. 2021; 6: 2022.

ISSN: 2474-1655

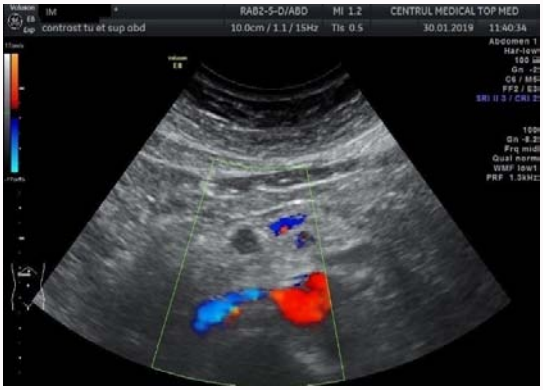

Figure 1: Pancreatic head tumor in 2D and color Doppler.

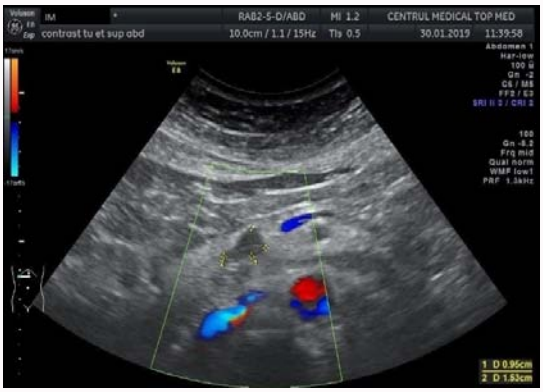

Figure 2: Pancreatic head tumor in 2D and color Doppler dimensions in transverse and anteroposterior plane.

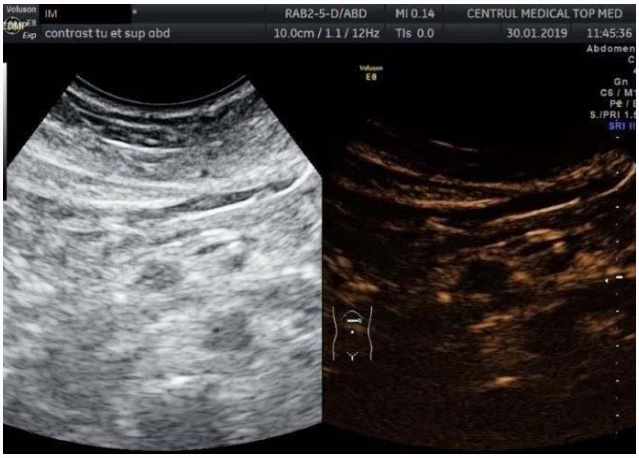

Figure 3: Before contrast administration contrast administration, the tumor presents discreet enhancement.

It was well outlined from the rest of the pancreas. The remaining pancreatic parenchyma was echogenic and homogeneous. In color Doppler ultrasound we didn`t see vascular spots (Figure 1, 2). On the 30th of January 2019 we repeated the examination, using contrast enhanced ultrasound on the same device, with MI 0.2 and 0.24 ml Sono Vue contrast agent administered intravenously, followed by a washout with 10 ml of bolus saline solution. We examined the suspected lesion for 5 min (Figure 3). We observed that the mass located in the pancreatic head showed enhancement in the arterial

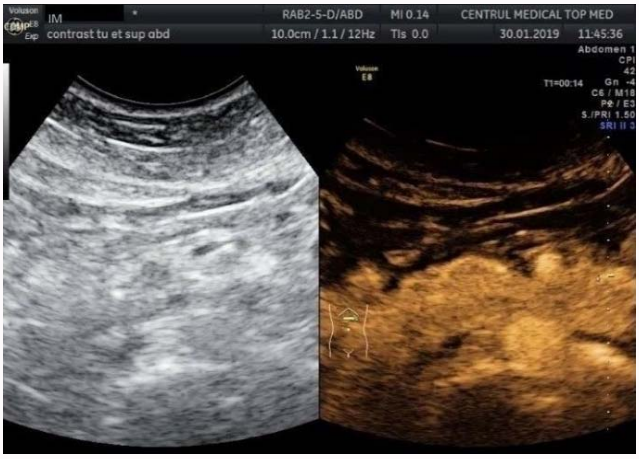

Figure 4: During the arterial phase, 14 sec after compared to the rest of the parenchyma.

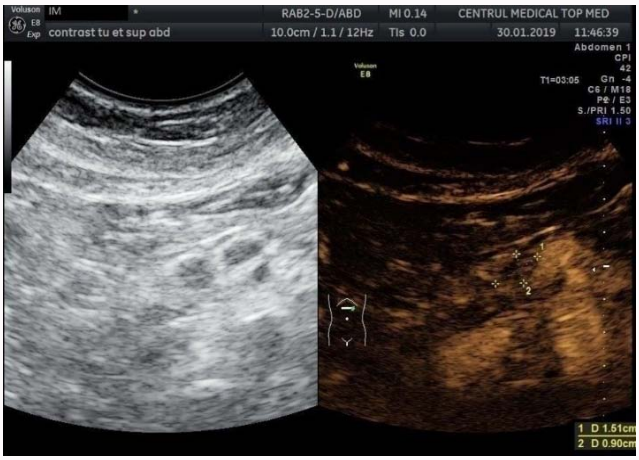

Figure 5: During the late phase, at 3 min and 5 sec, the tumor presents a more rapid washout compared to the rest of the parenchyma. The dimensions of the lesions are the same as in 2D.

phase compared to the rest of the parenchyma (Figure 4). During the venous phase, a washout started at 55 sec and it lasted until 4 min and 30 sec, when the mass remained completely without contrast (Figure 5). At this time the lesion was well differentiated from the rest of the parenchyma which still retained contrast agent. The ultrasound characteristics of the suspected mass were typical for a neuroendocrine tumor. The dimensions of the lesion were the same on the CEUS examinations as on the 2D ultrasound. Later on, two CT scans from two different medical departments showed no suspicion of malignant masses in the pancreas. Between the 4th and the 8th of February 2019, the patient was hospitalized in the Gastroenterology Department of the County Emergency Hospital from Cluj-Napoca. An echo-endoscopy with sedation was performed, showing the pancreatic lesion located in the uncinate process, adjacent to the third part of the duodenum and to the superior mesenteric vein, without invading these structures. A fine needle aspiration biopsy established the final diagnosis: Low grade neuroendocrine tumor of the pancreas. The immunohistochemistry revealed the following markers: CK+, chromogranin A +, TTF1 -. The proliferation index ki67 was 3%. The serum markers: Chromogranin A, serotonin and 5-hydrocyindolacetic were in normal range. The carcinoembryonic

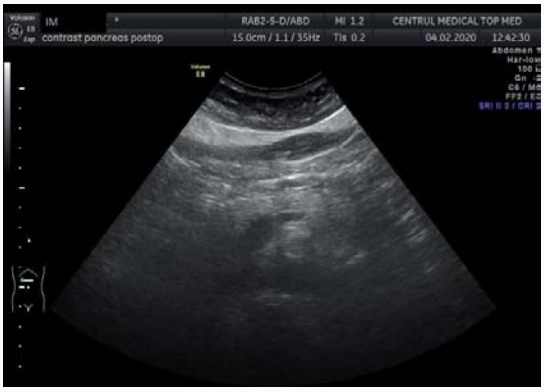

Figure 6: Post-surgery 2D pancreatic image.

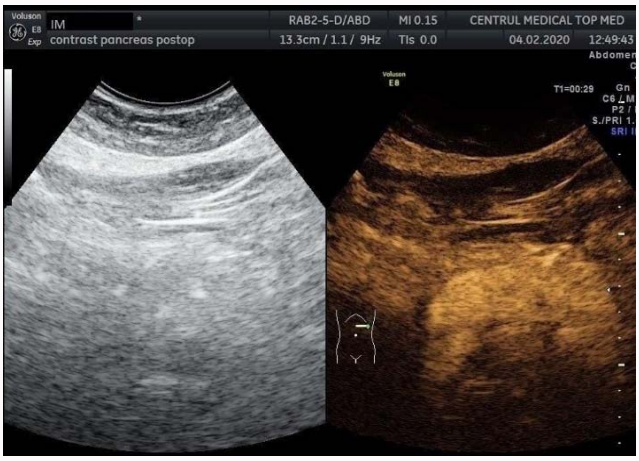

Figure 7: Post-surgery CEUS. At 29 sec during arterial phase, the contrast intake is synchronous in the entire pancreas.

antigen and the CA 19-9 also had normal values. An abdominal MRI was performed on the 20th of March 2019, revealing the pancreatic mass located in the uncinate process, measuring 15 mm, in diameter, with no signs of vascular invasion. On the 1st of April 2019 the patient underwent surgery, with total enucleation of the tumor, without any post procedural complications. The final pathologic report revealed a well delimited, encapsulated tumor and the microscopic description established the diagnosis of a well differentiated (G1) neuroendocrine tumor, pT1NxL0V0R0, with a proliferation index ki67 of 2%. The patient was subsequently addressed to the Oncology Department. Regular follow up was recommended, including the systematic evaluation of the neuroendocrine serum markers and repeated ultrasound. CEUS was performed every six months for 2 years, with negative results (Figures 6-8). The patient is clinically fit and living a normal life.

Discussion

Nonfunctional pancreatic neuroendocrine tumors are hard to diagnose. When they become symptomatic, there is usually a mass effect or metastasis can be found. However, surgery is easier to perform when these lesions are depicted earlier in time. The main imaging methods used for these tumors are MRI, CT scans and endoscopic ultrasonography [4-6]. Contrast-enhanced ultrasound is not considered a standard procedure for these tumors [7].

Recent studies have indicated that CEUS is a noninvasive and

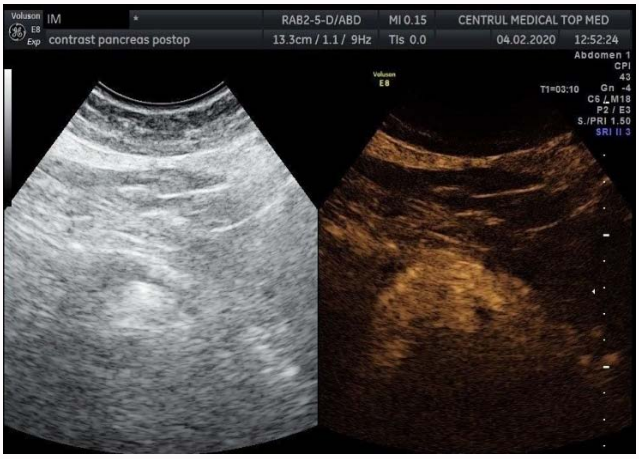

Figure 8: Post-surgery. During late parenchyma phase, at 3 min and 10 sec, the washout of the pancreas is concomitant, even if slightly inhomogeneous.

accessible technique that can provide accurate details regarding differential diagnosis between some histological subtypes of pancreatic malignancies [8,9]. The two most frequent pancreatic malignancies include neuroendocrine tumors and adenocarcinoma. In CEUS examination, ductal adenocarcinoma presents poor enhancement in the arterial time and then rapid washout, while neuroendocrine tumors show strong enhancement during the arterial phase, followed by rapid washout. The explanation is a poor vascularization of adenocarcinoma compared to the richly vascularized neuroendocrine tumor which is revealed in arterial time in the first 30 sec of exploration [10,11]. In this case, two different CT scans missed the diagnosis. And this is not a singular case in our clinical practice. We raised the question if this examination is always reliable when it comes to small pancreatic tumors. Recent studies have shown that CEUS might not be inferior to CT in these situations [12,13]. For tumors smaller than 2cm, sensitivity of a CT scan is 69% [14], while CEUS can provide a sensitivity up to 91% [15]. Our patient had a non functioning tumor. However, small functioning tumors may pass unobserved if symptoms occur latter in time. A carcinoid tumor may be responsible for wheezing, which could delay diagnosis especially if a patient has a history of asthma, like our patient did [16]. The only curable treatment is surgery and it is possible only in the early stages [17]. Parenchyma-sparing pancreatectomy is to choose. Rapid diagnosis and intervention could prevent many cases from becoming challenging when it comes to their clinical management.

Conclusion

Our experience showed that abdominal ultrasonography follow by CEUS can give enough information for early detection and identification of the most common types of pancreatic tumors. We recommend confirmation by echo endoscopy with FNA biopsy or, if it is not available, the use of MRI. We also consider that a usual screening of asymptomatic or mildly symptomatic patients could prevent diagnosing them at an advanced stage.

References

1. Das S, Dasari A. Epidemiology, incidence, and prevalence of neuroendocrine neoplasms: Are there global differences? Curr Oncol Rep. 2021;23(4):43.

2. Fraenkel M, Faggiano A, Valk GD. Epidemiology of neuroendocrine tumors. Front Horm Res. 2015;44:1-23.

3. Simoneaux, Richard. A look at the increasing incidence of neuroendocrine tumors. Oncol Times. 2020;42(6):1-4.

4. Gürkan Dumlu E, Karakoç D, Özdemir A. nonfunctional pancreatic neuroendocrine tumors: Advances in diagnosis, management, and controversies. Int Surg. 2015;100(6):1089-97.

5. Tamm EP, Bhosale P, Lee JH. State-of-the-art imaging of pancreatic neuroendocrine tumors. Surg Oncol Clin N Am. 2016;25(2):375-400.

6. Pavel M, Öberg K, Falconi M. Gastroenteropancreatic neuroendocrine neoplasm: ESMO Clinical Practice Guidelines for diagnosis, treatment and follow-up. Ann Oncol. 2020;31(7):844-60.

7. Del Prete M, Di Sarno A, Modica R. Role of contrast-enhanced ultrasound to define prognosis and predict response to biotherapy in pancreatic neuroendocrine tumors. J Endocrinol Invest. 2017;40(12):1373-80.

8. Bartolotta TV, Randazzo A, Bruno E. Focal pancreatic lesions: Role of contrast-enhanced ultrasonography. Diagnostics. 2021;11(6):957.

9. Półtorak-Szymczak G, Budlewski T, Ireneusz Furmanek M. Radiological imaging of gastro-entero-pancreatic neuroendocrine tumors. The review of current literature emphasizing the diagnostic value of chosen imaging methods. Front Oncol. 2021;11:670233.

10. D'Onofrio M, Gallotti A, Principe F. Contrast-enhanced ultrasound of the pancreas. World J Radiol. 2010;2(3):97-102.

11. Dörffel Y, Wermke W. Neuroendocrine tumors: Characterization with contrast-enhanced ultrasonography. Ultraschall Med. 2008;29(5):506-14.

12. D' Onofrio M, Crosara S, Signorini M. Comparison between CT and CEUS in the diagnosis of pancreatic adenocarcinoma. Ultraschall Med. 2013;34(4):377-81.

13. Reznek RH. CT/MRI of neuroendocrine tumors. Cancer Imaging. 2006;6:S163-S177.

14. Costache MI, Costache CA, Dumitrescu CI. Which is the best imaging method in pancreatic adenocarcinoma diagnosis and staging - CT, MRI or EUS? Curr Health Sci J. 2017;43(2):132-6.

15. Li XZ, J. Song J, Sun ZX. Diagnostic performance of contrast enhanced-ultrasound for pancreatic neoplasms: A systematic review and meta-analysis. Dig Liver Dis. 2018;50(2):132-8.

16. Spada F, Rossi RE, Kara E. Carcinoid syndrome and hyperinsulinemic hypoglycemia associated with neuroendocrine neoplasms: A critical review on clinical and pharmacological management. Pharmaceuticals. 2021;14:539.

17. Liu X, Chin W, Pan C. Risk of malignancy and prognosis of sporadic resected small (≤ 2 cm) nonfunctional pancreatic neuroendocrine tumors. Gland Surg. 2021;10(1):219-32.