Vascular Ultrasound Clinical Case Study

Portal Vein Thrombosis

Marilyn Zelesco
Lead Sonographer
Fiona Stanley Hospital
Murdoch, West Australia

Introduction

Obesity is one of the biggest problems facing today's health care systems. Not only does obesity lead to poor health outcomes but diagnosis becomes difficult. For medical imaging, particularly ultrasound, this is a daily struggle.

With the Aplio i800, Canon has shown they truly are leading the way in innovation by manufacturing a cutting-edge system that caters for our changing population. Due to our obesity epidemic superior penetration, excellent image resolution and color sensitivity with depth are three aspects of an ultrasound system that are imperative on any unique imaging platform.

Case Study

A 69-year-old male presented to emergency with generalized abdominal pain. His body mass index (BMI) was 40. The patient's history included a cholecystectomy five years prior and a myocardial infarction (MI) with stent surgery. The patient was prescribed Ticagrelor, an anticoagulant medication which acts upon platelets and fibrin in the blood to prevent them from forming a gel like mass in injured tissues or vessel walls which can lead to reduction of flow. Prior to his presentation at emergency, the patient had ceased taking Ticagrelor for three months in preparation for shoulder surgery at the hospital.

A CT of the abdomen and pelvis was requested, querying diverticulitis or localized perforation of the bowel. The CT showed evidence of partially occlusive thrombus in the superior mesenteric and main portal vein extending into and occluding the left portal vein. There was some mesenteric stranding and thickening of the small bowel. Further evaluation with CTPA showed no pulmonary embolus. Nil findings in chest x-ray. The patient was prescribed Warfarin to thin the blood and to slow the chances of more thrombus formation.

Discussion

Portal vein thrombosis is a condition where a blood clot forms in the portal vein – which is the main vein carrying blood towards the liver. It is usually caused by genetic or acquired disorders that affect coagulation of blood such as prothrombin gene G20210A mutation and antithrombin III deficiency. It can also be caused by blood stasis due to conditions such as cirrhosis or tumour compression. Long standing portal vein obstruction can cause the formation of collateral vessels in order to continue to supply the liver with blood[1].

Figure 1 Close examination of the portal vein shows evidence of some remaining thrombus measuring 34.8 mm in length.

Figure 2 mSMI was used to assess the portal vein for patency. The thrombus is outlined with calipers.

Conclusion

Canon continues to lead the way with ultrasound innovation. The Aplio i800 has improved levels of noise cancelling technology (Precision) to remove random noise from ultrasound images whilst retaining and enhancing true information. This case highlights this technology with the lack of noise evident in the liver vessels whilst the relevant echoes from the thrombosis remain.

Superb Micro-vascular Imaging (SMI) shows vast improvement on the Aplio i800 and is a technology designed to assess slow flow. However, it has also shown great success in looking at areas of high flow especially when spatial resolution is of importance. Monochrome SMI (mSMI) was used in this case to visualize the deep hepatic vasculature and showed the true lumen size without overpainting of color Doppler pixels. SMI can be displayed two ways. Color SMI (cSMI) which utilizes a ROI color box and the SMI pixels display the color flow. There is a range of color maps that can be used to display the flow. mSMI shows the B-mode image with a color box overlying a region of interest. Within this box the B-mode image is subtracted to allow even greater flow visualization sensitivity as the eye is not distracted by the B-mode greyscale pixels. mSMI is displayed in twin format with a B-mode reference image displayed beside the color image.

The Aplio i800 shows SMI has improved sensitivity and resolution in deep vessels of the liver.

The Aplio i800 provides penetration capabilities unlike any other system. The PVI-475BX matrix transducer allows high resolution in the far field due to its very fine beam which was appreciated in this case scanning a patient with a high BMI. The PVI-475BX multi frequency transducer has ultra wide bandwidth technology which provides more detail at depth but still maintains a homogenous near field resolution reducing the need to change probes.

The Aplio i800's improved efficiency in workflow, advanced technologies and optimized ergonomics continues to provide diagnostic confidence to make accurate decisions for better patient outcomes.

Figure 3 Another small area of thrombus in the portal vein could be seen on B-mode ultrasound.

Figure 4 mSMI with TwinView allows a B-mode reference image to be displayed next to the mSMI image - both images are live at the same time.

Reference

1. Said, A., (2016), Portal Vein Obstruction, Medscape, Viewed online 26th ay 2017 < http://emedicine.medscape.com/article/182425-overview#a5>

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Model number: TUS-AI800
MCSUS0011EAA 2022-03 CMSC/Produced in Japan

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