INTRODUCTION

Ascites is a common clinical finding with a wide range of causes. In approximately 10-15 percent of all these patients, it is refractory to first line treatment.\(^1\)

Peritoneovenous shunt (PVS) has been widely used as a suitable alternative to repeated large volume paracentesis especially for the treatment of patients with refractory ascites.\(^2\)

Fluid removal is based on intraperitoneal and intrathoracic superior vena cava pressure differentials and is performed via a pressure-sensitive one-way valve connected to a tube traversing the subcutaneous tissue of the chest wall to the neck where it enters the internal jugular vein and terminates in the superior vena cava (Figure 1). Among the various complications associated with PVS, the most common one is the obstruction of the prosthesis, which occurs in 40-60 percent of patients during first year of follow-up.\(^3\)

Evaluation of duct patency is very important in these patients presenting with gradually increasing abdominal girth after placement of LeVeen shunt tubing. Here, we present a simple but very rarely performed technique of demonstrating PVS patency using Tc-99m labeled macro-aggregated albumin.

CASE REPORT

A 27 years old known cirrhotic female patient who underwent peritoneovenous shunting (PVS) 6 months ago, was referred for the evaluation of shunt patency.

There was no history of malena or hematemesis. On examination, her abdomen was very tense and mildly tender with positive fluid thrill. Dilated cutaneous veins (caput-medusae) were visible around the umbilicus. From this clinical presentation, it was evident that her PVS was not functioning properly. We confirmed it and localized the site of shunt obstruction by a simple and non-invasive nuclear medicine protocol.

EVALUATION OF LEVEEN-SHUNT PATENCY USING TC-99M LABELLED MACROAGGREGATED ALBUMIN

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ABSTRACT

A LeVeen peritoneo-venous shunt is placed for intractable ascites. Determination of obstruction site in the shunt tube is a difficult problem. We describe a simple nuclear medicine method using 111MBq (3mCi) of Technetium-99m labeled macro-aggregated albumin injected intraperitoneally.


CASE REPORT

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Before paracentesis and administration of radionuclide into the peritoneal cavity, patient was informed about the procedure. After positioning and immobilization, abdomen was exposed from xiphisternum to the groin. Angiocath (22G) mounted on a 20cc syringe was used to enter through the anaesthetized area into the peritoneal cavity. Few ml of ascitic fluid was
aspirated to confirm whether the catheter was in peritoneal cavity or not. After removing the needle, 5cc syringe containing 111MBq (3mCi) of Tc-99m MAA was fitted with the catheter and activity was injected into the abdominal cavity. Patient was given a kinked straw and was instructed to inhale through to generate a pressure differential between thoracic and intra-peritoneal pressure allowing the ascitic fluid containing radiotracer to enter the superior vena cava through the LeVeen shunt.

Camera settings were adjusted with isotope peak at Tc-99m and window at 15%. Anterior static images of the chest using 128*128 matrix were acquired at different time intervals. In the early three images, activity was seen only in the peritoneal cavity but image acquired at 1st hour postinjection showed activity ascending in the lower end of shunt tube. It gradually went on increasing and persisted in the later images (Figure 2).

**DISCUSSION**

The LeVeen peritoneovenous shunt is designed to provide one way flow of sterile ascitic fluid from the abdomen to the vascular system. The shunt is designed in a way that permits only forward flow, when intraperitoneal pressure is approximately 3cm H$_2$O greater than intrathoracic and central venous pressures. The intended use of the LeVeen peritoneovenous shunt is to drain sterile ascitic fluid in the peritoneal cavity back into the vascular system from where it is originally derived. It has proven to be of most value in patients with intractable ascites refractory to medical management and symptoms may be alleviated by insertion of this shunt.

Nearly half of these patients may present with re-accumulation of their ascites due to blockade of shunt tube. The radionuclide shunt study in nuclear medicine is the study of choice in assessing shunt patency because it is a very sensitive, non-invasive test with no documented false positives or negatives as is the case with other diagnostic modalities such as shuntography and Doppler ultrasound.

Tc-99m-MAA and Tc-99m sulfur-colloid are two commonly used radiopharmaceuticals for the evaluation of LeVeen shunt patency. In case of Tc-99m sulfur-colloid, it should be injected in the shunt tubing because patent PVS lets colloidal particles pass through it and get localized in the hepatic Kupffer cells. Differentiation of hepatic uptake from intra-abdominal activity becomes very difficult if the LeVeen shunt is patent and tracer is injected in to the peritoneal cavity. On the other hand, Tc-99m MAA can be used intra-peritoneally because after passing through the patent PVS, and reaching into systemic circulation, tracer particles are lodged in the capillary beds of respiratory system. Although evaluation of LeVeen Shunt patency using radioisotopes labeled tracer particles is not an uncommon procedure but this has never been reported before by any radio-diagnostic center in Pakistan. We advocate that this simple and minimally invasive technique should be routinely performed in every patient presenting with suspicion of PVS obstruction before any surgical intervention.

**REFERENCES**