

Background:

There is an increasing demand for CT-guided interventional procedures such as biopsies, drainages and ablations. These can often be difficult due to a combination of anatomical location and lesion size.

A CT-navigation system could assist radiologists by displaying the expected needle trajectory and allowing better delineation of a suitable anatomical pathway to the lesion.

We present our single centre experience of the IMACTIS CT-navigation system for tumour ablations and lesion core biopsies in a tertiary referral centre in Belfast.

IMACIS Equipment:

The IMACTIS CT-navigation guidance system consists of a touch screen, electromagnetic localiser and needle holder with a sensor. It displays the anticipated needle trajectory in two planes.



Fig1: IMACTIS hardware. Left image: Touch screen demonstrating images in two planes. Top right: skin fiducial electromagnetic localiser. Bottom right: needle holder with sensor.

A Single Centre Experience Accessing the Usability and Efficacy of the IMACTIS CT Navigation System

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Fig2: Dr Kennedy demonstrating the IMACTIS CT navigation system set up.



Three cases of the use of the IMACTIS CT navigation system are detailed below.

Case 1.

Patient with cirrhosis and a small focus of HCC in superior portion of segment 8 less than 1 cm from the diaphragmatic surface. Underwent DEB TACE. Failed initial attempt at US guided RFA due to technical difficulty. IMACTIS CT guided RF ablation performed with a good result.

Case 2.

Pancreatic head and uncinate process adenocarcinoma. Unable to perform Whipples Procedure. Pancreatic head IRE ablation with four electrodes navigated past the overlying transverse colon and duodenum whilst avoiding the vasculature using the IMACTIS. Satisfactory ablation zone post procedure.

Case 3.

History of cystectomy for bladder carcinoma. Retroperitoneal mass lesion posterior to the left psoas musculature. Core biopsy performed. Histology demonstrated metastatic carcinoma.

Findings:

In total we have used the IMACTIS CT navigation system for 7 cases. Four core biopsies of hepatic, pulmonary, retroperitoneal and osseous lesions; three ablations of pulmonary, pancreatic and hepatic carcinomas. The core biopsies have all yielded positive histopathology results and the post procedure volume CTs have all demonstrated satisfactory ablation zones. No significant post procedure complications occurred.

Discussion:

The CT Navigation system allowed relatively uncomplicated ablation of the pancreatic head and uncinate process lesion by displaying the expected needle trajectory and allowing better delineation of a suitable anatomical pathway. Increased accuracy in the placement of ablation probes within a lesion could ensure a more complete ablation zone and therefore improve clinical outcomes.

The CT navigation system facilitated ablation of the small subcapsular hepatic lesion about 1cm below the diaphragm. This improved ability to target smaller lesions could allow both earlier histological diagnosis and therapeutic interventions.

In the final case the retroperitoneal mass lesion was 13cm from the skin surface. This was core biopsied with only three check CT images. Using a CT navigation system could decrease the total time taken to perform the procedure and the radiation dose both to the patient and operator as fewer needle adjustments and 'check' CTs are performed.

Conclusion:

All radiologists using the IMACTIS CT-navigation system for ablations and core biopsies felt it was easily operated, facilitated better pre-procedure planning of the anatomical pathway, displayed an accurate expected needle trajectory and would be a useful adjust for difficult cases in the future.

