PURPOSE: To refine the development and evaluate the near-infrared (NIR) extravasation detection system and its ability to detect extravasation during a contrast-enhanced computed tomography (CT) examination.

MATERIALS AND METHODS: The NIR extravasation detection system projects the NIR light through the surface of the human skin then, using its sensory system, will monitor the changes in the amount of NIR that reflected, which varies based on absorption properties. Seven female pigs were used to evaluate the contrast media extravasation detection system, using a 20-gauge intravenous catheter, when injected at a rate of 1 mL/s into 4 different locations just under the skin in the thigh section. Using 3-dimensional CT images, we evaluated the extravasations between time and volume, depth and volume, and finally depth and time to detect.

RESULTS: We confirmed that the NIR light, 950-nm wavelength, used by the extravasation detection system is well absorbed by contrast media, making changes easy to detect. The average time to detect an extravasation was 2.05 seconds at a depth of 2.0 mm below the
skin with a volume of 1.3 mL, 2.57 seconds at a depth between 2.1 and 5 mm below the skin and a volume of 3.47 mL, 10.5 seconds for depths greater than 5.1 mm and a volume of 11.1 mL. The detection accuracy was significantly deteriorated when the depth exceeded 5.0 mm (Tukey-Kramer, P < 0.05)

CONCLUSIONS: The extravasation system detection system that is using NIR has a high level of detection sensitivity. The sensitivity enables the system to detect extravasation at depths less than 2 mm with a volume of 1.5 mL and at depths less than 5 mm with a volume of 3.5 mL. The extravasation detection system could be suitable for use during examinations.

Other intravenous and vascular access resources that may be of interest (External links – IVTEAM has no responsibility for content).

Guide for intravenous chemotherapy and associated vascular access devices from Macmillan.

An example of peripheral cannulation OSCE from OSCE Skills.