Interview

Clinical use of Cios Spin

Mobile cone-beam CT for intraoperative localization of small pulmonary nodules

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About Tokushima University Hospital

As the only special care hospital in the Tokushima Prefecture Japan, it's aim is to provide and advance healthcare throughout the prefecture.

The department of respiratory surgery, which also serves as the prefecture's designated cancer care unit, has attracted attention due to a novel metal coil marking technique developed by the university. This technique allows minimally invasive resections to be performed on small lung lesions that are difficult to localize by palpation during surgery.

We interviewed Hiromitsu Takizawa, MD, Professor of Thoracic, Endocrinological, and Oncological Surgery and Director of Thoracic Surgery, regarding his use of the Cios Spin mobile cone-beam CT for metal coil marking. We asked him how this procedure can be done in normal operating theaters when previously a hybrid OR was needed.

Tokushima University Hospital is a leading teaching hospital for lung cancer care in Japan. It has about 700 beds and facilitates state-of-the-art treatment for all stages of lung cancer. The hospital facilitates image-guided lung interventions to enable minimally invasive surgery.

Interview with Professor Hiromitsu Takizawa

Professor Hiromitsu Takizawa, MD
Department of Thoracic, Endocrinology and Surgical Oncology, Graduate School of Medicine, Dentistry, and Pharmaceutical Sciences, Director of Respiratory Surgery

Tell us what's special about Tokushima University Hospital and its role in the community.

"As the only advanced treatment hospital in the prefecture, Tokushima University Hospital is responsible for providing highly advanced medical care. We also work with other facilities to co-ordinate cancer treatment as the region's designated hospital. In 2021, we treated approximately 470,000 outpatients, 207,000 inpatients, and performed around 7,000 surgeries. We act as Tokushima Prefecture's core hospital. In 2018, the "Comprehensive Medical Network" was established, which makes full use of Tokushima University Hospital's location next to Tokushima Prefectural Central Hospital. The plan was to set up a treatment hub that would improve the quality of medical care for the whole prefecture. We aim to be a university hospital that contributes even more to community medicine. We also want to expand medical partnerships and increase effective functional differentiation. As we're the only teaching hospital in the prefecture, I hope to contribute even more to training of young medical professionals so as to prevent staff shortages."

What are some standout features of the respiratory surgery department?

"Our hospital's department of respiratory surgery has seven respiratory surgeons. Five of these are also specialists in bronchoscopy. This gives us a total of ten specialists in respiratory surgery within the Comprehensive Medical Network, when you include Tokushima Prefectural Central Hospital. I guess you could say the high number of specialists is the standout feature of our hospital.

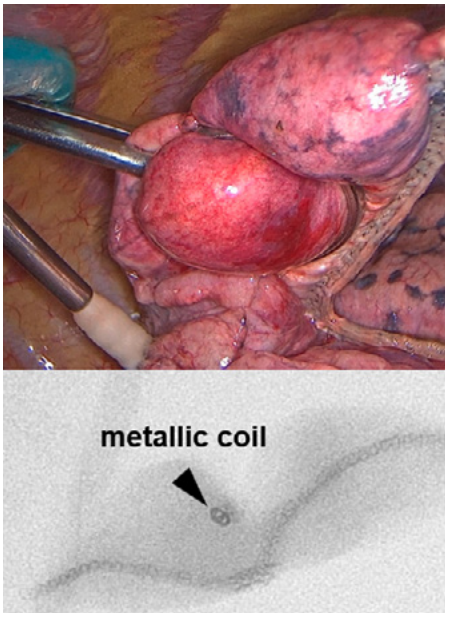
At present, Tokushima University Hospital performs around 250 respiratory tract surgeries every year. Of these, 120 to 130 are for lung cancer. But when you include the Comprehensive Medical Network, this number doubles. We use three robotic surgery systems, photodynamic therapy, laser ablation, stent therapy for airway lesions. We're also working on improving the diagnostic accuracy of bronchoscopic biopsy. This a procedure often performed by the internal medicine departments of other facilities. What also helps us to stand out is the broad spectrum of care that the respiratory surgery department provides – from diagnosis through to treatment."

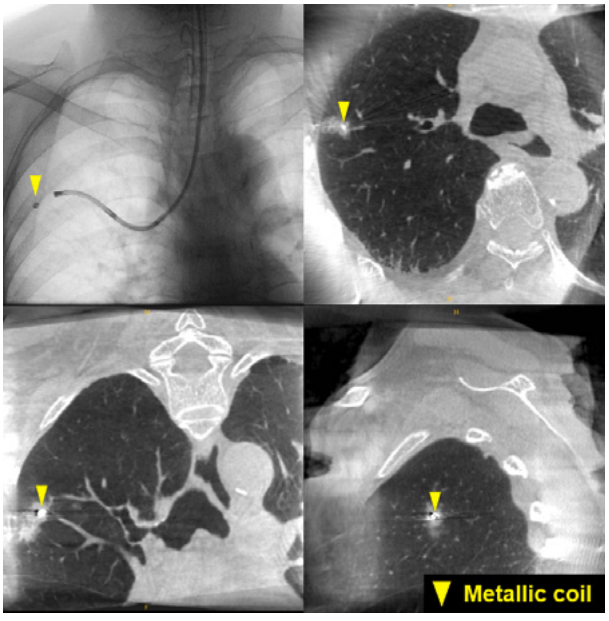
Could you tell us about the metal coil marking technique developed by Tokushima University to treat small pulmonary lesions?

"Advances in CT imaging in recent years have made it possible to detect numerous very small lung cancers and suspicious lesions. If the lesions are small and deep, it can be hard to locate them accurately during surgery and marking is needed before performing the resection.

At Tokushima University, we developed an unique metal coil marking technique. Our hospital has been working with this technology since 2004, originally in endovascular treatments. This means we have almost 20 years' experience in this field. The technique uses cone-beam CT imaging to guide a bronchoscope through the lumen of the bronchus and then insert a coil at the lesion position. This is then used as a marker to resect the lesion using a thoracoscope with guidance from C-arm fluoroscopy. We had initially been inserting the bronchoscopes under local anesthesia in the interventional radiology suite equipped with CT scanner placing the metal coil, and then performing the surgery three to five days later. The entire procedure from coil placement to surgery can now be done at a hybrid OR on the same day which is much better for the patient.

Transbronchial metal coil marking has a range of benefits. It's considered a safe procedure with fewer complications such as pneumothorax, hemorrhage, or embolisms compared to transthoracic marking methods. It gives us the ability to treat multiple lesions in one session as well as the capacity to identify and resect lesions reliably under full endoscopic view. Until now, patients who are diagnosed with early-stage lung cancer are given generous resection margins for tumor removal. We have observed no local recurrence in over 300 cases.In 2022, the Journal of Thoracic and Cardiovascular Surgery reported a study on the usefulness of metal coils in the resection of small pulmonary lesions after a multi-center joint study led by the University of Tokyo. This study investigated concomitant use of metal coils with the more conventional dye-marking technique.





How can intraoperative 3D images from the Cios Spin mobile cone-beam CT system be used in clinical practice?

"Metal coil marking is used to determine the lesion location during surgery using high-definition 3D imaging. We have just one hybrid OR where the metal coil marking technique can be performed. This means waiting until this OR is available. With a Cios Spin, however, we can use any OR. For metal coil marking you need a bronchoscope, anesthesia equipment, and the C-arm. These can get in the way of each other if the room is small. Cios Spin, by contrast, is compact and doesn't take up much space, so you don't have to worry about the size of the available ORs. I see no reason why it couldn't be used in hospitals that don't have hybrid ORs or have only small operating theaters."

How would you rate Cios Spin in terms of image quality and usability?

"Both the fluoroscopic and 3D images are exceptional. 3D image extraction is very fast. The images look fantastic even with a bronchoscope or metal coil inserted. This could be due to the metal artifact reduction function. Small pulmonary lesions are clearly visible [1]. This allows for safe and accurate resection. I feel like the performance and monitor are a cut above the traditional C-arm. As for usability, there are no issues with maneuvering the mobile C-arm to acquire the images. Also, the rotation of the C-arm does not interfere with other equipment. Overall, this makes the workflow very smooth."

At a glance: Cios Spin in pulmonolgy

- Acquisition of 3D images in 30 seconds
- Metal artefact reduction
- 25 kW power for larger patients
- Wide-space C-arm with 94 cm of free space from detector to tube cover to place the view of view at the periphery of the lung during 3D imaging.
- Wireless footswitch to trigger scanning from the distance

"The advantages of Cios Spin are that it's compact, easy to move, it can be used in small rooms, and it's simple to use in any operating theater. You don't need a special hybrid OR. I think there is huge potential to expand the scope beyond the main field of orthopedic surgery."

Professor Hiromitsu Takizawa, MD

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The customers are employed by an institutiont hat receives financial support from Siemens Healthineers for collaborations.

The product/feature and/or service offerings (mentioned herein) are not commercially available in all countries and/or for all modalities. Their future availability cannot be guaranteed.

The opinions expressed in this article are solely those of the featured physicians and may not reflect the views of Siemens Healthineers.

References:

[1] Avasarala et al. Multidimensional Precision: Hybrid Mobile 2D/3D C-Arm Assisted Biopsy of Peripheral Lung Nodules. J Bronchology Interv Pulmonol. 2021;27(2):153-155. Mean lesion size in study: 26 mm × 24 mm. The study was performed at a singe center and there can be no guarantee that other customers will achieve the same results.

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