PHILIPS

Computed Tomography

White paper

Advancing interventional CT

Precise Intervention

Overview

Philips Incisive CT features intellect at every step to help meet the challenges of interventional CT. Like never before, operator and design efficiencies come together for wise decisions from start to finish. With the Precise Intervention tool of Philips CT Smart Workflow, Incisive CT provides everything a user needs to quickly and confidently perform an interventional CT scan.

CT-guided percutaneous procedures are used for many different applications to aid diagnosis and treatment

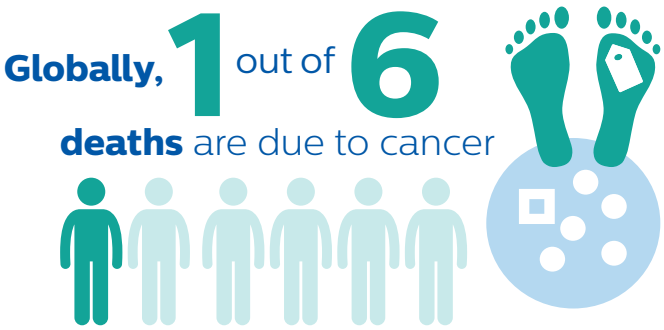
Procedure type	Application
Biopsy and puncture	Obtain biological tissue (biopsy) or liquid samples (puncture) for analysis
Drainage and nephrostomy	Drain air or liquid (urine for nephrostomy)
Alcoholization (celiac plexus block)	Inject alcohol in celiac plexus area for palliative pain management mainly in the context of tumor infiltration
Articular infiltration	Puncture and inject anti-inflammatory corticosteroid at the level of lumbar joints
Cementoplasty (i.e., vertebroplasty, kyphoplasty, osteoplasty, sacroplasty)	Inject cement (methyl methacrylate) into an osseous lesion
Radio frequency ablation (RFA) and microwave ablation (MWA)	Destroy tumor tissue with heat
Cryoablation or cryotherapy	Destroy tumor tissue with cold
Embolization	Trans-arterial embolization of tumors or traumatic hemorrhage

Cancer is becoming **a chronic condition**

Although there are different types of interventional procedures performed with CT systems, oncology-based interventions are the most challenging to perform and are projected to have the most growth.

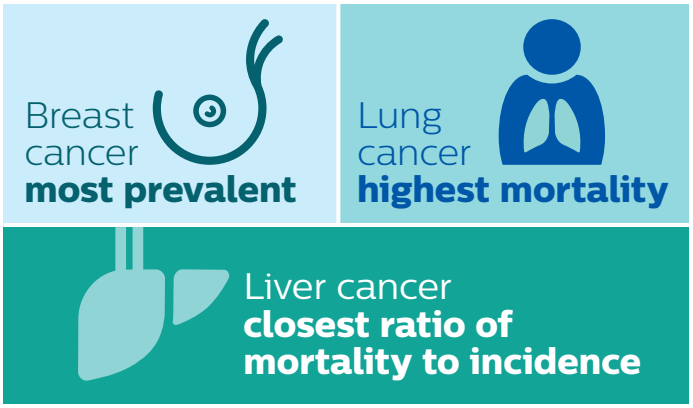
Background

The World Health Organization (WHO) states that 1 in every 6 deaths can be attributed to cancer, and that cancer is the second-leading cause of death after cardiovascular disease.



According to the American Cancer Society, the global cancer burden is expected to grow to 27.5 million new cancer cases and 16.3 million cancer deaths by 2040.[1]

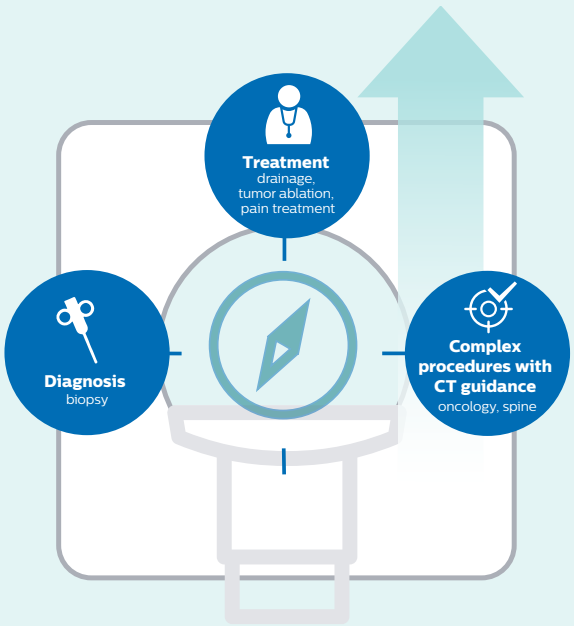
Globally, 2018 estimates show



Cancer incidence and mortality rates vary by country due to a variety of factors including the age of the population, prevalence of risk factors such as infections, availability and use of early detection tests (including preventive care), and the availability of advanced treatments.

CT is often chosen for diagnosis and treatment involving image-guided procedures because of its exceptional contrast and spatial resolution compared to other imaging modalities.

Image-guided procedures are increasing

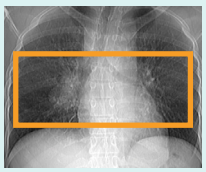


Potential benefits over surgery

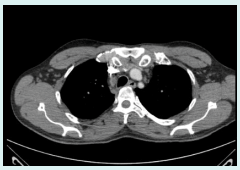
- Less patient discomfort
- Improved outcomes
- Greater cost-effectiveness

Typical workflow for CT-guided interventions

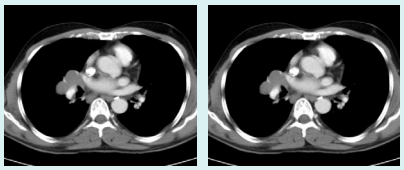
Location



Surview (optional)



Contrast-enhanced helix



Target and entry site selection

Procedure

Needle guidance (sequential or fluoroscopy CT)

Low dose
High accessibility
Work or scan bed motion

Fast and precise
Low accessibility
High dose

Control

Follow-up (sequential or helix)

The goals of interventional CT are to aid in planning, guidance, treatment and control.

Trends in **interventional CT**

Traditionally, CT systems have been installed in radiology departments. As CT image quality and speed have improved, so has the use of accurate, minimally invasive techniques. However, time is still a challenge for interventional procedures.

Most sites have to schedule extended time slots of up to 60 minutes with the CT system for an interventional procedure. As image quality has improved, the focus is now on reducing procedure time and also radiation dose.

Radiation **dose**

Depending on the type of interventional procedure, the entire study time may be as short as a few minutes, but it may also take many hours. Therefore, radiation dose plays a key role in decisions before and during the procedure.

Pre-procedure

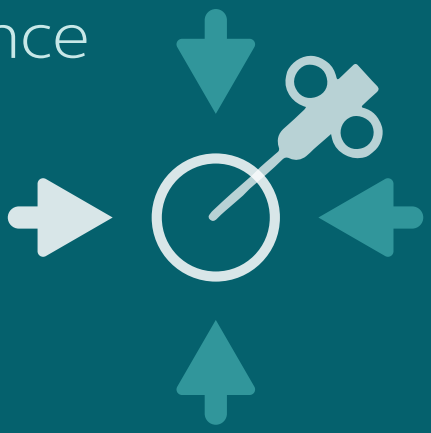
When decisions are made about the optimal imaging method to use, radiation dose is considered for the planning helical scan and during the needle or probe guidance.

During the procedure

Image-guiding techniques, single scan for step-by-step guidance vs fluoro CT for real-time imaging, and radiation dose per scan may be adjusted to optimize image quality, and at the same time, minimize dose to the user and the patient. There are also techniques to select an angle for the acquisition to minimize radiation dose.

Precise Intervention for confidence in interventional CT

Incisive CT has AI* advances for optimal lesion depiction and characterization from the planning stage through follow-up. Expect high image quality and low dose, with the efficiency to improve the experience for both patients and clinicians.



Reduce procedure time by 16%[2]
Perform more exams or procedures in a day using Precise Intervention.

Needle planning, guidance and tracking
Ensure visualization of the target path and needle by allowing the physician to verify or modify the needle angle according to scan parameters.

Radiation dose-conscious scanning
Perform efficient procedures with high image quality at low dose.

* According to the definition of AI from the EU High-Level Expert Group.

Image display with references

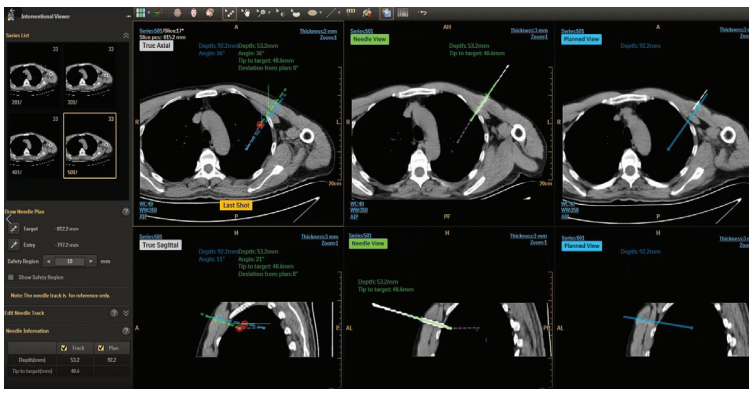
While acquiring images, it can be useful to display one or two reference images. These reference images allow the user to compare to a previously acquired image.

Advanced needle guidance

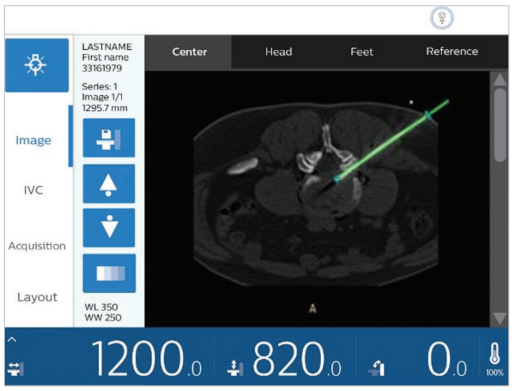
To ensure precise placement of a needle regardless of the complexity of access, Incisive CT allows the user to plan any needle obliquity, along with tracking of the needle, as it is inserted toward the target lesion. These tools allow for fast feedback on the accuracy of needle placement, which in turn permits the user to not only be confident in performing the procedure, but also to carry out the procedure in as short a time as possible. These tools assist in ensuring an optimal outcome of the procedure while reducing time.

- **Supports planning and re-plan and editing of the needle path**
- **Displays safety margins from 5 mm up to 20 mm**
- **Transmits depth and angle information for the planned path**
- **Provides automatic needle tracking algorithm, tracking results and system display measurements of needle tip to target, along with deviation from plan and insertion depth**
- **Workflow available on the gantry, and from in-room displays and the console**

Incisive CT features advanced interventional needle tracking capability.



Needle guidance on console and in-room display.

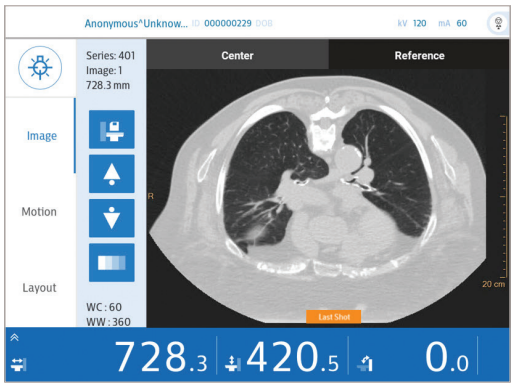


Needle guidance on the gantry touchscreen.

Touchscreen gantry controls for ease of use in interventional CT.

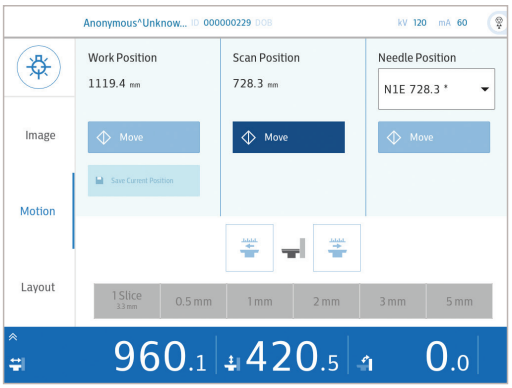
Flexible display

Interventional tools with the flexibility provided by the OnPlan gantry controls.



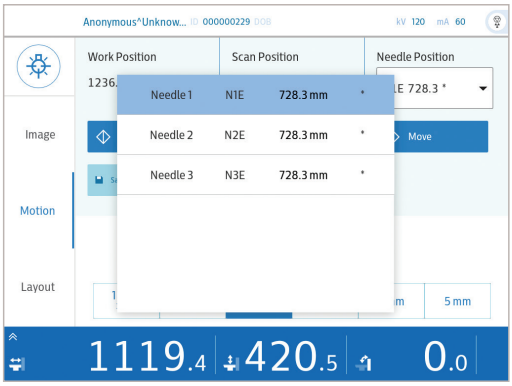
Image

Interventional images are displayed on the gantry panel, and the images are controlled using gesture controls such as scroll, WW/WL changes, pan and zoom. Images can also be saved.



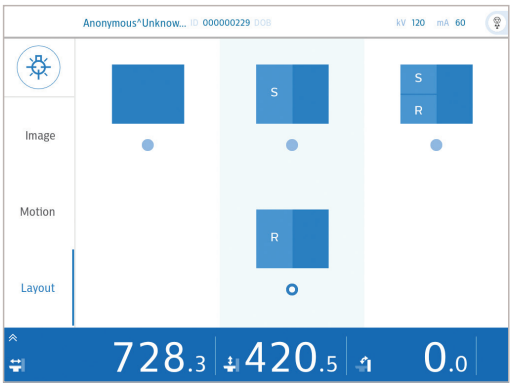
Interventional table controls

Saves multiple scan locations and moves to the selected location. Also allows user to move the table incrementally to aid in locating the needle tip.



Acquisition

Allows the physician to immediately change scan parameters to ensure visualization of the target, path and needle through change of scan modes or change of scan parameters, including slice thickness.



Layout

Flexibility to display images according to user preference. User can select to display one or three images. Simultaneously display either a single roadmap image or a roadmap and surview image to assist in guidance.

Clinical relevance

Interventional CT is becoming increasingly important in the guidance of complex procedures in oncology. Incisive CT with Precise Intervention delivers workflow advances and enables confident procedures in this critical but complex area of CT imaging.

Conclusion

Precise Intervention needle planning and tracking is a major enhancement that provides the ability to perform interventional CT procedures with accuracy and confidence. Incisive CT provides a number of meaningful advances encompassing workflow, all to make procedures easy and efficient.

References

1. American Cancer Society, Global Cancer Facts & Figures, 4th Edition. 2018.
2. Chacko C. Precise Intervention Clinical Review Report for Loong. Philips Doc ID: D000874955. 2021.

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