

Cancer is the second leading cause of death in most industrialized countries and dominates the attention of the medical community. Each year, more than 10.6 million patients are diagnosed with cancer worldwide. There are more than 1,300,000 cases of lung cancer, 1,200,000 cases of breast cancer, and 1,000,000 cases of colorectal cancer worldwide. Many cancer patients develop metastases, which are largely not surgically treatable. Until now.

## An Emerging Field – Interventional Oncology

Due to demographic change and an aging population, the number of cancer patients is on the rise. The number of cancer cases diagnosed annually will increase 50% from 10 million to 15 million, by 2020 according to the World Health Organization (WHO). Multidisciplinary teams of physicians are taking new approaches in the fight against cancer. Cancer treatment is moving away from surgical removal of tumours and chemotherapy or radiation therapy and is expanding into new areas. One of those areas is interventional oncology, which opens up new possibilities to treat tumours with minimally invasive techniques. Although surgery is still the treatment of choice for most

kinds of cancer, minimally invasive therapies have proven their advantages over surgery. When looking at liver hepatocellular carcinoma (HCC) surgery is feasible in only 25% of these patients; the remaining 75% are definitely candidates for minimally invasive treatment. The advantage of these new approaches is that these procedures are much less invasive than open surgery. Hospital stays are therefore shorter and patients can go home and continue with their daily life much earlier than after undergoing surgery. Within interventional radiology, interventional oncology is the fastest growing field. The number of chemoembolization cases has increased by 52% in

Left page: Image above: Large Volume *syngo* DynaCT provides an extended field of view to visualize the whole abdomen.

Image below: Previously acquired PET CT images can be fused with a Large Volume *syngo* DynaCT image using *syngo* InSpace 3D/3D Fusion.

the US since 1998<sup>1</sup>. Besides increasing costs associated with cancer, interventional oncology provides an opportunity for hospitals to differentiate themselves as unique relative to their competitors in the market<sup>2</sup>.

Within recent years, a variety of new minimally invasive, image-guided techniques has emerged for treating isolated tumors. These interventional oncology procedures fall into two categories: transcatheter therapies and ablative therapies. Transcatheter therapies consist of catheter-based delivery of treatment including a variety of embolizing agents are used to cut off the blood supply to the tumor. Chemoembolization material (transarterial chemoembolization, TACE) or small radioactive microspheres (selective internal radiation therapy, SIRT) are used for tumor embolization. Ablative therapies are relatively straightforward; these minimally invasive methods involve the placement of one or more needles directly into a lesion percutaneously and using several forms of energy such as radiofrequency, microwave or laser to destroy it. For these minimally invasive

therapy options, advanced image-guided technologies are crucial. Siemens offers an innovative and extensive portfolio of image-guided solutions that support interventional oncology procedures including high-end imaging systems and 3D applications. Siemens advanced applications support the physician during the entire interventional oncology workflow, from tumor evaluation and procedure planning to therapy and check-up.

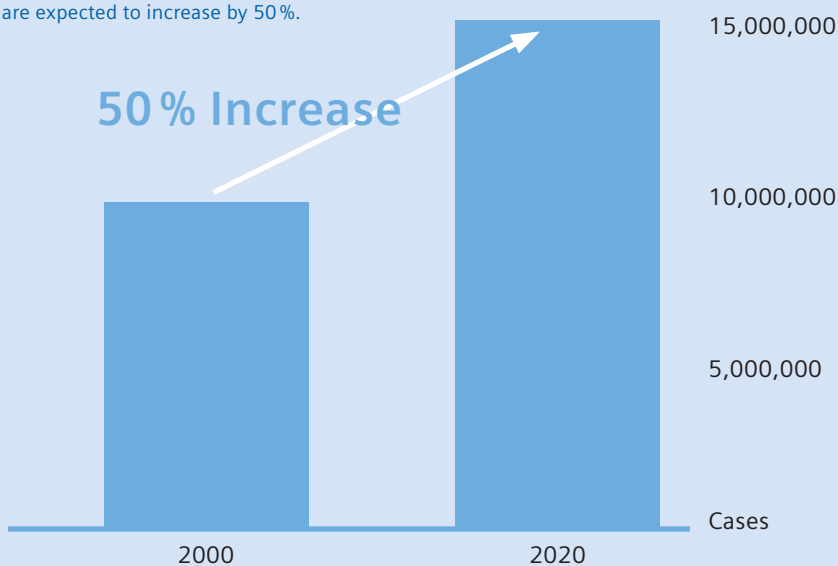
### **syngo DynaCT – Enhanced confidence during tumor treatment**

With *syngo* DynaCT soft tissue imaging physicians have excellent support for tumor treatment, planning, and therapy. It helps to visualize tumors as well as the complex structures of tumor-feeding vessels. Due to quick reconstruction times, abdominal images are available at bedside in 22 sec. Its fast operation workflow and excellent image quality support the selective injection through precise identification of the tumor-feeding vessels and provide immediate information on the procedure's status. A recent study from the University of Berlin demonstrated that *syngo* DynaCT has led to catheter repositioning in 50% of transarterial chemoembolizations<sup>3</sup> and therefore provides enhanced confidence during tumor treatment.

A step beyond imaging with *syngo* DynaCT is the enhanced application Large Volume *syngo* DynaCT, a unique benefit of the robotic assisted C-arm system Artis **zeego**. It provides interventional radiologists with almost unlimited freedom of movement. The flat detector of the system rotates two times 220 degrees around the patient with such high precision that cross-sectional images with a coverage of 47 cm are created. These images allow for more anatomical coverage than is possible with any other angiography system. The whole liver and lung can be visualized, thus increasing certainty and confidence during the procedure, particularly in heavily pre-treated patients with a complex arterial

By the year 2020, cancer cases worldwide are expected to increase by 50%.

50% Increase

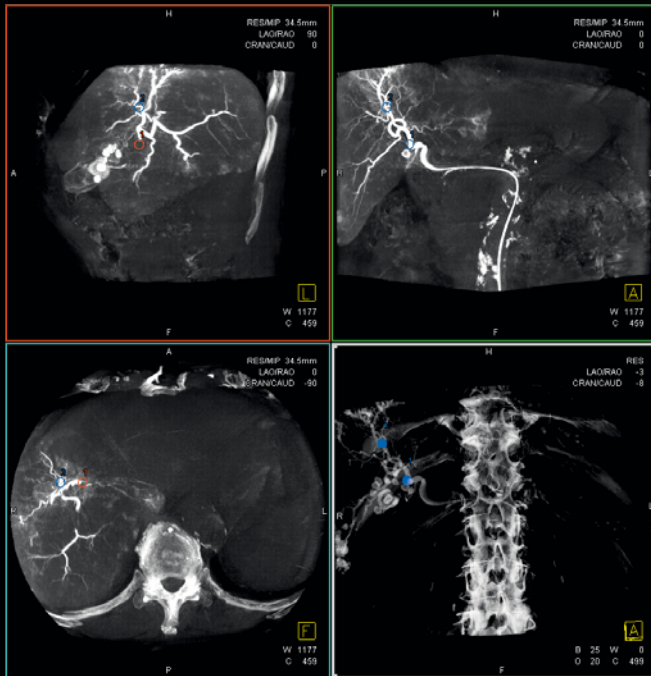


New cancer cases worldwide  
Source: World Health Organisation (WHO)

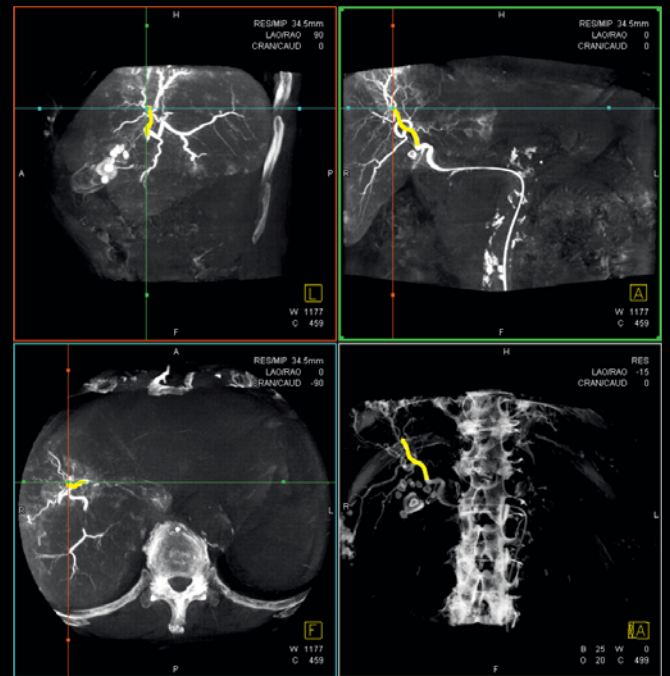
syngo DynaCT of the liver,  
Cross-sectional imaging of the lesion  
and tumor-feeding vessels.



syngo DynaCT of the lung,  
Cross-sectional imaging of soft tissue  
and tumor-feeding vessels.



syngo Embolization Guidance  
Enhanced planning for embolization procedures. Just the  
tumor-feeding vessel has to be marked.



Then syngo Embolization Guidance automatically calculates the  
center line of the vessel. This information can be overlaid on the  
live fluoroscopy image.

## “With its excellent image quality Large Volume *syngo* DynaCT enhances the identification of tumor-feeding vessels or aberrant vessels, which leads to improved planning of embolizational procedures like SIRT”

Tobias Jakobs, M.D., Klinikum Großhadern, Germany

anatomy, which is frequently observed in patients who are referred for SIRT or TACE therapy. Whole body check-up Large Volume *syngo* DynaCT runs can also save the CT exam after embolizations and help to keep the CT scanner free for more diagnostic scans.

### Demonstrating tumor activity in the angio suite

In cancer therapy, a diagnostic CT, MR or PET CT scan is a common procedure and it is also very important to have this imaging information available during the minimally invasive procedure. With *syngo* InSpace 3D/3D Fusion these pre-acquired images can be fused with a high-contrast angiographic 3D image or even with *syngo* DynaCT datasets to display all relevant diagnostic data at once. It overlays the acquired data with the

application creates an overlay with the live fluoroscopy image and highlights the marked vessels, thereby simplifying catheter guidance for tumor embolization. For the physician, this means more confidence during the procedures and less radiation dose for the patient.

### See pre- and post interventional results

For verification of pre- and post-procedural dynamic results after an interventional oncology procedure, *syngo* iFlow is the application of choice. It is especially useful to check the results before and after radioembolization therapy. *syngo* iFlow can demonstrate tumor perfusion changes by comparing two DSA acquisitions visualized in two single color-coded images. It may also help to better assess the distribution of yttrium-90 or chemo-embolization material in the tumor and normal liver.

### Unique variety

All these 3D applications are combined in one of the industry's most complete portfolio of imaging systems, the Artis **zee** family, including Artis **zeego**, the first C-arm system on the market with integrated robotic technology. The systems are ideally suited to support interventional oncology procedures. The floor- and ceiling-mounted systems as well as Artis **zeego** all bring unique advantages to the angio lab. Convenient and easy system positioning, 3D imaging capabilities, dose-saving parameters and a fully digital imaging chain make them a solid investment in interventional oncology. An investment which allows clinics to treat an entirely new group of patients in the interventional lab: cancer patients.

live fluoroscopy image in the lab and provides additional functional information on the tumor such as its activity during the procedure. It is a great support tool for minimally invasive cancer therapy.

### Bringing embolization material to the target

Besides visualizing organs, tumors or metastases, catheter guidance to the target region is crucial. Another advanced tool for planning the embolization path is *syngo* Embolization Guidance. The

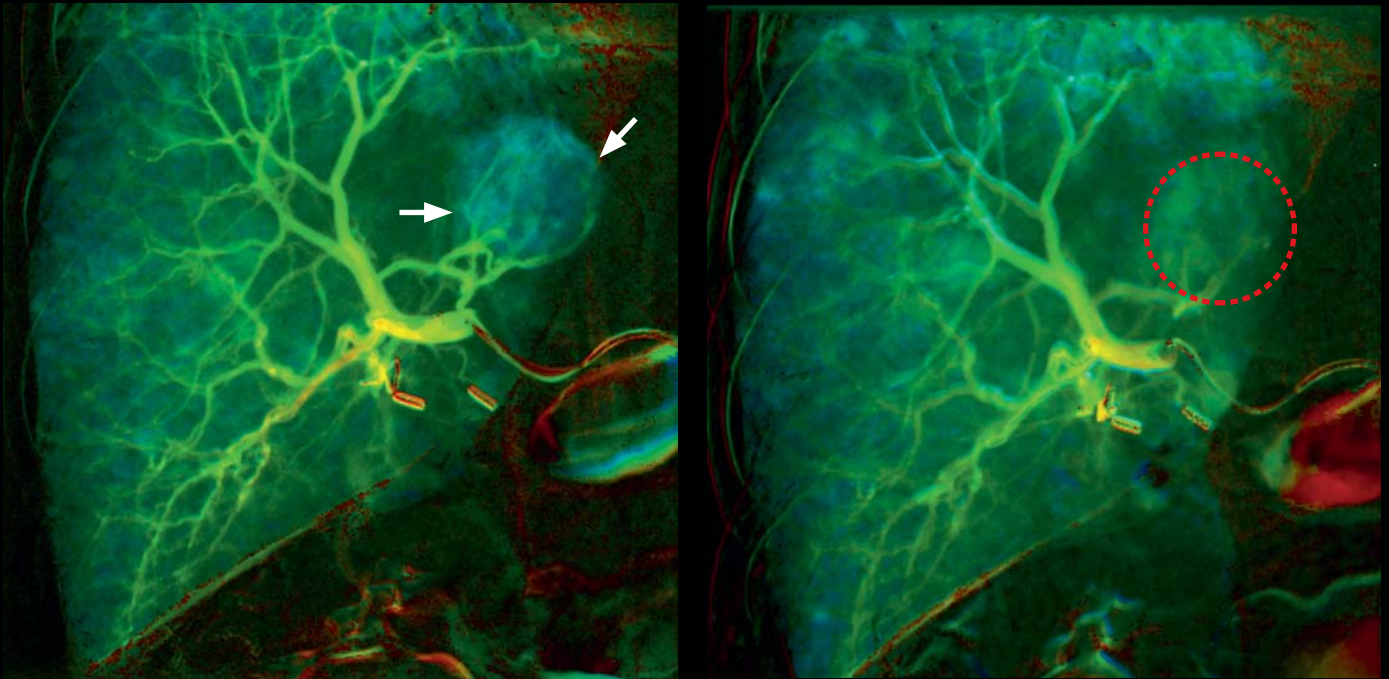
1 IVM report 09

2 Ann H. Carlson: An Emerging Discipline: Interventional oncology is poised to advance cancer treatment options for hospitals. *Imaging Economics* October 2007

3 Results of a study published in *European Radiology* March 2009 by Dr. Meyer, University of Berlin, Charité, Germany and Prof. Dr. Wacker; Johns Hopkins Hospital Baltimore, USA

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syngo iFlow visualized pre- and post-treatment results in a single DSA acquisition.

## SIRT

Selective internal radiation therapy or SIRT is a non-surgical outpatient therapy using radioactive microspheres (yttrium 90) or SIR – Spheres® to deliver radiation directly to the site of the tumor. The microspheres themselves are usually made of resin, which can embolize the artery more easily and therefore stop the blood supply. The yttrium-90 isotopes and the beta emitters have an average penetration of 2.5 mm (one tenth of an inch). With a half-life of 2.6 days, the radioactivity is gone within approximately two weeks after the procedures, although the particles remain in the vessel. This unique, targeted therapy spares healthy tissue while delivering up to 40 times more radiation to the tumor than would be possible using conventional radiotherapy. Performing SIRT procedures involves carefully steering a catheter into the artery supplying the tumor. The therapy requires highly sophisticated image-guided technologies and imaging applications that provide sufficient information and orientation for the physician. SIR-Sphere therapy was released in the U.S. and in Europe in 2002 and helped to treat more than 1,500 patients so far.

The very young therapy has many advantages as most patients tolerate the treatment well, the radiation dose is gone very early and liver tumor growth can be controlled very effectively using SIRT therapy.

