

Accuracy Far Beyond Conventional Pneumological Practice

Worldwide, cancer is a leading cause of death, with lung cancer causing more deaths than stomach, liver, colon and breast cancer. Taking biopsies from small lung nodules to diagnose cancer at an early stage poses an opportunity and a challenge at the same time. The smaller the nodule, the higher the survival rate of the patient, but the more difficult the biopsy. An efficient solution lies in guided navigation. With no artificial contrast medium but air the tumor is clearly visible with *syngo* DynaCT.

by Lena Schnabl

According to the WHO the lung tumor group is often diagnosed in the advanced stages, resulting in poor prognosis. However, a study from the American Cancer Society shows that if discovered early enough the overall survival rate is 88%, making precautions, precise and reliable diagnosis essential. In June 2011 the National Lung Screening Trial (NLST) publicized its primary results. The trial was launched in 2002 and compared two ways of detecting lung cancer: low-dose helical computed tomography (CT) and standard chest X-ray. The primary results show a 20% decrease in mortality from lung cancer in the low-dose CT group as compared to the radiography group. The rate of positive results was more than three times higher with low-dose CT screening than with radiographic screening.

A number of trials of low-dose CT screening are currently underway in Europe. More lung screenings will most likely result in more positive findings, such as the detection of a high number of small nodules that make clarification through biopsies necessary. Taking biopsies from small lung nodules to diagnose cancer at an early stage poses an opportunity and a challenge at the same time. The smaller the nodule, the higher the survival rate of the patient, but the more difficult the biopsy. The likelihood of a lesion being malignant varies depending on age and smoking behavior as well as its size: As published in the 'Guidelines for Management of Small Pulmonary Nodules Detected on CT Scans', lesions measuring less than 4 millimeters found in low-risk individuals prove malignant in only

one percent of cases. Those measuring 8 to 10 millimeters have a 10 to 20 percent chance of being malignant and 50 percent of lesions over 20 millimeters are cancerous, making clarification essential.

Challenge: Increase Accuracy of Tissue Samples

However, Schreiber found out that the accuracy of tissue samples taken from lesions of this size is relatively low: 33 percent in the case of lesions less than 20 mm as opposed to 62 percent for lesions over 20 millimeters. Small pulmonary nodules (SPN) tend to be benign rather than malignant, but they require more invasive treatment because conventional bronchoscopies on lesions of this size result in a low accuracy rate. Thus tissue samples can be false-negative. Dr. Wolfgang Hohenforst-Schmidt, Senior Physician at the Department of Cardiology, Angiology and Pneumology (Head of the Department Prof. Dr. Johannes Brachmann) at the Coburg Hospital in Germany says: "This poses a real problem. If the tissue sample proves to be malignant, I hit the lesion without doubt. But in the case of benign results the main question is, if I ought to believe these results. We urgently need an enhanced solution for the diagnostic clarification of small, peripherally located lung lesions in order to prevent false-negative results. This is only feasible via navigation." According to Hohenforst-Schmidt, the solution lies in guided navigation with *syngo* DynaCT. As the pulmonary medicine unit is located in the Department of Cardiology, Angiology and Pneumology the lung specialist has access to an angiography suite equipped with a

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Wolfgang Hohenforst-Schmidt, M.D., Department of Cardiology-Angiology-Pneumology, Klinikum Coburg, Coburg, Germany

ceiling-mounted angiography system. The *syngo* DynaCT application generates a CT-like dataset within a few seconds. Real-time fluoroscopic images are superimposed on this during the bronchoscopy, facilitating navigation within the bronchial tree. Hohenforst-Schmidt ensures that the diaphragm remains in a fixed position via jet ventilation during deep sedation. He uses no artificial contrast medium but air to make the tumor clearly visible with *syngo* DynaCT. According to the lung specialist, the major benefit of this approach is that it is a real-time procedure. Both stages – the acquisition of the *syngo* DynaCT dataset and the bronchoscopy under fluoroscopic guidance – are performed at the same time, in the same place and with the diaphragm in the same position.

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To date, the lung specialist has taken biopsies from over forty patients via *syngo* DynaCT-guided bronchoscopies – with impressive results: During the proof-of-concept period the hit rate was 80% in lesions with an average diameter of 24x23x23 mm, and 58% in very small nodules with an average of 15x14x16 mm – only by forceps biopsies. "The increase in the hit rate to around two thirds poses a seismic

shift", says the lung specialist, "But the problem of false-negative results is still conspicuous. To solve this, we want to bring additional instruments, such as needles, brushes, suction-cytology and 20-Mhz-miniprbes to the lesion in the near future. The expectation from other studies is that the additional use of these instruments will bring another 10 - 15 % of detection rate." Hohenforst-Schmidt has also done several transthoracic biopsies using *syngo* DynaCT and *syngo* iGuide, the live and integrated needle guidance software. Tissue samples taken during transthoracic biopsies are usually bigger and therefore more accurate diagnosis is possible. *syngo* DynaCT enables the verification of the correct needle position and thus makes transthoracic needle procedures more effective. Furthermore, the lung specialist has demonstrated that it is possible to dye small lesions so that they are more visible and easier to remove during subsequent surgical interventions. Additionally, Hohenforst-Schmidt believes *syngo* DynaCT can become a powerful tool to make progress in local ablative therapy modalities like radiofrequency ablation, microwave ablation, laser induced thermotherapy or intratumoral chemotherapy.: "Intratumoral chemotherapy can considerably extend the lifespan of patients and I am convinced

that *syngo* DynaCT can contribute to doing so more precisely." Other types of ablation, such as RFA, microwave and LITT or endoluminal brachytherapy also depend on exact navigation. Depending on the tumor size, these "total" local ablations are expedient in the context of a therapy using intratumoral chemotherapy, since affected lymph tracts and lymph nodes can absorb the outflowing chemotherapeutic agent in significantly higher concentrations than is the case with systemic administration. Undiscovered residual tumors in lymph tracts and lymph nodes are not reached by the local ablation, however, they are reached by intratumoral chemotherapy.

syngo DynaCT in the Hybrid Room

When asked which departments could benefit from angiographic imaging, the lung specialist answers that it is mainly suited to hospitals with a high patient circulation, in which at least 800-1,000 bronchoscopies are performed annually. "I believe hybrid rooms are the future of medicine. In such multi-level rooms, where angiography and surgery take place on the same table, cardiologists as well as pulmonologists, hepatologists and surgeons can gain from the benefits of intra-procedural imaging."

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