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## Cios Alpha: Flat Detector Mobile C-Arm Imaging in Gastroenterology

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High Imaging Standard for  
Successful Gastroenterological  
Interventions –

# The Mobile C-Arm Cios Alpha

At all levels of the gastrointestinal tract, diagnoses are increasingly accompanied by treatments delivered at the same time and the same place. In addition to the endoscopic image, the physician will therefore more often also require the live X-ray image. Prof. Dr. med. Juergen Siebler, Chief Physician and Head of the Endoscopy Unit at the Medical Clinic at the University Hospital in Erlangen, Germany, has clear requirements when it comes to imaging: a sharp picture and rapid, intuitive usability. The mobile C-arm Cios Alpha meets these standards, he says.

Text: Matthias Manych   Photos: Sven Doering

Prof. Dr. med. Juergen Siebler  
strives to advance patient-  
friendly and precise diagnos-  
tics as well as therapies.

*“A key factor for successful therapy is the quality of imaging.”*

**Prof. Dr. med. Juergen Siebler,**  
University Hospital Erlangen,  
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Forty years ago, endoscopic retrograde cholangiopancreatography (ERCP) marked a new milestone in medicine; today it is all in a day's work for gastroenterology. It is an elegant method for examining as well as treating diseases of the bile duct. Irrespective of whether a blockage was caused by gallstones or by stenoses – with an ERCP, these problems can be treated without open surgery, long anesthesia, or separately conducted diagnosis and intervention. This huge advancement for patients was introduced for practical application in the early 1970s.

### **“Bile Must Flow”**

Today, ERCP, a combination of gastroscopy and fluoroscopy, is one of the most frequently conducted examinations in Erlangen, and one that is extremely important for the patients. If drainage into the duodenum is blocked, the retention of bile can build up all the way to the pancreas and the liver. Patients then develop jaundice, with some experiencing very strong itching and a severe

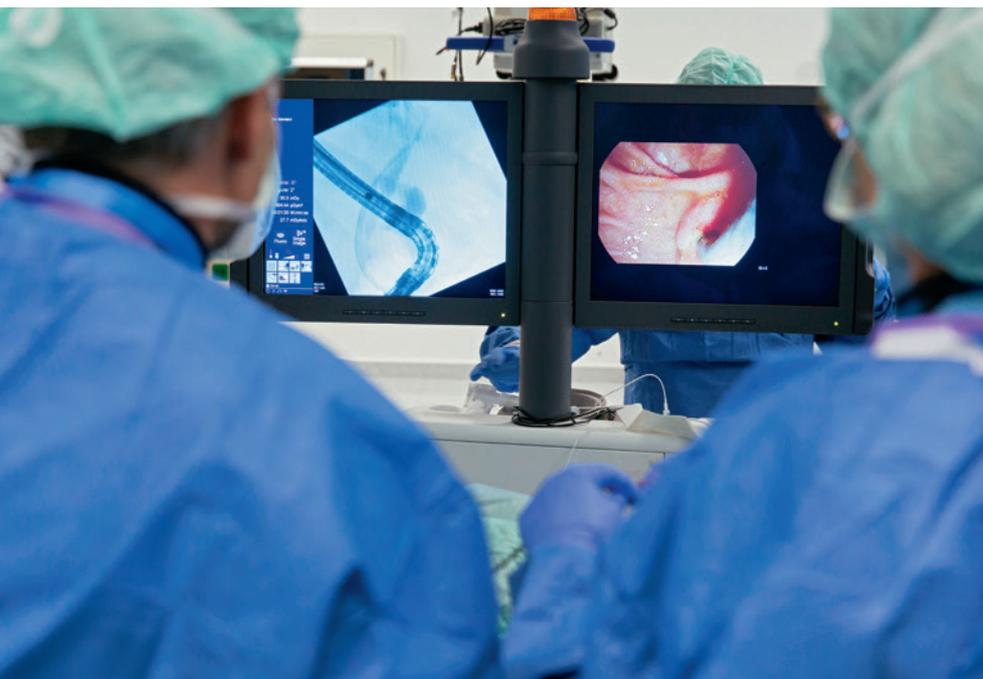
deterioration in their quality of life. If gallstones are the cause, the patient will experience colicky pain, while such pain is absent if the blockage is caused by tumors. But, as Prof. Juergen Siebler explains, the real danger of a bile blockage lies elsewhere: “The risk for patients is bacteria accumulating in the bile ducts as well, leading to suppurative cholangitis, which can be life-threatening. In such cases, it is not enough to give patients an antibiotic course; they need relief – the bile must flow.” The buildup of bile can be unblocked during an ERCP by either recovering and removing existing gallstones or by treating stenoses.

### **The Main Matter: Brilliant X-Ray Imaging**

In order to be able to assess all bile ducts during the ERCP, doctors require not just the endoscopic images from inside the body, but also high-resolution X-ray images. To this end, special catheters and contrast agents are used together with C-arms that can deliver the required quality of imaging.

“I trace changes in the bile ducts indirectly by observing the distribution behavior of the contrast agent,” says Siebler. The alternative procedure to the ERCP, percutaneous transhepatic biliary drainage (PTBD), is also carried out with X-ray monitoring. It is required if the aperture of the common bile duct into the duodenum cannot be reached with the endoscope, for instance due to a constriction caused by a tumor. By applying a PTBD, the buildup of bile can be drained through the skin.

Irrespective of whether the esophagus, the gastric outlet, the duodenum, or the large intestine is affected, X-ray monitoring with extremely high-resolution imaging is always an issue when stenoses are expanded and stents are implanted. The structures in question are extremely delicate; sometimes, clinically relevant stenoses are only five to ten millimeters in length. For a stent intervention to be successful, the endoscopist must be able to bridge the stenosis completely with the stent. Therefore, he must have full confidence in the ability of the X-ray system



Endoscopic and X-ray images side by side.

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## Sample Case: Painless Icterus with Growth at Pancreas Head Intervention: Stent Implant in Bile Duct Stenosis with X-Ray Monitoring Using Cios Alpha



Prof. Dr. med. Juergen Siebler fine-tunes the C-arm position.

**Disorder:** Bile duct stenoses, also known as DHC stenoses (ductus hepaticus communis, common hepatic duct), may occur in connection with tumors such as pancreatic carcinoma or cholangiocellular carcinoma. However, they can also occur due to scarring following cholelithiasis (gallstones).

**Patient:** A 79-year-old patient with icterus was not in pain, therefore a malignant tumor was suspected. The sonographic examination revealed a growth at the pancreas head with a displacement of 2.5 by 3 centimeters. Initially, the bile ducts were dilated. Over the next nine weeks, the patient lost 8 kilograms in body weight. The CT revealed a swelling of the pancreas head with truncation of the bile duct, but no certain diagnosis for carcinoma of the pancreas head.

**Therapeutic decision:** Once the endosonographic fine needle biopsy had returned a diagnosis of IgG4-associated autoimmune pancreatitis, a stent was

implanted into the DHC stenosis and a cortisone therapy initiated.

**Intraoperative challenge:** Exact placement of stent in order to bridge the stenosis safely. The physician depended on highly detailed X-ray images in order to identify both stent and stenosis within the fine vascular structures easily and safely. Also, the ERCP required that the imaging system be able to display endoscopic images in HD quality simultaneously with the X-ray image. In order to nevertheless be able to focus on the procedure, the physician had to be able to view the images in an ergonomically optimal position and to make necessary adjustments intuitively.

**Result:** Three months later, the patient returned for stent exchange or withdrawal attempt. An ERCP was carried out; no stenosis was visible in the area of the bile duct anymore.



## Precise Images, Improved Quality and Security

Cios Alpha with its flat detector technology can deliver the required level of imaging quality. The large 30-by-30 centimeter flat detector with a resolution of 1,500 by 1,500 pixels displays detailed images that are distortion-free even at the edges. Each pixel is read out up to 30 times per second. The image area, which is up to 25 percent larger than conventional image intensifiers, provides a general overview of the anatomical situation in the bile tract even in its finest branches. Everything can be taken in at a glance. In Siebler's everyday clinical work, in addition to precise imaging, the zoom function and the innovative collimation system are especially important. The team at the University Hospital in Erlangen uses the zoom to accentuate crucial structures and thus to be able to check for any remaining residual stenoses. The new collimation technology of Cios Alpha serves the same purpose – focusing on what matters. It allows the rectangular image to be cropped asymmetrically on all sides to leave only the area of immediate importance.

There is another aspect of collimation that matters especially to Siebler: "I want to work with the bare minimum of radiation dose possible." Simultaneously, the collimation option reduces the radiation exposure both for patients and for the medical staff.

The quality of imaging has become a factor in quality assurance. Thus, after a stent placement, a radiological check of the stent position and image documentation are routine matters. The new mobile C-arm delivers more reliable images than the previous mobile C-arms used for this purpose, and Siebler believes that when it comes to image quality, Cios Alpha is equal to the fixed C-arm also installed at the University Hospital in Erlangen.

Another challenge to the performance of mobile C-arms that has emerged on the patient side is obesity. The number of obese patients has increased noticeably in the past 20 years. In such

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Prof. Dr. med. Juergen Siebler, University Hospital Erlangen, Germany

to depict the situation as precisely as possible. For example, a patient suffering from carcinoma of the pancreatic head may have developed a dangerous stenosis at the lower end of the common bile duct. Using a delicate guide wire and a soft catheter (bougie), Siebler begins by expanding the stenosis. In order for the bile to run off well in the long term, a special stent is implanted in the common bile duct during the same intervention. Then the correct placement of the stent must be verified using X-ray imaging. "A key factor for successful therapy is the quality of imaging," Siebler emphasizes.

situations, especially when it comes to imaging of small stenoses, a C-arm must deliver the necessary power. "Here, conventional C-arms reach their performance limits," Siebler reports. However, Cios Alpha with its 25-kilowatt X-ray generator has sufficient power reserves. The mobile C-arm was tested for several weeks in the gastroenterology ward, which also conducted ERCPs on highly obese patients. Here, the image quality was also given very high marks.

## Improving Workflow with Intuitive Usability

Siebler especially appreciates the intuitive and fast handling of Cios Alpha. "In particular, the option of controlling the mobile C-arm yourself is a good step forward," the physician emphasizes. All functions, including asymmetric collimation, can be directly controlled via a touch screen right at the treatment table. Moreover, individual C-arm positions can be saved with this panel and recalled using the motorization. If the physician wishes to fine-tune the C-arm manually, this can also be done quickly: With a click of a button at the front of the flat detector casing, the brakes can be released and the C-arm easily repositioned. This function also allows angulations at any given time. They are particularly useful for Siebler when bile ducts inside the liver must be spatially assessed.

Cios Alpha has another component that contributes to ease of workflow. Thanks to the integrated HD VideoManager,

## Professor Dr. med. Juergen Siebler



Before Juergen Siebler came to Erlangen in 2009, he worked at the Mainz University Clinic. From his work there, the specialist in internal medicine, gastroenterology, and internal oncology introduced minilaparoscopy at the University Hospital in Erlangen – a new method for conservative and precise liver diagnostics. The video-endoscope employed in that method is just 2 millimeters thick. In 2011, Siebler was appointed Professor of Hepatology in Erlangen. At Medical Clinic 1, he is in charge of endoscopy, gastrointestinal oncology, and hepatology. The bulk

(80 percent) of his clinical work focuses on endoscopy. As a scientist, Siebler conducts fundamental research into a relatively new family of interferons and their role in the development of inflammations and cancers of the large intestine associated with colitis. As a clinical researcher, Siebler participates in studies on new substances for treating liver cell and carcinomas of the gastrointestinal tract.

the physician can view endoscopic and X-ray images side by side on Cios Alpha's two monitors. Siebler believes that this simultaneous viewing option is hugely important in particular during difficult procedures such as ERCP. The HD EndoStore not only permits X-ray images, but also endoscopic and ultrasound images to be stored in DICOM format and sent to the PACS (picture archiving and communications system).

In order to answer the decisive question of whether a stent has been placed precisely, Cios Alpha offers the live graphical overlay function in addition to high-resolution images. On the touch screen at the treatment table, important anatomical structures such as an esophageal stenosis can be marked in the subtraction image with white lines. These lines remain in the subsequent fluoroscopy, allowing for accurate positioning of the stent. The time-consuming manual marking on the screen that

was previously used is no longer necessary.

Siebler names intuitive usability as one of the key requirements of a C-arm; he believes in addition to delivering impressive image quality, Cios Alpha completely meets that requirement as well. Which means working with Cios Alpha is relaxed and at the same time faster. These effects make themselves paid in the day-to-day operations of a modern clinic. Patients who are increasingly older and afflicted by comorbidities gain relief, and medical staff are supported in a demanding workflow.

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The University Hospital Erlangen specializes in advanced care of patients with hepatic disease.

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