

Case Study **No 04**  Haukeland University Hospital



3D X-ray guided interventional procedures

Advancing interventional endoscopy helps to extend the lives of patients with malignant biliary obstruction

Helse-Bergen, Haukeland University Hospital, Bergen, Norway

A step further

Dr. Pham's work is significant for developing new solutions to treat obstructed bile ducts caused by malignancy.

By combining multimodal imaging techniques like endoscopic ultrasound and intraoperative 3D imaging with endoscopy, Dr. Pham gains access to obstructed bile ducts.

Dr. Pham's contributions to the field of advanced interventional endoscopy in Norway were recognized with the Innovation Award from the Western Norway Regional Health Authority.

With 1,100 beds and 61 departments, Helse-Bergen, Haukeland University Hospital (HUS) in Bergen is one of the largest hospitals in Norway. HUS is a center for research, education, and service development, connected to a multidisciplinary network that offers a maximum range of services.

Norway is divided into four healthcare regions. As part of the Norwegian National Cancer Plan, HUS is one of four regional centers of excellence and therefore responsible for the most advanced cancer treatments covering Western Norway. This includes the development of new patient-centric therapy options. In addition, HUS is also one of the leading centers for complex endoscopic interventions with international recognition. Patients from all over the country find their way to HUS when conventional therapies have been exhausted.

DR. KHANH DO-CONG PHAM

There's no such thing as impossible.

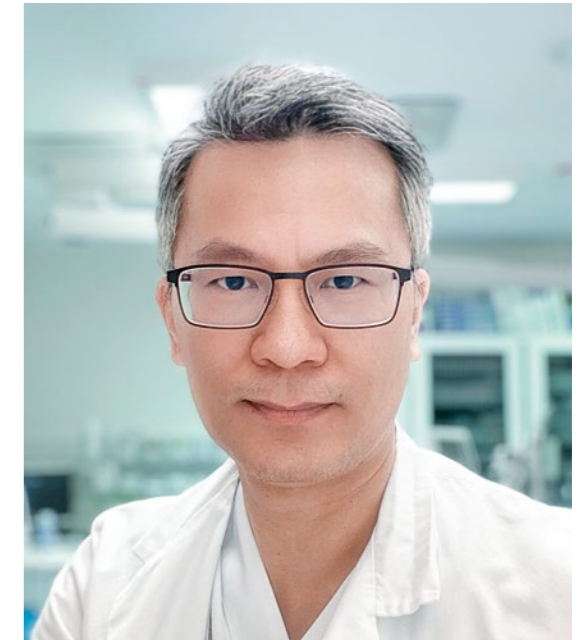
High-resolution 3D imaging guides the procedures

Since 2013, Dr. Pham has been a consultant at the Department of Medicine at HUS, not only specializing in gastroenterology and endoscopy but also incorporating concepts and skills from various disciplines and specialties into the endoscopy suite.

In 2021, the Western Norway Regional Health Authority recognized Dr. Pham's outstanding contributions to promoting advanced endoscopy in Norway by awarding him an accolade. His innovative procedures for conditions that previously required surgical intervention have resulted in better patient care, decreased pain, faster recovery, and lower complication rates and mortality than conventional surgery.

In 2022, Dr. Pham took an effort to improve clinical outcomes to the next level by expanding his intraoperative imaging capabilities.

He implemented a state-of-the-art mobile 2D and 3D imaging system that delivers excellent image quality while significantly reducing dose exposure, thereby protecting



Khanh Do-Cong Pham, MD
Consultant gastroenterologist,
Haukeland University Hospital
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both patients and staff. The key considerations for the new system included an independent iso-center for 3D acquisition, an ultra-compact design, high versatility, flexibility and mobility. The ability to sustain long procedures without overheating was also crucial.





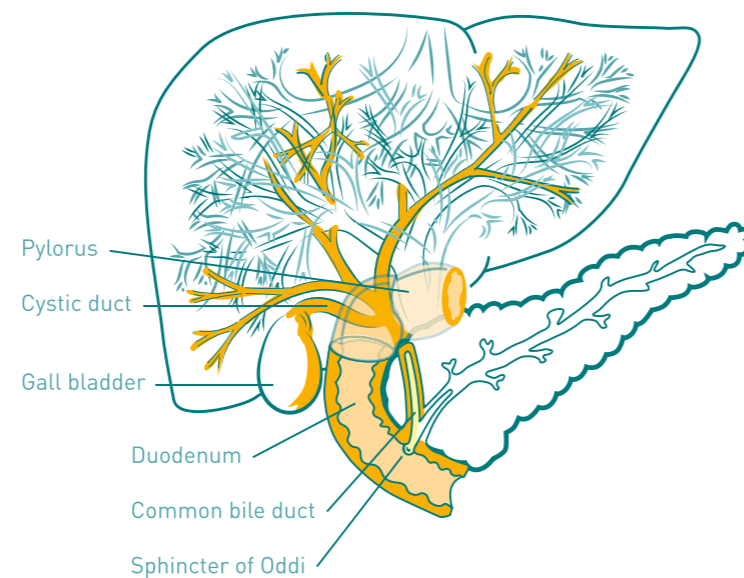
CASE REPORT

The intervention

Endoscopic retrograde cholangiopancreatography (ERCP) is a procedure that combines endoscopy and fluoroscopy to diagnose and treat certain pathologies of the biliary or pancreatic ductal systems. The accompanying fluoroscopy is usually performed using conventional 2D imaging.

Over the years, however, there has been an increase in the number of more complex ERCP cases.

This can be attributed to various factors, such as advancements in oncological treatment, resulting in longer survival rates,



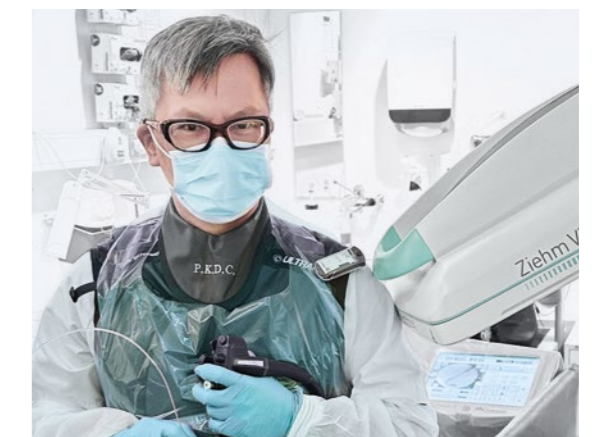
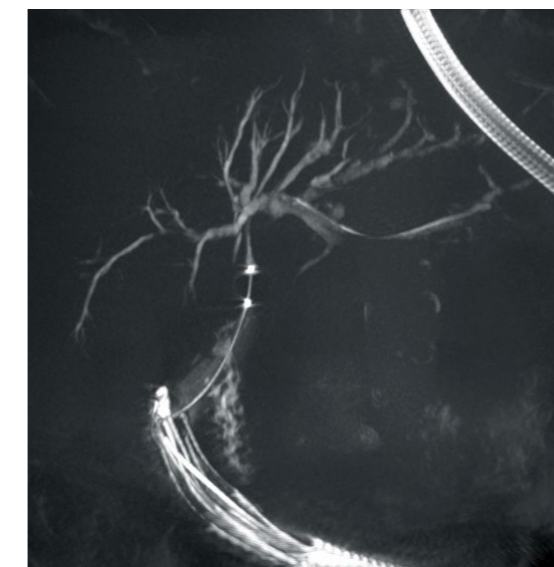
and an aging population. In severe cases, malignant tumors can cause complete obstruction of the biliary system, which can lead to stasis of bile and severe infections. If left untreated, this can result in sepsis and even death within days. In the long term, untreated obstructed bile ducts can lead to liver failure.

In some cases, endoscopic access to the bile ducts with ERCP may be impossible, especially in cases with gastric outlet obstruction due to malignancy. In such cases, Dr. Pham must create a new drainage route between the gastrointestinal tract and the biliary system using stents.

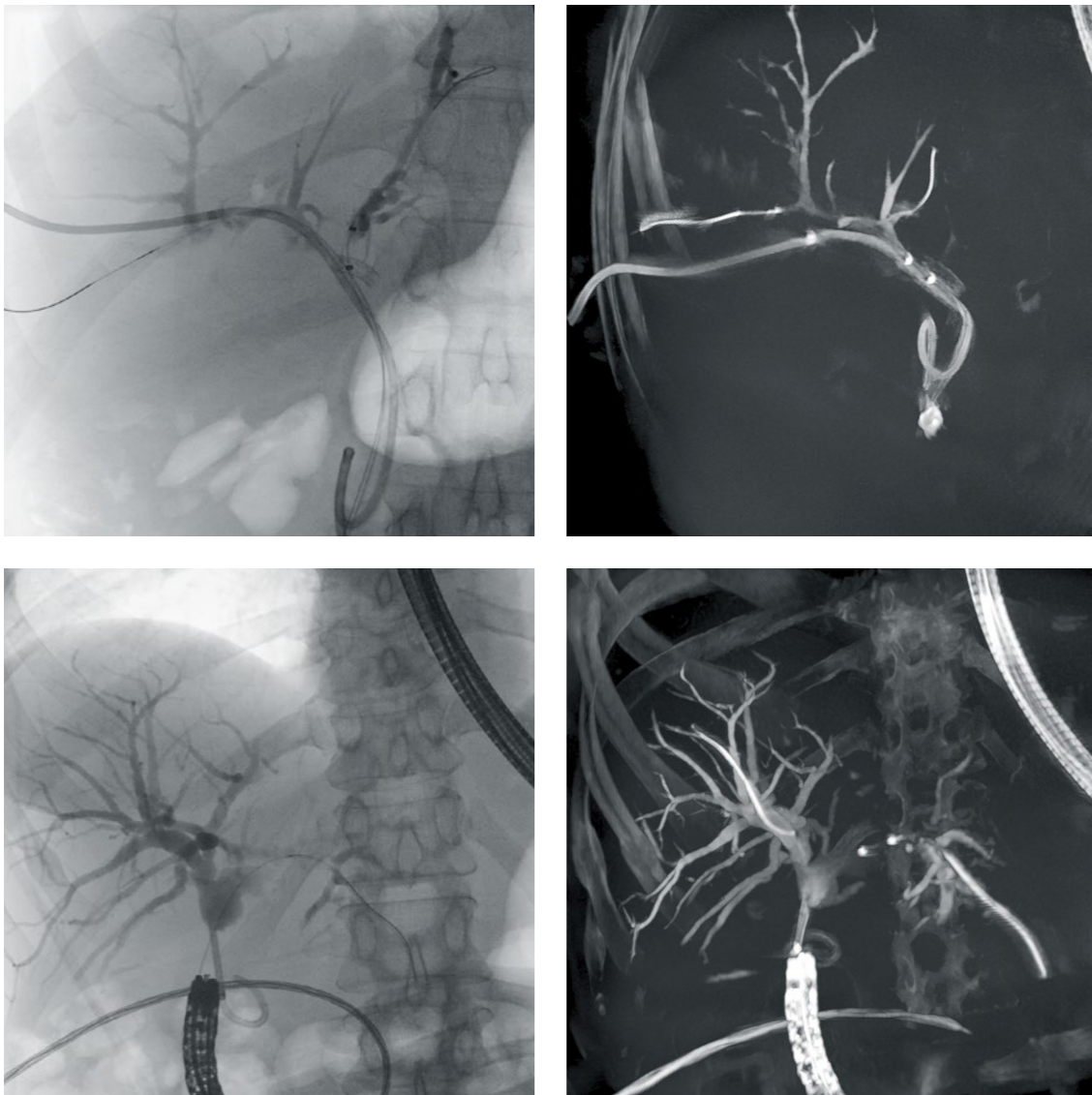
Dr. Pham used to rely on 2D fluoroscopy during procedures before he had access to the Ziehm Vision RFD 3D. However, he was

faced with difficulties in distinguishing the complex anatomy with overlapping intrahepatic bile duct branches in a single projection, which made it a tedious task. After using the 3D scan, which takes only a minute to perform, Dr. Pham can clearly visualize all the small anatomical structures within the region of interest, which increases his confidence and the safety while reducing misinterpretations, compared to conventional 2D fluoroscopy.

Dr. Pham stresses the importance of performing a three-dimensional scan of the bile ducts that enables the acquired image to be rotated to identify pathologies, acting as a road map for intervention and later control. The three-dimensional model makes it easier to plan and perform interventions.



3D images produced with the Ziehm Vision RFD 3D CMOSline deliver an easy-to-interpret and objective visualization for his endoscopic navigation at a high level of accuracy.



3D reconstruction of the biliary tree in patients with obstructed bile ducts due to cholangiocarcinoma.

While pre-operative CT or MRI might provide a lot of information, these examinations give a static representation, while the situation during the intervention may potentially be completely different. An intraoperative

3D scan, on the other hand, can display the correct patient anatomy at that exact moment, allowing necessary adjustments to be made during the procedure.



“ This Ziehm Vision RFD 3D CMOSline¹ improves ERCP by delivering exceptional anatomical details. Thanks to this, our patients can receive an improved level of care. ”

Khanh Do-Cong Pham, MD
Haukeland University Hospital

Freedom of movements,
flexibility and reliability

ZIEHM VISION RFD 3D

Exceptional treatment based on precise intraoperative 3D imaging

Dr. Pham's ability to push the boundaries of what is possible for his patients is greatly aided by the Ziehm Vision RFD 3D.

The combination of 2D and 3D imaging during ERCP provides Dr. Pham with greater intraoperative information and guidance, allowing him to adapt to anatomical challenges and achieve even better outcomes. The 3D imaging technology provides optimum anatomical information for treatment guidance and quality assessment of the clinical outcome, extending the capability of interventional endoscopy.

- By utilizing his extensive knowledge and cutting-edge CMOS technology, he can achieve exceptional interventional outcomes.
- Patients typically recover within a few days, and their quality of life improves rapidly.
- This combination of skill, experience, and technology has the potential to greatly enhance and reduce the overall intervention time, leading to a remarkable advancement in patient care.

¹ CMOSline represents a system configuration that is based on a Ziehm Imaging CMOS flat-panel detector.

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