

Case Study No 03



3D Image Fusion

with Ziehm Vision RFD Hybrid Edition
and Therenva EndoNaut®

Clinique Mutualiste de la Porte de l'Orient, Lorient, France

3D IMAGE FUSION IN VASCULAR IMAGING

More accuracy in vascular imaging

According to the World Health Organization, the number of cases for advanced vascular interventions is rising worldwide. Challenging vascular procedures like EVAR and F-EVAR are the result of this development. These high-end interventions call for the most precise intraoperative outcome to increase accuracy and security for the hospital team, improve patient outcomes, and shorten hospital stays.

With the introduction of 3D vascular image fusion to the mobile hybrid room, Ziehm Imaging and Therenva are breaking new ground in intraoperative precision for vascular imaging.

CLINIQUE MUTUALISTE DE LA PORTE DE L'ORIENT

About the Clinique

The Clinique Mutualiste de la Porte de L'Orient located in Lorient (France), which belongs to the mutualist group HOSPI GRAND OUEST, is recognized for its professional surgical and anesthesia excellence, the quality of care and patient intake, as well as its advanced technology, which permits high precision gestures, in particular for complex surgical procedures.

The surgical vascular and endovascular team comprises five vascular surgeons. Dr. Jean-Baptiste Bocquel is a member of the Collège de Chirurgie Vasculaire, the Société de Chirurgie Vasculaire et Endovasculaire (SCVE) and the Association de Recherche en Chirurgie Vasculaire (ARCHIV).



FOR DEMANDING CARDIOVASCULAR PROCEDURES

Planning meets imaging

Since 2007, Therenva has been helping physicians to perform high-quality cardiovascular procedures through innovative, well-designed and efficient imaging solutions.

The unique EndoSize® 3D case planning software has become an essential daily tool for many physicians and healthcare professionals. By widening the skills of the users and their abilities to plan cases quickly and accurately, EndoSize® saves time and improves patient care.

Combined with our Ziehm Vision RFD Hybrid Edition, we are investing together in the future of intraoperative 3D vascular navigation. Therenva's mobile image fusion system allows the physician to achieve more accuracy in demanding hybrid OR procedures. The combination of preoperative CT data with our intraoperative images on the EndoNaut® system allows physicians to benefit from a reduced X-ray dose and less contrast media use for even more precise results.



Endovascular Case Planning with EndoSize®

Ziehm Vision RFD Hybrid Edition

Vascular 3D Image Fusion with EndoNaut®

Ziehm Vision RFD Hybrid Edition in combination with Therenva EndoNaut®



Save patients with more ease by extending clinical capabilities from daily PAD procedures to more complex cardiovascular procedures like EVAR or FEVAR



Save precious OR time and boost OR efficiency by empowering the complete cardiovascular workflow with hand-in-hand working solutions



Save dose exposure and reduce contrast media with dose-sensitive hardware and software settings as well as innovative 3D roadmaps



Save overall costs and increase financial performance with a sustainable and affordable alternative to fixed installed hybrid room solutions

ENDOVASCULAR SURGERY

3D navigation for infrarenal aortic aneurysm repair and iliac thrombosis recanalization

Clinical case

The patient is a 62-year-old male, smoker in smoking cessation, diagnosed and treated for a lung cancer with a significant life expectancy. He presents a threatening 68mm-diameter aortic infrarenal aneurysm and an invalidating claudication on calcified thrombosis of both common iliac arteries. The selected treatment option for this fragile patient is minimally invasive endovascular surgery using a percutaneous catheterization under local anesthesia and sedation.

Preoperative planning

Infrarenal aortic repair with a bifurcated modular aortic stent graft (GORE® EXCLUDER® AAA Endoprosthesis) preceded by iliac artery recanalization was planned preoperatively using the EndoSize® CT-based preoperative planning and sizing software (Therenva SAS, Fig. 1 – 2). The preoperative planning performed autonomously by the surgeon highlighted the difficulty of the thrombosed and calcified arterial access. 3D models and virtual paths were extracted to prepare device guidance through the occluded lesions.

Intraoperative procedure

The procedure was performed under local anesthesia with the assistance of X-ray imaging from a Ziehm Vision RFD Hybrid Edition mobile flat-panel C-arm (Ziehm GmbH, Nuremberg, Germany), an ImagiQ2™ surgical table (Stille AB, Torshälla, Sweden) and an EndoNaut® 3D navigation system (Therenva SAS, Rennes, France) providing fusion technology (Fig. 3).

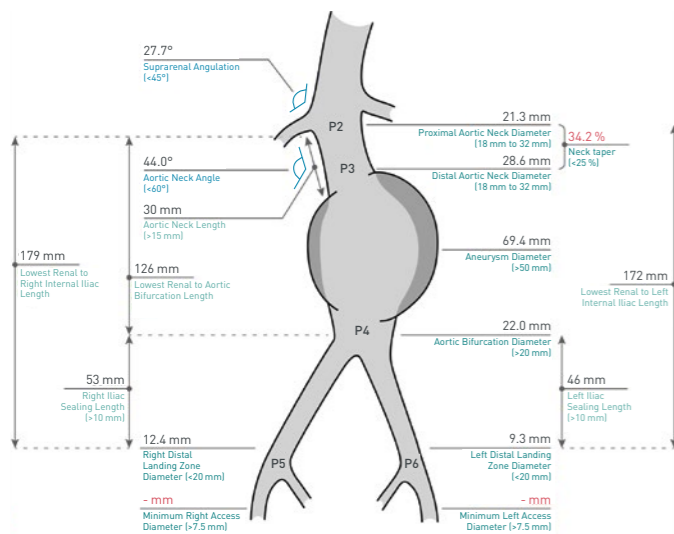


Figure 1: EndoSize® sizing sheet



Figure 3: Organization of Ziehm Vision RFD Hybrid Edition C-arm and EndoNaut® station in the OR

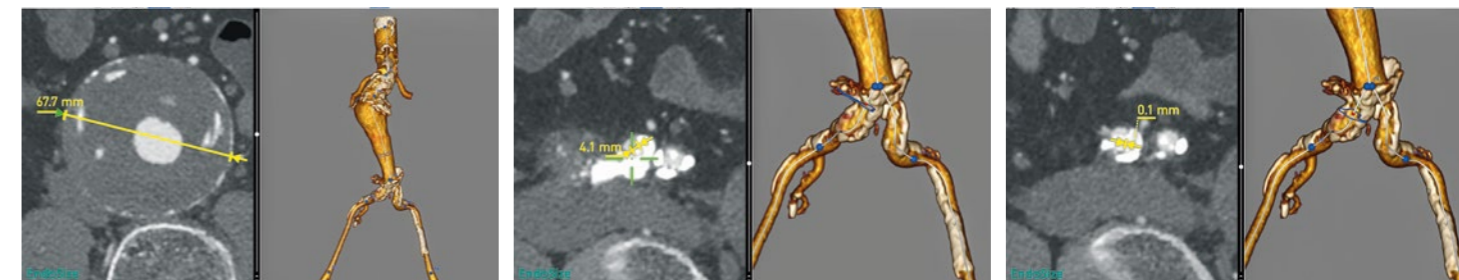


Figure 2: EndoSize® preoperative sizing captures

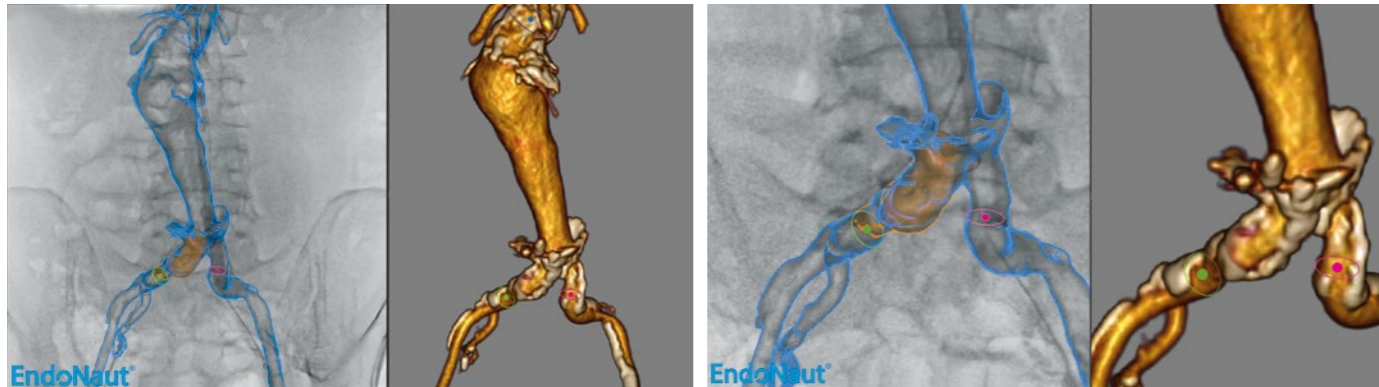


Figure 4: EndoNaut® 3D overlay fusion (b: use of numerical zoom without increasing irradiation or processing latency)

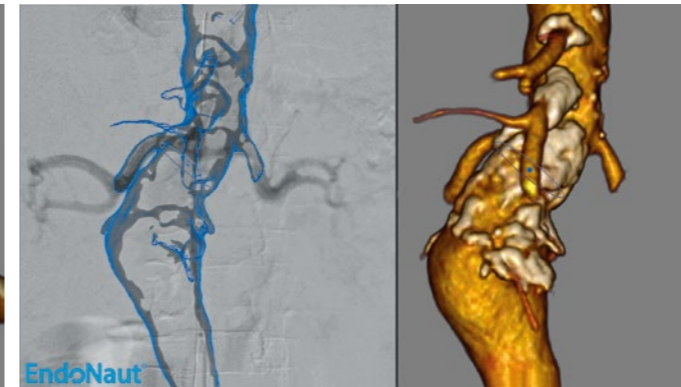


Figure 5: Renal artery positions: angiography and fusion

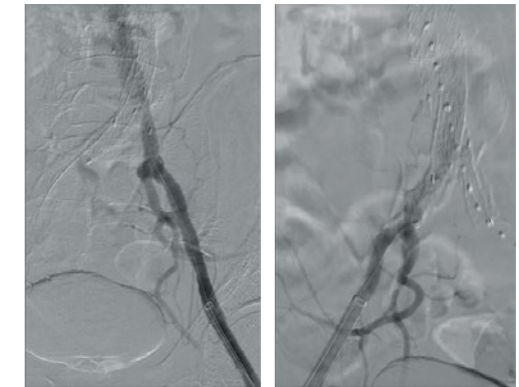


Figure 6: Hypogastric control injections



Figure 7: Final control angiography

- 1) Percutaneous arterial access (ProGlide, Abbott Vascular, US) was performed under ultrasound guidance.
- 2) Iliac recanalization procedures were performed on both the left and right sides without intraoperative contrast injection thanks to the 3D CT-based vessel/thrombosis EndoNaut® roadmap (Fig. 4) first with a 5 mm diameter balloon (on the right side) and then with 8 mm diameter balloons (on both sides).
- 3) The main body of the stent graft was introduced and deployed using the information provided by the EndoNaut® fusion overlay and an angiography provided by Ziehm Vision RFD Hybrid Edition to confirm the infrarenal device position (Fig. 5).
- 4) Catheterization of the contralateral leg of the bifurcated body and deployment of both iliac leg extensions were achieved while preserving the hypogastric arteries, located by customized key points placed previously during preoperative EndoSize® planning (Fig. 4, Fig. 6).

- 5) Final angiography provided by Ziehm Vision RFD Hybrid Edition confirmed aneurysmal exclusion, iliac artery revascularization and renal and hypogastric artery patency (Fig. 7).

Throughout steps 2, 3 and 4, using the EndoNaut® fusion imaging system, 3D CT-based vascular overlays were displayed to enrich intraoperative images, thus reducing the need for contrast injections. EndoNaut® was directly controlled by the surgeon.

During iliac thrombosis revascularization (step 2), the vessel lumen and the thrombosis overlays could be clearly differentiated on the live 2D images (Fig. 4, blue and orange overlays respectively) and helped the surgeon navigate his devices. The CT scan was often reviewed directly on the EndoNaut® navigation cart from the sterile field (Fig. 8). Dedicated measurement tools (distance along center-line, diameters) allowed the surgeon to re-evaluate his options during the procedure

to adapt his decisions. Furthermore, the devices visible on the fluoroscopic images could be interactively selected and located in the synchronized 3D CT scan, providing more local information to support the clinical decision (Fig. 9).

Conclusion

The combined use of the Ziehm Vision RFD Hybrid Edition mobile C-arm and EndoNaut® technology was used to overcome intrinsic limitations of 2D fluoroscopic imaging, reduce the contrast dose, facilitate navigation, and provide surgeons with additional information thanks to 3D patient data overlaid on live fluoroscopic images. Infrarenal aortic aneurysm repair and iliac recanalization procedures were efficiently secured by multiple imaging tools controlled by the surgeon from the operating table.



Figure 8: CT scan consultation in sterile field directly on EndoNaut® workstation

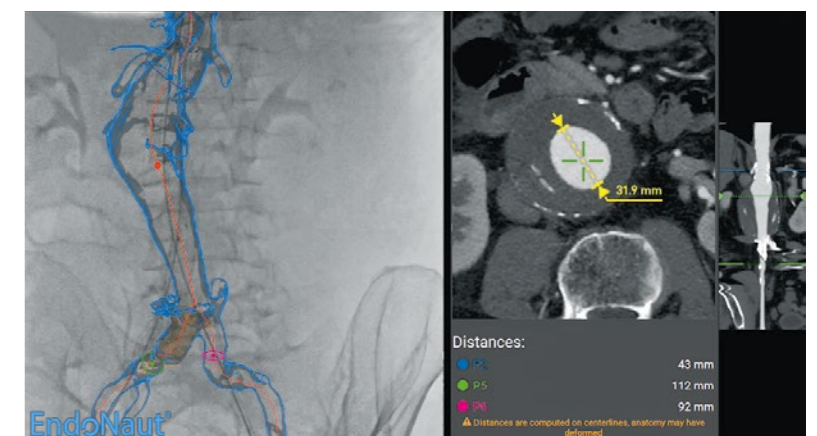


Figure 9: EndoNaut® localization tool

THE COMPREHENSIVE MOBILE HYBRID SOLUTION

Ziehm Vision RFD Hybrid Edition

The Ziehm Vision RFD Hybrid Edition with up to 30kW generator power is a powerful mobile C-arm that is also available with CMOS imaging technology to successfully perform during highly demanding interventional cardiovascular procedures – flexible and everywhere – at any time. With its zero room preparation, the comprehensive mobile hybrid solution easily takes your OR to the next level. Combined with intraoperative 3D vascular navigation, the system allows greater accuracy to be achieved in demanding hybrid OR procedures. Plug in your system and start your hybrid procedure.

Unlike fixed installations, the Ziehm Vision RFD Hybrid Edition is the ideal solution for every OR situation. As a mobile device, it offers all the required qualities to instantly convert conventional ORs into a hybrid room.

The future combination of mobile image fusion will enable the surgeon to achieve more accuracy while minimizing radiation dose and contrast media use for even more precise results. Inexpensive operating and lower purchase costs will lead to a faster return on investment.



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