Vascular

Experience of Using BRANSIST safire Dual-Plane System

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1. Introduction

Our hospital **(Fig. 1)** is in the central part of Oita City, Oita Prefecture, on the eastern side of the island of Kyushu. It is an acute-care hospital with 340 standard beds and 24 departments **(Fig. 2)**. We tackle the three areas of emergency/disaster medical care, treatment of cancer, and treatment of lifestyle diseases with an awareness of our mission as a Red Cross hospital and the needs of local residents.
After several construction phases, the reconstruction of our hospital was finally completed in January 2009. As part of this, we made improvements to wards, operating rooms, the Department of Radiology, endoscopes, and dialysis rooms, established an ICU, and installed the large-scale equipment required for acute care. We also introduced electronic medical charts, RIS, and PACS, took steps to improve quality, including the safety of medical care, to increase speed and efficiency, and to generally enhance the hospital functions.
In 1999, we established a Hepatobiliary/Pancreatic Center, and have been tackling malignant diseases in this area, in which treatment is often difficult, with a high level of medical care. As proof of this, there was a report in a special feature of a certain magazine that our hospital ranked 74th nationally (1st in Oita Prefecture) in terms of the number of operations performed in the hepatobiliary/pancreatic area. This is probably a result of the way in which the number of introductions to our hospital for treatment in this area is increasing year by year, and of the way in which every department cooperates in the execution of medical care.
At the Department of Radiology, we started using an MRI and a linear accelerator and also started to conduct angiography in 1997. In 2007, we upgraded our MRI; in 2008, we upgraded our linear accelerator to one supporting IGRT; and in the same year, we got a 64-MDCT system to go with the existing 4-MDCT to form a dual-system. Furthermore, in April 2009, we started operation of an RI system equipped with SPECT-CT.
There are fears of a breakdown in regional medical care, and Oita Prefecture is no exception. There are areas that are not equipped to treat emergency and critical cases, and patients are often brought to this hospital from such areas by emergency services. It is fair to describe our hospital as central, both in terms of location and in terms of the role it plays in prefectural medical care.

Fig. 1

Fig. 2

2. Angiography Room

Our hospital is located in the center of the city and it was very difficult to secure a site for its construction. As a result, we were only able to establish one angiography room. At present, the Department of Radiology uses it on Mondays, Wednesdays, and Fridays to perform IVR, and the Department of Cardiovascular Internal Medicine uses it on Tuesdays and Thursdays mainly to perform cardiac catheterization. The Department of Renal Internal Medicine uses it as needed to perform shunt PTA. In 2007, 441 cardiac catheterization examinations, including 126 PCI procedures, and 82 shunt PTA procedures were performed. 204 angiography procedures were performed by the Department of Radiology. We conduct examinations and treatments for emergency cases on a 24-hour basis.

When we first started performing angiography, we used a dual-plane system consisting of 16-inch and 9-inch image intensifiers. On the occasion of our recent reconstruction, marking 10 years since the introduction of the first set of equipment, we upgraded our system.

Much of the IVR performed at our hospital is for the abdominal area, and a particularly large proportion of that consists of TACE for liver tumors. In the past, in addition to a conventional DSA system, we have conducted treatment using simple IVR-CT based on a combination of 64-MDCT and mobile DSA. We had to use 64-MDCT because of the structure of the room and CT equipment. With this setup, CT was used exclusively for IVR and, as a result, work efficiency was poor. There was also a great deal of going back and forth between the angiography room and the CT room, which presented a significant burden to both patients and staff.

As a result of much consideration of various points, we introduced a dual-plane system, similar to the previous one, and introduced CT-like imaging as a substitute for IVR-CT.

Our main criteria in the selection of CT-like imaging were image quality and reconstruction speed. These criteria led us to the introduction of BRANSIST safire VC17 and HF9.

3. BRANSIST safire Dual-Plane Angiography System

We have set up a ceiling-mounted C-arm equipped with a 17-inch FPD and a floor-mounted C-arm with a 9-inch FPD so that they face each other (i.e., at 180°), and rotate the table toward whichever C-arm we are using **(Fig. 3 and 4)**. We switch the images displayed on the monitor screens by selecting either “17 inch” or “9 inch” **(Fig. 5)**. There is one control panel for each unit and at times this causes confusion. It would be nice if the two could be combined into one.

With this system, we only use pulse mode for both fluoroscopy and radiography, and change the pulse rate in accordance with the situation **(Table 1)**.

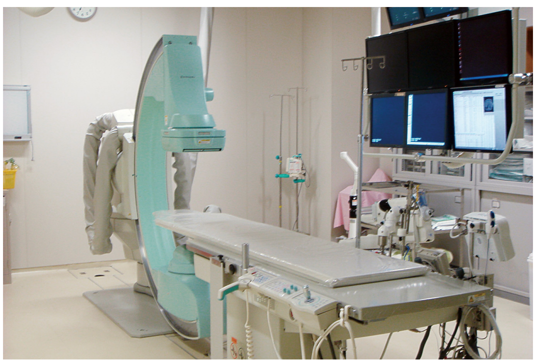


Fig. 3

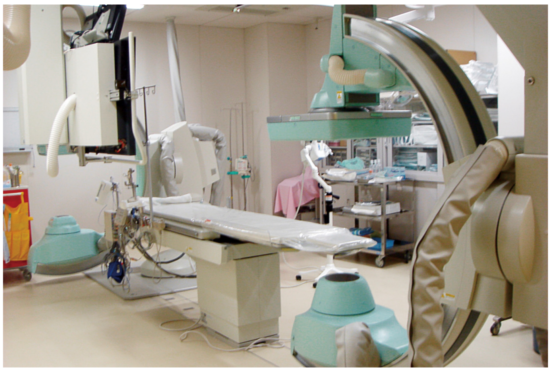


Fig. 4

Fig. 5

9-inch system	
Procedure	Pulse rate
Fluoroscopy	30pps/H
	30pps
	15pps/H
	15pps/H(-)
	15pps
	15pps(-)
	7.5pps
Radiography	30/15fps (DA)
	7.5/5/3/2fps (DSA)
	15fps (RSM-DSA)

17-inch system	
Procedure	Pulse rate
Fluoroscopy	30pps/H
	15pps/H
	15pps/IVR
	15pps
	7.5pps
	3.75pps
Radiography	30/15fps (DA)
	7.5/5/3/2fps (DSA)
	15fps (RSM-DSA)

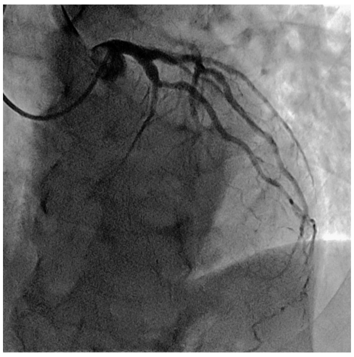
Table 1 Main Pulse Fluoroscopy/Radiography Modes

3.1. Superior Visualization Capability

Both units use direct-conversion FPDs and are equipped with the SUREengine high-speed real-time image processing engine.

Recently, in the field of severe coronary artery lesions, it has been more likely to come across retrograde approaches in the treatment of chronic total occlusions (CTOs). With this technique, however, it is considered necessary to be able to clearly identify collateral circulation and to visualize fine guide wires in fluoroscopic images[1).

The same can be said for TACE. Because microcatheters and guide wires are used in TACE, it is considered necessary that both of these can be visualized. With direct-conversion FPDs and SUREengine, visualization capability has significantly improved, and it has become possible to perform examinations and treatments safely and accurately **(Fig. 6)**.


L-CAG Based On SUREengine


R-CAG Based On SUREengine

Fig. 6

3.2. Saving Images

In order to save images, we introduced Photron's Kada-serve image server. We have set the system to automatically transfer all obtained images, which has helped reduce the amount of work required. Cardiac catheterization and DSA images can be viewed by accessing Kada-serve from electronic medical charts. On the BRANSIST safire VC17 side, a few still images are transferred to Synapse for every series. These are used as attachments for diagnostic reports produced by physicians in the Department of Radiology.

4. State of Use

4.1. BRANSIST safire HF9

The HF9 is mainly used by the Department of Cardiovascular Internal Medicine to perform heart examinations.

Physicians in the Department of Cardiovascular Internal Medicine expressed a desire to use power injectors and so we introduced a Sheen Man Zone Master **(Fig. 7)**. Imaging is performed over a period of 3 to 4 m/sec with a volume of 4 to 6 mL.

In cardiac catheterization, the C-arm is rotated and imaging is performed from many directions. The rotation rate of the previous system was low, making it stressful to use, whereas the HF9 is much faster, with a maximum rotation rate of 25°/sec. The angles are set in Direct Memory, which greatly simplifies the work of angle setting **(Fig. 8)**.

Up to 1,023 frames of fluoroscopic images can be saved and used as necessary. In particular, when starting to pull back an IVUS catheter, saving fluoroscopic images as appropriate makes it possible to reduce the number of exposures required and thereby reduce exposure **(Fig. 9)**. Fluoroscopic images can also be saved with the VC17.

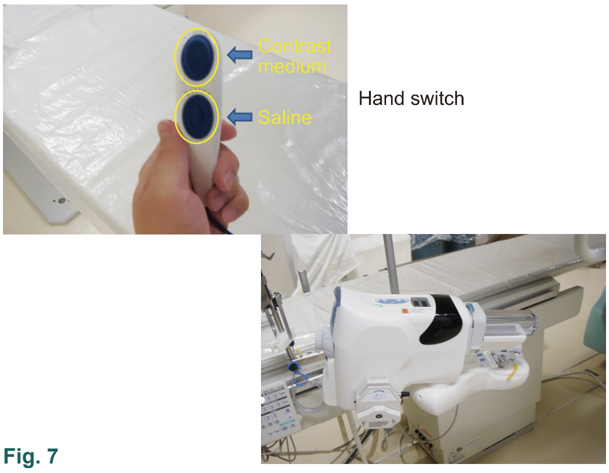


Fig. 7

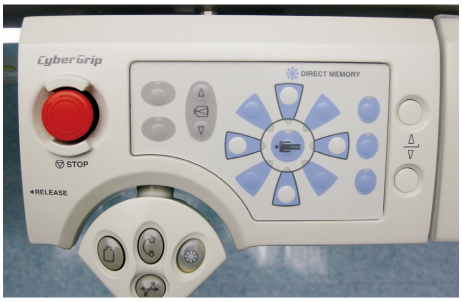


Fig. 8

Fig. 9-1

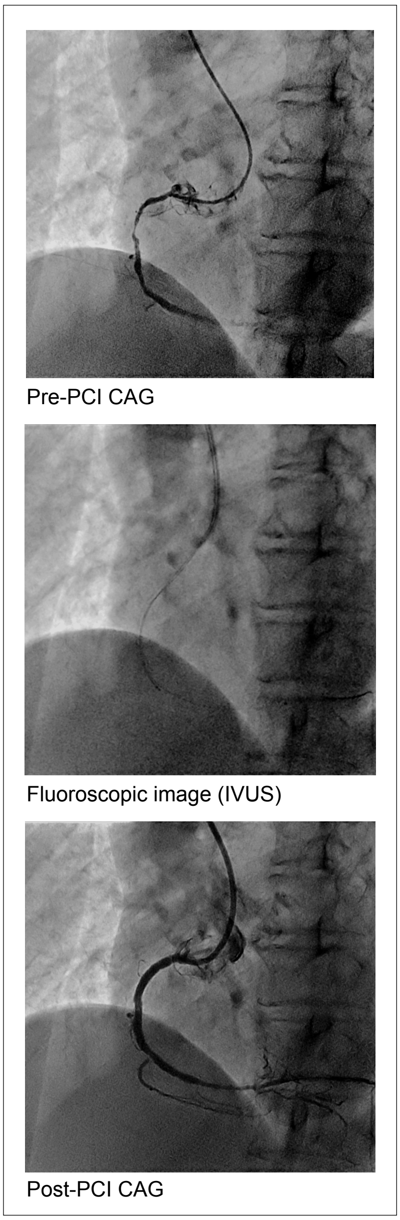


Fig. 9-2

4.2. BRANSIST safire VC17

The VC17 is used by the Department of Radiology to perform IVR on structures all over the body (except the heart) and by the Department of Renal Internal Medicine to perform shunt PTA. The large field of view makes it possible to capture the entire abdominal area or lower or upper arm with a single exposure **(Fig. 10)**.

3D-DSA and CT-like imaging have also become possible. The path of rotation for both of these is the same but the rotation rate is different **(Table 2)**. Instructions for setting are displayed on the screen. Simply following these instructions makes the procedure extremely easy. Before exposure, a test run can be executed. This feature, which reflects consideration of safety, makes it possible to check that there are no collisions or that the cables do not get caught on anything **(Fig. 11)**.

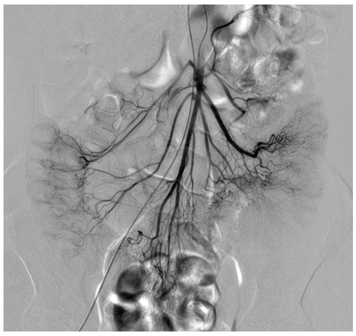


Fig. 10

	Rotation rate	Acquisition rate	Number of acquired images	Imaging range
3D-DSA /DA	60°/sec	30 fps	Approx. 100	195° to 200°
CT-Like Imaging	20°/sec (abdomen)	30 fps	Approx. 315	215°
	10°/sec (head and neck)	30 fps	Approx. 630	

Table 2 Imaging Specifications for 3D-DSA and CT-Like Imaging

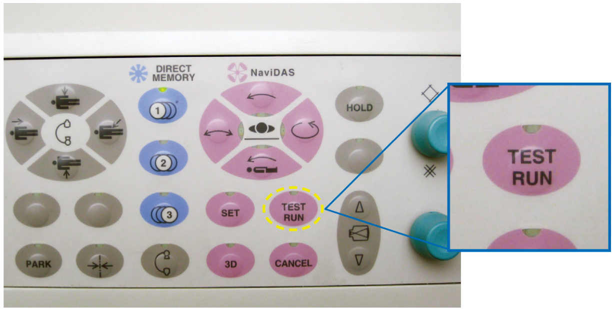


Fig. 11

4.2.1. 3D-DSA

Data is displayed in 3D and so vascular analysis is easier than it was with conventional 2D-DSA. The data obtained in rotational DSA imaging is automatically transferred to 3D-WS and displayed in 3D. All we have to do is to adjust the images. We have experience of using the software that WS is based on and so we have no trouble with the operations.

4.2.2. CT-Like Imaging

As the name would suggest, CT-like imaging produces images that are similar to CT images. Due to improvements in low contrast resolution, CT-like imaging can now produce images that easily allow judgments to be made about tumor staining and the existence of staining in the region of interest. CT-like images are shown in **Fig. 12** and selective CTHA images are shown in **Fig. 13**. It is easily possible to make judgments about the existence of staining and about the extent of chemical stagnation.

The data for CT-like images is also transferred automatically to 3D-WS and images can be displayed in approximately 90 sec.

The introduction of CT-like imaging has improved the work efficiency of both CT and angiography. The time required for examinations and treatments has also been reduced.

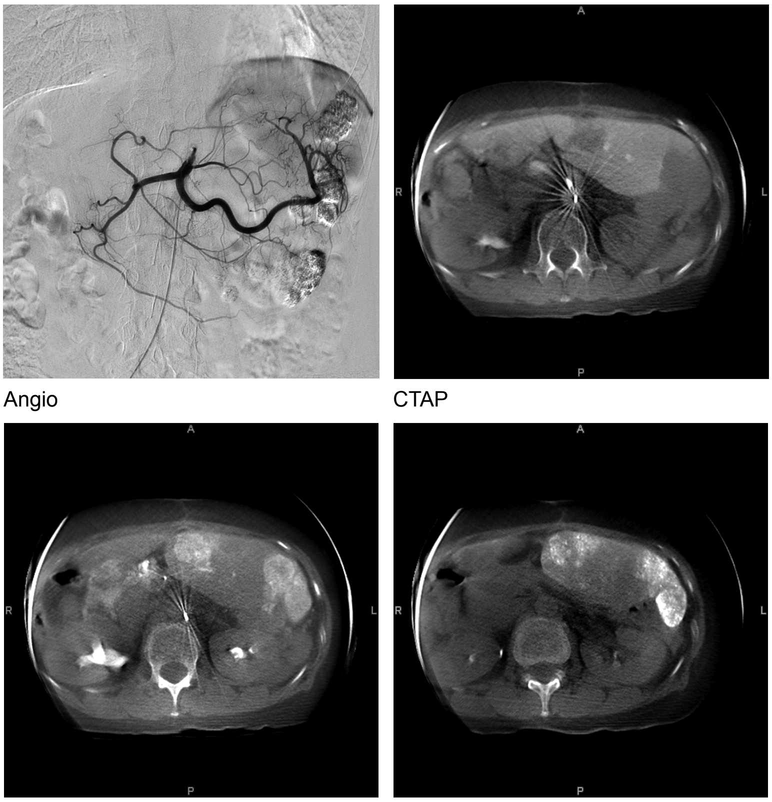


Fig. 12

Fig. 13

5. Summary

Our hospital introduced a 17-inch/9-inch dual-plane system. It is a system that can probably meet the needs of all departments at facilities that, like ours, have a limited number of examination rooms.
It is expected that the range of application of 3D-DSA and CT-like imaging will expand in the future. As we gain experience, we will continue to investigate new applications in partnership with the manufacturer.

Reference

1) Mitsunori Abe: The usefulness of the flat-panel detector X-ray system in cardiovascular intervention : In Chronic total occlusion, New Medicine, No. 407, p. 47-51, 2008

*This system cannot be sold in China or EU countries.