# Minimally Invasive Procedures in Practice

## —Effort by Fukuoka Kieikai Hospital Part 2—

Medical Systems Division, Shimadzu Corporation
**Hiroyuki Kinoshita**

Given the conplication and sophisticated interventional procedures in recent years, users are requesting angiography systems that can achieve lower X-ray dose levels, less required contrast agent, and shorter examination times. Shimadzu's latest Trinias series angiography system has various features for achieving minimal invasive procedures.

Continuing from the previous article, Part 2 of this series highlights uses of various functions for neurointerventional radiology and describes efforts made by Trinias at Fukuoka Kieikai Hospital.

## 1 Using Low-Dose Fluoroscopy Mode

Keeping the X-ray dose at the minimal level is important both for patients and physicians, particularly in the case of neurointervention. It is desirable to manage the exposure dose of not only the radiation exposure of a skin, but also the exposure of the crystalline lens, which has the deterministic effect.

At Fukuoka Kieikai Hospital, radiological technologists work together with physicians to achieve low dose practices. Although a fluoroscopy program of 10 pps[*1] is often used in neurointerventional procedure, they use 10 pps/Low (low-dose 10 pps mode). This mode reduces the X-ray dose by around 48 % and achieves a remarkable decrease insubstantial dose of X-ray **(Fig. 1)**. Use of the mode has been highly evaluated as follows, "The X-ray dose reduction is effective, and loss of image quality is permissible."

*1 pps: pulse per second

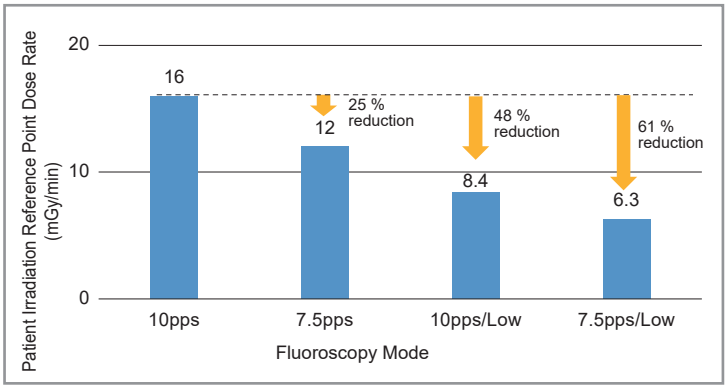
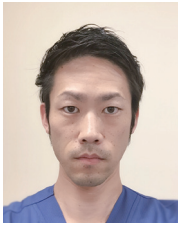



Fig. 1 Dose Rate Compared by Fluoroscopy Mode
Patient irradiation reference point dose rate for 12-inch field of view and 20 cm of acrylic
* Actual measurements taken with a Shimadzu system

## 2 Using Flex-APS that Automatically Corrects for Body Movement

Cerebral arteries have penetrating branches and other microscopic blood vessels that are just 0.1 to 0.5 mm in size. The presence and distribution of these vessels have a major effect on a treatment strategy. However, even slight movements of the patient' s body during DSA will cause misregistration artifacts that substantially reduce the visibility of blood vessels.

They use the original Flex-APS function of Trinias series unity edition to minimize the occurrence of the artifacts. Flex-APS is a function that, in real-time, corrects the artifacts in DSA images caused by patient body movements in real time[1] **(Fig. 2)**. Flex-APS differs from previous correction functions. It processes individual pixels, and allows to correct motion generated by three-dimensional twisting and motion caused by jaw movements in one area of an image. The



### Comments of Ryosuke Abe, R.T., Department of Radiology

Our hospital introduced the Trinias B12 unity edition in June last year as construction completed on our new hospital site.

The Trinias has a variety of functions and we especially highly evaluate the Flex-APS. It is quite useful because it provides not only excellent DSA images but also high quality road map images as well.

In addition, we create merged image of vessels(artery & vein) and bones using 3D-DSA and CBCT data to create fusion images for better understanding of the positional relation of vessel structures with cases of tumor embolization procedure done before a tumor removal surgery. The workstation is also easy to operate and can create useful images in a short period of time.

function requires no special manipulation, and the image processing is applied automatically in real-time, so it does not interrupt the treatment procedures. Flex-APS has been appraised as follows, “Even when there is patient movement during the procedure, penetrating branches and other microscopic blood vessels that used to be difficult to observe can now be seen clearly on DSA images.”

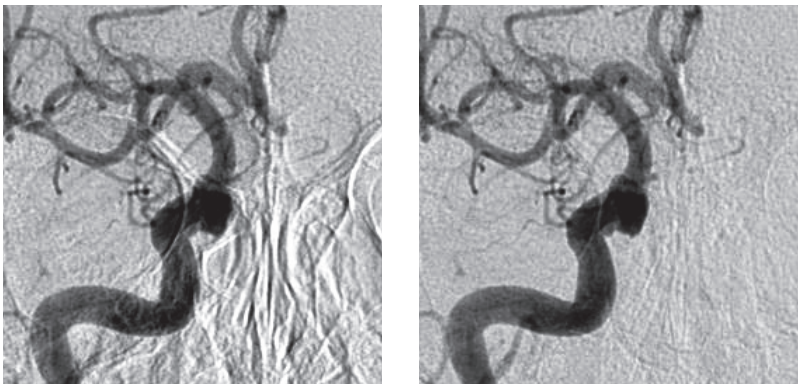


Fig. 2 Example of Microscopic Blood Vessels Visibility Improved by Flex-APS
(Left: without Flex-APS, Right: with Flex-APS) * Shows a part of a 12-inch field of view image.

## 3 Utilizing the Multi Data Fusion Protocol

SCORE 3D Workstation, which is the 3D workstation for Trinias series systems, has a multi data fusion protocol that enables to display and process multiple sets of data together. This function is used to merge different sets of data of a same patient in three-dimensional space and display volume-rendered (VR) images. This multi data fusion protocol can be used for up to four different sets of data.

They utilize this function to create a variety of images for different purposes. For example, in the case of intracranial aneurysm, they create a fusion image of the internal carotid artery acquired by 3D-DSA and the bone acquired by SCORE CT in order to make it easier to understand visually positional relationship of the arterial aneurysm and the skull base. Similarly, they merge the data of the internal carotid artery and that of the bone to create an image which can be used to simulate the situation of a craniotomy surgery by making a virtual hole on the skull in the case of arteriovenous malformation (AVM), which is shown in **Fig. 4**. **Fig. 5** shows an image of d-AVF case. It enables to display feeder vessels extended to a shunt on the top of head from left and right in one image by merging contrast images of left-CCA and right-CCA. This feature has been appraised as follows, “It has a wide range of uses, including the production of images to assist complicated surgical procedures. If there are opportunities, we are looking forward to using the multi data fusion protocol in other cases of complicated treatment procedures that has not been used before in the clinical area.”

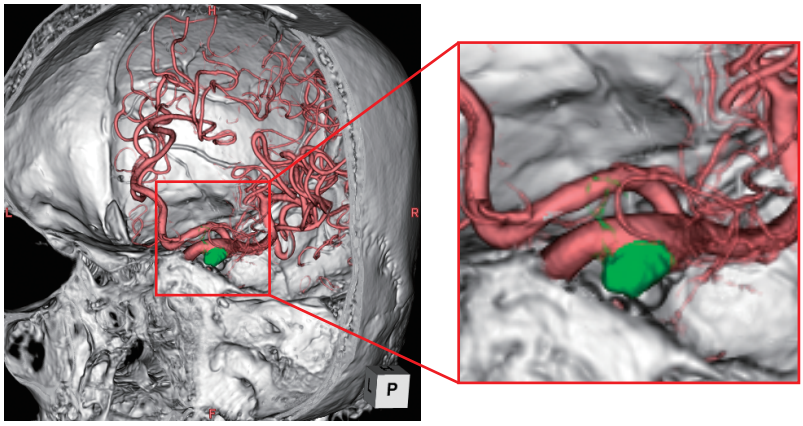



Fig. 3 Fusion Image Showing the Right Internal Carotid Artery (3D-DSA) and the Skull (SCORE CT) of a Patient with a Brain Aneurysm

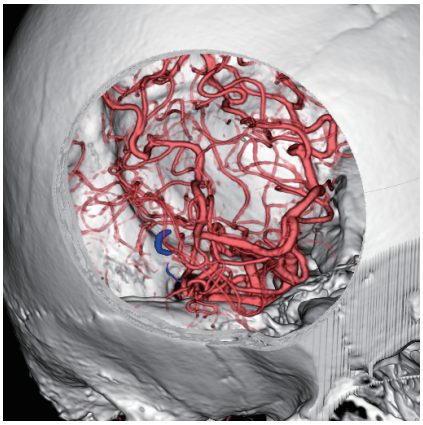


Fig. 4 Fusion Image Showing the Right Internal Carotid Artery (3D-DSA) and the Skull (SCORE CT) after the AVM Embolization procedure

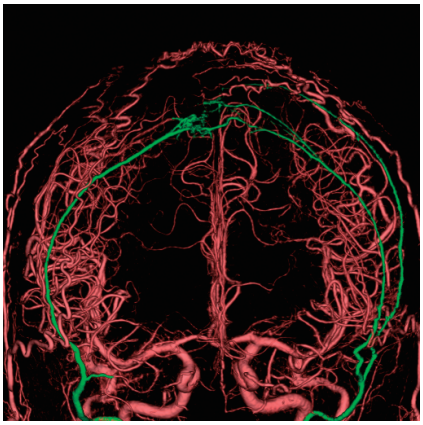


Fig. 5 Fusion Image Showing Left and Right Common Carotid Arteries (3D-DSA) of a Patient with d-AVF

**Reference**

1) Masayuki Yasumi, Trinias Family of Angiography Systems—Latest Technological Development in SCORE Imaging, MEDICAL NOW, No. 82, 11-13, 2017