

Vascular

Reason Why I Became a Fan of Using SCORE Chase for EVT



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1. Introduction

The Iwaki City Medical Center is located in Iwaki City at the center of Hamadori area of the Pacific coastal area of Fukushima Prefecture. Only we have the tertiary emergency medical care center in that area, and our hospital plays an important role in an acute medical care. With 700 inpatient beds, 10 ICU beds, and 20 ECU beds, we accept over 4,500 emergency cases transported to the hospital each year.

The Department of Cardiology has over 40 years of experience since it started cardiac catheterization procedures in earnest in 1974 and offers the most experienced and advanced procedures throughout the Tohoku Region, which includes almost the entire northern portion of Japan's largest island. The hospital covers a region from the Hamadori area in Fukushima Prefecture to the northern part of Ibaraki Prefecture and other surrounding areas, which has a population of about 500,000 people. An advanced emergency and critical care center is attached, therefore many patients from acute phase to chronic phase come. The facility is also certified to perform a wide variety of treatment method, making it one of the few hospitals in the Tohoku Region that can offer advanced procedures.

Percutaneous Coronary Intervention (PCI)

The center is one of the hospital that has the large number of cases and has approximately 600 PCI cases per year. About 150 cases of those cases are acute myocardial infarctions (AMIs). Nowadays we use drug-eluting stents (DES) that is coated with immunosuppressant drug. Restenosis rates with DES have been improved to 5 to 10 %, compared to that with conventional stents (20-30%). We also perform procedures using rotablaters, excimer lasers, DCA and so on.

Endovascular Treatment(EVT)

Many EVT cases (about 400 per year) are performed in our center. We actively treat peripheral vessel diseases such as arteriosclerosis obliterans and

venous shunt occlusions in the lower extremities, renal artery stenosis. Our EVT has enabled patients with difficulty of walking to visit the hospital as an outpatient on foot. The field of such procedures is a specialty of us.

Arrhythmia Treatment

For lethal arrhythmia, we implant implantable cardioverter defibrillator (ICDs) or perform radiofrequency catheter ablations.

Heart Failure Treatment

Progress of Heart failure treatment is remarkable, and we can treat it both by drug therapy and by cardiac resynchronization therapy (CRT) with biventricular pacing.

After completing our new hospital building in December 2018, we now have two catheterization rooms dedicated for cardiovascular procedures, one multi-purpose catheterization room, and two hybrid catheterization rooms. Consequently, the number of stent graft and TAVI cases has been steadily increasing. Under these circumstances, in the same year we introduced a new biplane angiography system of Shimadzu, Trinias B12 unity edition (referred to as "Trinias" system below) and started to use it for EVT and radiofrequency catheter ablation procedures. As the result, we cover almost all procedures that we intend to offer. The more we use the Trinias system, the more we admire its superb operability developed with the specific craftsman spirit of Japanese manufacture. In this article, I want to review how our hospital uses the revolutionary function offered by the SCORE Chase and the clinical utility it provides, particularly for EVT.

2. Trinias Features I Particularly Recommend

After nearly one year since we started using the Trinias biplane system, I am most impressed with the following features.

1. Achieves low dose levels while maintaining high image quality.
2. The field of view is square 12-inch (about 30 cm) on a side, on the other hand outward form size is compact. Therefore, we can use for both PCI and EVT procedures without stress.
3. Stent position can be confirmed easily by using a function creating stent enhancement images in real time (SCORE StentView).
4. In interventional procedures in the lower extremities, both RSM(Realtime Smoothed Mask DSA) images and DSA images can be obtained only with a single contrast media injection by computed-table motion (SCORE Chase).
5. Tilting the catheterization table up to 16 degrees to the left or right (tilt function) makes it easier to puncture below the knee(BK).
6. Fusion images combined with CT images can be created, and it can be synchronized with the C-arm angle.



Fig.1 Trinius B12 unity edition (Model with Multifunctional Catheterization Table)

3. SCORE Chase Function

SCORE Chase function is outlined below. To fully utilize the capabilities of SCORE Chase, we introduced a multifunctional catheterization table that can be tilted, rolled and panned with motor-driven. In addition, the table has computer-controlling system which enables automatic positioning and coordination linking with various applications. We fully realize that less invasive treatments, especially not only reducing the quantity of contrast media used for patients but also reducing the radiation exposure to physicians, is fulfilled by those functions.

1. Automatically and Instantaneously Displays Long-View Images Showing Overall Lower Extremities
 - SCORE RSM displays long-view images with blood vessel enhancement. It is possible to pan the table to follow the flow of contrast

- media because Long-view image is generated by automatic correction for any panning.
- Long-view subtraction images of overall lower extremities can also be obtained using RemoteChase DSA.
 2. Positioning is Possible without Performing Fluoroscopy
 - The virtual field of view of FPD is shown on the long-view image, which enable to confirm estimated irradiation area without fluoroscopy.
 3. Long-View Images Provide a Fluoroscopy Roadmap
 - If the patient does not move after the acquisition, long-view images can be used for fluoroscopy roadmap. That can help reduce contrast media use.

In most cases of EVT, we use Remote Chase DSA to observe and grasp the blood flow of the overall lower extremities including stenotic areas. That requires working with radiological technologists, but we made it routine and increased experiences. As a result, we are now able to obtain long-view subtraction images quite easily. That procedure and corresponding movements are shown in **Figs. 2 to 6**. Images from clinical use are also shown in **Fig. 7**.



Fig.2 For most patients, overall lower extremities can be observed and acquired, without reversing head and feet positions, by setting the front C-arm at an oblique position. In the picture, the irradiation area is positioned around the common iliac area from where injected contrast media flows. The feet tips are indicated with a red arrow.

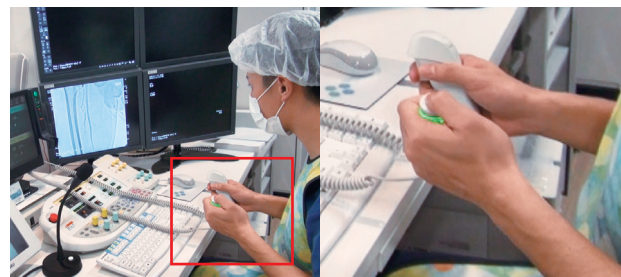


Fig.3 Start acquisition of the lower extremities when the radiological technologist gives the signal. Long-view images of the overall lower extremities are acquired by using the X-ray emission switch (left hand) and the ChaseConsole dedicated table controller (right hand) to control table movement to follow the flow of contrast media.

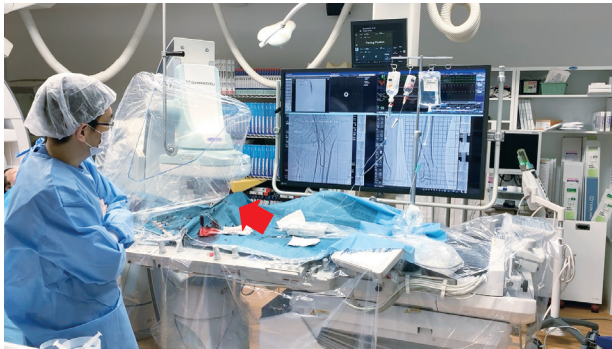


Fig.4 Acquire the flow of contrast media up to feet tips.



Fig.5 Perform mask acquisition sequentially. ChaseConsole, mentioned above, enables to completely reproduce the same starting position.



Fig.6 The multifunctional catheterization table automatically traces the same movements (movement speed and ending position) as the initial angiography during mask acquisition. A subtraction image is displayed in real time in the lower left area of the monitor screen during mask acquisition. A long-view image is automatically created immediately after acquisition.

By using long-view radiography, we can see stenosis condition of the overall lower extremities. In particular, long-view images can be zoomed and panned in the monitor screen keeping the original resolution, and we can display the interested region immediately without scrolling here and there with a mouse unlike the conventional system. The images also make it easy to compare vessel condition of before and after the procedure and make it extremely easy to explain it to the patient as highly understandable images. Although we perform angiography with Iopamiron 370 diluted by about three times to minimize amounts of contrast media, we still obtain good



Fig.7 Left: Long-View RSM Image
Right: Long-View DSA Image after Mask Acquisition

images with high contrast due to the outstanding performance of the Trinius. We are confident that the burden on patients is reduced.

4. Clinical Example of Using ChaseMAP

SCORE Chase also enables automatic fluoroscopy roadmap based on long-view images. The position information in long-view image can be transferred to the catheterization table. In addition, the table can be automatically moved to the target area, and we can perform fluoroscopy roadmap at the spot. Because a mask image for roadmap does not need to be acquired again, that enables to reduce the amount of contrast media used.

Case Studies

A case of an EVT procedure on a 77-year-old woman with 90 % blockage in the proximal region of the right superficial femoral artery (SFA) (**Figs. 8 to 10**).

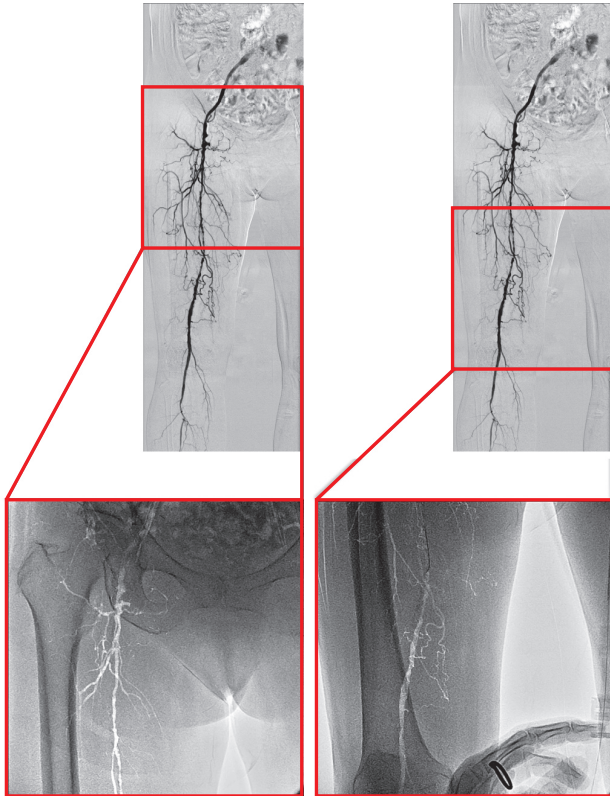
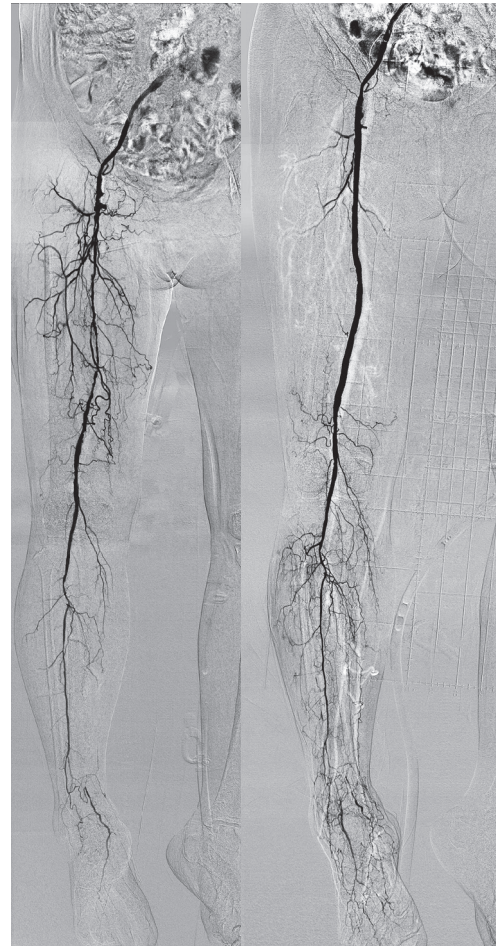


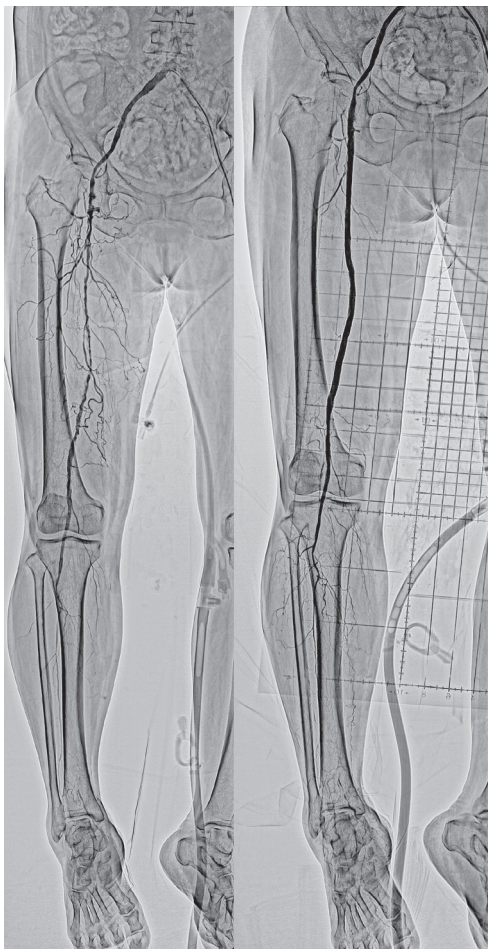
Fig.8 Chasemap around Two Stenotic Regions
 Because the blood vessel mask is created from the long-view image, the roadmap can be created without using contrast media again. The catheterization table moves automatically to the specified blood vessel location.



Before procedure

After procedure

Fig.10 DSA Long-View Image Comparison before and after procedure



Before procedure

After procedure

Fig.9 RSM Long-View Image Comparison before and after Procedure

The contrast media used for long-view acquisition was Iopamiron 370 diluted by about 3 times (3 cc contrast media plus 7 cc saline solution). The medium was injected into one foot, pushing the plunger with as much force as possible by hand.

Conclusion

Before the Trinias was introduced, I had not ever created even normal roadmaps in EVT to prioritize procedure speed. However, the Trinias functions described in this article not only shortens the procedure time, but also reduces amounts of contrast media, therefore I now actively use those functions. Furthermore, though I could not mention above, Trinias also has SCORE Navi+Plus function that can link fluoroscopy images with 3D images from CT. Using that with the other functions can help reduce the stress on patients further in EVT procedures.