Vascular

SCORE Link-Driven Continuous Growth of the Angiography System

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Abstract

This article introduces the Trinias series with SCORE Opera used at our hospital. This system is equipped with AI image processing technology, and by providing high-quality images at a low dose, it can support advanced procedures while helping to maintain patient safety. In addition, regular updates through SCORE Link make the latest functions and applications continuously available, and additions such as voice control functions have been made, contributing to ongoing improvements in usability in the clinical setting.

1. Introduction

Our hospital is located near JR Osaka Station, beyond the skywalk of a large commercial complex. It was founded in 1916 and has a history of more than 100 years, making it the third oldest hospital within the Saiseikai hospitals. Based on the spirit of “se-yaku kyu-ryo” (relieving people in financial difficulty through the provision of medicines and treatment), Saiseikai, founded in 1911 by Emperor Meiji of the Meiji era, continues its activities with three goals: actively supporting people in financial difficulty, contributing to the community through the latest medical care, and providing seamless medical and welfare services. At our hospital, approximately 210 physicians and approximately 1,600 staff members work across 31 clinical departments and provide care for a wide range of diseases.

The cathlab used by the Department of Cardiology consists of three rooms, and one of them has been operating with the Shimadzu Trinias B8s with SCORE Opera (hereafter, Trinias Opera) since January 2023 **(Fig.1)**. A key feature of this system is its AI image processing, which provides clear images even at low dose. The user interface is also easy to use, and fine dose adjustment is possible, especially because dose control can be performed easily at the bedside. Use of a biplane setup also helps reduce contrast medium usage, and the system is therefore considerate of both patients and medical staff.

Since installation, Trinias Opera has undergone two updates and has grown into a more refined system. In this article, I describe the features of the latest version of Trinias Opera.

2. Growth Through SCORE Link

Our Trinias Opera is subscribed to SCORE Link, the application platform provided by Shimadzu Corporation. An angiography system is expensive and is used over a long period of time, but after several years of use, it may become inconvenient because new functions and applications available on the latest models cannot be used.

With SCORE Link, the system is updated to the

Fig.1 The installed Trinias B8s with SCORE Opera and the author

latest version at each annual contract renewal, so the latest functions and applications are always available. At our hospital, updates were performed after installation in 2024 and 2025, with additions and improvements made to functions. We have felt progress, especially in image processing and voice control.

2.1 Growth in Image Processing

SCORE Link also includes updates to image processing. The image quality at the time of installation had already reached a certain level, but there were still aspects where further improvement was expected, so we conveyed our requests to the manufacturer. After two updates, stepwise improvements were made to the AI model, and we are now obtaining satisfactory images **(Fig.2,3)**. This improvement in image quality has been applied to fluoroscopy, acquisition, and the stent-enhancement functions SCORE StentView and StentShot.

In addition, after the first update, when the image quality had reached a certain level, we began operating with an aim to reduce fluoroscopy dose in clinical practice. We mainly use a fluoroscopy mode that is about 30% lower than the standard setting, return the dose to standard when clearer images are needed, and adjust the dose as appropriate during long procedures such as chronic total occlusion lesions according to the dose being used, in an effort to operate at an appropriate dose. A mechanism that allows dose level control easily not only in the control room but also at the bedside is also provided, and this is one of the features of Trinias Opera.

2.2 SMART Voice, a New Function

Among the SCORE Link updates, not only existing functions and performance were improved, but new functions were also added. One of these is the voice control function SMART Voice. By speaking into the microphone mounted next to the monitor, various functions can be used; the ones we use most often are fluoroscopy recording and launching the stent-enhancement applications SCORE StentView/StentShot. Previously, we had to press buttons on the bedside touch panel or instruct the technologist to operate the system, but this involved shifting our gaze and hands to the touch panel and sometimes led to communication errors. With SMART Voice, these inconveniences have been resolved, and it is helping improve workflow in the cathlab.

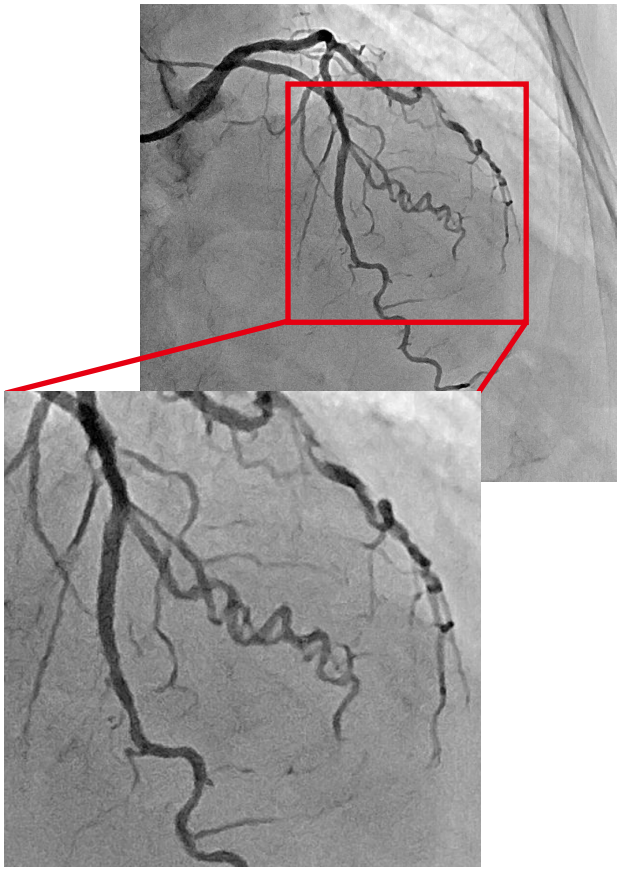

Fig.2 Post-update acquisition image

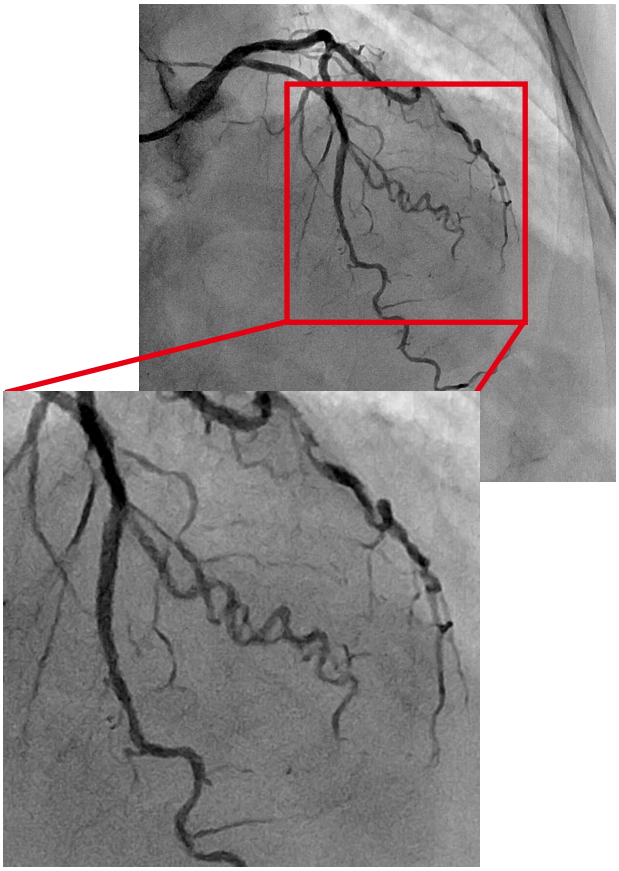

Fig.3 Acquisition image before the update

During the second update, a C-arm position change function was added. This also previously required somewhat cumbersome button operations, but position instructions can now be given by voice alone, and in ischemic procedures, switching between single-plane and biplane can be performed more smoothly. In practice, we perform examinations in biplane during CAG and can then switch to single-plane by voice when moving to treatment, which is a small but noticeable convenience.

3. SyncView and the Monitoring Room

In today's cathlab, many staff members are required to keep track of various kinds of information and proceed with procedures while communicating correctly with one another. Trinias Opera also takes image distribution into account, and we use this in our cathlab.

Our Trinias Opera is equipped with a 58-inch monitor in the examination room and two 31-inch monitors in the control room, each of which can independently display multiple images and change layout. The function called SyncView allows an additional monitor with multiple-image display and free layout to be added. By connecting it to a large monitor mounted on a cart, staff can more easily keep track of procedure progress.

We also established a monitoring room **(Fig.4)** so that all three cathlabs can be viewed from an overview perspective. All images from the three rooms are consolidated there, and by giving instructions while checking the status of each cathlab, smooth operation of the three rooms is achieved. With Trinias Opera, image distribution can be easily achieved not only for fluoroscopy and reference images but also for images from ancillary devices such as IVUS and OCT.

Such a highly flexible image distribution function is useful when multiple cathlabs are operating simultaneously because it helps staff quickly understand the status of procedures and coordinate appropriately with one another, and it is a capability that is strongly required in angiography systems today.

4. Clinical Case

The patient was a man in his 70s. Thirteen years earlier, he had proximal stent occlusion in the left anterior descending artery and 99% stenosis of the circumflex artery at a bifurcation lesion between the left posterolateral branch and the left posterior descending artery **(Fig.5)**. Because the perfusion territory of the right coronary artery was small, coronary artery bypass surgery was performed using the right internal thoracic artery to the left diagonal branch, the diagonal branch to the left internal thoracic artery to the left anterior descending artery, and the aorta to the saphenous vein graft to the left posterolateral branch and left posterior descending artery. The postoperative course was uneventful, but around 12 years after surgery, heart failure control became poor, with BNP trending upward. At 13 years after surgery, coronary CT was performed to evaluate the bypass grafts, and occlusion of the saphenous vein graft connecting to the circumflex artery and occlusion of the circumflex artery itself was observed **(Fig.6)**. PCI for the circumflex artery was therefore planned.

After engaging an 8 Fr guiding catheter, a slight channel was seen angiographically toward the posterolateral branch, so we first attempted wire crossing with an X-treme XT-A wire, but the wire could not advance because it was blocked by a stenotic segment thought to be a calcified nodule proximal to the occlusion, which appeared to be the start of the lesion. We then changed to a SION black wire and an ASAHI Gladius EX wire, but neither could pass the same segment. When we switched to a Gaia Next 4 wire, it was able to pass. We advanced Corsair Pro and stepped down to an ASAHI Gladius EX wire, but because the wire could not be advanced toward the posterolateral branch, we advanced it toward the distal circumflex main branch; however, neither Corsair Pro nor the AnteOwl WR IVUS could pass. The main branch was dilated with a ZINRAI 1.5 × 10 mm balloon,

Fig.4 Monitor layout in the monitoring room. Images from all three rooms are displayed continuously.

Fig.5 Pre-CABG angiographic findings (13 years earlier)

Fig.6 Pre-PCI angiographic findings

Fig.7 Wire entered the subintima in the distal main branch (marked separation), angiogram after wire crossing toward the posterolateral branch

Fig.8 Under IVUS-guided tip-detection, the Gaia Next 4 wire could be guided into the true lumen

Fig.9 Final angiogram (the main branch was stented, and the posterolateral branch was treated with dilation using a drug-eluting balloon)

and once the IVUS could pass, we confirmed the wire path. The proximal segment relative to the posterolateral branch had passed through the true lumen, but the distal segment had entered the subintima, and angiography image showed marked dissection.

For this reason, we used ASAHI SASUKE and attempted wire crossing toward the posterolateral branch with an X-treme XT-R wire, which allowed passage in that direction **(Fig.7)**. Next, for the distal main branch, the tip-detection method under IVUS guidance enabled us to guide the Gaia Next 4 wire into the true lumen **(Fig.8)**. We then dilated both the main branch and the posterolateral branch with balloons. The posterolateral branch was dilated with an Agent 2.5 × 15 mm balloon, and a XIENCE Skypoint stent 3.0 × 48 mm was implanted in the main branch direction, followed by additional post-dilation of the proximal main branch with an NC TREK NEO 3.5 × 12 mm balloon. Good blood flow was confirmed in both directions, and PCI was completed **(Fig.9)**.

The total procedure time was 331 minutes and the fluoroscopy time was 136.6 minutes, both of which were long; however, because we switched to low-dose mode partway through, we were able to complete the procedure with a lower dose than before. The front dose was 2437.65 mGy, the lateral

dose was 491.01 mGy, and the total dose was 2928.66 mGy. PCI for chronic total occlusion lesions such as this often takes a long time and often results in increased fluoroscopy dose, but by making use of low-dose mode, it is possible to complete the procedure with a lower dose than before. Because Trinias Opera's low-dose mode provides images that do not interfere with procedure progress, we now perform treatment in low-dose mode from the start of the procedure regardless of procedural difficulty.

This progress in fluoroscopy technology that makes use of AI may help make it possible to carry procedures through to completion in cases that, in the past, might have been abandoned midway because of excessive dose, and I believe it is an important technology that contributes to procedural success.

5. Conclusion

In addition to the functions described in this article, various improvements have been made with each update, and usability has continued to improve. Requests we have felt through clinical use have also been addressed, and this is a system that feels as if we are developing it together. We hope that Trinias Opera will continue to be refined and grow so that it becomes an even more patient- and staff-friendly system.

※ The artificial intelligence (AI) technology used in Trinias is not designed to continuously learn from new data after deployment.