X-ray / Seminar Report

Clinical Experience with the New R/F System Zexira i9

- Future Potential of Multipurpose Examinations -

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Introduction

We have introduced the new digital R/F system Zexira i9 at our hospital. This system has been used for a wide variety of clinical applications not only by the Department of Radiology but also by many other departments, including the Department of Urology and the Department of Obstetrics and Gynecology. It is expected to become an even more powerful tool as we gain further clinical experience with the system's capabilities. In this lecture, I would like to describe our early experience with Zexira i9 and discuss our initial impressions of its features and new functions.

Features of Zexira i9

Zexira i9 is a new multipurpose fluoroscopic diagnostic X-ray system manufactured by Canon Medical Systems Corporation. Since its introduction at our hospital, the system has been used for a wide variety of clinical applications by many departments, including the Department of Radiology, the Department of Urology, the Department of Obstetrics and Gynecology, the Department of Rehabilitation Medicine, the Department of Anesthesiology, the Department of Gastroenterological Surgery, and the Department of Internal Medicine (Fig. 1).

- ✓ New multipurpose fluoroscopic diagnostic X-ray system manufactured by Canon Medical Systems Corporation

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  - ✓ Currently used for the following clinical applications at our hospital
  - ✓ Radiology - MDL, excretory urography
  - ✓ Urology - Retrograde urethrography (adult and pediatric), nephrostomy
  - ✓ Obstetrics and gynecology - Hysterosalpingography
  - ✓ Rehabilitation medicine - Videofluorographic swallowing studies
  - ✓ Anesthesiology - Nerve root block
  - ✓ Gastroenterological surgery, internal medicine - Contrast imaging of drainage tubes, PICC placement, etc.

Figure 1: Clinical applications of Zexira i9 at our hospital.

We started to use the new system in close consultation with all these departments. The four most outstanding features of Zexira i9 are as follows: <1> it is a remarkably compact system, <2> it has a wide range of movements and image acquisition modes, providing easy access to the patient, <3> it incorporates a variety of useful new functions, and <4> it allows us to perform examinations and procedures with the lowest possible radiation exposure.

Zexira i9 is a very compact system with a depth of about 173 cm. It can also be installed against a wall. This leaves a wide working area in front of the system, allowing stretchers to easily be moved in and out of the room (Fig. 2).

The wide movement range of the system improves access to the target region during procedures (Fig. 3). Zexira i9 also has a nearly symmetrical design, and the FPD can be moved up to 9 cm from either the head end or foot end of the tabletop. When the "i-fluoro" function (described later) is used, even a position as close as 9 cm from the end of the tabletop can be observed in enlarged view. This feature is greatly appreciated by our clinical departments.

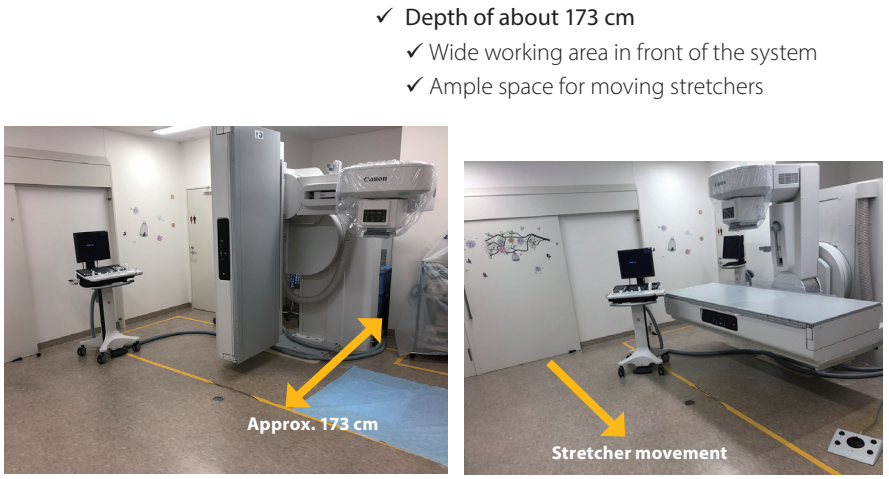

Figure 2: Compact design of Zexira i9.

Figure 3: Wide range of movements and image acquisition modes maximizes access to the target region

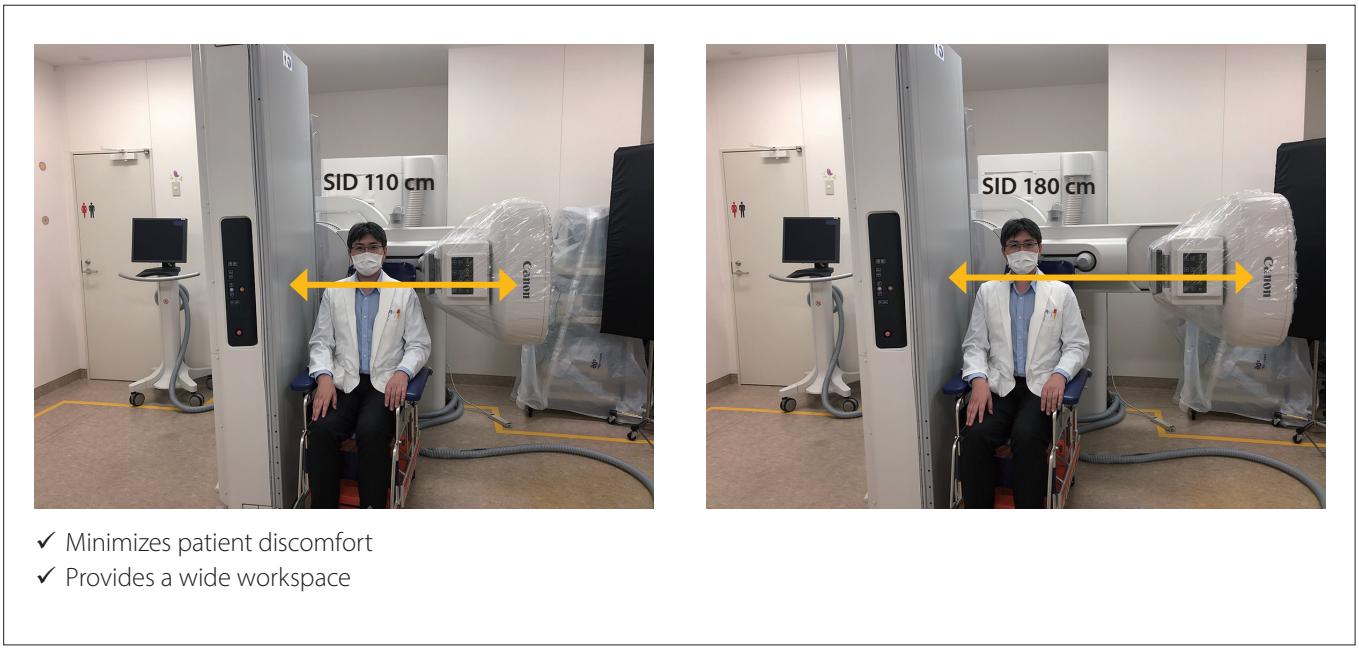

Figure 4: Variable SID (110 cm to 180 cm)

In addition, the distance between the X-ray tube focus and the image receptor (SID) can be adjusted over a range from 110 cm to 180 cm (Fig. 4). The use of a longer SID in videofluorographic swallowing studies minimizes patient discomfort and provides a wide workspace for the physician (Fig. 5).

New functions of Zexira i9

Zexira i9 is provided with a number of new functions. Although we have only recently installed our system and have not yet explored all its functions, I would like to describe those we have already employed and found to be particularly useful.

1. i-fluoro

The i-fluoro function, which allows off-center regions to be observed without the need to move the tabletop or the imaging system, is an outstanding new function of Zexira i9 (Fig. 6). In conventional systems, only the central area of the FPD is enlarged, but with i-fluoro, the user can select any desired area of the FPD to be displayed in enlarged view. This means that off-center regions can be observed in enlarged view without moving the patient or the system. This feature is extremely useful when performing procedures near the end of the table, such as nephrostomy and hysterosalpingography, or procedures in which the field of view needs to be moved, such as peripherally inserted central catheter (PICC) placement. Moving the table or the patient during such procedures could lead to accidents and also increases the workload on medical staff. Eliminating the need to move the table or patient is truly a great benefit, and we feel that i-fluoro is the most useful of all the new functions of Zexira i9. Figure 7 illustrates how i-fluoro is used in actual clinical practice. Although the figure shows light rather than fluoroscopic X-rays, it is clear that off-center regions can easily be observed in enlarged view without moving the patient or the system.

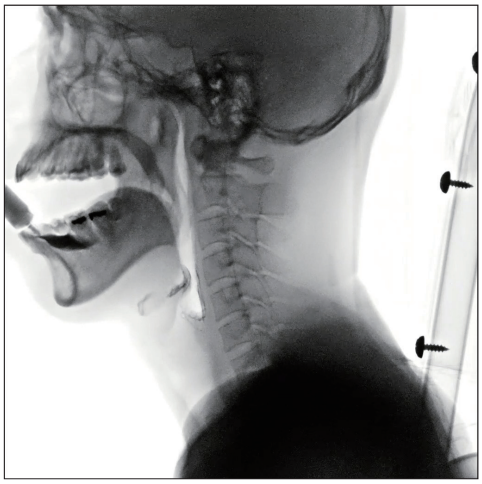

Figure 5: Use of a long SID in videofluorographic swallowing studies
Movement of the contrast medium can be clearly observed.
(pulse rate: 15 fps, dose mode: Normal)

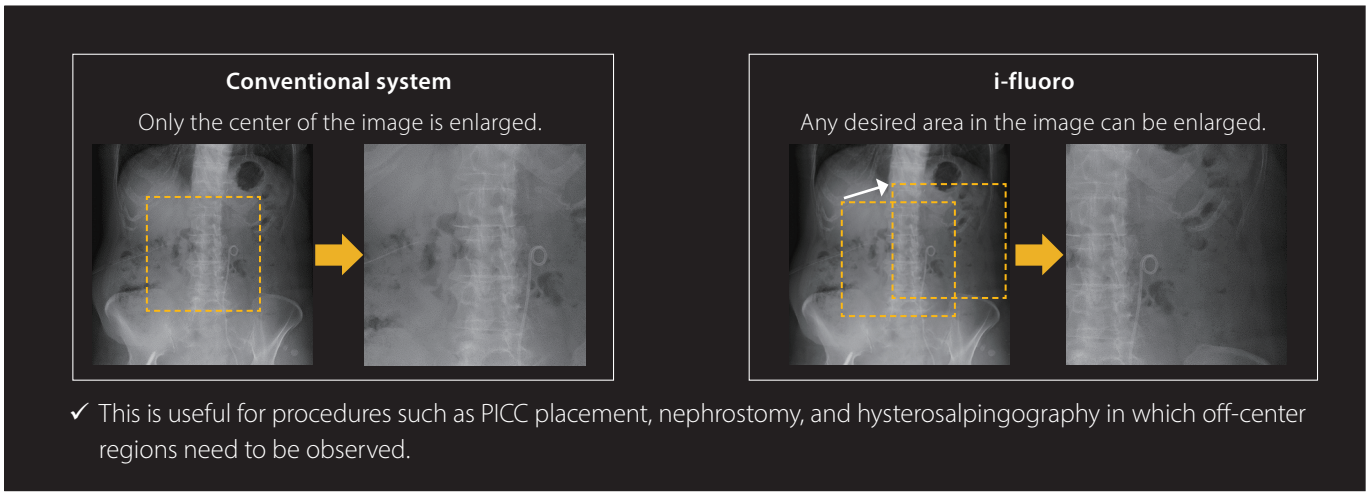

Figure 6: i-fluoro (function that allows the desired region to be observed without moving the tabletop or the imaging system)

KEY POINTS

- ✓ At our hospital, Zexira i9 has been used for a wide variety of clinical applications by many departments. Its compact design and the ability to set an extended SID are highly appreciated by these departments.
- ✓ Among the new functions of the system, i-fluoro allows off-center regions to be observed in enlarged view without the need to move the tabletop or the imaging system. We have found this feature to be particularly useful.
- ✓ The system helps promote dose reduction and allows us to perform mandatory dose management using its dose report function.

I would now like to present a number of cases in which i-fluoro was used. Figure 8 shows replacement of a nephrostomy catheter in the right kidney. After the overall image was acquired (Fig. 8a), the area of the image showing the right kidney was enlarged in order to perform catheter replacement without moving the patient (Fig. 8b). The wire and catheter within the contrast medium could be clearly observed during fluoroscopy using i-fluoro. Figure 9 shows contrast-enhanced images acquired during vesicostomy. In this study, the area of the image showing the pelvis was enlarged using i-fluoro to obtain a clear image providing all the required information. We also perform hysterosalpingography in the pelvis. This is a good example of an examination in which it is difficult to move the patient after they have been positioned on the tabletop. The usefulness of i-fluoro in hysterosalpingography is especially appreciated by the Department of Obstetrics and Gynecology.

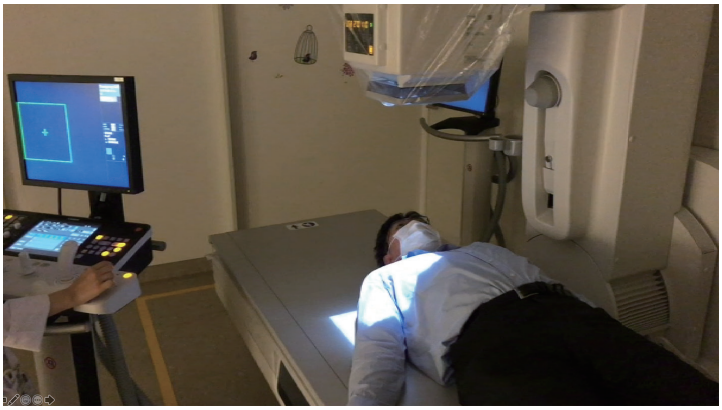

Figure 7: Use of i-fluoro, in which the field of view is moved but the tabletop and imaging system do not move

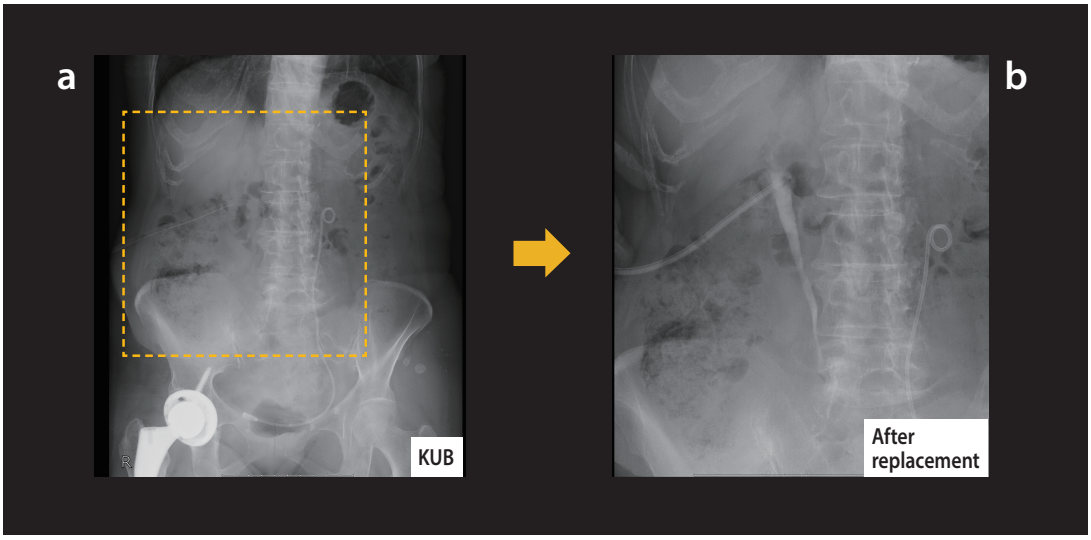

Figure 8: Example of use of i-fluoro during nephrostomy catheter replacement in the right kidney

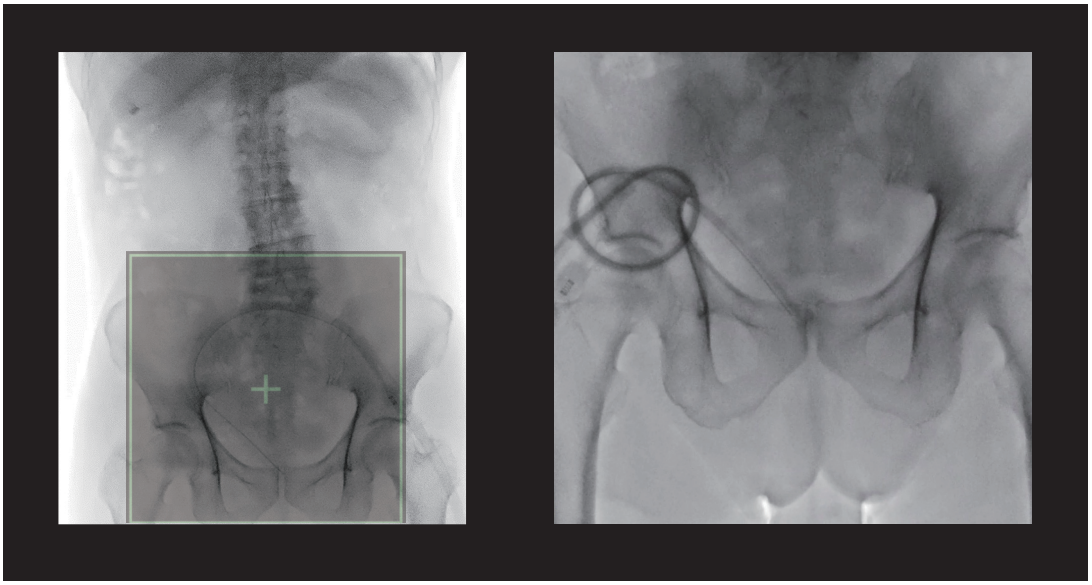

Figure 9: Example of use of i-fluoro for contrast-enhanced imaging during vesicostomy (pulse rate: 7.5 fps, dose mode: Normal)

2. Stitching radiography

Next, I would like to introduce the stitching radiography function. It is used to perform stitching radiography for a series of exposures and is mainly intended for imaging of the entire spine or the entire length of the lower extremities in the field of orthopedics. Because a stitching radiography system is already available in the general radiography room at our hospital, we do not use it for diagnosis, but we do use it for the inspection and management of X-ray protective equipment in accordance with recent requirements. Stitching radiography of such X-ray protective equipment allows precise evaluation with no density nonuniformity or junction lines in the stitched images. Images can be acquired in about 10 seconds and viewed immediately, which is highly appreciated by medical staff (Fig. 10).

3. Tomosynthesis

The tomosynthesis function is another new feature of Zexira i9. Tomosynthesis provides images with reduced metal artifacts and high spatial resolution. It is most commonly used for chest imaging and orthopedic studies. Thanks to the system's wide stroke, tomosynthesis of the lower part of the body can be performed in the upright vertical position. This position minimizes patient discomfort and also provides images in which structures are subjected to gravity loads, which cannot be obtained by CT. For these reasons, we have very high expectations for tomosynthesis (Fig. 11).

Figure 10: Stitching radiography of X-ray protective equipment

- ✓ Tomosynthesis
  - ✓ A technique that has recently come back into the spotlight
    - ✓ Reduces metal artifacts
    - ✓ Provides high spatial resolution

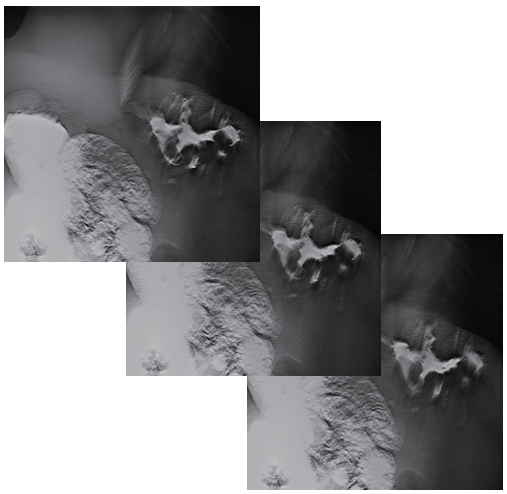

Figure 11: Tomosynthesis

✓ Larger number of pulse rate settings
✓ 1, 2, 3, 5, 7.5, 10, 15, 20, 30 fps
✓ The availability of more choices at lower rates (5, 10 fps) is highly appreciated by our clinical departments.
✓ Particularly useful for pediatrics

Additional benefits:

✓ The dose mode can be switched while maintaining the brightness of the monitor at a constant level.
Dose mode: Normal
Mid
Low

Combined use allows the optimal dose to be set in a wide variety of examinations.

Figure 12: Dose reduction due to a larger number of pulse rate settings etc.

Figure 13: Pediatric VCG
(pulse rate: 3 fps, dose mode: Low)

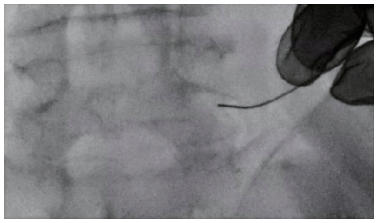

Figure 14: Nerve root block
(pulse rate: 7.5 fps, dose mode: Mid)

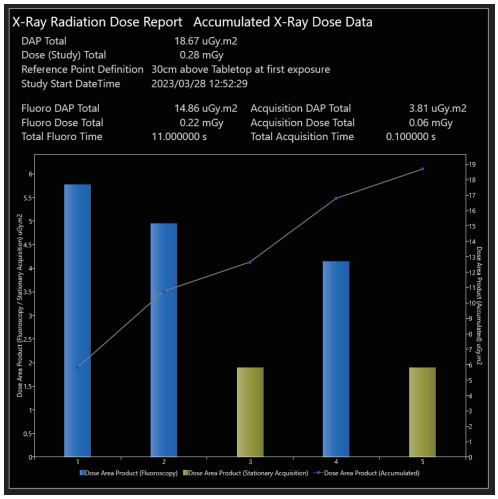

Figure 15: Dose report function of Zexira i9

Dose reduction

Radiation exposure is unavoidable in imaging studies employing X-rays. Nevertheless, Zexira i9 provides a larger number of pulse rate settings (especially at the lower end of the range) to help achieve the optimal balance between image quality and exposure dose (Fig. 12). In addition, the dose mode can be adjusted in three steps (Normal: 100%, Mid: 50%, and Low: 35%) while maintaining the brightness of the monitor at a constant level. Using this function in combination with an appropriate pulse rate makes it possible to achieve the optimal dose in every examination. Figure 13 shows pediatric voiding cystourethrography (VCG) in which the exposure dose could be substantially reduced while maintaining high image quality by setting the dose mode to Low. This feature is also useful when nerve root block is performed by specialists in the Department of Anesthesiology (Fig. 14).
It should be noted that dose reports can be automatically created and saved in Zexira i9 to facilitate compliance with the mandatory dose management requirements that came into effect in 2020 (Fig. 15).

Summary

Zexira i9 is a remarkably compact system with a wide range of movements and image acquisition modes. We feel that, among the new functions of the system, i-fluoro is especially useful. The types of examinations that can be performed with a single Zexira i9 system are significantly expanded thanks to the stitching radiography and tomosynthesis functions, and we believe that the system has great potential to be a powerful tool with a wide range of new clinical applications based on innovative ideas and approaches.

* This article includes comments based on the author's personal experience and opinions.

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