

Digital R/F

Overview of SONIALVISION safire II Digital Table Equipped with Direct-Conversion Flat Panel Detector



Mr. Yasuaki Sakano

Department of Radiology, Tokyo Metropolitan Health and Medical Treatment Corporation
Ebara Hospital
Yasuaki Sakano

1. Introduction

On 1 April 2006, the functions of Tokyo Metropolitan Ebara Hospital were transferred to the Health and Medical Treatment Corporation Ebara Hospital, and under the official name of the Tokyo Metropolitan Health and Medical Treatment Corporation Ebara Hospital, the hospital started to fulfill a central role in the local healthcare network of Tokyo's Jonan District. The department of radiology comprises three sections, diagnostic imaging, nuclear medicine, and radiation therapy, and responds to the medical needs and trust of Ota Ward, and the three neighboring wards. All staff like to think of this hospital as a medical institution that earnestly provides safety and peace of mind to its patients.

At our hospital, in order to provide advanced, specialized medical care, we operate two 1.5-tesla MRI scanners and two MDCT scanners at full capacity 24 hours a day. There is a very strong desire to learn among our staff, many of whom have been well received at national academic conferences. Currently, the numbers of patients receiving MRI and CT examinations at our hospital every month respectively exceed 1,000. Therefore, with regard to the introduction of an X-ray TV system equipped with a flat panel detector (FPD), in comparing fluoroscopy with MRI, CT, and other techniques, cost-effectiveness naturally had to be considered in addition to usability and necessity. A level of efficacy exceeding that of alternative techniques was required.

Under these circumstances, from the point of view of examination demand and promptness, there has been a general tendency for fluoroscopy systems to be regarded lightly. We introduced the SONIALVISION safire II digital table equipped with a direct-conversion FPD (Fig. 1), which is the subject of this article, under the assumption that it would fundamentally reverse this way of thinking.

Physicians from all departments insisted that no self-respecting hospital should be without a fluoroscopy system, and everybody agreed that, in order to provide patient-centered medical care,

fluoroscopy should be introduced. This could be described as a victory for the strong feeling of the physicians at this hospital who, supported by tradition and experience, believe that medicine is more about benevolence than arithmetic.

Here, rather than stringing together pleasantries and compliments, by giving some concrete examples of applications, mixed with the frank opinions of the radiological technologists who actually use the equipment, I would like to describe the real usability of this system.

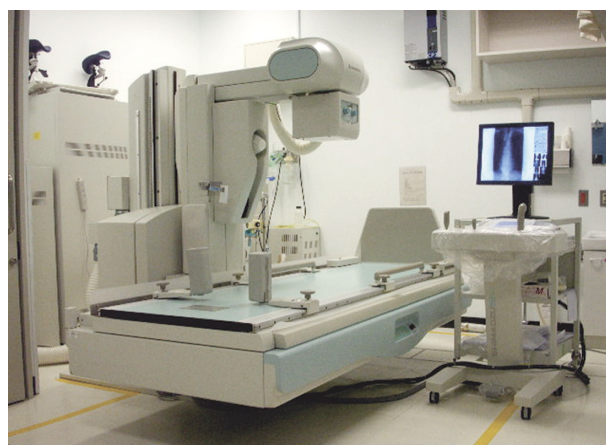


Fig.1

2. Basic Considerations Behind Introduction

Evaluation consisted of reconfirming the following:

- ① Imaging with an FPD that covers a wide field of view
- ② Incorporation of the latest DR system, which optimizes the performance of the FPD
- ③ Creation of a patient-friendly examination environment
- ④ Tomosynthesis functions that expand the range of possibilities of clinical applications

X-ray conversion method (FPD)	Direct conversion
Field of View size	17 × 17 inches
Table tilting range	89° (standing) to -89° (inverted standing)
Table elevation range	47 to 110 cm (horizontal position)
Movement range of imaging system	155 cm (no retraction of the imaging system in any tabletop position; ceiling height: 285 cm; SID: 110 cm)

Table 1

(1) Items Considered

Some of the items considered are given below.

① Patient-Friendly Equipment

In order to ensure the safety and peace of mind of the patient, this system is equipped with a contact safety switch and a protrusion detection switch. When the safety switch operates, the system stops automatically to ensure safety. In order to facilitate movement of the patient, the system is equipped with a tabletop elevation function.

② Staff-Friendly Equipment

The system is equipped with a mechanism that automatically stops the imaging system if the operator, caregiver, or patient makes contact with it during an examination. It is also equipped with a tabletop elevation function that allows the tabletop to be lowered to a height of 47 cm, a useful feature for both operator and patient. Also, combining exposure reduction functions, such as low-dose fluoroscopy, and the high sensitivity and high image quality offered by the direct-conversion FPD makes it possible to achieve both extremely high image quality and low exposure in a balanced way. These features all make for a people-friendly examination environment, both in terms of operation and performance.

③ Meeting the Needs of Several Departments, Including Internal Medicine, Surgery, Pediatrics, Gynecology, Urology, and Otolaryngology

Thanks to the combination of the large, distortion-free field of view obtained with the 17×17-inch direct-conversion FPD and the large imaging-field stroke offered by the digital table, only minimal positioning is required for high-performance imaging in a variety of applications, including imaging of the digestive tract after the administration of an enema, examinations of the abdomen and the urinary organs, and examinations related to orthopedics.

④ Results of Comparison of Direct-Conversion and Indirect-Conversion Methods

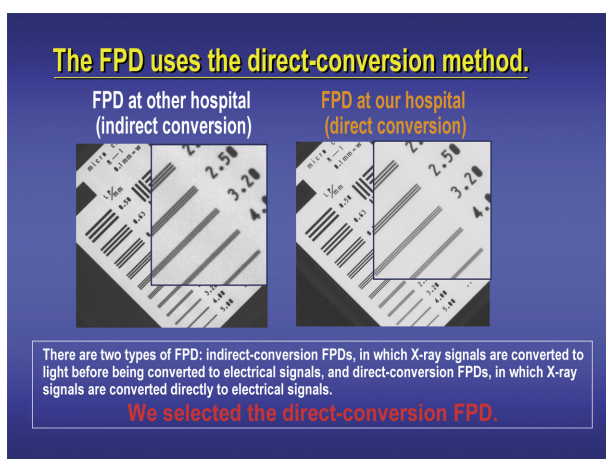


Fig.2

⑤ Superior Image Sharpness

The 2,880 × 2,880-matrix (max.) ultrahigh-definition digital images achieved with Shimadzu's direct-conversion FPD can be processed and saved in their original state. The highly versatile Windows is used as the operating system, and using complete parallel processing makes it possible to perform filming and filing without stopping examinations, and this has led to an increase in examination efficiency.

As I believe that other institutions are considering the introduction of this system, I will describe some of the installation specifications applied at our hospital.

(2) Requirements of the System

- ① The installed system must comprise a remotely operated X-ray fluoroscopy table (equipped with an FPD) and a digital radiography device. It must support effective utilization in a wide range of examinations, including those for the stomach and other parts of the digestive tract (using an enema), the abdomen, and orthopedics.
- ② In the actual installation of equipment, measures must be taken to prevent the equipment from toppling over or moving sideways in the event of an earthquake.
- ③ The installation, operation, and adjustment required to facilitate full operation of the system in the place specified by this hospital must be carried out by a date decided in consultation with hospital representatives. Also, the explanations and guidance required for operation and maintenance must be provided to the users of this system.
- ④ All of the transportation, installation, wiring, tube connection, and adjustment required for the full operation of this system must be performed.
- ⑤ The warranty period for the equipment must be one year following delivery. A warranty certificate must be provided by the manufacturer.
- ⑥ During and after installation of the system, education and training must be provided, as necessary, over a certain period.

The above points were all implemented.

We also submitted detailed requirements for the digital radiography device, but these were all satisfied. We required the implementation of remote maintenance based on the observance of the confidentiality of personal information.

The results of the above were as follows:

(3) Results of Consideration

- ①The tabletop and over-tube elevation functions were very good.
- ②Operation was simple, even for veteran technologists.
- ③The system was capable of handling a wide variety of examinations.
- ④For reasons stated elsewhere, we decided to use a direct-conversion FPD.
- ⑤Image quality was very good.
- ⑥There was a service framework capable of making quick repairs in the event of post-delivery malfunctions.

The system was considered to be excellent.

3. Future Usability of Digital Tomosynthesis

At this hospital, we have high expectations of the future usability of the digital tomosynthesis function that is incorporated in this system. I will give a general summary of what we know about this function at the present moment.

Digital tomosynthesis is considered to offer a lower level of exposure than CT and a high level of spatial resolution. The Henry Ford Health System (U.S.) has, in cooperation with Shimadzu Corporation, conducted research related to digital tomosynthesis, and has presented the results of this research at the RSNA. Apparently, it can produce extremely good results in the imaging of the knee joint with weight applied, results that cannot be attained with MR or other techniques. We, too, are interested in this sort of capability. In the future, we hope to be able to utilize this technique, in which a series of consecutive images obtained from a single cross-sectional imaging operation can be used to reconstruct an image of the desired slice.

4. Features and Overview

SONIALVISION safire II is a digital table that was released in Japan in July 2006. The combination of the wide, distortion-free field of view obtained with the 17×17-inch direct-conversion FPD and the large imaging-field stroke offered by the digital system enables high-performance imaging in a variety of applications, including imaging of the digestive tract after the administration of an enema, examinations of the abdomen and the urinary organs, and examinations related to orthopedics. In addition to outlining the main features below, I invite the reader to get a feel for the usability of this system in real situations by reading the comments made by two veteran radiological technologists

(**Fig. 3**) with 40 years of experience.

- ①Large, distortion-free, 17×17-inch field of view
- ②Ability to process and store 2,880×2,880-matrix (max.) ultrahigh-definition digital images in their original state
- ③Ability to perform high-speed serial imaging, such as that required in swallow tests (7.5 frames/s max.)
- ④Superior operability based on completely simultaneous parallel processing
- ⑤The system is equipped with a digital tomosynthesis function, an original application developed by Shimadzu, in which a series of consecutive images obtained from a single cross-sectional imaging operation can be used to reconstruct an image of the desired slice.

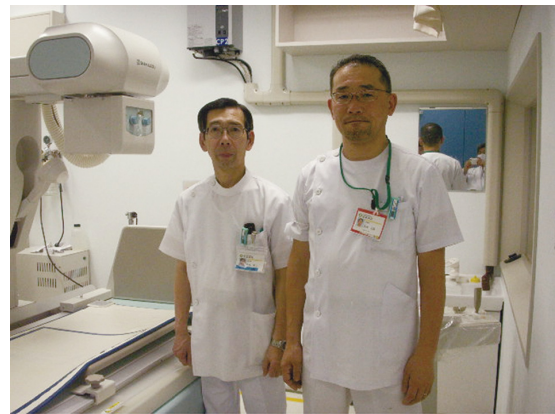


Fig.3



Comments from Mr. Chikada (Chief X-ray Technologist)

With the new system, there is little exposure to patients and operators. In particular, the incorporation of pulsed fluoroscopy makes it possible to reduce the level of exposure experienced during long periods of fluoroscopy, thereby ensuring peace of mind. The ability to lower the tabletop is greatly appreciated not only by patients, but also by physicians and nurses.

In its lowest position, the distance between the floor and the tabletop is 47 cm (**Fig. 1**).



Comments from Mr. Yamazaki (Chief X-ray Technologist)

Compared to the previous system, this one gives better quality radiographs and produces clearer monitor images, and has consequently been well received. In myelography, for example, because the angle of the X-ray tube can be altered to allow oblique incidence, it is easy to obtain clear images of the spinal cavity interior. The system itself is easy to operate, and I was impressed by the quietness of the system during operation. I also think that it helps patient undergo examinations with greater peace of mind. The tabletop can be lowered to a height of 47 cm from the floor (Fig. 1), which makes it easy to use and is helpful to patients.

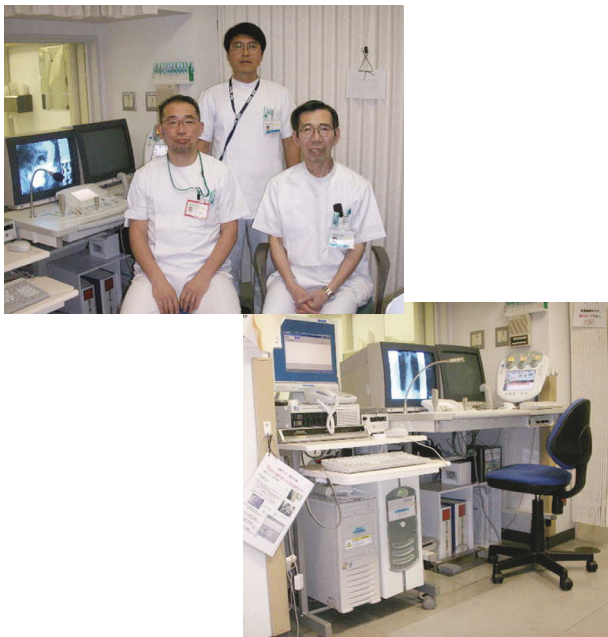


Fig.4

5. Flat Panel and RIS

This is an indispensable fluoroscopy device. The consistency and compatibility with RIS is highly appreciated by medical practitioners.



Fig.5

- * Easy to use in standing position.
Optimal for swallow tests.
Minimum height is 35 cm, allowing use for patients in wheelchairs (Fig. 5).
- * Easy to use in recumbent position.
Minimum height is 47 cm (Fig. 1).



Comments from Mr. Yonekawa (Section Head)

- ① Because of the large tabletop elevation range, it is possible for patients to mount the tabletop directly from a wheelchair, and the burden placed on patients in mounting and dismounting is significantly reduced.
- ② Connecting to a radiology information system has eliminated the possibility of confusing different patients and has made it possible to inspect images saved in a server at any time using a special-purpose viewer.
- ③ In the calibration that is conducted every morning, the system performs self-diagnosis on itself. This ensures the early discover of problems and has dramatically increased system reliability.
- ④ Image processing, printing, and saving can be performed independently during imaging. Film output processing is simple, and examinations can be conducted efficiently.

Refer to Fig. 6 for an overview of a configuration connected to an RIS.

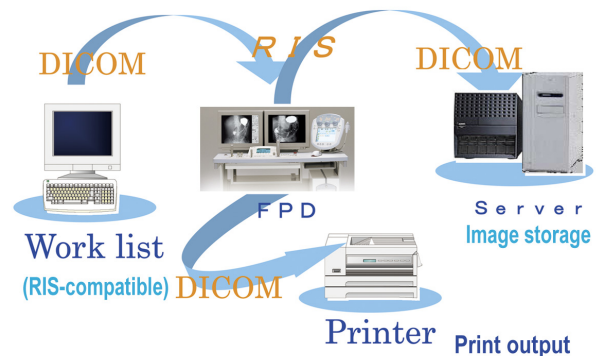


Fig.6

6. Summary

At our hospital, we are promoting the digitization of image-related information, and through the introduction of electronic medical records, we are working to create a framework that is capable of providing patients with a fast, safe, and worry-free medical service.

At a time when we are constantly surrounded by technological innovation, including developments in medical equipment, there is a danger that efficiency and economy are emphasized at the expense of patient-centered healthcare. We are continually striving to eliminate this way of thinking. As providers of a conscientious medical service, we intend to continue our efforts to attain self-improvement into the future, without capitulating to this severe, somewhat paradoxical environment. As users, we look expectantly towards Shimadzu Corporation, a Japanese manufacturer that produces excellent medical equipment, including X-ray TV systems equipped with FPDs and general radiography equipment. We would like to see it produce results that reflect its status as one of Japan's leading companies in this field.