

Fluoroscopy System Suitable for Swallowing Examination Aids Rehabilitation



Mr. Manabu Fujita

Ms. Yuko Bongohara, Department of Radiology

Mr. Manabu Fujita, Unit of Speech Therapy, Department of Rehabilitation

■ Regional Leader of Dysphagia Rehabilitation

Our hospital (Fig. 1) is located on the south end of Fukuoka city and has 123 beds. It specializes in rehabilitation and dialysis care. We provide regional healthcare based on our hospital philosophy of providing the best possible medical and welfare services for each patient's life stage.

Currently, there is an increasing demand for expanding the venues for providing medical and welfare services from the hospital to the home. Our hospital serves an important role in regional healthcare by leading the region with services such as in-home medical cares, in-home and outpatient rehabilitation, joint long-term nursing care and health facilities, and in-home nursing care stations.

Our first hospital director actively started developing our rehabilitation program long before many others. In 1981, he introduced various methods for speech therapy, which did not even have a national certification system at the time. We now have 13 speech therapists on staff for rehabilitation of conditions such as adult aphasia, dysarthria, dysphagia, and higher brain dysfunction.

We intend to serve the region's medical needs by continuing to increase our expertise and promoting the integration of medical, welfare, and health services.



Fig. 1 Nagao Hospital

■ Video Fluoroscopy (VF) of Swallowing in High Demand

At our hospital, about 40 percent of the examinations performed using our FLEXAVISION F3 R/F system (simply "F3" below) are for Video Fluoroscopy of swallowing ("VF" below). We perform 3 or 4 VF cases each Thursday, for a total of about 100 cases per year.

Recently, there has been an increase in demand for the examinations, not only for inpatients, but also for patients referred from other hospitals.

Demand for the examinations continues to remain strong due to 2014 revisions to the Japanese medical compensation system, such as additional allowances for rehabilitation to restore normal oral eating functions and for evaluating swallowing functions during gastrostomy.

■ Using Examination Results for Rehabilitation or Explaining Treatment to Family Members

VF is meaningful for both diagnostic and treatment purposes and is not performed simply to determine whether or not patients are not swallowing properly. If pharyngeal residue or accidental swallowing is confirmed during an examination, we also determine any compensatory swallowing measures that can be taken to minimize the problem and help ensure food can be ingested more safely. We consult with the examining physician to determine whether there are any useful compensatory swallowing measures available and whether or not basic swallowing exercises should be added to the therapy plan. In addition, the speech therapist assigned to the case tries to improve the effectiveness of the exercises by reviewing, reanalyzing, and reconfirming video of results after examinations. Furthermore, such videos are also widely used for explaining medical conditions to patients or their family and are included as documentation for patients transferred to another facility.

■ Design Features such as the 1.5 m X-Ray Tube Extension Function Are Ideal for VF

Adequate space for examinations was a key consideration when we were selecting a fluoroscopy system. Due to VF examination characteristics, the system must allow us to recline the patient to the 30 degree position. At our hospital, we use a VF chair with a high back to keep a patient's head and neck stable. Therefore, we need enough space to allow us to recline the VF chair without the headrest interfering with the imaging unit support column. Also, though images are usually acquired from the side (Fig. 2), it is not uncommon to require images from the front (Fig. 3) as well. Therefore, the F3's ability to extend the X-ray tube 1.5 meters to easily acquire frontal images, even with the seatback reclined, without causing undue stress on the patient is a significant advantage of the F3.

In addition, the compact base plate of the F3 seems to facilitate changing direction and maneuvering wheelchairs more easily. The ability for doctors to use a bedside controller to adjust the table height themselves, to the height they prefer, during gastrostomy or when inserting a central venous catheter is also appreciated.



Fig. 2 Lateral Fluoroscopy Fig. 3 Frontal Fluoroscopy

■ High Image Quality and Large Field-of-View Are Beneficial for VF

One of the reasons we selected the F3 was its ability to rotate the 14 × 17-inch FPD either Portrait or Landscape. VF sometimes involves changing the reclining angle during examinations, which can make it difficult to capture images in the center 12-inch area of the panel normally used. However, even in such cases, the panel can be rotated 90 degrees to achieve a large field-of-view of up to 17 × 14 inches. Furthermore, the high image quality allows more precise evaluations.

■ Ability to Reduce the Exposure Level At Ease

VF procedures can be time-consuming due to the simulated foods and positioning involved, but using the 15 pps pulsed fluoroscopy and replacing the image intensifier with the FPD allow us to reduce the exposure dose level, which not only relieves any patient concerns, but also ensures hospital personnel can perform examinations feeling at ease.

There was increasing concern about the effect of radiation exposure, even among hospital personnel, so the ability to reduce exposure levels was a factor considered when selecting the model and choosing to introduce an FPD system.

■ Specialized Image Recording System Saves Images Efficiently

The image recording system introduced at the same time as the F3 system offers the following benefits and improves the efficiency of recording and saving images (Fig. 4, 5).



Fig. 4 Fluoroscopy Image Recording System (left) and Remote Control Console (right)

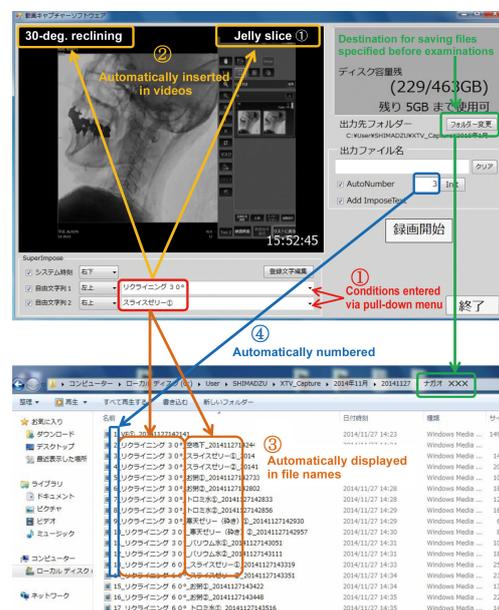


Fig. 5 Windows for Fluoroscopy Image Recording System

- Saves images automatically at the same time as irradiation.
- Intake conditions for examinations (reclining angle and type and quantity of simulated food) can be entered via a pull-down menu ((1) in the image). The terms listed in the pull-down menu can be freely customized by easily editing or adding terms.
- Intake conditions entered in fields (1) are automatically inserted in the fluoroscopy image ((2) in the image).
- A separate file is created for each shot, with intake conditions automatically included in the file name, which makes it easier to review and study images after examinations (3).
- Each shot is automatically numbered chronologically in the order they were acquired and saved in a folder created before the examination (we use a patient's name for a folder name) (4).
- A switching hub can be used to easily switch between VF and VE (videoendoscopic) swallowing examination screens. Captured VE video images are also automatically saved in the same folder.
- Sound is also recorded during examinations, which allows us to capture patient reactions and instructions by the examining physician.
- The 15 pps pulse rate for pulsed fluoroscopy provides more than adequate image quality for recording images as AVI files at 30 fps, according to VF guidelines.

■ Broad Applicability of Examination Data

The video files are saved in a versatile AVI format, which can be viewed on almost any computer without a special codex. Therefore, they do not require any special editing before transferring them as patient documentation to another facility. Because intake conditions are included as part of file names, it is easier for the receiving party to view the files. VF videos can also be pasted easily into PowerPoint presentations being prepared for academic conferences or study meetings.

Advice to Doctors Considering Introducing This System

The ability to extend the X-ray tube 1.5 meters and the additional examination space provided by the compact base plate are especially helpful when positioning the VF chair. In addition, the image recording system we also introduced is well suited for recording and saving VF results and can be used in a variety of situations.