

# Radiation Protection Effect of Novel Pb Plate in Videofluoroscopic Swallowing Study

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## TEACHING POINTS

- Protection of staff exposure during Videofluoroscopic swallowing study using a **Original novel Pb shield**.
- Radiation protection education for staff using **radiation dose map**.

# Background

- The new occupational dose limit of the crystalline lens was recommended by the International Commission on Radiological Protection (ICRP 118) in 2012.
- Lead shield **already exist** for use with the bed **‘horizontally’**.
- There has **never** been a lead shield attached to the bed when used **‘vertically’**.



Bed : horizontal position

# Purpose

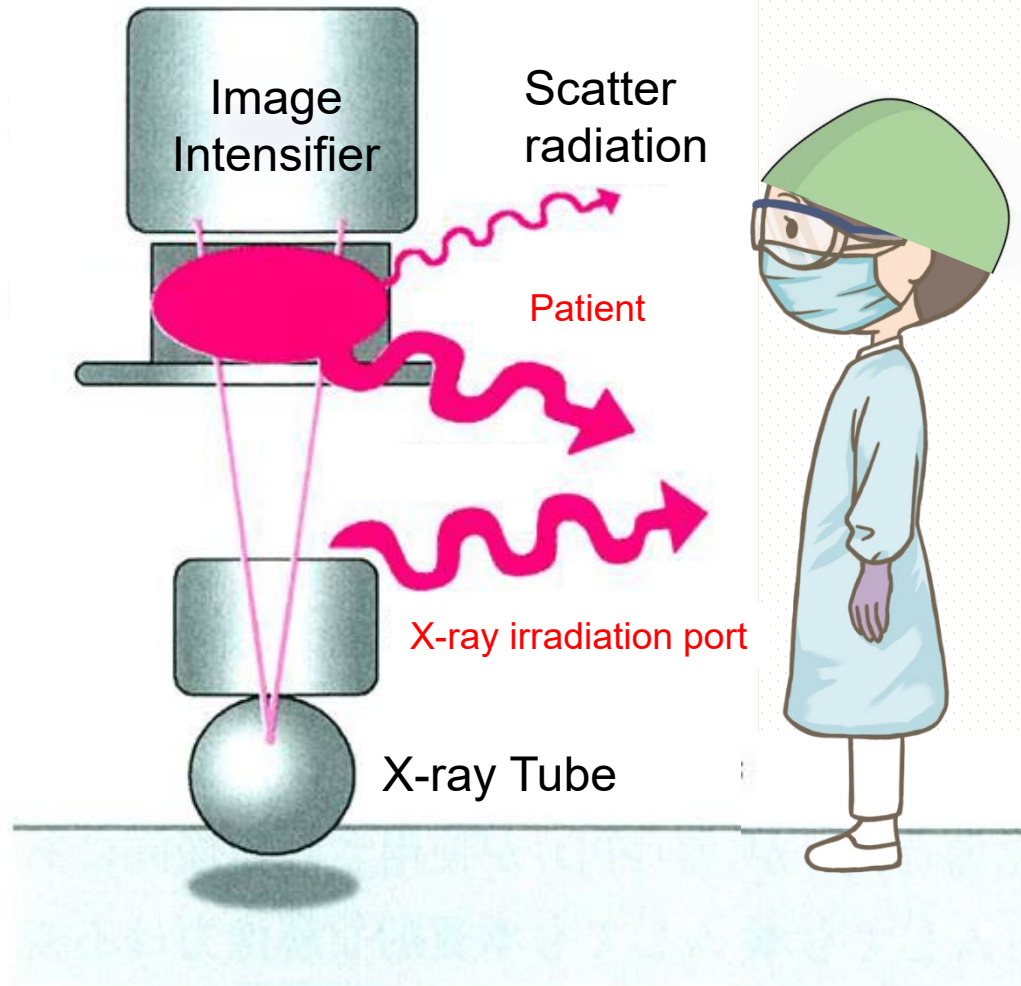
To investigate the effectiveness of **Original novel Pb shield** for **reducing** the scatter radiation during Videofluoroscopic Swallowing Study .

# Staff Exposure

Exposure to scattered radiation comes from where?



1. Patient
2. X-ray irradiation port



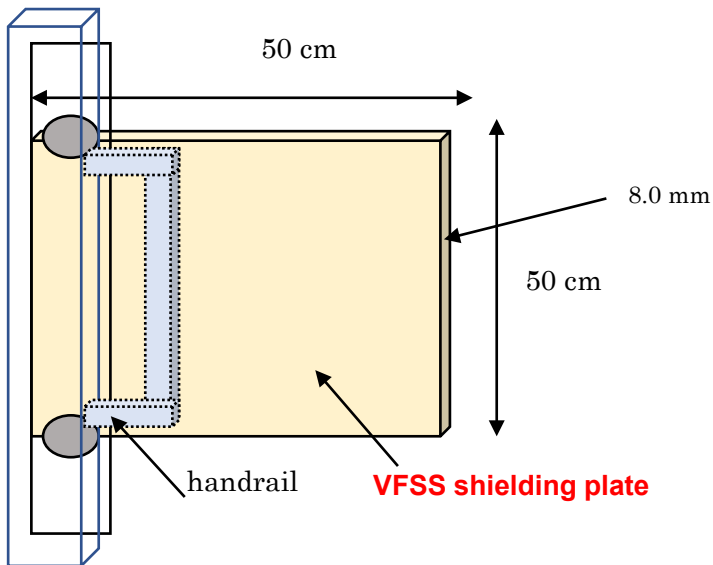
Knowing the **source** of scattered radiation



Very important for staff **radiation protection education**

# Original novel Pb shield

(Using Videofluoroscopic Swallowing Study :VFSS )



Original novel Pb shield

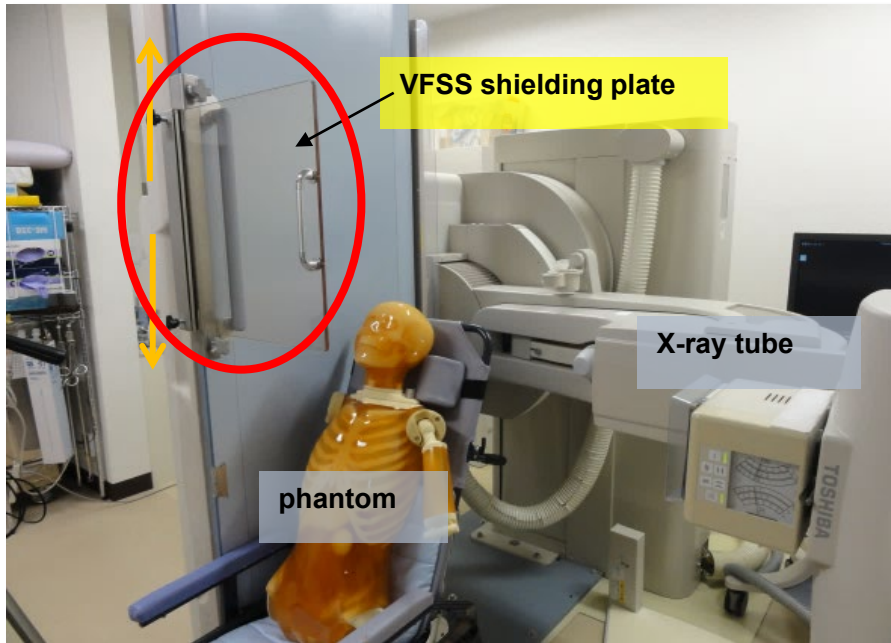


**‘VFSS shielding plate’**

VFSS Shielding Plate use **vertically** in the bed and **attach to the handrail** of the table.

Lead equivalent of 0.3mm Pb, weighs about 6 kg, and is 50cm × 50cm × 8.0mm.

# Methods : Phantom study setup



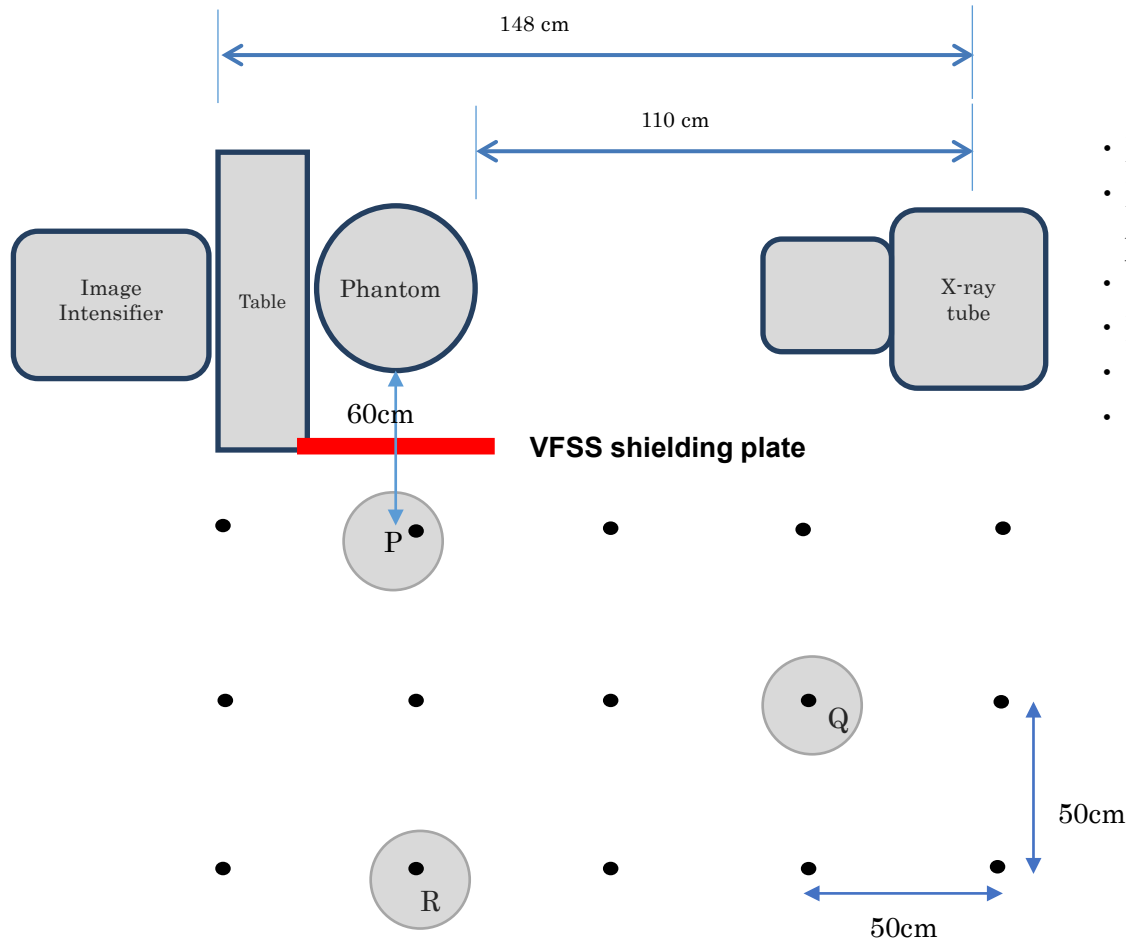
Bed : vertical position

- Measurement plan for this study, X-ray tube, phantom, **VFSS shielding plate**
- VFSS shielding plate can be moved up and down according to the physician's eye level (→)
- Radiation survey meter (ICS-321, HITACHI, ALOCA Medical Ltd. measuring range of 1-300 mSv/h).



Measurement scatter radiation **with** and **without** VFSS shielding plate

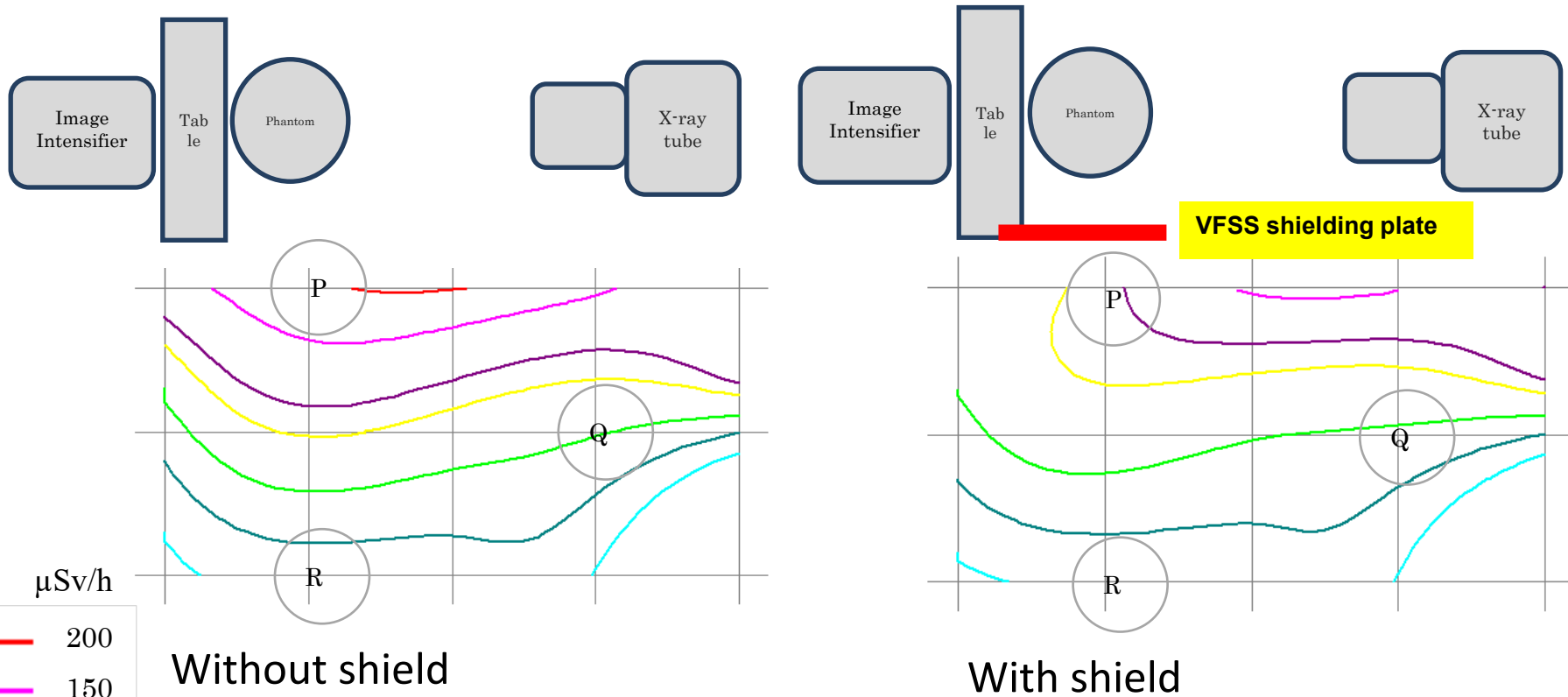
# Measurement Diagram



- X-ray tube - image intensifier :148 cm
- X-ray tube - entrance surface of the human phantom :110 cm
- Human phantom - physician's position : 60cm
- Measurements at 15 points (black point)
- 50 cm intervals
- 150 cm in height above the floor (Physician's eye level)

P: physician's position  
 Q, R: medical staff position (nurses and speech-language pathologist)

# Result : Radiation dose map



	Without shield	With shield	Reduction rate(%)
P	190	92	51.6
Q	52	46	11.5
R	21	18	14.3

$\mu\text{Sv/h}$



# Use case in clinical



Using ‘VFSS Shielding Plate’ the physician will reach out from under the shield and let the patient eat and drink, so it will not hamper in VFSS.

Setting VFSS Shielding Plate

Physician's eye level

# Conclusion

- ‘VFSS shielding plate’ **effectively** provided protection from scattered radiation at the **physician's position** during VFSS (**> 50%**).
- The protective effect was **about 10%** at the **staff's** position. The original scatter dose is low, but staff should **keep away** from the **patient** and **X-ray tube**.
- The **radiation dose map** can visually confirm the effect of scattered radiation protection and is **useful** for **staff radiation protection education**.