Transition of the patient dose by the diagnostic X-ray examinations in the area of the local-area survey by the novel patient dose calculation system

H.Sato, E.Nakajima Ibaraki Prefectural University of Health Sciences

Background

The diagnostic reference level (DRLs) was proposed as a tool for the patient dose optimization of X-ray examinations.

Purpose

The purpose of this study was to estimate the entrance surface dose(ESD) for the different types of X-ray examinations in the regional hospital. In this study, a novel calculation system was developed for estimating the entrance surface doses and the result of the local survey about the patient dose of the local area was reanalyzed.

Methods

The entrance surface dose by novel calculation system (call estimation patient dose calculation system) was calculated using the parameter of an X-ray output (tube voltage, current time product, filtration, focus-skin distance, field size, etc.). The coefficient which standardized the output in each conditions based on the measurement result of a standard air kerma was used for this calculation system. The measurement employed the electrometer (EMF521: EMF Japan) and ionization chamber (DC300: Wellhofer) which the traceability corrected by Japan Quality Assurance Organization (JQA) established. The software which calculates a radiation dose by calculating the coefficient of ESD was created. Although the standard body thickness according to different types of X-ray examination, exposure field size, etc. are used in initial setting, modification was also possible respectively.

The result to which survey of the patient radiation dose was intermittently conducted by the Ibaraki Association of Radiologic Technologists (IART) from 1987 against the hospital of Ibaraki Prefecture (Japan) was calculated with this compute system.

Results and Discussion

The created software (estimation patient dose in diagnostic X-ray examination : EPD) is shown in Fig.1. As for the calculation result, a maximum of +20% of difference was confirmed to the measurement result of an ionization chamber type dosimeter(Fig.2). However, it is proper as an estimate to the survey for attaining rationalization of a dose. There is a limit in accurate dose estimate by the range from 40 to 150 kV tube voltage, the difference in filtration, etc. The result of having re-analyzed a local survey is shown in Fig.3,4,5. Although the dose was a decline tendency on the whole in the re-analysis result of the patient dose by the novel dose calculation system, transition was trifling in recent years.

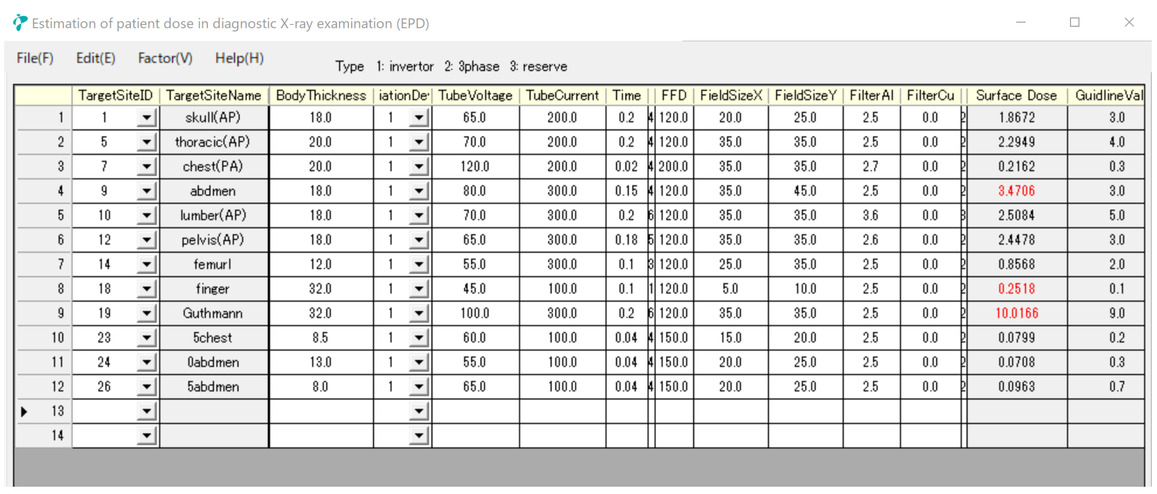

Fig.1 A novel calculation system for estimate of patient dose in diagnostic X-ray examination (EPD).

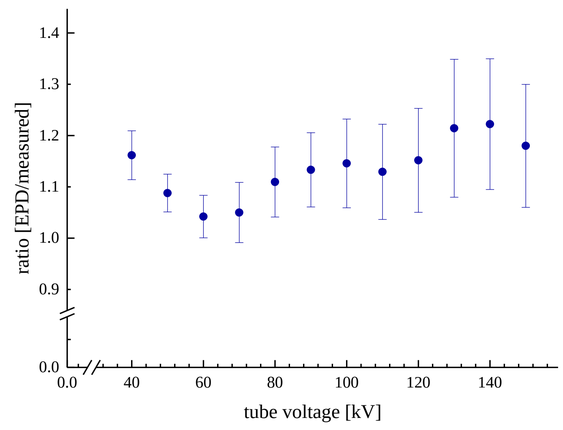

Fig.2 The ratio of a computed value to a measured value.

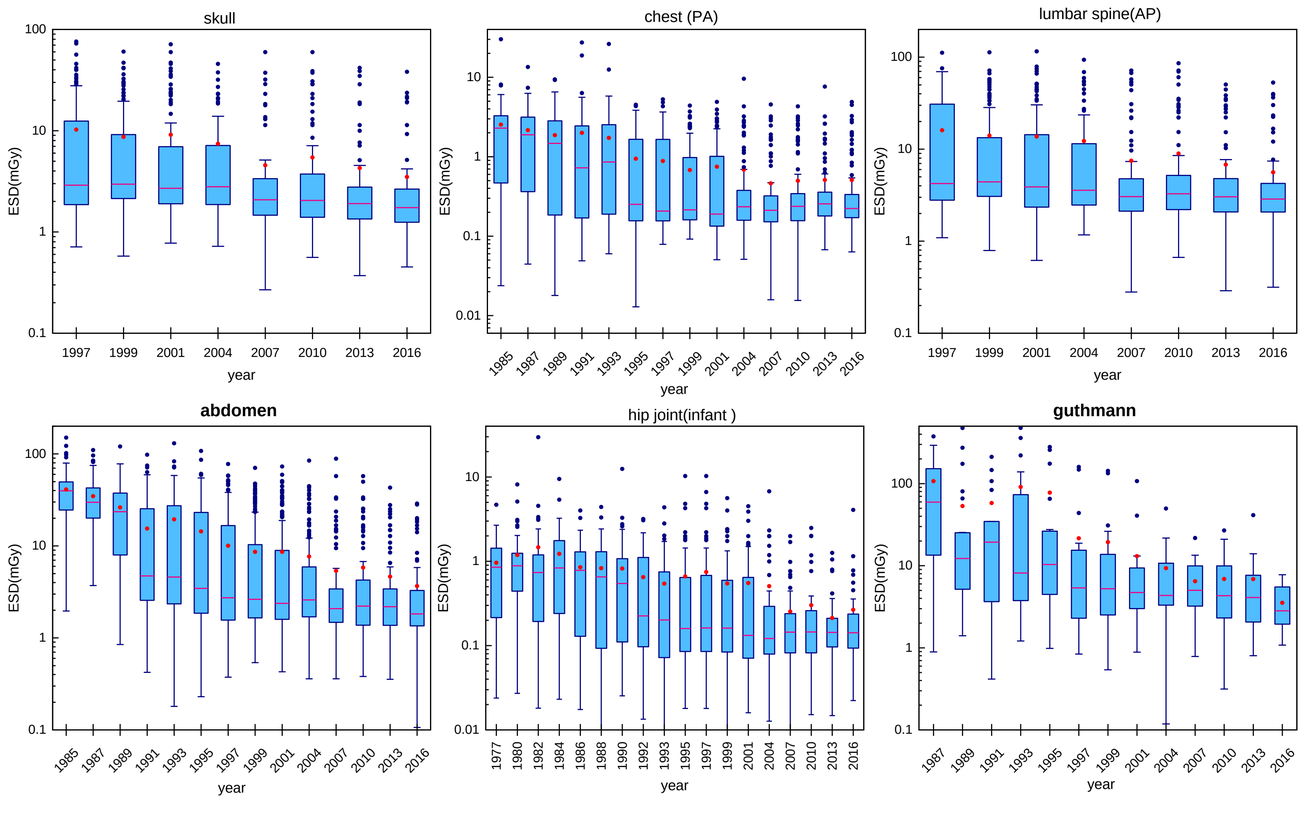

Fig.3 Transition of the patient dose(ESD) of local survey of typical X-ray examination.

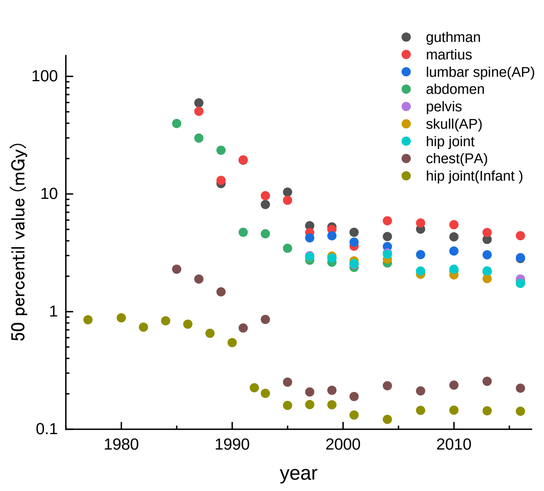

Fig.4 Transition of the medium value of ESD.

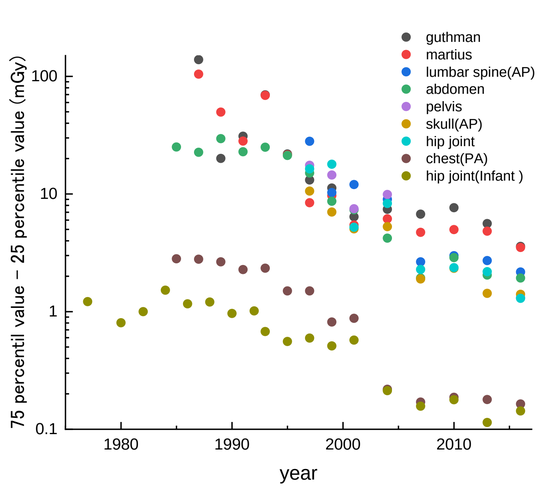

Fig.5 Transition of the 75% value-25% value of ESD.

Conclusions

A novel calculation system was developed for estimating the entrance surface dose and the result of the local survey about the patient dose of the area was reanalyzed. The accuracy of dose estimation was investigated and the usefulness was confirmed. It is useful for understanding a transition of the level of a patient dose.