ziehmimaging

Do you know the truth about achieving a balance between dose and image quality on mobile C-arm fluoroscopic imaging systems?

The answer from Ziehm Imaging to GE dose and GE image quality paper.

Ziehm Imaging became aware that a number of customers were concerned about statements made about our mobile C-arm products due to a 2013 GE whitepaper titled "Mobile C-Arm Fluoroscopic Imaging Systems: Achieving Balance between Dose and Image Quality." This paper compares the GE OEC 9900 C-arm and Ziehm Solo C-arm.

Methods

Ziehm Imaging analyzed the abovementioned GE whitepaper, critically challenging the methods and setups used. The following questions were analyzed:

- Were the Ziehm Solo kV/mA curve and settings used correct?
- Which Low Dose Mode was used on the Ziehm Imaging unit?
- Is it adequate to use copper for patient simulation

Results

Incorrect setups and methods were used in the specified GE whitepaper. The settings on Ziehm Solo seem to be manipulated as a Low Dose Mode was used with an increased dose and higher kV and mA values that do not correspond to the version released by Ziehm Imaging. The dedicated low-dose key with lower kV and mA values on Ziehm Solo was not used during the comparison.

A copper phantom was defined to simulate the patient. State of the art is the use of a PMMA phantom. Using a PMMA phantom would change the results of the dose measurements since copper influences the X-ray spectrum and prevents lower energy radiation from reaching the image intensifier.

Entrance Skin Exposure Rate (ESE)
Low Dose Mode

Ziehm Imaging offers a specially designed Low Dose Mode. All settings, including the kV/mA curve, are optimized for low dose application with a reasonably good clinical image quality. However, Ziehm Solo has never been set up with a low dose kV/mA curve, which allows the parameter

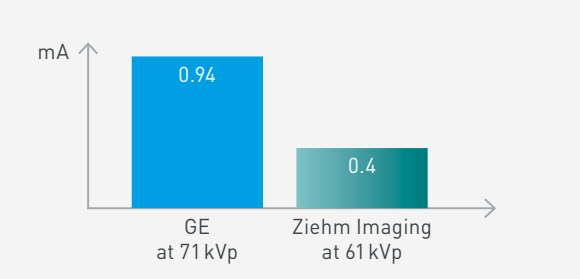

Fig. 1: Applied mA of the GE OEC 9900 at 71 kVp and Ziehm Solo in Low Dose Mode at 61 kVp.

combination **61 kVp** and **6.0 mA,** as mentioned in the GE paper. Ziehm Solo offers a Bone Low Dose program at **61 kVp 0.4 mA**. Fig. 1 shows the true ratio between the kV and mA settings used by GE and the officially released kV and mA settings of Ziehm Imaging in Low Dose Mode.

These original Ziehm Imaging settings would lead to a dose reduction of about 48 % in Low Dose Mode in comparison to standard fluoroscopy dose.

Furthermore, compared to the GE OEC 9900, which uses continuous fluoroscopy, Ziehm Solo uses pulsed fluoroscopy. In addition to the dose reduction via Low Dose Mode, pulsed fluoroscopy provides the option of further reducing the applied dose. In the case of going down to 15 pulses/s, the dose is reduced to 26 % and in case of 10 pulses/s the dose is reduced to 17 % of the standard fluoroscopy dose. This dose reduction option is accompanied by a stable image quality for each single image.

In contrast with the use of continuous fluoroscopy there is no opportunity to achieve this kind of performance in dose saving as it is known for Ziehm Imaging pulse technology. This option is not even available on GE OEC 9900.

Exposure rates using copper phantom

It is absolutely uncommon to use copper in X-ray technology for simulating patients. The absorption behavior of copper differs too much from the absorption behavior of a patient. By using a copper phantom the GE whitepaper presents a strategic test design that prefers the GE OEC 9900 dose strategy. Since Ziehm Solo runs on a characteristic dose curve based on less kV in comparison to the GE OEC 9900, it is obvious that a higher dose is needed in front of the copper. This higher dose is required as the copper, in contrast to a human body, absorbs the lower energized part of the X-ray photons.

Clinically, this simulated scenario is not correct.

PMMA or water is normally used for simulation of patients in X-ray technology as this simulation is close to the behavior of a human body. Ziehm Imaging systems are set up for human application. Using PMMA would therefore have been the state-of-the-art method for performing dose and image quality measurements.

Discussion and Conclusion

The GE whitepaper comparing the GE OEC 9900 and Ziehm Solo seems to be incorrect due to wrongly applied methods and manipulated settings of Ziehm Solo.

It can be clearly stated that Ziehm Imaging is fully committed to ALARA as a worldwide accepted dose saving strategy.

Ziehm Imaging designed the dose saving concept SmartDose which is used in thousands of hospitals on a routine basis. Among other things, SmartDose offers the following dose saving features:

- Application-optimized anatomical programs
- Pulsed radiation technique
- Removable grid (option, especially useful for pediatrics)
- Object Detected Dose Control (ODDC)
- Low Dose Mode

This concept has been specially developed to offer the best image quality applying a reasonably lower dose amount for the application performed.

If you want to learn more about dose saving with Ziehm Imaging C-arms, please contact us or visit our website.

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http://www.ziehm.com/en/smartdose