Purpose: The MAF is a new high-resolution detector which is being clinically evaluated in neurovascular procedures. The detector contains a large-dynamic-range, high-sensitivity light image intensifier with variable gain. Since the MAF is a research prototype only partially integrated with the clinical system, x-ray technique parameters must be set manually. To improve workflow we developed an automatic method to estimate and set the proper LII voltage (MAF gain) for DSA acquisition based on the fluoroscopic parameters.

Methods: The detector entrance exposure (XD) can be written as the x-ray tube output exposure (Xo) times an object attenuation factor and an inverse-square correction. If the object attenuation, scatter and distances are unchanged and the effect of x-ray kVp changes are neglected, then the DSA XD can be expressed as the ratio of Xo(DSA)/Xo(Fluoroscopy) multiplied with XD(Fluoroscopy). We measured Xo for fluoroscopy and DSA for mAs and kVp ranges appropriate to neuro-vascular interventions and fit the data with a 2D function. To estimate the XD(Fluoroscopy) we derived a curve of XD versus LII-voltage for a mid-dynamic-range average pixel gray-level. Since the MAF system during clinical fluoroscopy automatically adjusts the LII voltage until the desired gray-level value is achieved, by reading that voltage we can estimate the XD(Fluoroscopy). Using the 2D-fit function, Xo(DSA) is automatically calculated for the kVp and mA values set and XD(DSA) can be estimated using the relation above. Using the inverse LII calibration curve, the proper LII-voltage can be determined for the desired average gray-level.

Results: The algorithm was implemented and evaluated in thirty-two in-vivo DSA runs on rabbits. The proper LII voltage was selected in all cases with no failures.

Conclusions: Using the fluoroscopic LII gain setting to determine the appropriate DSA setting can greatly improve the workflow in clinical evaluations of the MAF.

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