Purpose: To demonstrate a C-arm mounted, high-resolution, microangiographic-fluoroscope (MAF) during neuro-vascular clinical interventions (NVCI) with increased x-ray tube output while still using the small focal spot.
Method and Materials: The MAF consisting of a 300 μm CsI input phosphor coupled to a micro-channel-plate light image-intensifier, in turn coupled to a CCD sensor through a minifying fiber-optic taper was mounted on a clinical C-arm. To take advantage of the MAF's high resolution, the small focal spot must be used. In general NVCIs require x-ray tubes to use near maximum available mAs during fluoroscopy and angiography even with a larger focal spot. To tackle the problem we implemented a variable temporal filter (TF) and modified imaging protocols to enable use of the small focal spot. For DSA we increased the frame rate to 15 fps with the maximum mAs available and implemented a 3-frame TF. For short but critical fluoroscopy durations where high resolution was essential for guiding a NVCI such as stent deployment, we used the small focal spot with a low exposure angiography protocol at (2-4)X fluoroscopy settings which we refer to as High Definition (HD) mode.
Results:
The variable temporal filtering was used successfully during fluoroscopy to compensate for mAs limitations. Depending on patient motion we used TF weights between 3 and 7. Temporally-filtered, high-speed angiograms allowed visualization of fine vasculature details better than the standard imager. HD mode was used during stent deployments allowing visualization of detailed stent structure which normally is not visible using standard x-ray imagers.
Conclusions:
X-ray output limitations during NVCI were overcome by a combination TF and x-ray protocol modification to meet the MAF high-resolution requirements. The imaging improvements were significant with patients benefiting from more accurate treatments or in one case the elimination of an additional costly procedure.

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