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# Development of a software based on an anthropomorphic image atlas for image quality optimization in 3D angiography mode

F. Gardavaud\*<sup>1</sup>, M. Gautier<sup>1</sup>, H. Pasquier<sup>2</sup>, and F. Boudghene<sup>1,3</sup>

<sup>1</sup>Medical imaging department, HU Tenon, AP-HP, Paris, France – Assistance publique - Hôpitaux de Paris (AP-HP) – Service d’Imagerie Médicale, Hôpital Tenon 4 rue de la Chine 75020 Paris, France

<sup>2</sup>Medical Imaging department, HU Henri Mondor, AP-HP, Créteil, France – Université Paris-Est Créteil Val-de-Marne (UPEC), Assistance publique - Hôpitaux de Paris (AP-HP) – 51 Avenue du Maréchal de Tassigny 94010 Créteil CEDEX, France

<sup>3</sup>Université Pierre et Marie Curie - Paris 6 - UFR de Médecine Pierre et Marie Curie (UPMC) – Université Pierre et Marie Curie (UPMC) - Paris VI – 4 place Jussieu - 75005 Paris, France

## Résumé

**Introduction:** In order to improve patient dose management [1], a software was developed to enable the visualization of the effect of 3D angiography (3DA) protocol optimization on Image Quality (IQ) and radiation dose in interventional radiology.

**Methods:** For the four most representative anatomic areas of our clinical practice (liver, pelvis, lung, spleen), five reference protocols were set-up in our interventional radiology system (Innova IGS 540, GE Healthcare, Buc, France) with different IQ/dose preferences from low dose to high Image Quality (IQ). These preferences were defined by adjusting the Automatic Dose Rate and Image Quality (ADRIQ) strategy, the detail level and the rotation speed for 3DA sequences. For these 20 protocols, 3D angiography images were acquired on an anthropomorphic phantom (PBU-60, Kyoto Kagaku). All acquired images were qualitatively validated by a senior radiologist. These images were implemented in a home-made software (ProtoEnhanceIR) in order to optimize protocols by displaying the anthropomorphic images and associated Peak Skin Dose (PSD). The radiologist has the ability to select the most suitable protocols in regard with his own clinical practice. Then, the operator has the possibility to import selected protocols in the system. The PSD delivered to the anthropomorphic phantom by our 3DA clinical routine protocol (PSDRoutine) was compared to the PSD for the 3DA optimized protocol chosen by the senior radiologist in ProtoEnhanceIR (PSDProtoEnhanceIR).

**Results:** Compared to our 3DA clinical routine protocol, the chosen 3DA optimized protocol proposed by ProtoEnhanceIR allowed an average dose reduction of 69% while keeping clinical IQ (for lung, liver, pelvis and spleen PSDProtoEnhanceIR was  $0.98\pm 0.09$ ;  $2.95\pm 0.43$ ;  $3.07\pm 0.27$ ;  $3.11\pm 0.34$  mGy while PSDRoutine was  $2.79\pm 0.12$ ;  $10.02\pm 0.89$ ;  $10.94\pm 1.31$ ;  $11.20\pm 0.58$

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\*Intervenant

mGy respectively).

**Conclusions:** The proposed software allows improvement of the IQ/dose balance of IR protocols according to radiologists' preferences. From our clinical experience, ProtoEnhanceIR offers significant dose reduction opportunities while maintaining validated clinical IQ.

**References:**

Gabriel Bartal et al. Management of Patient and Staff Radiation Dose in Interventional Radiology: Current Concepts. *Cardiovasc Intervent Radiol* (2014) 37:289-298

**Mots-Clés:** interventional radiology, 3D angiography mode, dose optimization, anthropomorphic phantom images database