2:27 P.M.

222. Dual-Energy Digital Chest Radiography: System Design Considerations

Mike M. Tesic, Ph.D., Highland Heights, OH • Richard A. Sones, M.S. • Samuil Kofman, Ph.D. • James F. Vidmar

System design considerations for a second-generation digital chest radiographic unit are reported. The system employs a scanning linear array detector that allows acquisition of both conventional and dual-energy images at a fixed peak kilovoltage. With appropriate processing of the image data, soft tissue and bone images are obtained. We present analysis and experimental results showing the trade-offs between x-ray tube heat loading, detector efficiency, spatial resolution, and image signal-to-noise ratio. The concept of basis images and their linear combination to obtain bone and soft tissue images is discussed. Examples of results obtained with phantoms are shown to illustrate the clinical potential of this novel system.

2:39 P.M.

223. A Fast Dual-Energy Computational Method Using Isotransmission Lines and Table Look-up for CT and Digital Radiology

Keh-Shih Chuang, M.S., Los Angeles, CA • H. K. Huang, D.Sc. • David Rohler, Ph.D.

Conventional methods using Newton-Raphson iteration to solve nonlinear equations in dual-energy techniques are time-consuming and the resulting images are noisy. We describe a fast computational method based on (1) isotransmission lines derived from the high- and low-energy calibration data, and (2) two look-up tables between these transmission values and the photoelectric and Compton components of the material. We performed experiments using this technique for both CT and digital radiology. Comparisons between the conventional method and the table look-up method on time required for the computation and quality of the resulting images are presented.

2:51 P.M.

224. Dual-Energy Digital versus Conventional Chest Radiography in the Detection of Nodules

Loren T. Niklason, Ph.D., Birmingham, AL • Nancy M. Hickey, M.D. • Dev P. Chakraborty, Ph.D. • Eduardo A. Sabbagh, M.D. • Michael V. Yester, Ph.D. • Robert G. Fraser, M.D. • Gary T. Barnes, Ph.D.

The performance of a prototype dual-energy digital chest unit in detecting calcified and uncalcified simulated pulmonary nodules was compared with the performance of a highly optimized conventional system. Three to 12 nodules were projected over the lungs of a frozen, unembalmed human chest phantom. Six observers examined 60 posteroanterior projections for each modality with different randomized nodule locations. Detection consisted of localizing and assigning a level of confidence to each perceived nodular opacity. The digital unit produced three hard-copy images—a conventional chest image, a soft tissue image, and a bone image—and all three were used in the evaluation. The resulting plots of TPF versus the mean number of false positives per projection indicated that in the case of calcified nodules, the digital unit performed better. For uncalcified nodules there was little difference between the two modalities.

3:03 P.M.

225. Dual-Energy Projection Radiography Using Condenser X-ray Generator and Digital Radiography Apparatus

Hiromu Nishitani, M.D., Fukuoka, Japan • Yoshiyuku Umezu, R.T. • Kazuhisa Ogawa, R.T. • Hirohumi Yuzuriha, M.S. • Hiroshi Tanaka, M.S. • Kelichi Matsuura, M.D.

In dual-energy double-exposure projection radiography, rapid switching of energy is mandatory to eliminate motion artifacts, but it is costly to use in a clinical environment. We developed a system with practical exposure intervals and adequate mA settings at reasonable cost by modifying a condenser-type x-ray generator. The generator was modified so that high-energy (120 kVp, 2 mAs) and low-energy (70 kVp, 25 mAs) exposures were achieved within 1.6 sec. A commercially available system for digital radiography (Fuji computed radiography) was used to subtract images. Preliminary experience in chest and head-neck radiography will be presented.

Radiology

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RSNA SCIENTIFIC PROGRAM

Monday Afternoon • Lindheimer II • Papers 226–230

Neuroradiology (Technique)

Presiding: **Kenneth R. Davis, M.D.**, Boston, MA

Computer Code: H10 • 1 hour • Give credit voucher to usher.

2:15 P.M.

226. Embolization of Carotid-Cavernous Fistula through the Superior Ophthalmic Vein Approach

Sergio Lima, M.D. • Renan Uflacker, M.D., São Paulo, Brazil • Guilherme C. Ribas, M.D. • Ronie L. Piske, M.D.

Four patients aged 23–33 years with traumatic carotid-cavernous arteriovenous fistula were treated by retrograde embolization through the superior ophthalmic vein approach, using a cutdown technique. Three patients had been already treated by multivessel ligation and had experienced fistula recurrency. Embolization through the ophthalmic vein resulted in long-term cure in three patients. The fourth patient was successfully treated by embolization through the carotid approach, after embolization through the ophthalmic vein approach failed. This is a new and rewarding technique for treating a controversial disease, provided the ophthalmic vein is thickened and arterialized.

2:27 P.M.

227. Percutaneous Transluminal Angioplasty of Subclavian Steal Syndrome

Fong Y. Tsai, M.D., Kansas City, MO • Grant B. Hieshima, M.D. • Gregory Y. Tiu, M.D. • C. Mark Mehringer, M.D. • Mark F. Inciardi, M.D. • Sara Y. Shull, M.D. • Caprice M. Olomon, M.D.

Subclavian steal syndrome is the result of severe stenosis or total occlusion of the prevertebral subclavian artery with reverse vertebral and subclavian arterial blood flow from the contralateral circulation. Recently, percutaneous transluminal angioplasty (PTA) has been applied to supra-aortic arterial stenosis after introduction of the Gruntzig and Hopff double-lumen balloon catheter. PTA of subclavian arterial stenosis is the most frequent angiographic procedure performed for the treatment of supra-aortic arterial stenosis. Subclavian steal is a variety of subclavian arterial stenosis, and PTA of subclavian arterial stenosis is similar to PTA of stenosis without steal. However, total occlusion of the subclavian artery with subclavian steal does require special techniques to reopen the occluded segment. In the past 4 years we have treated 49 patients with subclavian arterial stenosis. Of these, 17 patients had subclavian steal, and six of the 17 had total occlusion of the proximal subclavian artery. We successfully treated the 11 patients with stenosis and the two patients with total occlusion. Patients' ages ranged from 46 to 79 years. We will present our experience in detail.

2:39 P.M.

228. Intraluminal Thrombus in Atherosclerotic Disease of the Carotid Arteries: Angiographic Resolution with Anticoagulant Therapy Alone

David M. Pelz, M.D., London, ONT • Alastair Buchan, M.D. • Allan J. Fox, M.D. • Henry J. M. Barnett, M.D. • Fernando Vinuela, M.D.

Intraluminal thrombus in the carotid arteries demonstrated by angiography is believed to require emergency surgery to prevent distal embolization or complete vessel occlusion, or both. Sixteen patients with angiographically demonstrated thrombus were treated acutely with anticoagulant medication. Seven patients underwent follow-up angiography; the thrombus had resolved in six. There were no new neurologic events in these 16 patients in the course of medical therapy. Six patients subsequently underwent delayed endarterectomy. Prompt institution of anticoagulant therapy may result in angiographic resolution of intraluminal thrombus with no deterioration in clinical status.

2:51 P.M.

229. Transluminal Intracranial Electroencephalography in Primates: An Endovascular Procedure for Localizing Temporal Lobe Epileptic Foci

John M. Pile-Spellman, M.D., Boston, MA • Keith Baker, B.S. • Barry Sandrew, Ph.D. • Glen Pransky, M.D. • Louise Edwards, Ph.D. • Warren E. Foote, Ph.D. • Stephen Schachter, M.D. • Nicholas T. Zervas, M.D. • Juan M. Taveras, M.D.

Selective cerebral angiography was performed via a transcutaneous femoral approach in four primates. Using a 3.5-Fr coaxial system, a specially designed 450-μ electrode was passed into the intracranial vessels, and electrically induced paroxysmal activity in the temporal lobe was successfully recorded. In each case the transluminal intracranial electrode (TIE) recordings were of high fidelity, with little artifact in either the ictal or