Abdominal X-Ray Examinations - Conventional and Digital Techniques


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The value of digital radiography in abdominal x-ray examinations was investigated by comparing digital luminescent radiography (DLR) with conventional screen-film systems (CFS) and digital image intensifier radiography (DIR) with photofluorography (PF), respectively. In the first group (DLR/CFS) 403 matched conventional and digital abdominal examinations were obtained by CFS speed class 200 and DLR (PCR-SP, Philips). In the second group (DIR/PF) 92 conventional and digital barium and iodine meals were compared following the same schedule (Sircam 103/Polytron 1000, Siemens). In each digital technique two differently postprocessed images were obtained from one x-ray exposure. Conventional and digital images were evaluated randomly and separately by 4 radiologist using a questionnaire. DLR and DIR proved to be diagnostically equivalent to the conventional techniques. High spatial frequency enhancement (DLR) and displays in positive contrast (DIR) did not provide additional diagnostic information and should therefore be dispensed with in abdominal x-ray examinations.

Introduction

The main advantages of digital luminescent radiography (DLR) and digital image intensifier radiography (DIR) are the availability of digital data for picture archiving and communication systems, the lack of faulty exposures and an improved image quality, as image brightness is maintained at a constant level by electronic postprocessing (1,4,5). However, the spatial resolution of DLR (2,5 - 3 lp/mm) and DIR (1,5 - 3,2 lp/mm) is distinctly lower than that of conventional radiography, the latter being 4,4 - 6 lp/mm in screen-film systems (CFS) and 2,3 - 3,9 lp/mm in photofluorography (PF), respectively (1,4,5). The questions, whether the lower digital spatial resolution results in a loss of dia-
nostic information, and whether digital postprocessing can add to diagnosis, will be discussed in abdominal x-ray examinations.

Methods

DLR was compared with CFS, speed class 200 (group I) and DIR with PF (group II), respectively.

In 403 patients (group I) conventional and digital plain films of the abdomen and pelvis (71), excretory urograms (140), barium and iodine meals (36), barium enemas (120), lymphograms (22), cholezystograms (8) and venograms (6) were obtained by both DLR (PCR-SP, Philips) and CFS speed class 200 (Quanta fast Detail-CFS and Cronex 10-films, Dupont), the digital exposure being 50\% of the conventional. In each patient one single digital exposure was obtained in addition to one of the conventional radiographs of an examination. Image documentation was carried out by a laser-imager (PCR-SP, Philips) and CR 633-films (Fuji). In DLR two differently postprocessed images were obtained from one X-ray exposure: a display with low spatial frequency enhancement was filtered to look like a conventional radiograph (DLRa) and opposed to a complementary display with high spatial frequency enhancement (DLRb).

In 92 patients (group II) contrast examinations of the oesophagus (52), the stomach (30) and the small bowel (10) were carried out by PF (Sireskop D, Siemens, image field diameters: 17 and 25 cm). One matched digital examination (Polytron 1000, Siemens) was added to one of the conventional exposures of an examination (Sircam 103, Siemens and Cronex MRF 21-films, Dupont). Exposure dose was reduced to approximately 1/7 of that used in CFS speed class 200. Hardcopies were done with a laser-imager (Multispot M, Siemens) using Cronex MRF 31-films (Dupont). Postprocessing was carried out by generally adjusting image brightness and using a slight edge enhancement (Transikon, Siemens) in 47 cases, the character of the resulting images resembling that of a well exposed conventional radiograph. Displays in negative (92) and positive contrast (61) were obtained from each digital data set, respectively.

In group I the spectrum of differential diagnosis included normal findings (214), bowel obstructions (9), GI perforations