Purpose
Satisfactory imaging facilities are mandatory to make relevant measurements to support endovascular aortic repair (EVAR). Rotational angiography with flat panel technology is a relatively new imaging modality with an additional functionality that enables creation of Computer Tomography (CT)-like slice images. We have tested the impact of two different contrast injection protocols on image quality in EVAR procedures.
Methods
Prospective study on 20 patients treated with Zenith ® (Cook, Bjaeverskov, Denmark) stent-graft. Post treatment slice images were created after endovascular aortic repair (EVAR). The imaging modality was an Axiom Artis dTA with DynaCT® (Siemens, Erlangen, Germany). 11 patients received 33 ml of radiographic contrast medium (Visipaque® 270 mgI/ml, GE Healtcare, Oslo, Norway) at 3 ml/sec (mean total dose of iodine 7 020 mg) and 9 other patients received 100 ml of Omnipaque (GE Healthcare) diluted to 100 mgI/ml at 8 ml/sec, (mean total dose of iodine 10 000 mg). The study period lasted from December 2005 to March 2007. The two sets of image data were evaluated by two different experienced radiologists, who assessed the visibility of 9 anatomical areas of relevance to EVAR. The investigators gave scores for visibility on a scale from 1 to 4, blinded to each other's results. The score 2 represented the lowest diagnostic relevant score.
Results
Visibility score of the left renal artery increased from 2.0 to 2.5 ($p < 0.05$) after change of contrast. The increased dose of contrast seemed to have largest positive impact on the visibility of the iliac arteries below the stent-graft as the score increased from 1.8 to 2.8 ($p = 0.003$). For the other anatomical areas that were scored for visibility, there were no significant changes in visibility scores after the change of contrast protocol. These areas were: The right renal artery, metallic markers in the stent graft, both the renal borders against surrounding tissue, the aortic lumen above the proximal end of stent-graft, the vena cava inferior below the renal veins and the differentiation of the psoas muscle from the surrounding tissue.
Discussion
A larger volume of diluted contrast medium gives an increased and more uniform opacification of the vessel lumen. This is mandatory for reliable measurements needed in endovascular treatment as in EVAR. Optimal delineation of retroperitoneal structures is necessary to identify bleeding from vessels. The slightly increased total dose contributes to this. In our study the effect of increased contrast volume was best for the distal arteries. The 100 ml contrast protocol was sufficient for visualisation of lumen in larger abdominal vessels.
Conclusion
Our experience indicates that a sufficient dose of contrast medium has a significant impact on the evaluation that is needed to plan and carry out EVAR. A larger volume of diluted contrast medium significantly increases the visualisation of the distal arteries.

Strain Analysis in Myocardial Infarction by Using Tagged MRI: Correlation with Delayed Enhancement and Perfusion

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Keywords Strain Analysis; Tagged MRI; Infarction; Delayed Enhancement; Perfusion; Image Registration
Abstract
In myocardial infarction (MI), the contractive function is altered and the systolic function depends on the compensation provided by the healthy segments. When the affected myocardial mass is important, or when coronary arteries are obstructed, the compensation provided by the healthy segments is not sufficient, producing a decrease of the systolic function in the left ventricle (LV). In this work, we have analyzed radial strain patterns in infarcted patients, and studied their correspondence with Delayed-Enhancement MRI (DE-MRI) of gadolinium and results of cardiac catheterism. We have recovered strain maps from Tagged MRI (T-MRI) sequences by applying a novel image registration method. Results show that infarcted regions present a lower strain with respect to healthy volunteers. We have also observed the presence of compensation mechanisms in the myocardium through an increased strain of healthy segments. Finally, we have found regions with normal DE-MRI, low radial strain and abnormal catheterism, suggesting a potential use of strain as a marker of regions with high risk of infarction.

Intraoperative Workflow analysis and recognition of atypical situations

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Keywords Workflow, Surgery, prediction, sensor based
Purpose
Increased economic constraints and the need to enhance patient safety have stimulated new strategies to improve operating room efficiency. The aim is to save time and resources by accelerating the throughput and to improve the outcome. Conceivable is a system like an autopilot in an aircraft to support the surgical personnel as well as the nursing staff. However, no surgical procedure is always performed in exactly the same way, since the experience of the surgeons is different, the anatomy varies and complications may occur. Therefore, it is still difficult to estimate in advance the course and duration of an individual surgical intervention, even if it is a highly standardized procedure. We attempted to identify typical patterns of events which reliably indicate the respective stage of a surgical operation.
Material and Methods
Laparoscopic cholecystectomy is a highly standardized surgical intervention which is typically accomplished in a low to medium time. Therefore, we decided to use this surgical operation for this study. Laparoscopic cholecystectomy was structured according to the eight distinct steps or sub-processes of the intervention:

1. Insufflation
2. Insertion of the trocars
3. Preparation of the bile duct and the cystic artery
4. Application of clips
5. Dissection of the gallbladder
6. Extraction of the gallbladder
7. Visual control of the gallbladder-bed and field of operation
8. Closure of the trocar incisional sites

Each of these sub-processes were broken down into various single actions, which may be iterative or repetitive. To analyze the progress of the intervention and, moreover, to detect atypical situations (i.e.: conversion from laparoscopic to conventional open surgical technique, bleedings or cardiovascular problems) we equipped the operating room with various sensors for online data retrieval. Sensors were integrated for measuring the intraabdominal pressure, use of rinsing fluid and suction activity, tilt of the operating table, activation of cutting and coagulation current, as well for detecting states of the room lights and operating lamps. During the intervention all sensor

parameters were recorded in real time with a DAQ-device and analyzed simultaneously by the software.

Results

Recording of sensor data was always possible without any difficulties. Nursing and operating personnel accepted the additional work and integrated it into the common workflow. Sole exception was the measurement of the rinsing fluid; here the combined rinsing/suction instrument showed sometimes leakage which resulted in a steady increase of measured volume, even though the instrument was not in use. However, this error was filtered after automatic recognition of the steady increase. Based upon the records of 120 cholecystectomies, characteristic patterns for each single stage of the operation could be identified. Using these patterns, the actual state of the procedure could be identified, if the course of the operation was regular. Detection of atypical situations was possible in most cases, for example, mild bleedings during preparation were indicated in a short increase of rinsing and suction volume with intermittent use of coagulation current. In contrast to that, a relevant bleeding resulted in extensive use of coagulation current, with high increase of suction and rinsing volume, and additional tilt of the operating table to less anti-trendelenburg position, or even to a levelled or trendelenburg position. Conversion to a conventional open procedure could be detected in all cases. This situation is detected by a sudden loss of intraabdominal pressure to 0, with operating and room lights switched on in a short timeframe. To discriminate the conversion from extraction of the gallbladder, the system only reports the conversion event after detection of cutting current for more than 15 seconds immediately afterwards.

Conclusion

With a continuous sensor based data acquisition and online analysis of all the data, it is possible to detect irregularities during a highly standardized surgical operation. Additionally, prolongations of single stages could be predicted. The database of measured interventions could be helpful to develop an adaptive system which searches automatically for analogue sequences for corrections and prediction.

Radiologists unveil mysteries of the pastCT and X-ray examination of ancient burial contents from archeological excavations

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Keywords archeology, CT, volume-rendering

Purpose

Authors wish to present horizons of modern radiology reaching beyond medical applications and its potential to offer valuable information to our archeologist/ anthropologist/ art historian colleagues that would be otherwise lost or won in time-consuming and labourous alternative conservation processes.

Methods

Within 2003–2007 we examined over 40 various archeological specimen (skeletal remains, artifacts, sculptures, burial pottery) in cooperation with various archeological and historical institutions. The specimen were examined on digital X-ray, multidetector CTs or both modalities, if found advantageous. The raw data were further digitally processed on standard diagnostic CT workstation in a manner that would yield the best visualisation of elements searched for by the archeologist/ anthropologist/ art historian.

Results

Basically, there were three types of specimen

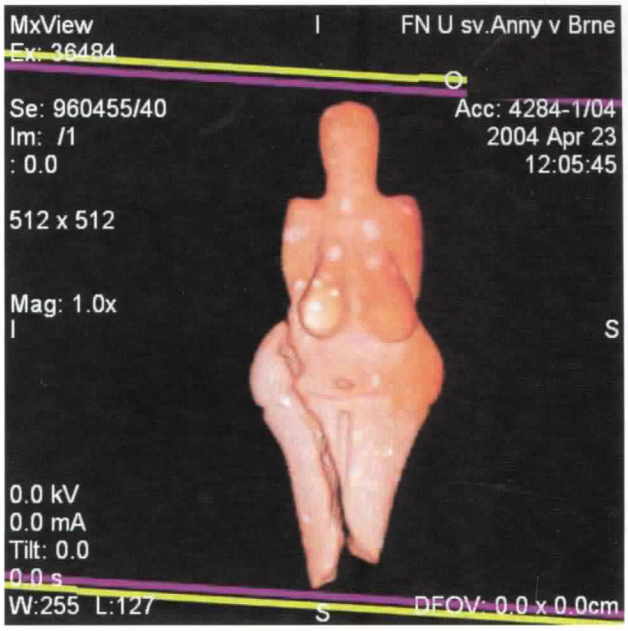

Fig. 1

1. Ancient statuettes and artifacts. The highlight of the portfolio was examination of the Venus of Dolní Věstonice (site DV 1), one of only handful pieces of similar kind in the world, 28.000 BP, and mammoth ivory statuette of man believed to be a shaman from Brno (site Brno 1), 23.680 BP and other paleolithic artifacts. CT shows well structure, composition and defects of ancient sculptures from which it was possible to guess sequence of

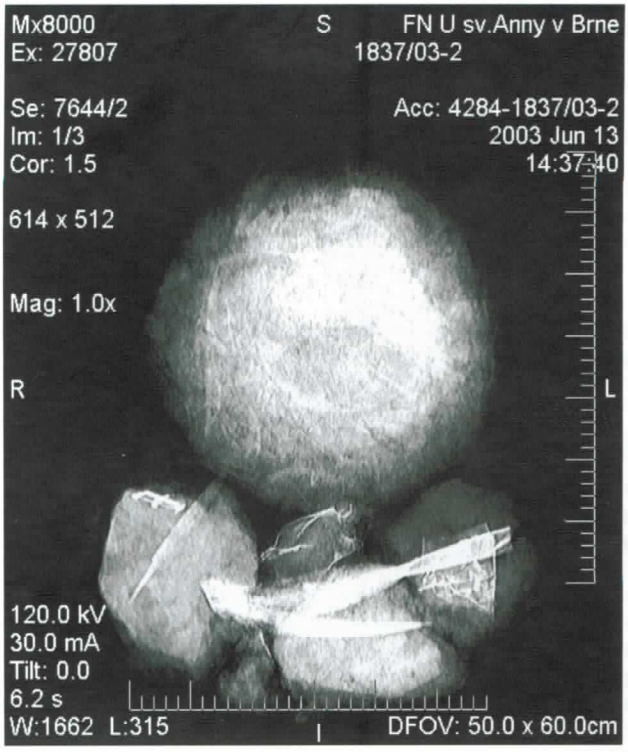

Fig. 2