"The future is here. It's just not widely distributed yet." (William Ford Gibson)
Exceeding the Limits with *syngo* TimCT

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Based on sliding multislice (SMS) technique *syngo* TimCT Oncology* is on the way to revolutionize axial moving-table MR imaging. The adoption of commercially-available sequences with their typical contrasts in combination with seamless data acquisition around the isocenter of the magnet and automatic coil switching render this technique extremely attractive for oncologic whole-body work-up. Besides image quality, one of the most striking features of TimCT Oncology is time efficiency. Technical refinements like motion correction and online reconstruction help to minimize artifacts. Our own investigations clearly point out the high diagnostic accuracy of the procedure which has been used for oncologic staging since the end of 2005. Experiences with Sliding Multislice are available for whole-body staging of rectal cancer, gynecologic malignancies, prostate cancer, breast cancer, lung cancer, gastrointestinal stromal tumors (GIST), plasmocytoma, lymphomas and for diagnostic work-up of patients with Crohn's disease.
In MAGNETOM Flash issue no. 1/2007 we previously reported on technical aspects and initial results of sliding multislice moving-table MRI [1, 2]. Concerning abdominal tumor staging our data was so encouraging that in a first step a shift in rectal cancer work-up could be established at our institution [3, 4]. Additionally, the technique has also gained acceptance as an imaging tool for patients with Crohn's disease.

Have we already reached the top of the ladder?
Certainly not. In a second step our investigations focused on extending the procedure to the lungs in order to obtain a real one-stop-shop imaging for tumor patients. For pulmonary nodule detection the free-breathing TIRM sequence from the SMS protocol was compared to multislice CT as the reference standard with unexpected results. The study identified a total of 321 nodules. On a per-patient basis the sensitivity and specificity for pulmonary nodule detection with the free-breathing TIRM were 81.8% and 94.7% respectively. Receiver operating characteristic (ROC) analysis revealed high values of specificity ranging between 91.6% and 99.1% with average mean sensitivities above 90.2% for lesions larger than 3 mm in diameter and accuracies over 94.5%. Noteworthy, the technique can be utilized almost independently of patient compliance. All clinically-relevant lung lesions are distinguishable and thus can be monitored during follow-up.

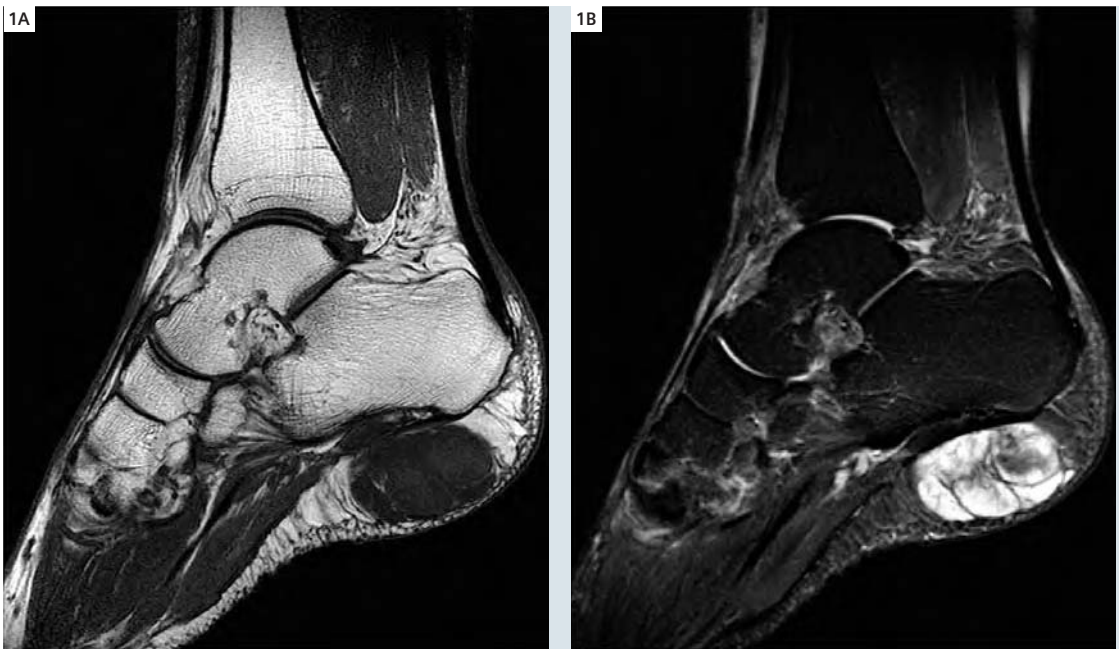
What are our opinions about *syngo* TimCT Oncology to date?
The major benefit of this technology represents seamless imaging from head to thighs within a few minutes acquiring 2 different image contrasts. Consequently, the procedure is easily applicable as an adjunct to dedicated high-resolution MRI for local tumor staging especially in patients with pelvic malignancies. Patient repositioning and stepwise examination for whole body coverage are completely omitted. The disadvantage of inferior lesion characterization using SMS technique instead of standard MRI will be removed in the near future by implementation of additional image contrasts and continual technical optimization. From a user's point of view sliding multislice moving-table MRI embedded in the upcoming *syngo* TimCT Oncology package has meanwhile reached a high degree of practicability and substantial acceptance. TimCT Oncology represents a cutting-edge technology for cancer staging with whole-body MRI and has the potential to dramatically improve patient workflow.

*Works in progress (WIP). The information about this product is preliminary. The product is under development and not commercially available in the U.S., and its future availability cannot be ensured.

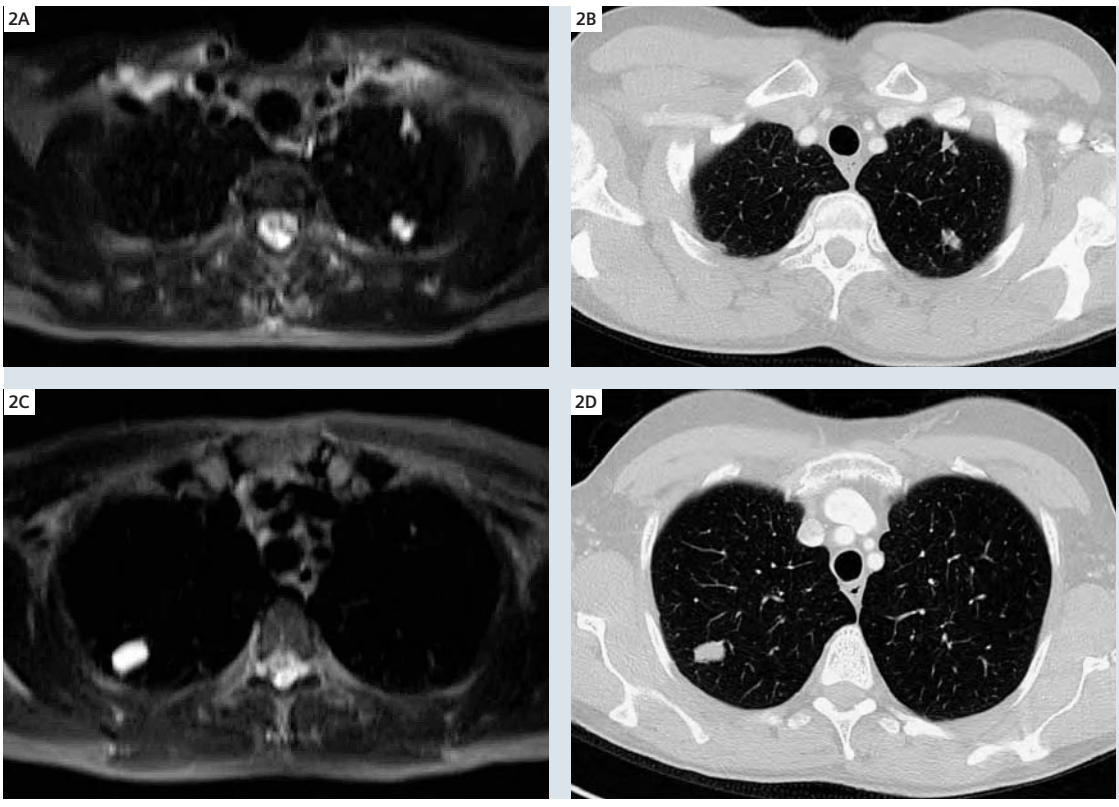
References
1 Fautz HP, Kannengiesser SA. Sliding Multislice (SMS): a new technique for minimum FOV usage in axial continuously moving-table acquisitions. Magn Reson Med 2006;55:363–370.
2 Fautz HP, Honal M, Saueressig U, Schaefer O, Kannengiesser SA. Artifact reduction in moving-table acquisitions using parallel imaging and multiple averages. Magn Reson Med 2007;57:226–232.
3 Schaefer O, Langer M. etection of recurrent rectal cancer with CT, MRI and PET/CT. Eur Radiol 2007;17:2044–2054.
4 Schafer AO, Baumann T, Pache G, Wiech T, Langer M. Preoperative staging of rectal cancer. Radiologe 2007 [Epub].

Female with pulmonary metastatic extraskeletal mesenchymal chondrosarcoma of the heel.

Combined local high-resolution MRI of the ankle and *syngo* TimCT Oncology for M-staging.
Subsequent thoracic multislice computed tomography (MSCT).



1 Sagittal T1-weighted TSE and TIRM images reveal the primary tumor within the subcutaneous tissue of the right heel.



2 Axial sliding multislice free-breathing TIRM images and corresponding MSCT images demonstrate multiple pulmonary metastases.

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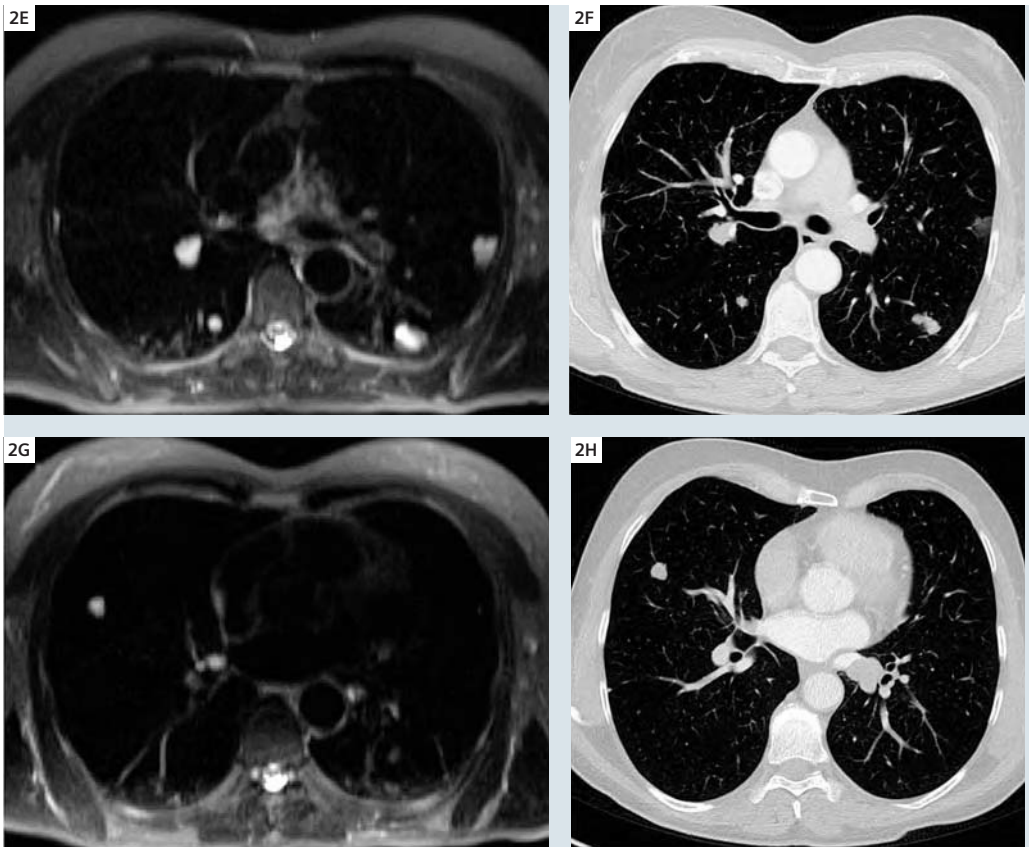

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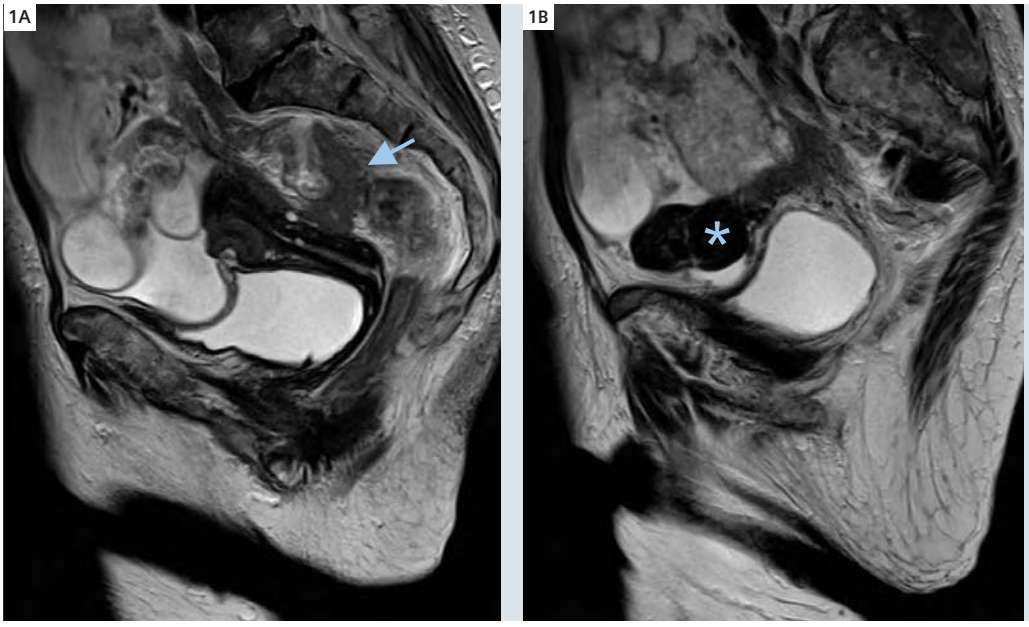
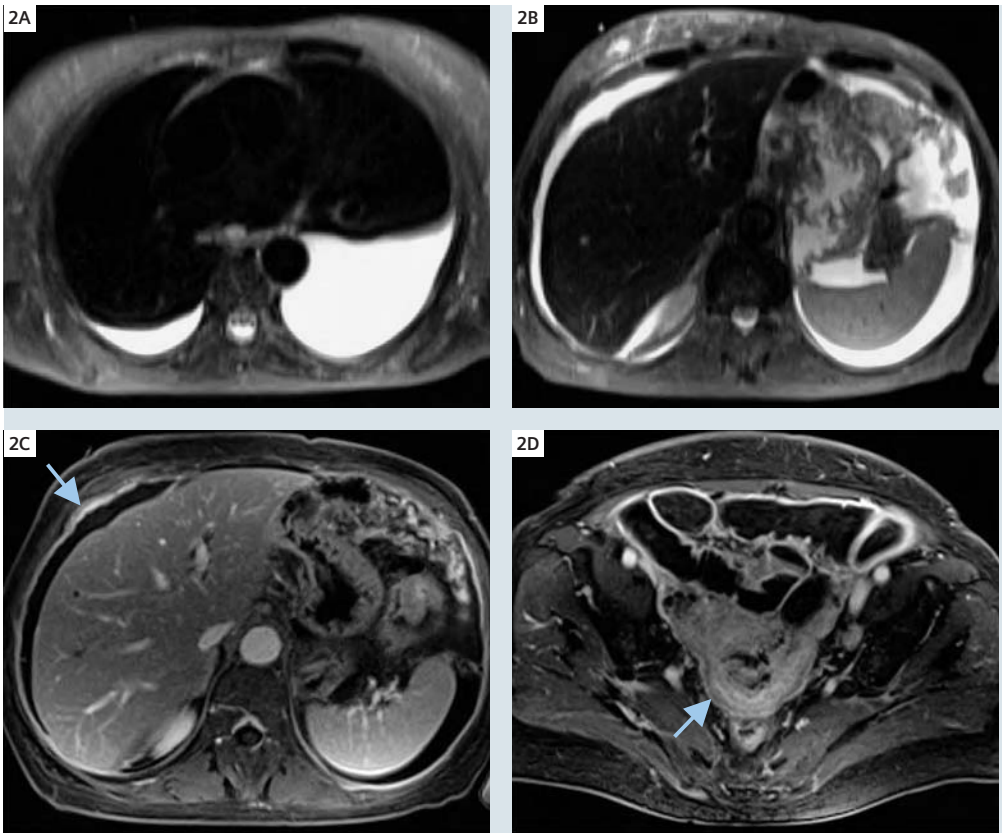
Female with FIGO (International Federation of Gynecology and Obstetrics) stage IV left ovarian cancer:

Peritoneal carcinosis with subileus, ascites, pleural effusions and lymph node metastases.
Combined local and M-staging performing dedicated pelvic and MR imaging with *syngo* TimCT Oncology.

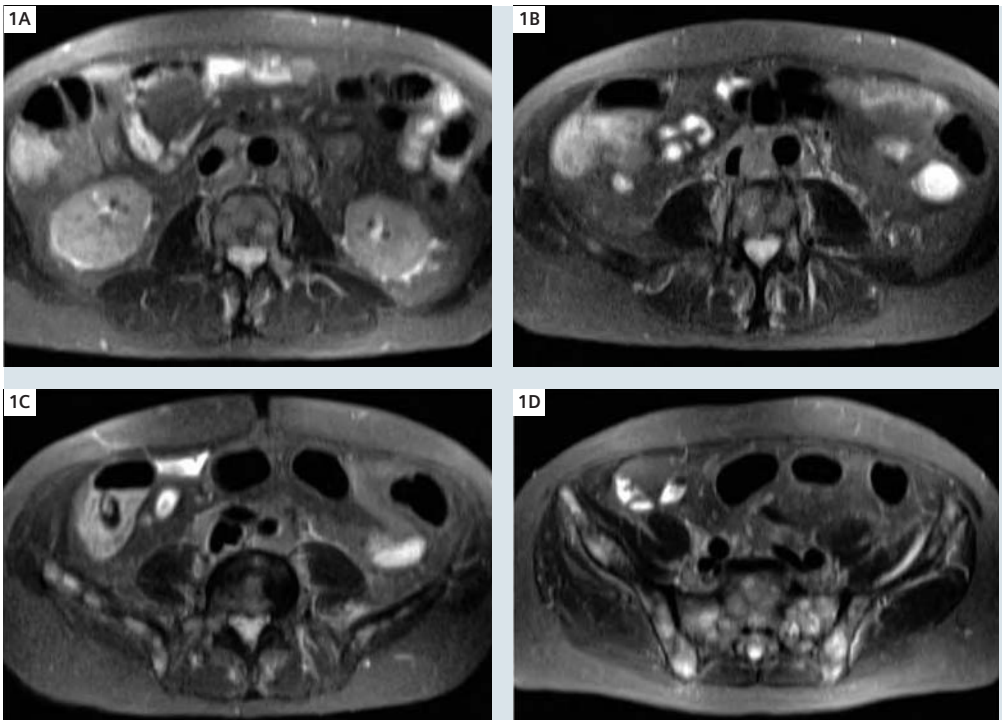


1 On the sagittal and axial T2-weighted TSE images detection of a low-signal left ovarian carcinoma (asterisk), an advanced peritoneal carcinosis (arrow), a left iliac lymph node metastasis (arrow), ascites and subileus.



2 Axial sliding multislice free-breathing TIRM and contrast-enhanced breathhold FLASH-2D images reveal pleural effusions, ascites and peritoneal carcinosis (arrows).

Male with recurrent prostate cancer, initially pT4N1. Moving-table staging using *syngo* TimCT Oncology.



1 Axial sliding multislice free-breathing TIRM images show retroperitoneal lymph node metastases and extensive bone infiltration.

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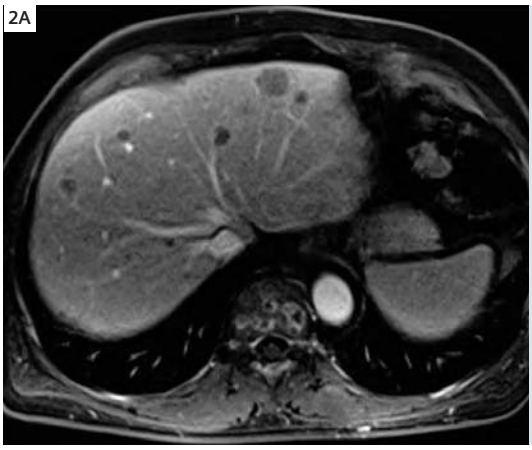
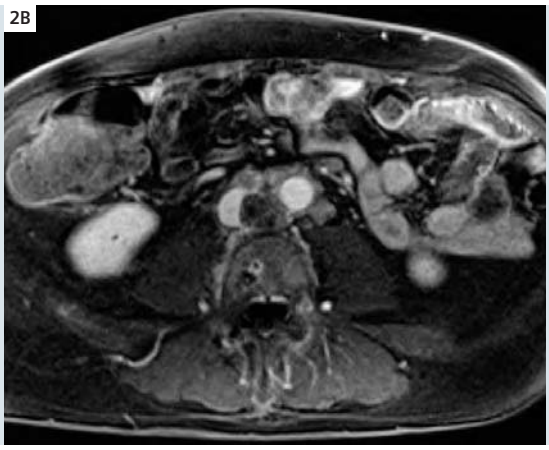


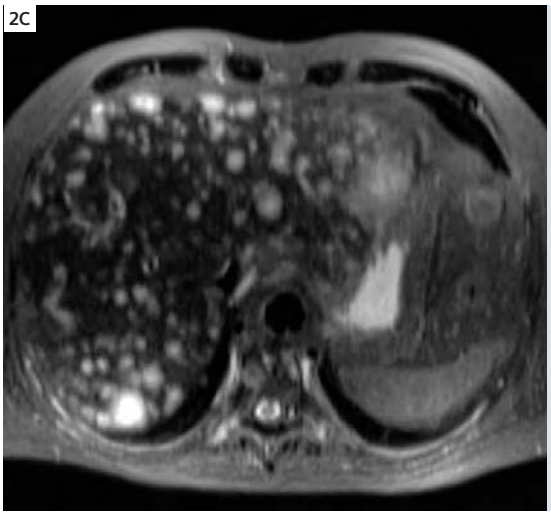


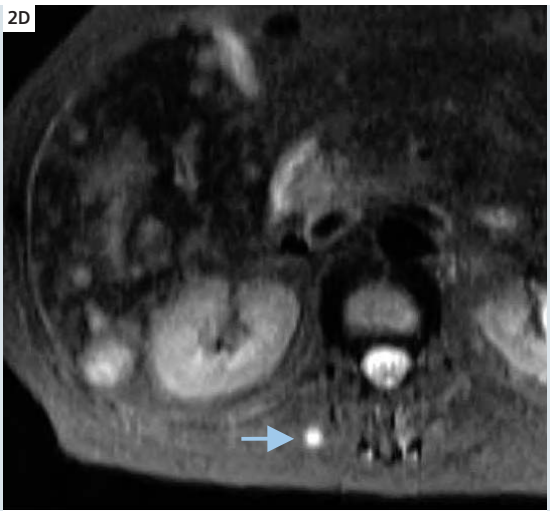
2 On the axial sliding multislice contrast-enhanced breathhold FLASH-2D images liver metastases are apparent. The confluent retroperitoneal lymph node metastases causing compression of the inferior vena cava.

Male with stage cT3N2M1 neuroendocrine cacinoma of the rectum. Diffuse hepatic and osseous metastatic disease, soft tissue metastases. Combined local and M-staging using *syngo* TimCT Oncology.

1 Axial T2-weighted TSE images demonstrate stenosing, wall-exceeding rectal cancer with adjacent mesorectal lymph node metastases.

2 Axial sliding multislice free-breathing TIRM images show normal lung, diffuse bright-signal liver metastases, multiple bone metastases and a small metastasis in the erector spinae muscle (arrow in Fig. 2D).





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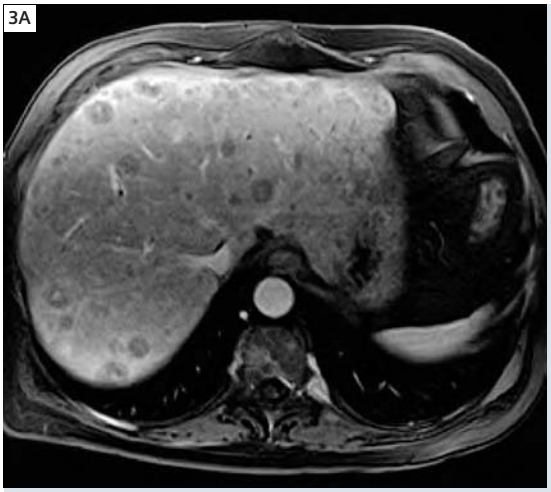

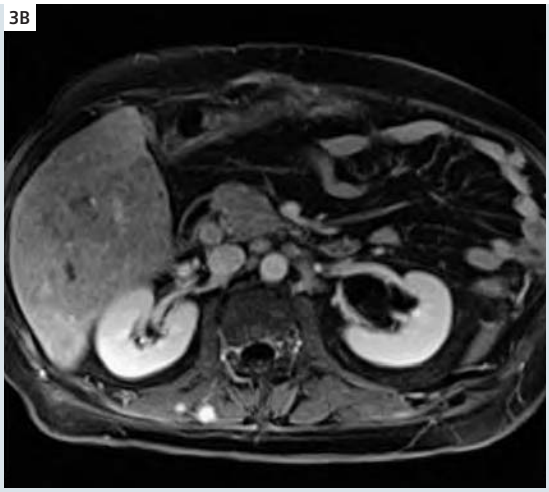

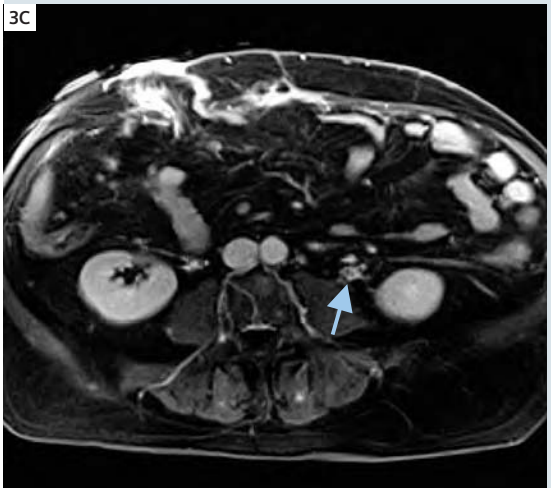

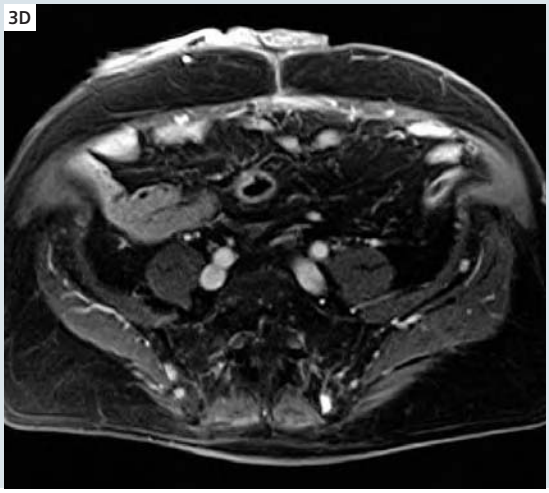

3 Axial sliding multislice contrast-enhanced breathhold FLASH-2D images reveal liver metastases, left hydronephrosis due to ureteral infiltration (arrow), small metastases in the erector spinae muscle and hypervascular bone metastases.