

# syngo.via RT Image Suite: Empower Radiation Therapy with MRI Information

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## What if you could bring your clinical capabilities to a higher level?

With cancer incidents expected to rise by as much as 45% by 2030, oncologists are under pressure to perform more efficiently [1]. This global healthcare trend affects, amongst others, Radiation Therapy (RT) providers who treat approximately one in every two patients presenting with cancer.

The last decade has seen a rapid growth in the utilization of MR

images in treatment planning of radiation therapy. This is partially owing to the fact that MR information brings additional clarity to the clinical image, enabling more confident treatment decisions. But even when clinics have access to the latest imaging devices, making the most of imaging data remains cumbersome and time-consuming with current software solutions. Consequently, healthcare institutions could expand their clinical capabilities by introducing solutions that maximize RT imaging intelligence.

syngo.via RT Image Suite has been developed by Siemens to fulfill this need. It helps oncologists to devise and assess routine and complex treatment strategies. And by providing a comprehensive view of the patient, its flexible, intuitive design supports even the very complex cases. Efficient 3D and 4D image assessment, precise contouring and streamlined collaboration among physicians will help to advance the quality and efficiency of radiation therapy treatments.



1 Exploiting all imaging information at hand to its full potential: A CT image of a brain tumor that will later be used for dose calculation, shown side-by-side with two MR contrasts. The contours were drawn on MR and are shown on all images.

## What if you could drive improved outcomes with a comprehensive view of your patient?

### See clearly

Your institution is striving to provide high-quality, tailor-made treatments. You have at your disposal a wide spectrum of images from 3D or 4D CT, to PET and MRI, which can form a basis for treatment decisions. And their optimal use will help meet the ultimate goal of optimizing outcomes for each patient.

With syngo.via RT Image Suite you can visualize a wide range of clinical images including anatomical and physiological images, for example through multiparametric MRI. A concurrent display of up to eight image series<sup>1</sup> (four single or four fused series) is possible on up to two monitors<sup>2</sup>. Rigid and state-of-the-art Deformable<sup>3</sup> Registration supports a confident inclusion of images, even if those were not acquired in treatment position. These powerful capabilities enable a comprehensive clinical view of the patient, for example when preparing initial consultations for a tumor board, during the course of consulting Radiotherapy on how to optimally plan their treatment strategy, or even when evaluating the progress of a particular patient.

By providing the complete picture at great clarity, you have a solution that enables easier and more intuitive clinical decision making.

## What if you could streamline your contouring tasks with an elegant and easy-to-use solution?

### Contour efficiently

Your institution is required to meet increasing quality demands and increasing patient numbers, despite budgetary and staffing constraints. Achieving these objectives requires you to adopt processes that are more efficient, a difficult challenge given the essential task of contouring.

Although contouring on CT images has been a task of Radiation Oncologists for over a decade, contouring on MRI is still an evolving field where cross-department collaboration is highly desirable.

syngo.via RT Image Suite is an intuitive and easy-to-use software solution that enables this collaboration, by facilitating the contouring of both routine as well as advanced cases efficiently. It can be deployed in a variety of ways, for instance as a server-based solution with one or more clients installed in Radiology. Simple import from CDs and DVDs, pre-fetching from PACS, and easy patient data reconciliation allow you to get started quickly. A set of modern tools including Deformable Registration<sup>3</sup> or 3D Smart Freehand Segmentation in any orientation, support fast 3D and 4D CT, MR and PET delineation. In particular, contour changes performed on any image are immediately reflected on all other images: this parallel contouring capability significantly accelerates the segmentation in multi-modality cases while letting you use all available information to their full extent. In cases where a multitude of images is available, the ability to simultaneously display on the screen up to eight<sup>1</sup> image series eases the otherwise cumbersome and time-consuming process of switching panes and exchanging data between applications.

Contouring for treatments that rely heavily on MRI information, such as radiosurgery and brachytherapy, is also supported. Figure 2 illustrates this with a clinical case of vaginal high-dose brachytherapy (explained in detail in MAGNETOM Flash #59, 4/2014, p14-19). Finally, the ability to configure for automatic send to TPS (Treatment Planning System) saves valuable time in completing cases.

From start to finish, syngo.via RT Image Suite supports you in achieving high-quality results, efficiently.

## What if you could strengthen your clinical practice by enabling image-based cancer care pathways?

### Advance your clinical practice

Your team constantly strives to advance its clinical capabilities. Imaging is frequently the critical factor, whether investigating the optimal treatment for a recurrence, adapting a strategy during the course of treatment, monitoring the progress of therapies, or simply exploring the added value of functional imaging in treatment planning. However, providing image-based care pathways seems impractical partially owing to the lack of adequate tools.

syngo.via RT Image Suite enables you to make imaging part of the daily clinical and research practice. To assess the need for re-contouring, you can visualize previously drawn structures on your current image series, supporting clear decision making. And when adaptation is needed, contour warping using Deformable Registration<sup>3</sup> supports new segmentation and further re-planning.

The application also aids in preparing the treatment of patients presenting with tumor recurrences. In this case, the ability to display images and visualize structure sets used during prior treatment on the current dataset guide new contouring smoothly.

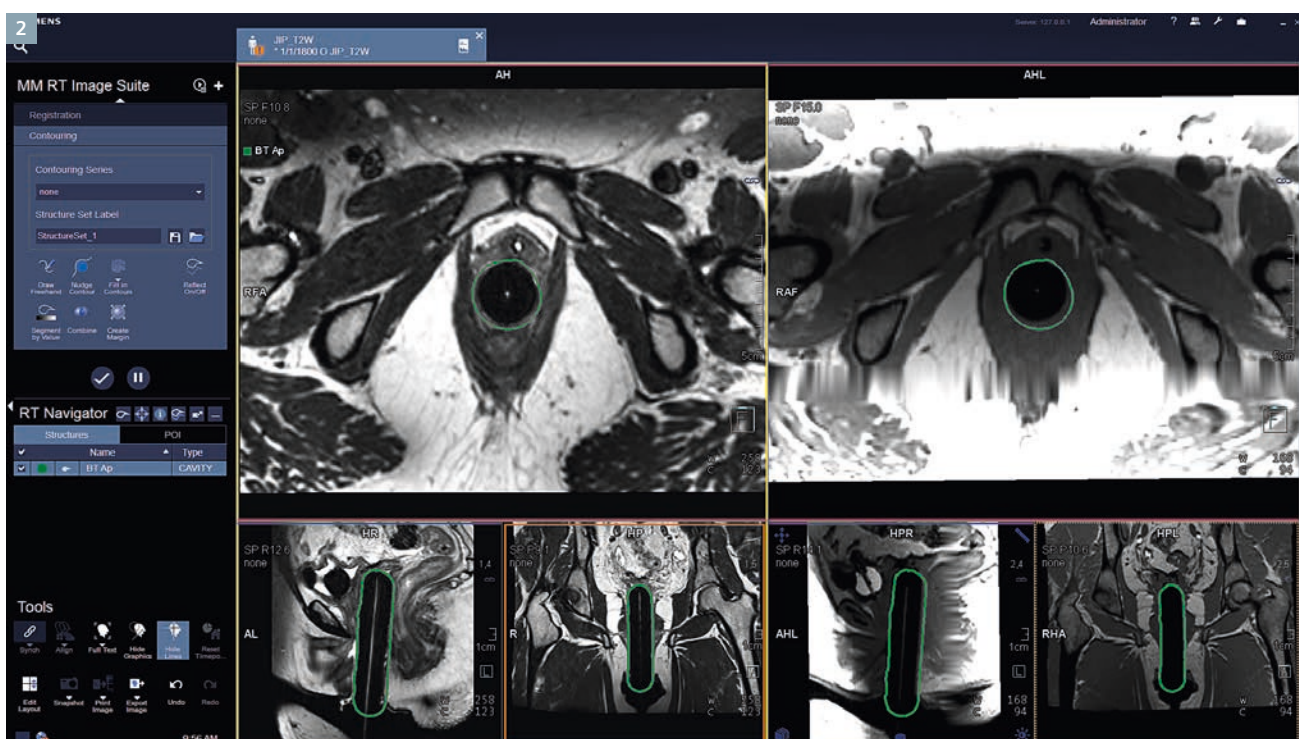
All these cases profit greatly from the Advanced Visualization<sup>1</sup> functionality allowing you to compare and contour a variety of images such as diffusion-weighted and contrast-enhanced MRI, Dual Energy CT, 'Cone Beam CT-of-the-day' or PET images acquired with different tracers. Additional syngo.via applications<sup>2</sup> support you in tasks such as quantification, aiding therapy prognosis and monitoring treatment

<sup>1</sup> Requires Advanced Visualization option

<sup>2</sup> Optional

<sup>3</sup> Requires Deformable Registration option





2 Contouring a vaginal cylinder in preparation for brachytherapy treatment planning. Left: 3D T2w SPACE, Right: 3D T1w MPRAGE. Images courtesy of Dr. Prisciandaro, University of Michigan, Ann Arbor, MI, USA.

response. Whether you are a Radiologist contouring for the Radiation Therapy department or a Radiation Oncologist with a dedicated MRI, the client-server architecture greatly facilitates efficient communication and teamwork.

From adaptive therapy, to treating recurrences and performing imaging in Radiation Therapy research, syngo.via RT Image Suite supports you and your team in advancing your clinical practice.

### Clinical Example: Adding MRI soft tissue clarity to CT images of the prostate for reducing normal tissue toxicity in whole gland radiotherapy

Radiotherapy treatment to prostate tumors has traditionally targeted the whole prostatic gland, even when the extent of the disease was suspected to be confined to a smaller region. Today, state-of-the-art treatment planning is based on CT images, which are considered

essential due to their capability to provide both the electron density information needed for dose calculation and the geometric accuracy that is expected for planning a precise treatment.

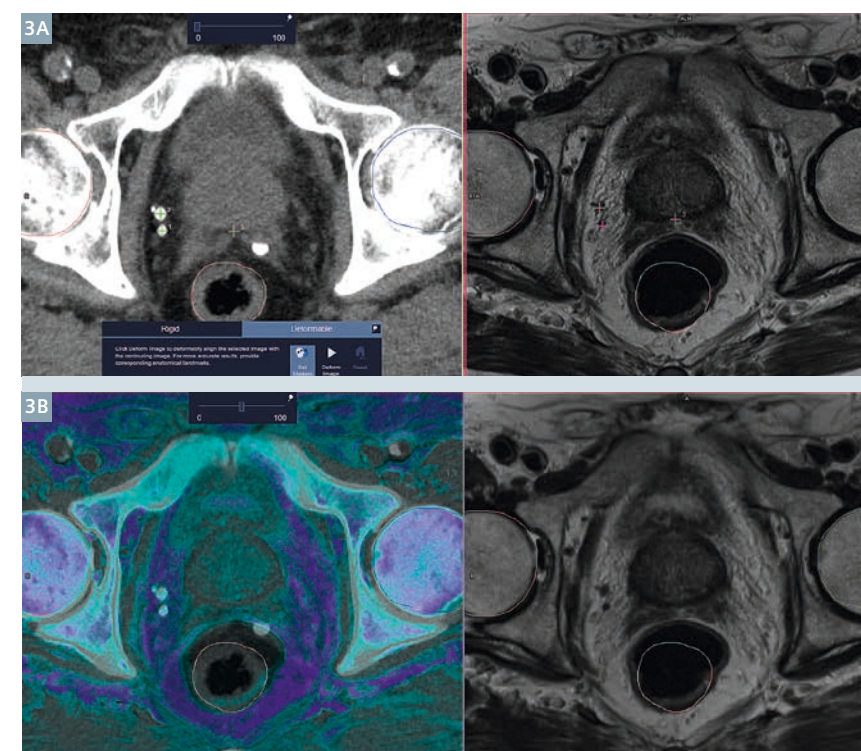
A number of clinical studies [2, 3, 4] have shown that adding the soft tissue information that MRI brings to the picture can help reduce the target volume which is often overestimated by CT alone. Furthermore, Villeirs et al. [5] have shown that the use of MRI in combination with CT improves the accuracy of prostate gland as well as organ-at-risk (OAR) delineation, with decreased inter-observer variability. It is anticipated that this will make an impact on the regions of the surrounding anatomy that would otherwise be exposed to the high-dose region. Reducing, for example, dose to healthy/functional tissue will have a direct effect on any treatment complications experienced by the patient, whether they are manifested as acute or late effects. Alternatively, a dose escalation of 2-7 Gy can be achieved for the same rectal wall dose when MRI is used in organ definition [6].

In the example illustrated below, (Fig. 3) the MR image was acquired in a radiology setting; the patient was not lying on a flat table-top<sup>4</sup> in the 'treatment position'. As a consequence, in order for MRI information to enhance that provided by CT, a Deformable Registration of the MR images was necessary. In figure 3A, the images prior to registration can be seen, while figure 3B shows the results of the registration.

Contouring of all ROI can then proceed on the image that carries the relevant information (e.g. femoral heads on CT, prostate, rectum and bladder on MRI) and those contours can be associated to the CT and sent to a treatment planning system (TPS) for further dosimetric planning.

Deformable registration is also often needed when the CT and MRI were acquired with a significant time difference between the two scans, without following the same protocols; this could give rise to diverse organ filling, making rigid registration lead to odd results.

<sup>4</sup> See [7] for further information.



3 CT and MRI of the same patient acquired in different positions and therefore requiring Deformable Registration before proceeding to contouring. (3A) Landmarks selected to guide the registration and (3B) result of the registration with the MR overlaid on the planning CT.

### Conclusion

syngo.via RT Image Suite helps to leverage MRI and other multi-modality information in Radiation Therapy. syngo.via RT Image Suite improves decision-making with a clear and comprehensive view of your patients, efficient and precise contouring, as well as treatment monitoring and adaptation capabilities that enable personalized therapy.



The product syngo.via RT Image Suite is based on syngo.via VB10. It is still under development and not yet commercially available. Its future availability cannot be ensured.

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### Further Reading

For further articles, application tips and clinical talks from experts focusing on the role of MRI in Radiation Therapy, please visit us at:

[www.siemens.com/magnetom-world-rt](http://www.siemens.com/magnetom-world-rt)

### References

- 1 Benjamin D. Smith, Grace L. Smith, Arti Hurria, Gabriel N. Hortobagyi, Thomas A. Buchholz. "Future of Cancer Incidence in the United States: Burdens Upon an Aging, Changing Nation", J Clin Oncol 27. 2009.
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- 6 Steenbakkers et al. (2003). Reduction of dose delivered to the rectum and bulb of the penis using MRI delineation for radiotherapy of the prostate. Int J Radiat Oncol Biol Phys 57 (5), pp. 1269-1279.
- 7 MAGNETOM RT Pro edition. (s.d.). Available at <http://www.healthcare.siemens.com/medical-imaging/magnetic-resonance-imaging/mri-guided-therapy/magnetom-rt-pro-edition>