



Guide to Neuroradiology CT

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CT in Neuroradiology

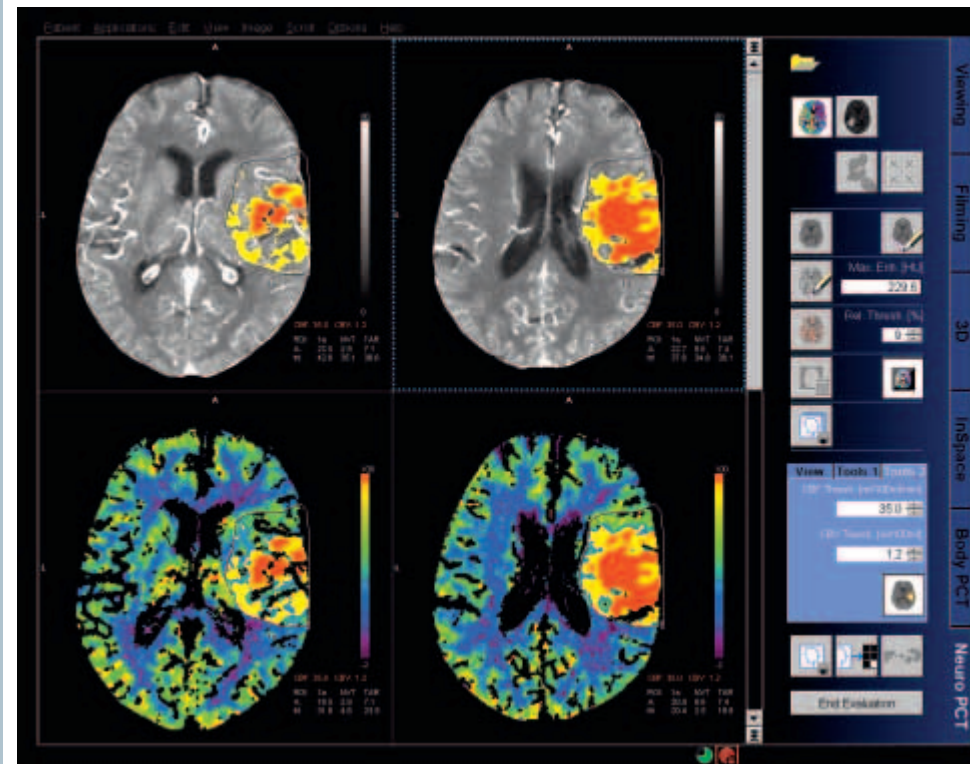
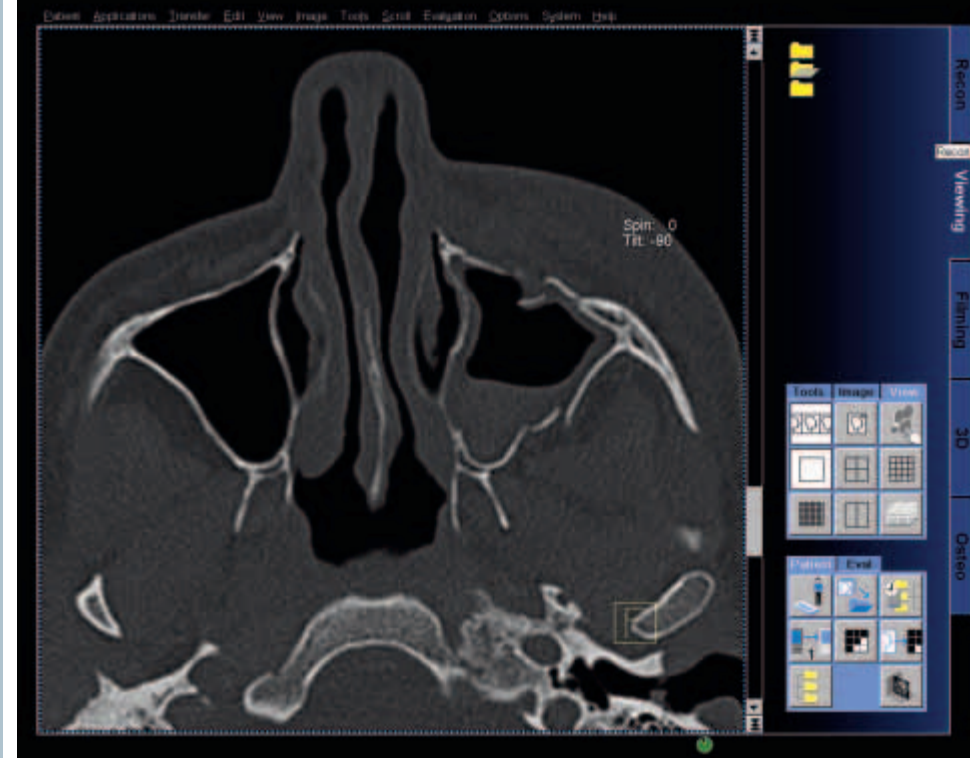
Computed Tomography is the imaging procedure of choice in the evaluation of acutely injured patients or patients with a neurological deficit. According to the IMV¹⁾ report, 40 % of all CT examinations are related to head, neck, and spine imaging. Siemens provides a unique solution for both your daily routine and advanced evaluation of images in neuroradiology by combining the most innovative scanner technology and streamlined workflow tools. As a result, difficult cases, e.g., inflammation or tumors of the inner ear or whole brain perfusion, can be easily addressed utilizing Siemens' latest z-Sharp™ Technology or Adaptive Spiral Technology²⁾. Intracranial screening of vascular malformations like aneurysms is now a routine task using CT DSA (digital subtraction angiography) with time-saving workflow improvements such as auto-preprocessing. Moreover, with Siemens, you can benefit from applications that support the diagnosis and treatment-planning of diseases of the head, neck, and spine, for instance AVMs, brain tumors, acute head trauma, suspected acute intracranial hemorrhage, and stroke.

Our latest SOMATOM® CT scanner technology, in combination with our CT Neuro Engine, offers you a unique and complete solution for all aspects of neuroradiology.

You will enjoy high workflow efficiency and offer superior patient care.

¹⁾ IMV report CT, 2006.

²⁾ Depending on system configuration.

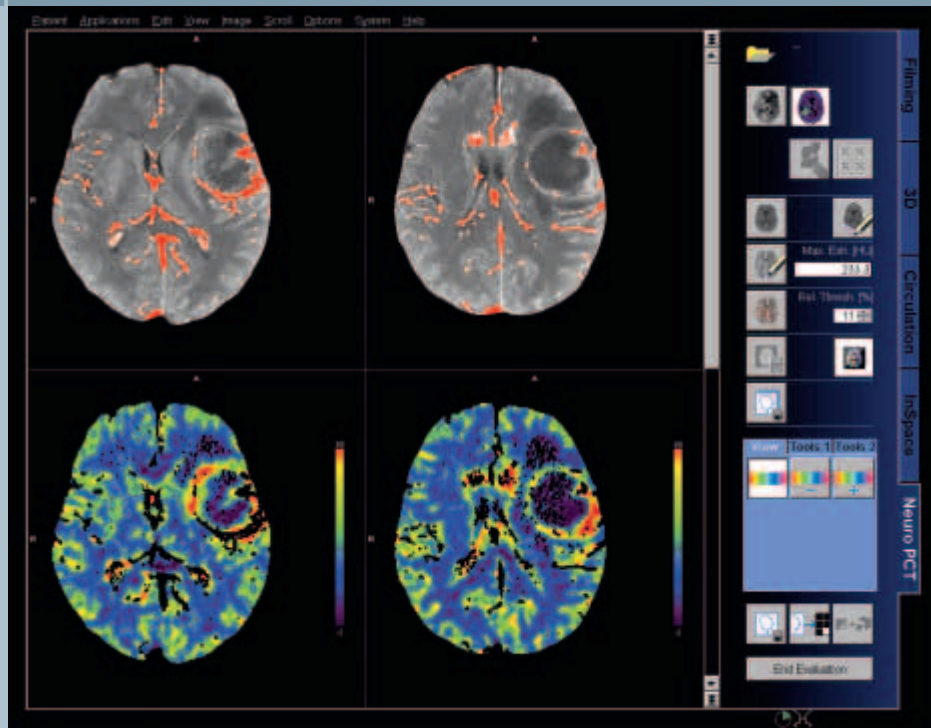




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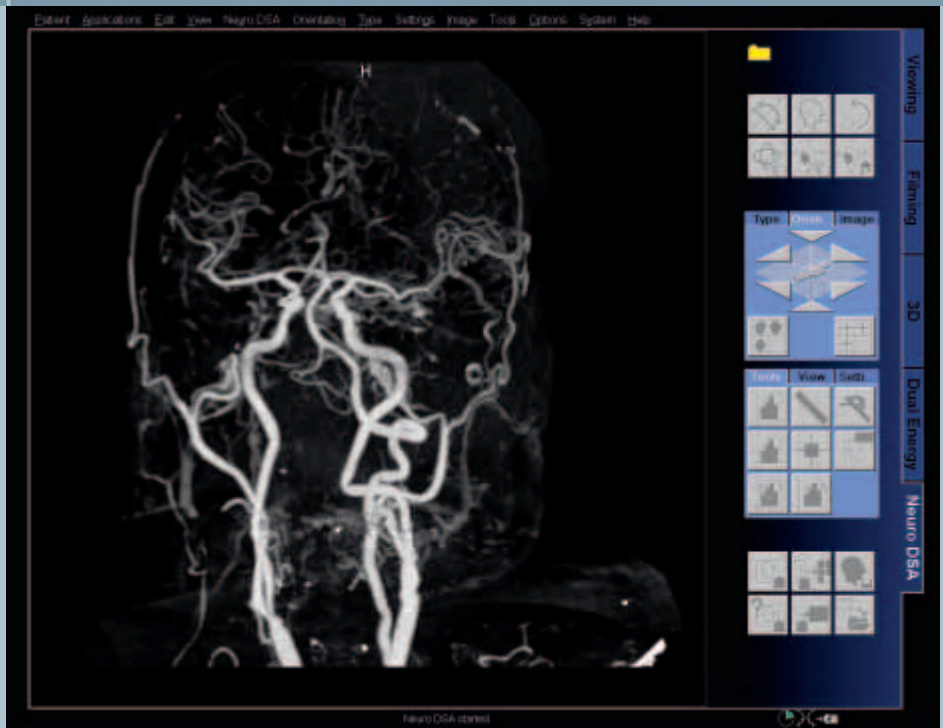
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Tumor Evaluation



- Fast, automated evaluation of brain tumors with *syngo* Neuro Perfusion CT to enhance the ability to grade tumors, plan biopsies, and monitor therapy.
- Acquisition of finest detail in combination with fast coverage, greater accuracy in determining change in tumor size or enhancement by using Siemens exclusive z-Sharp Technology.
- Adaptive 4D Spiral Technology for quantitative 3D perfusion information of brain tumors.

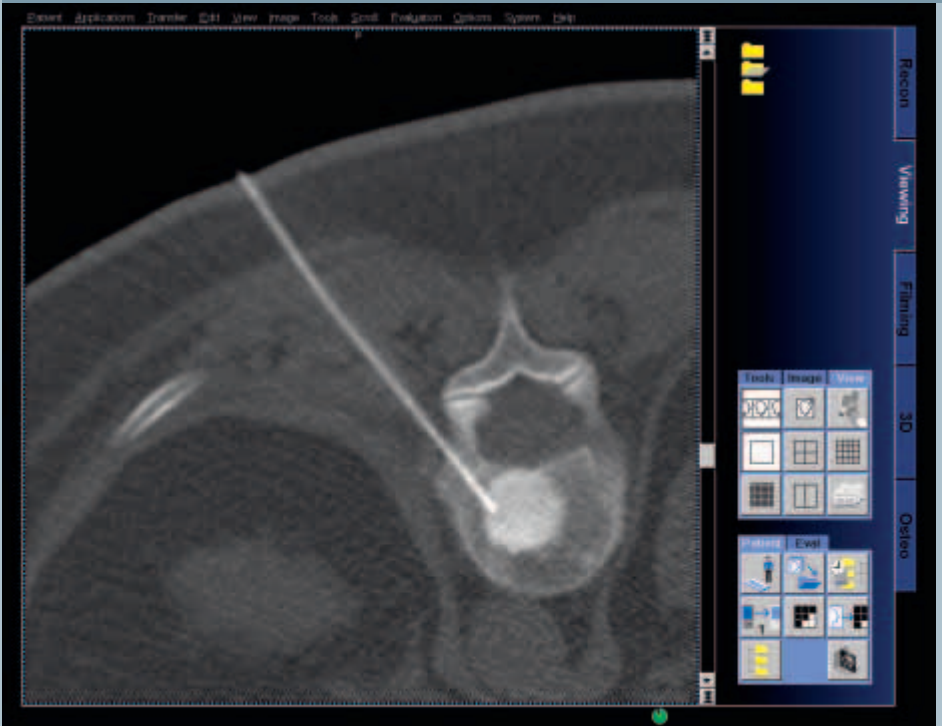
Vascular Evaluation



- Complete assessment of vascular structures of the head and neck with automated CT DSA or spiral Dual Energy.¹⁾
- Auto preprocessing for CT DSA combined with *syngo* Neuro DSA CT speeds up the evaluation of intracranial and extracranial vessels.
- Pure arterial imaging of smallest vessels by combining up to 0.33 mm resolution and industries fastest sub-mm coverage of up to 87 mm/s.
- Phase-resolved CTAs to assess arterial and venous phase for exclusion of aortic vessels or assessment of venous thrombosis.

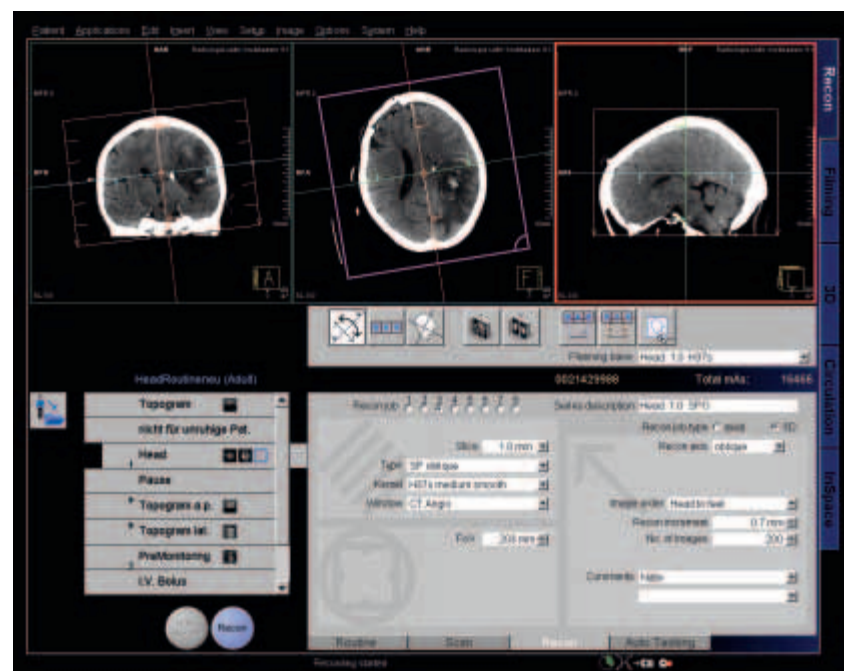
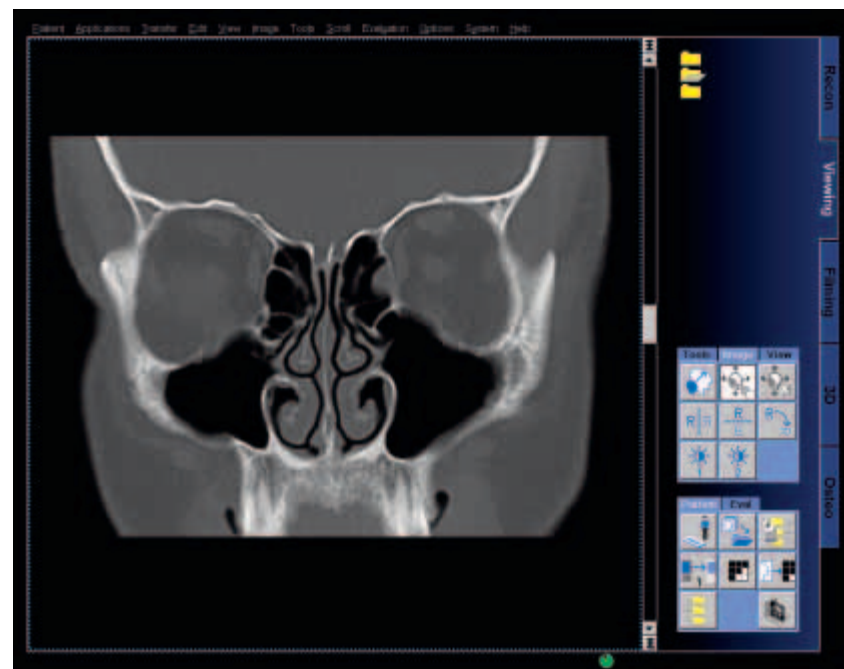
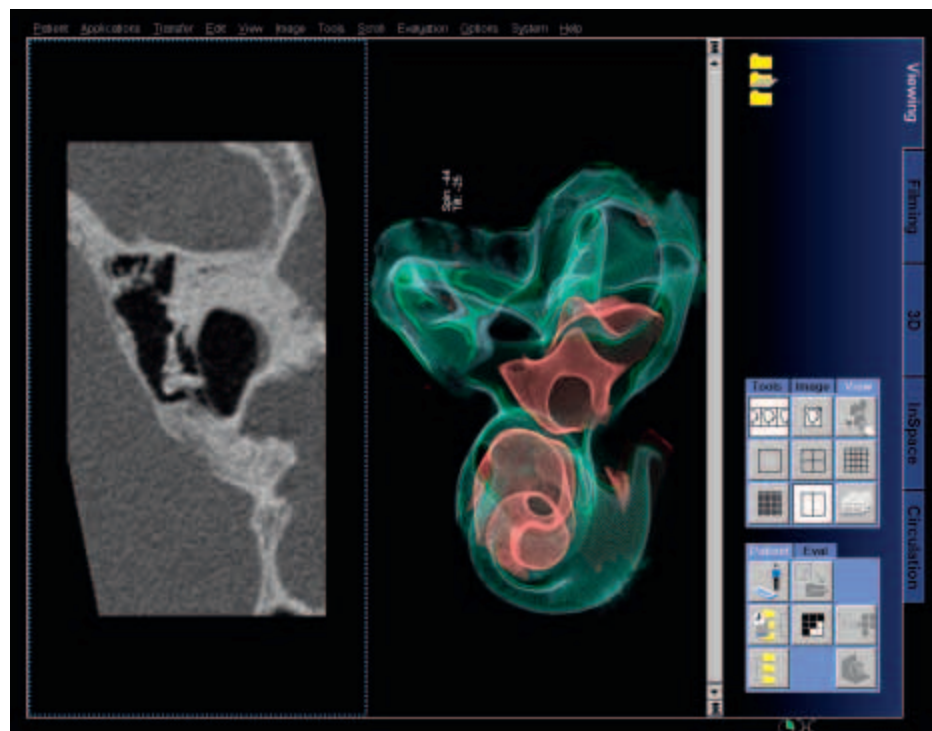
¹⁾ For SOMATOM Definition only.

Intervention



- Interventional solutions designed for a fast and intuitive workflow for both non-fluoroscopic and fluoroscopic interventional procedures of neck and spine.
- Real-time 3D-guided intervention for full control in every plane.
- Fast, accurate needle placement using auto-stop table positioning, path planning tools, and CARE View™ imaging.
- Wide gantry opening for better patient access.
- Wireless in-room control for access of complete system functionality.





Routine

Computed Tomography provides you with fast, non-invasive visualization of routine neuroradiological questions such as non-distinctive headaches and traumas. Our SOMATOM CTs, in combination with the CT Neuro Engine, offer a robust solution for routine and advanced neuro examinations.

Artifact-free imaging of dense structures like the cranium, spine, and more is ensured with our unique z-Sharp Technology.¹⁾ Moreover, a precise delineation of complex inner-ear bones can be achieved with the industry's highest z-UHR resolution (0.24 mm). By offering both fast volume coverage and high spatial resolution, pure arterial imaging is available when you need it.

The Adaptive 4D Spiral technology gives you the possibility to adapt the coverage to virtually any organ size.¹⁾ And, to protect you and your patient, the fully automated CARE Dose4D™ achieves maximum image quality at minimum dose.

Excellent image quality is an important component of a reliable diagnosis, but there are many necessary steps between patient preparation and diagnosis. A subsequent streamlining of all processes throughout the entire CT workflow allows you and your team to work with highest efficiency. WorkStream4D, for instance, virtually eliminates time-consuming manual steps: oblique and double-oblique reconstructions are available immediately.

¹⁾ Depending on system configuration.

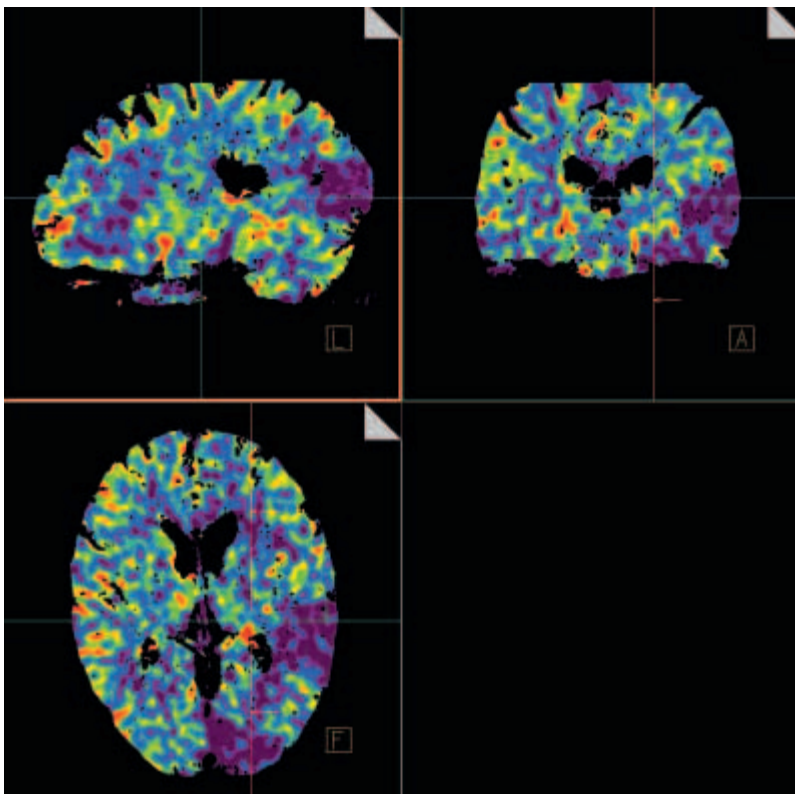


3D Stroke Imaging

As a radiologist or neuroradiologist, you are certainly aware that stroke is one of the three most frequent causes of death worldwide and that the information that CT can efficiently provide is crucial for your diagnoses and for your patients' well-being. Ideally, you need to see the entire extent of a stroke and see the perfusion dynamics of the infarcted area and the surrounding tissues to make confident therapy decisions. With Siemens 3D stroke imaging, you will enjoy not only exquisite image quality with up to 0.33 mm spatial resolution enabled by our innovative CT scanners, but also a unique and intelligent software solution including an automated workflow for the differential diagnosis of ischemic stroke. *syngo* Perfusion CT facilitates quantitative evaluation of selected areas. In combination with 3D Perfused Blood Volume, the Siemens neuro solution presents a fast and easy-to-use 3D overview of the extent of the

infarcted area. The Adaptive 4D Spiral Technology gives you the possibility to adapt the coverage to virtually any organ size allowing for full brain perfusion information.¹⁾ For optimized therapy planning, you can appreciate the dynamic information and 3D visualization of the stroke provided by *syngo* applications and the CT Neuro Engine.

Whether a fast stroke evaluation or the display of the infarcted and surrounding area is needed, everything is available at your fingertips in only seconds. Share your findings with the treating physician or a colleague by simply granting them remote access with *syngo* Expert-i from any PC in the network. And to speed up your clinical workflow, 3D evaluations can be performed by simply using *syngo* WebSpace from any PC or laptop where the Internet can be accessed.

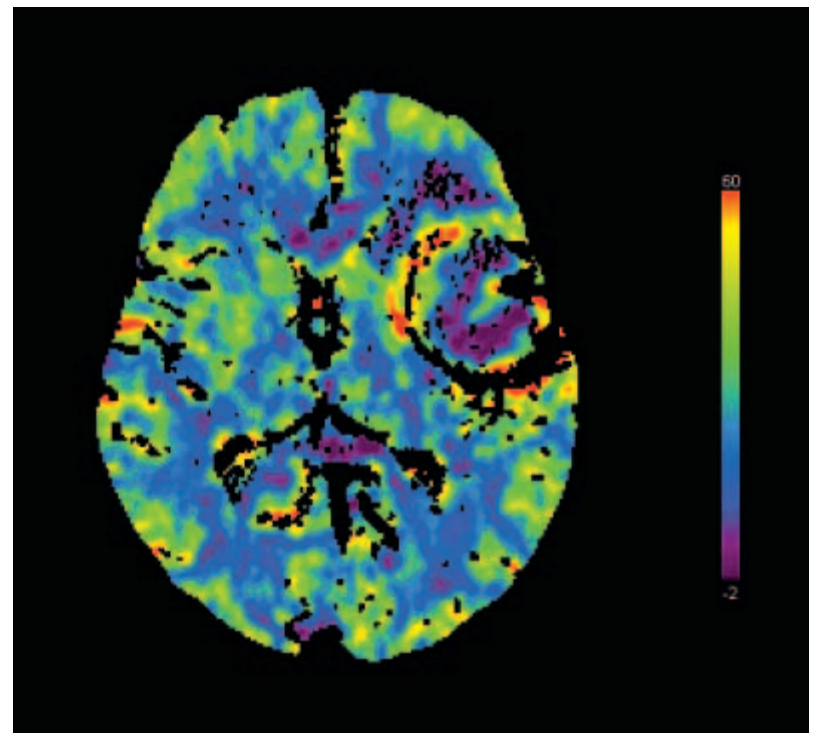
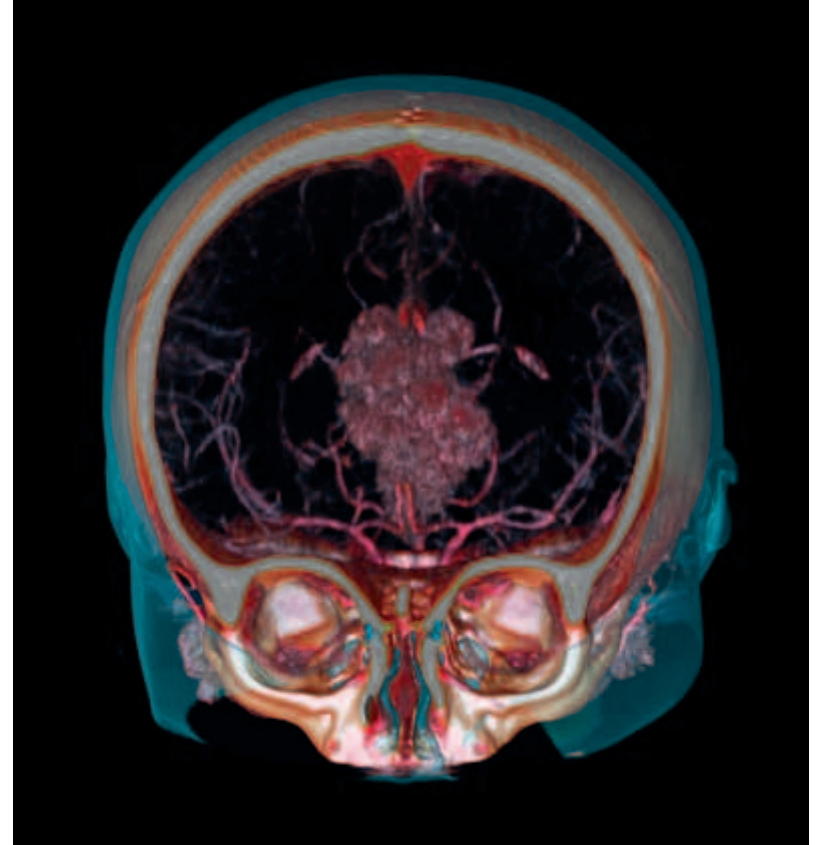


¹⁾ Depending on system configuration.

Tumor Evaluation

Brain imaging of oncology patients plays a vital role in neuroradiology. But for fast and accurate assessment of brain tumors and feeding vessels, you need more than just the most innovative scanner. You also need intelligent software programs that speed up and improve confidence of diagnosis. Using tumor perfusion studies in 2D and 3D¹⁾ provides you with a very valuable tool for fast, easy-to-use, automated quantitative evaluations even for whole tumor. This permits the calculation of physiologic parameters such as cerebral blood volume and extra-vascular leakage of brain tumors. Supporting the discrimination between benign and malignant intracranial and skull base tumors as well as investigating vascular pathology which occurs in patients with a primary intracranial malignancy. Furthermore, syngo Neuro Perfusion CT augments the physiologic parameters for biopsy planning and therapy monitoring.

¹⁾ Depending on system configuration.



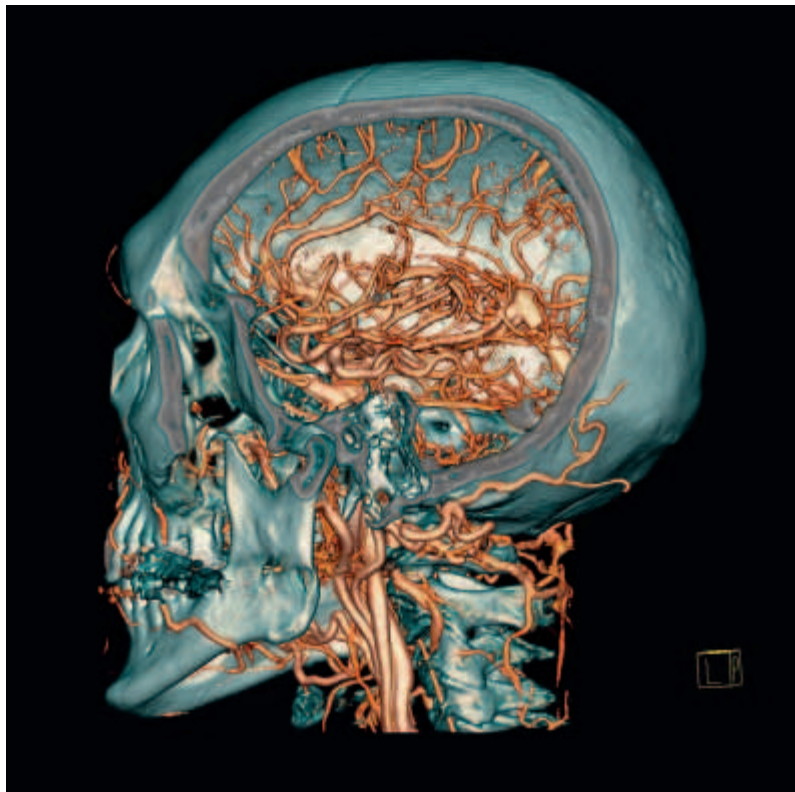


Vascular Evaluation

Enjoy a better all-round solution for vascular evaluation that facilitates your diagnoses with optimal visualization and evaluation of complex intracranial vascular structures and delineation of aneurysms and other vascular diseases. With Siemens SOMATOM scanners, you have all this plus consistently superior image quality, streamlined workflow for shortest time to diagnosis, and intelligent applications that are easy to use for more confident results.

Through z-Sharp we offer the industry's highest spatial resolution of 0.33 mm within the entire scan field with no increase in dose. And this combined with SureView™ ensures highest image quality at any speed.

Moreover, the automated syngo Neuro DSA CT delivers exactly the specific technology required for fast and accurate visualization of complex neurological disorders of head and neck. You can quickly remove bone from CTA data of head and neck, always having control over source data, thanks to immediate



switching between CTA and Neuro DSA CT data without user interaction. syngo Neuro DSA CT datasets allow improved visualization of all cerebral vasculature, especially in areas that are closely connected to bone structures.

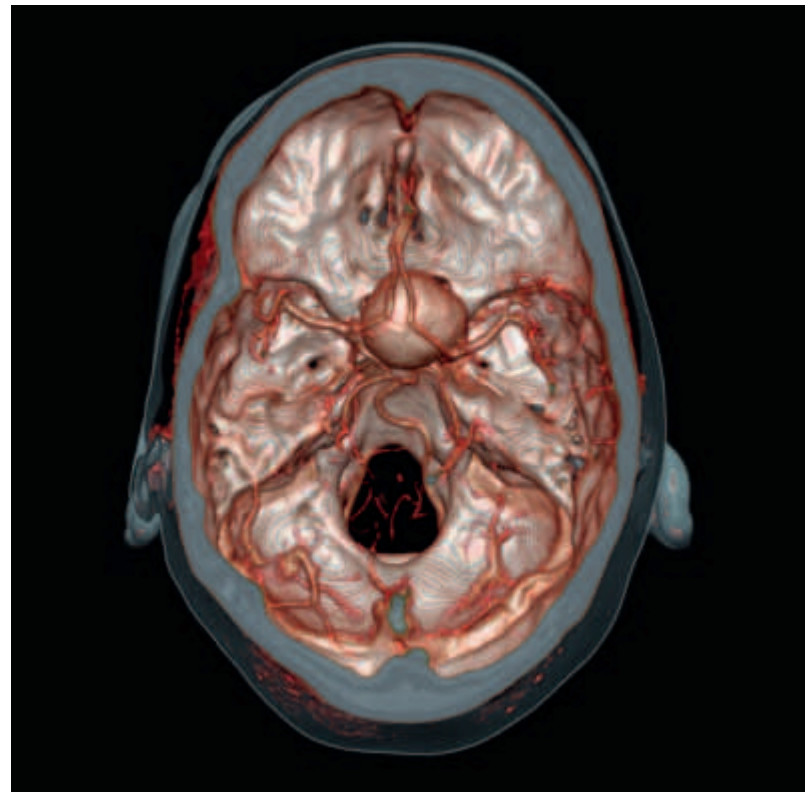
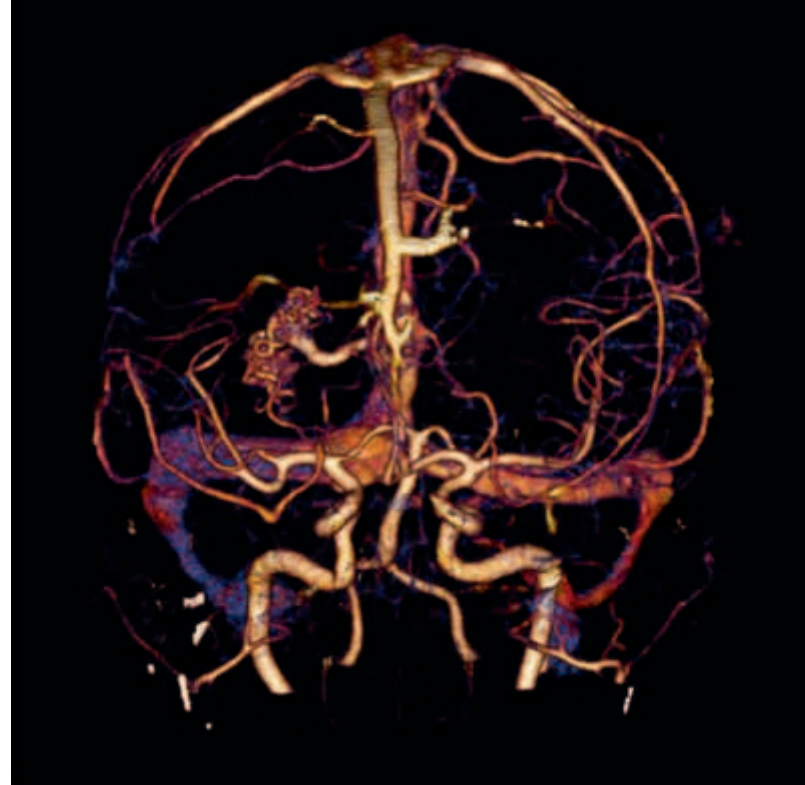
With auto-preprocessing CT DSA, data are immediately preprocessed for reading after being sent to the workstation, making them ready for evaluation whenever you need them. This helps you to deliver excellent diagnostic outcomes with a fast, easy, automated workflow.

Using the unique Adaptive 4D Spiral Technology¹⁾ advanced CTA studies are capable to visualize phase-resolved arterial and venous phases of head and neck in one examination.

And, with spiral Dual Energy, we open the door to a new world of visualization enabling direct subtraction of bone with only one scan for even faster and more reliable diagnoses.²⁾

¹⁾ Depending on system configuration.

²⁾ Only available on SOMATOM Definition as an option.



Intervention



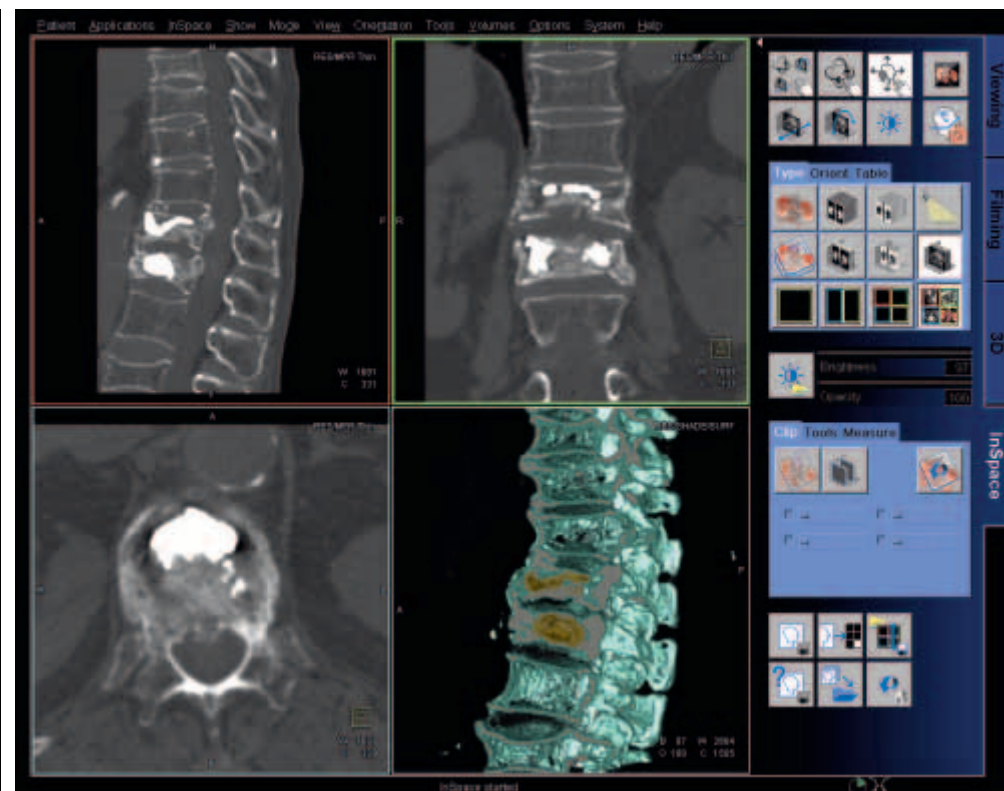
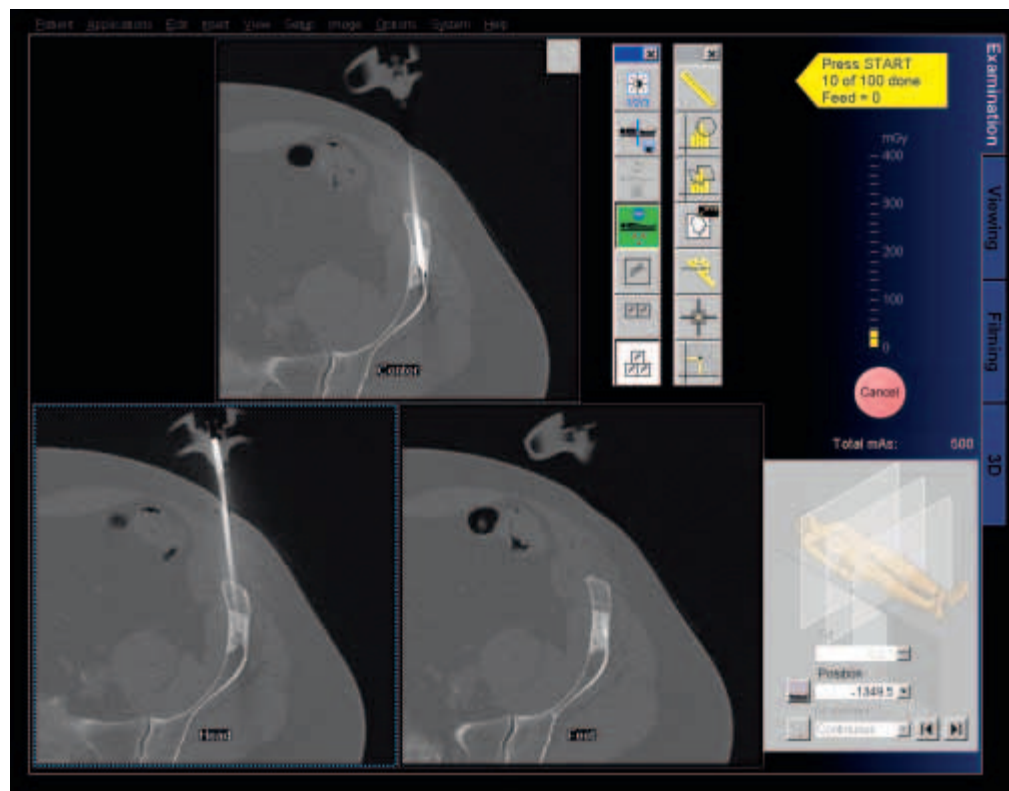
Guided CT interventions such as vertebroplasty tumorous lesions and image-guided percutaneous laser disk decompression are becoming more and more common.

SOMATOM CT scanners are designed for a fast and intuitive workflow supporting these minimally invasive procedures. Whether you perform fluoroscopic or non-fluoroscopic procedures, you want first-class images so that you can clearly see your needle position in an instant or even better in any plane¹⁾. With our SOMATOM CTs, we offer not only wider gantry openings of up to 82 cm for better patient access, but also highest accuracy due to real-time 3D image guidance in combination with path planning tools and needle artifact prevention, for safe and fast procedures while delivering minimum possible dose.¹⁾ Our latest CT intervention²⁾ solutions combine fully configurable scanning user interfaces enabling you to adapt your intervention scans to your needs. With HandCARE™, you have significant physician dose reduction in all modes.

Utilizing CARE View means having access to your images instantly in both fluoroscopic and non-fluoroscopic modes. A new auto-command toolbar enables one-click windowing and allows you to switch image views with a single click. From the auto-command toolbar, you can also control the precise position of the table – whether using the joystick or one click at the CT console – offering you unprecedented speed and accuracy in patient positioning. In-room, scan-start control is now also available for non-fluoroscopic procedures. With our unique 3D-guided interventional solutions, a new level of precision and control for faster and more accurate CT-guided, minimally invasive procedures is now available.

¹⁾ Depending on system configuration.

²⁾ Optional.







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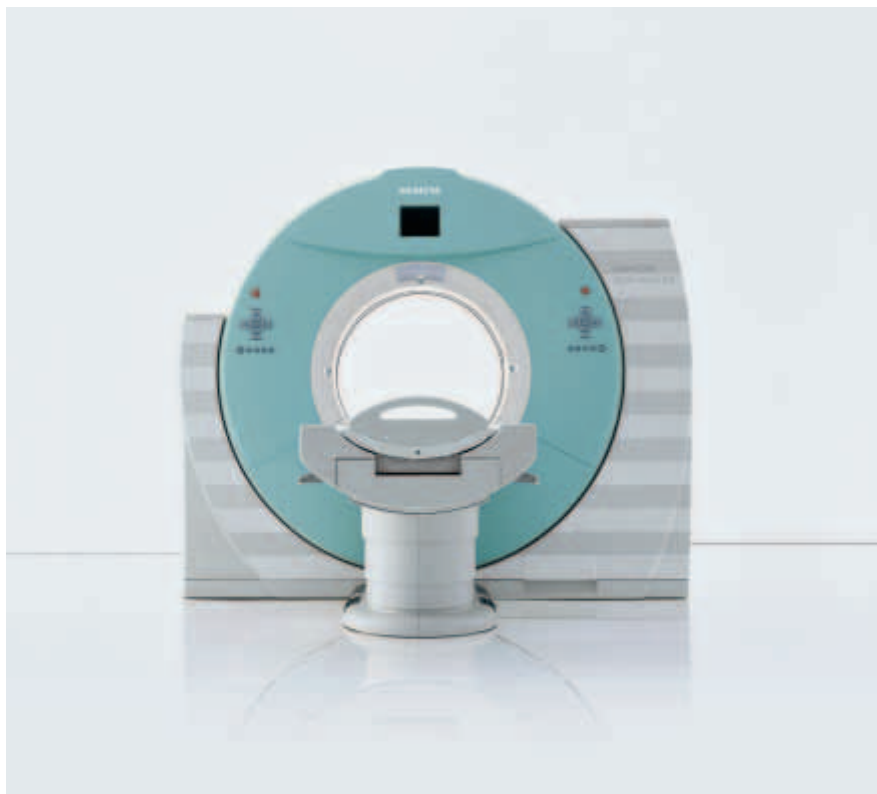
“The Siemens Neuro CT solution covers all my needs in daily routine from exclusion of fractures to highly advanced postprocessing in stroke patients.”

SOMATOM Definition

Dual Source CT allows you to scan any heart rate without the need of beta-blockers – at the lowest radiation dose ever achieved. Moreover, it provides one-stop diagnoses regardless of size and condition of the patient, saving precious time and money in acute care. And imagine all the new clinical opportunities spiral Dual Energy scanning offers in CT by characterizing materials.

SOMATOM Definition AS

Our new CT scanner is the world's first to adapt to your patients and to your clinical questions – breaking the barriers of conventional CT. Imagine a truly adaptive CT scanner that intelligently adapts, on the fly, and gives you exactly what you need. By modifying every component of Multislice CT, we make the SOMATOM Definition AS an expert in virtually any clinical field.



System Overview

Since Siemens Medical Solutions introduced the world's first CT from a medical equipment manufacturer in 1974, we are widely accepted as a leader in CT innovation. Siemens' customer-focused philosophy has always been to continually integrate cutting-edge imaging applications into daily clinical practice, ensuring the highest quality patient care while lowering costs. Over the years, these innovations have spanned, for instance, from the first spiral CT scanner to the STRATON®, the industry's only 0 MHU X-ray tube, to Dual Source CT in 2005, and the world's first adaptive scanner in 2007. It is then no surprise that Siemens invests more than twice as much on research as any other CT scanner manufacturer. Improving healthcare efficiency with innovative technology makes SOMATOM CT scanners the preferred solution for both leading healthcare institutions and physicians around the world.

With the SOMATOM Spirit, we deliver an accurate, reliable, and fast diagnosis – the only outcome that counts in the CT world. It is our multislice CT scanner for all who dreamed about an affordable and reliable system with the absolute newest, future-oriented technology.

The SOMATOM Emotion beautifully illustrates Siemens' attention to detail and insistence on excellence. Designed to make your day easier

and clinically more successful. Innovative imaging technology supported by outstanding workflow concepts will make your workday exceptional.

To meet today's and tomorrow's demands, Siemens had to shift thinking from how CT has always been built to how it can be used. Not just as a discrete imaging modality, but as a critical tool to help manage a complete patient story. The vision began in 2005 with SOMATOM Definition, the world's first Dual Source CT. With the SOMATOM Definition, we have redefined the clinical role of CT by doubling temporal resolution, doubling speed, and by offering twice the power while lowering dose even further.

It continues today completing the SOMATOM Definition Era with the introduction of the world's first adaptive scanner, the SOMATOM Definition AS. The result? You can go beyond seeing the sharpest picture in CT to seeing the big picture in healthcare. The Definition Era opens up new worlds of clinical and economic possibility everywhere, ensuring higher quality and cost-efficient healthcare. It helps you as well as leading healthcare institutions and physicians all around the world to move from almost to always, from where to what, and from there to anywhere.



SOMATOM Emotion

With more than 5,000 systems worldwide, the SOMATOM Emotion is the most popular CT in the world. With both 6-slice and 16-slice configurations outfitted with Siemens' newest technological advances, you can expect, and will receive, high-end imaging performance from an unbelievably compact scanner that will continuously protect your investment.



SOMATOM Spirit

SOMATOM Spirit is a subsecond, multislice CT scanner adapted specifically for economical day-to-day clinical routine. This cost-effective solution benefits from Siemens' latest developments that lead to superb image quality and dose efficiency. Our system is designed to perform CT examinations easier than ever before, a simple entry into the fascinating world of Computed Tomography.

Thinking About the Future of Your Routine 3D Workflow?

syngo
It's All About You.

syngo, our unique solution for diagnostic and therapeutic cycles, knows how you work and what you need. What's most important, fast, easy, and intuitive *syngo* brings together all the solutions critical to you – and to your patients. Uniquely role-based for your workflow, *syngo* completely integrates your day, your department and beyond, leading to a whole new level of clinical excellence. And a partnership you can grow with. It's the beginning of a virtual, "always on, anywhere" world of healthcare.

The time to *syngo* is now.

Think of the advantages of innovative software solutions when they are seamlessly integrated into your CT workflow: more intuitive scanning, higher patient throughput, plus faster and more confident diagnostic decisions. Imagine instant access to CT imaging data wherever and whenever you need it, with the flexibility of 3D image processing in your office, even a second opinion in the middle of the night without leaving home. And, imagine knowing that in the future you will continue to have access to the newest software technologies ...

For Siemens CT, everything you can imagine is today's reality. Innovative scan technologies such as z-Sharp and CARE Dose4D™, automatically facilitate scanning with the highest possible image quality at the lowest possible dose. Furthermore, our unique one-touch contrast management solution automatically synchronizes scanning and contrast injection.

Siemens also leads the field in "Zero Delay" data processing, in pioneering shared database concepts, and in automated direct 3D image reconstruction, WorkStream4D ensures that you achieve outstanding image quality while maximizing patient throughput. Access to the right clinical software solutions can help you reach a confident diagnostic decision more quickly. Our trendsetting portfolio for routine oncology, cardiac, vascular, and neuro imaging offers you unique, clinically proven time-saving tools for automated tumor measurement and follow-up, coronary vessel evaluation, and stroke assessment, to name a few. And, if you need a second opinion, *syngo* Expert-i gives remote access to your *syngo* workplace. The latest addition to our clinical portfolio, *syngo* WebSpace, uniquely offers instant access to 2D reading and 3D postprocessing tools whenever and wherever you need it.¹⁾ "Zero Delay" data streaming between a Siemens SOMATOM CT scanner and

the *syngo* WebSpace server offers our customers the industry's fastest access to data via Fast Data Link. By accessing the server from a variety of PC types including PACS or your office PC or laptop, up to 20 users can simultaneously benefit from advanced clinical tools such as bone removal, vessel segmentation, and 4D heart visualization.

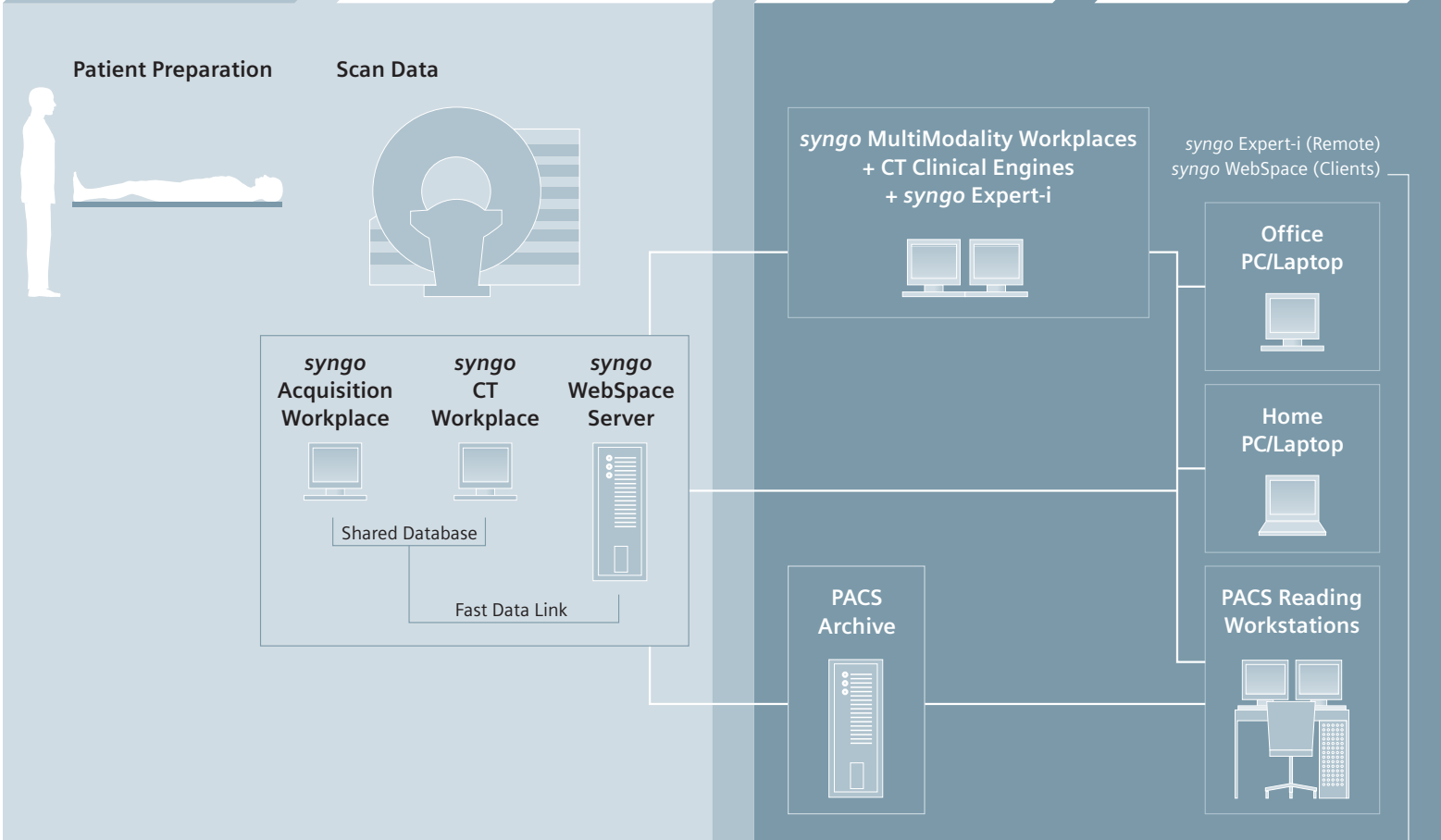
What about the future? Your future security is our future success, which is why we developed a program specifically designed to keep you at the clinical forefront – our commitment to your investment in a Siemens CT solution. Whether you want to stay at the clinical cutting edge, protect your investment or both, our new e-Tune program offers you the opportunity to ensure that your *syngo* WebSpace platform is ready for the newest cutting edge clinical applications.

¹⁾ Internet access required.

Terms and conditions apply. Please contact your Siemens partner for more information.



Data Flow



Benefits

- Planning, Preparation, Scanning and Reconstruction for several patients by two parallel workplaces.
- Immediate data access at *syngo* Acquisition Workplace and *syngo* CT Workplace through shared database.
- Virtually "Zero Delay" availability of thin slice data through Fast Data Link to *syngo* WebSpace Server.

- 3D data where needed with *syngo* WebSpace.
- Get a second opinion with *syngo* Expert-i.
- Parallel 3D Reading by concurrent sessions.

Specialized syngo CT Applications

syngo Neuro Perfusion CT

This application evaluates dynamic CT data of the brain. It aids in the early differential diagnosis of acute ischemic stroke, providing quick and reliable assessment of dynamic cerebral perfusion parameters such as cerebral blood flow, cerebral blood volume, time to peak, and tissue at risk classification.

syngo Neuro Perfusion CT – Tumor Evaluation

It provides fast, automated evaluation of blood brain barrier disruptions in brain tumors.

syngo Neuro PBV CT¹⁾

syngo Neuro Perfusion Blood Volume (PBV) CT allows for quantitative measurement of perfused blood volume visualizing infarcted areas of the whole brain in 3D.

syngo Neuro PWM²⁾

syngo Neuro Perfusion Weighted Map (PWM) is a powerful tool to visualize color-coded CTA source images for 3-dimensional display of acute ischemic stroke.

syngo Neuro DSA CT

syngo Neuro Digital Subtraction Angiography (DSA) CT provides detailed visualization of intracranial vascular structures based on digital bone removal.

Auto Preprocessing CT DSA³⁾

syngo Neuro DSA CT data are automatically preprocessed and transferred to the *syngo* MultiModality Workplace, allowing immediate evaluation of the data when they are needed.

Advanced Intervention

Advanced Intervention is the biopsy mode combined with CARE Vision CT designed for a fast and intuitive workflow for all fluoroscopic interventions.

WorkStream4D

Fully automated reconstruction and reformatting of raw data provide optimal image quality and enhance diagnostic confidence. Reconstruction occurs at both the *syngo* Acquisition and *syngo* CT Workplace parallel to acquisition of direct 3D reconstruction. Data is stored economically in your daily workflow and your data volume is reduced by up to a factor of 10. Furthermore, all diagnostic information is captured in 3D slices.

syngo Dual Energy Advanced⁴⁾

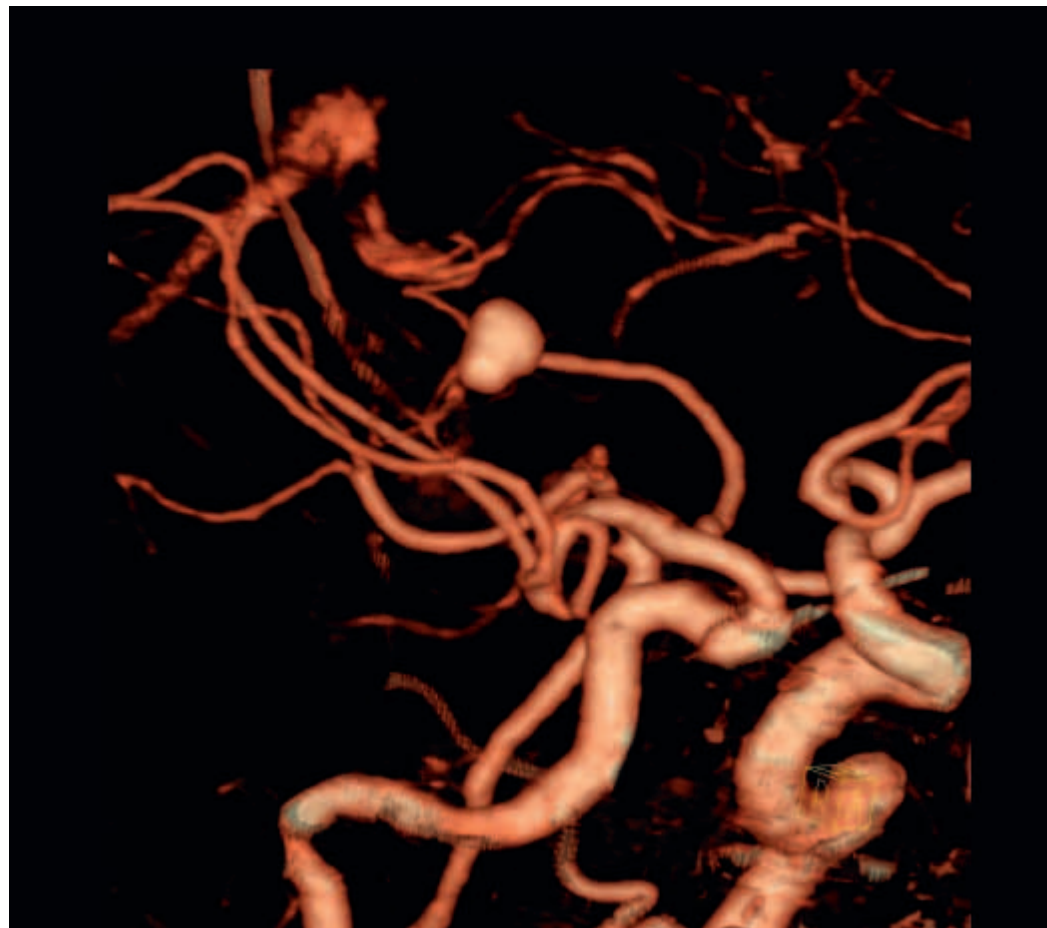
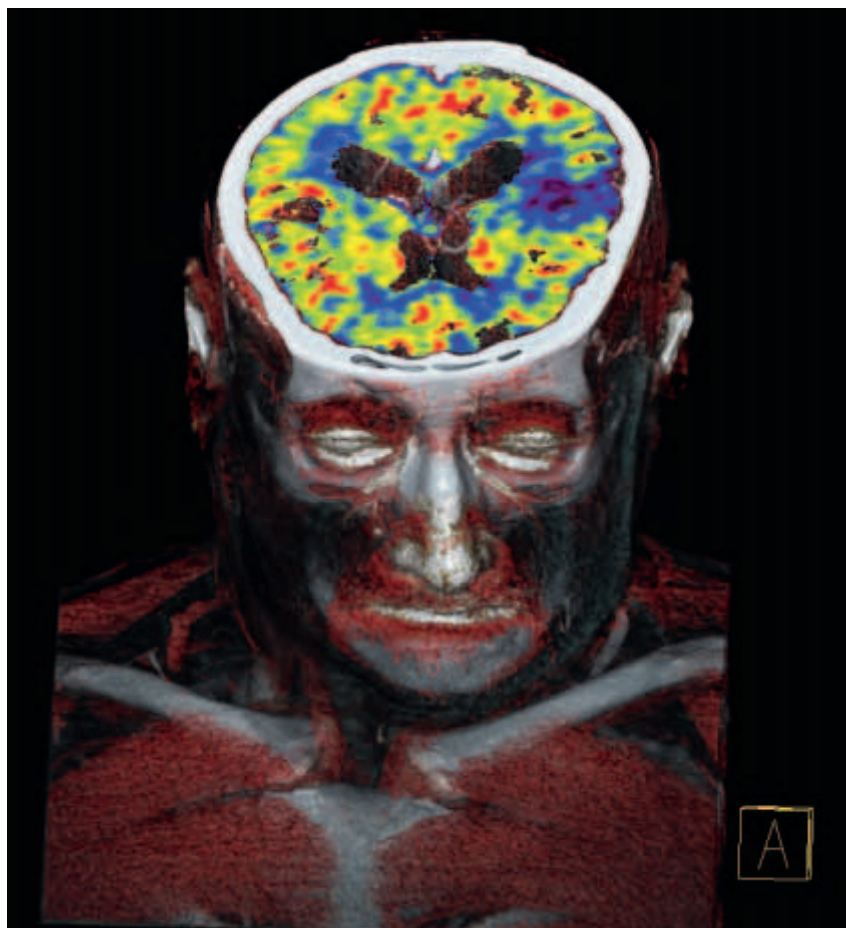
Dual Source CT permits the simultaneous use of two sources at two different kV levels. The resulting images show a different attenuation depending on the material scanned and thus allow differentiation of soft tissues from fat, or contrast agent from hard plaque or calcification, for example. Clinical applications range from organ perfused blood volume to iodine removal from liver scans generating a virtual non-contrast image. Potential new applications include the classification of tumors.

¹⁾ Only for SOMATOM Sensation and SOMATOM Definition. Includes *syngo* Neuro PWM license. Requires *syngo* CT 2007 for *syngo* CT Workplace and *syngo* 2007C for *syngo* MultiModality Workplace.

²⁾ Only for SOMATOM Emotion. Requires *syngo* CT 2007C for *syngo* MultiModality Workplace.

³⁾ Requires *syngo* 2008A.

⁴⁾ Only available on SOMATOM Definition. Must be purchased separately.



Are We Speaking the Same Language?

Siemens CT solutions for neuroradiology imaging are the result of working together with experts around the world, analyzing workflows and developing solutions to enhance them, and driving for better clinical outcomes with innovative scanner technologies and intelligent time-saving software solutions. The language we share is the language of images. The proof of our finely tuned imaging solutions are the images we share, the images you use every day to make life-saving diagnostic decisions. Our neuroradiology solutions are designed to help you obtain the best possible images and to provide you with the innovative tools you need to make confident decisions.

And from the moment of your purchase Life, our unique customer care solution, will accompany you. To sharpen your skills, choose from a wide range of education programs – from application training to clinical education. Benefit from the professional knowledge of our education specialists and clinical partners. Learn in your department, workshops, via e-learning tools, or attend fellowships and symposia.

With *syngo* WebSpace, our trendsetting technology, your postprocessing workflow changes. *syngo* WebSpace will give you the freedom to access your clinical images, postprocessing functionalities, and tools from almost any location¹⁾. Our investment protection program “e-Tune” keeps your CT Clinical Engine software and *syngo* WebSpace software up-to-date – from day to day, from year to year. As the functionality of our CT Clinical Engines is continuously improved and enhanced, you will participate in these innovations. By changing key hardware components and the complete server, we even offer an investment protection for your *syngo* WebSpace hardware platform.

Your partnership with Siemens brings you to the forefront of the most cutting edge in CT performance. It opens the door to the newest generation of technology and developing medical fields – with Life.

¹⁾ Internet access required.





Clinical cases by courtesy of:

Alamance Regional Center, Burlington, NC, USA
Hopital Georges Clemenceau, France
University Medical Center Grosshadern, Munich, Germany
University of Erlangen, Erlangen, Germany
Hospital CIMEQ, La Habana, Cuba
Hartsdale Imaging, Hartsdale, USA

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