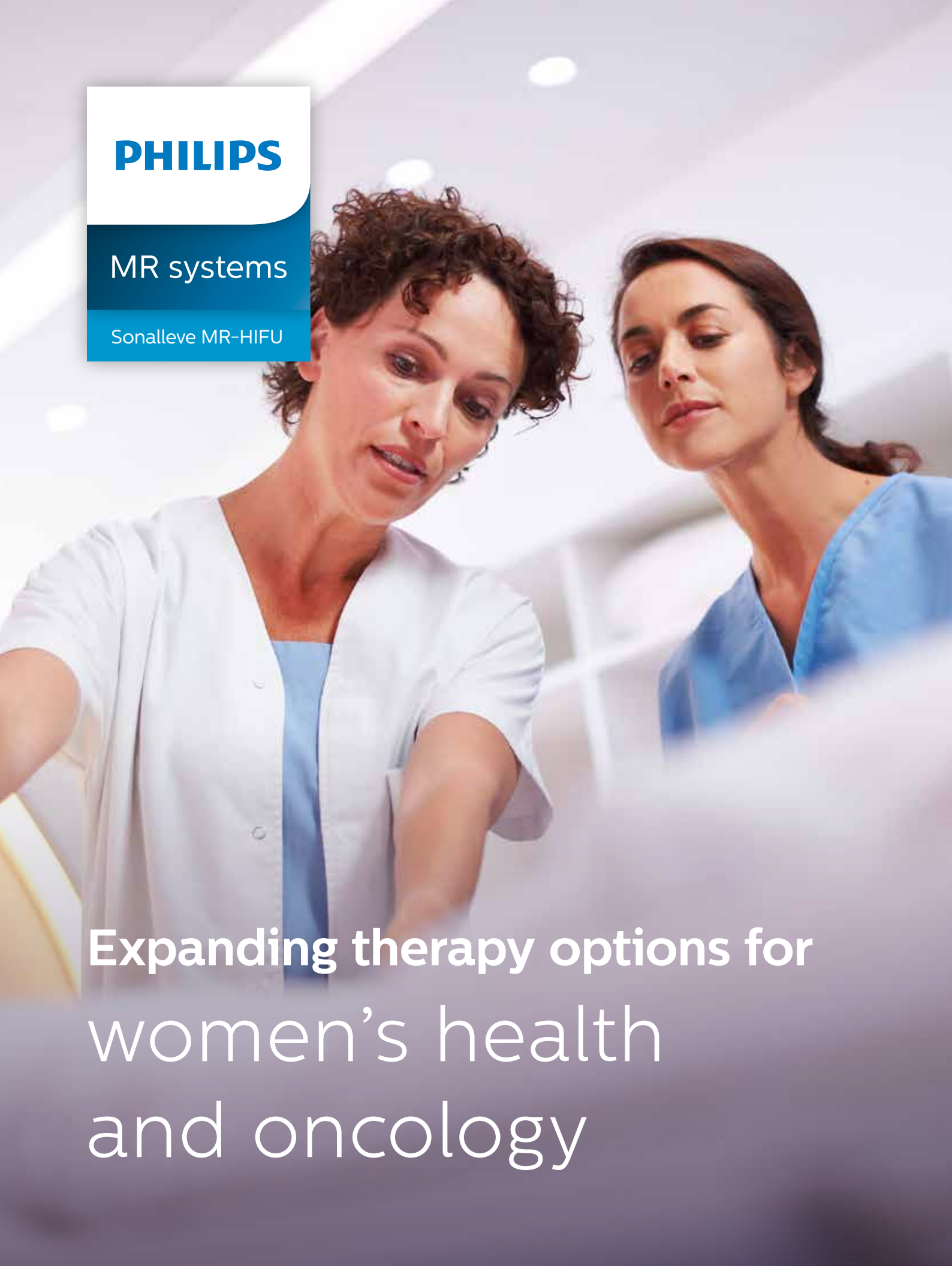


PHILIPS

MR systems

Sonalleve MR-HIFU

Expanding therapy options for women's health and oncology

Discover the freedom
of patient-friendly and non-invasive therapy options

Sonalleve MR-HIFU is an innovative therapy platform that integrates an advanced High Intensity Focused Ultrasound (HIFU) system into the patient table of Philips MRI systems.

This allows you to perform non-invasive HIFU therapy supported by advanced planning and temperature monitoring using MR imaging. Since 2010, healthcare providers have been relying on this platform to offer patients a non-invasive alternative to traditional surgical treatment for uterine fibroids.

As a physician, you want to provide innovative therapies that will improve patient health and well-being. We share the same goal. Philips Sonalleve MR-HIFU unlocks a new stream of patient-friendly, non-invasive therapy options. It offers new alternatives for conditions where current therapies come with significant side effects and for patients who may not tolerate an invasive procedure.

Sonalleve MR-HIFU is ready today for the treatment of uterine fibroids, adenomyosis, and palliative pain management of bone metastases. Offering a true alternative to current treatment options for these very prevalent conditions, Sonalleve MR-HIFU can make a real difference for the patient.

We're working closely with our clinical collaborators in exploring and expanding the application of MR-HIFU technology to other areas. These include the treatment of benign or malignant conditions of the prostate, female breast, or other organs, addressing the desire of patients for an effective but less invasive procedure.

"The most important thing is that patients want the procedure. I think that is a major push for our program. We have patients who ask for the procedure; they don't want surgery they want a non-invasive or minimally invasive procedure."

Prof. Dr. M. van den Bosch, interventional radiologist, University Medical Center, Utrecht, the Netherlands

Imaging and therapy
in one solution

Switch between diagnostic MR and HIFU therapy in minutes
HIFU is integrated in the dedicated Sonalleve table, which easily slides over the lowered MRI table. You don't need to move patients or remove the MRI table.

Help decrease patient length of stays
Some MR-HIFU procedures can be performed as an out-patient procedure, helping you decrease patient length of stays and the costs associated with them.

Provide extra patient comfort
The curved tabletop comes with various mattresses to comfortably support patients in different positions. You can also give patients peace of mind with Philips Ingenia's 70 cm gantry opening.

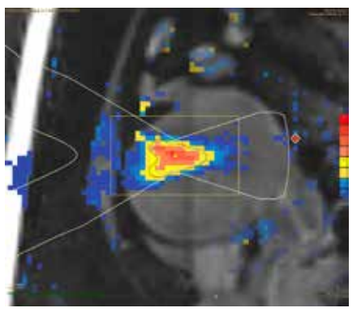
Support excellent results
Take advantage of top-notch positioning and signal to noise ratio (SNR) with dedicated imaging coils. They're integrated in the Sonalleve tableand designed for human pelvic and abdominal/body therapy applications.

A smart combination
Philips Sonalleve MR-HIFU combines the advantages of a HIFU system with the superb imaging of Philips MRI systems. You're empowered to perform non-invasive HIFU therapy supported by advanced planning and temperature monitoring using MR imaging.

High Intensity Focused Ultrasound…
HIFU therapy uses a focused transducer to bundle ultrasound energy into a small volume at the target locations inside the body. During treatment, the ultrasound energy beam passes through the intact skin and soft tissue, causing localized high temperatures only in the focus area. The skin and intermediate tissue are left unharmed. Within a few seconds this produces a well-defined region of coagulative necrosis.

… combined with MR image guidance
Only Magnetic Resonance Imaging (MRI) can measure temperature changes within the human body non-invasively, just by imaging. 3D MR images provide the anatomical reference data for treatment planning, while real-time temperature sensitive images are acquired during ablation to provide real-time information about treatment progress and monitor critical anatomical structures.

MR imaging based temperature map shows realized temperature during treatment of a uterine fibroid in real time.



Sonalleve in action

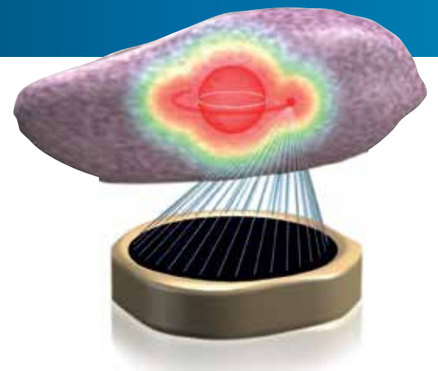
Volumetric ablation with feedback

Efficient ablation and short treatment times don't need to be mutually exclusive. Sonalleve MR-HIFU uses a quick-moving ultrasound beam as well as monitoring based on real-time temperature-sensitive MR images. These are incorporated into a feedback loop to create a uniform temperate distribution.

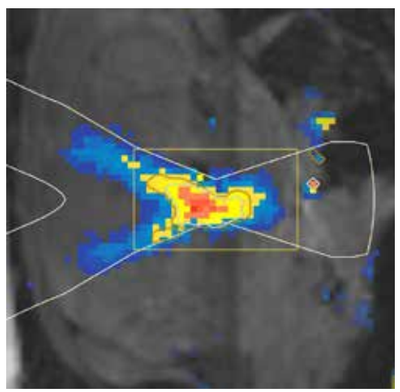
Volumetric heating
The focused ultrasound beam is rapidly scanned over the volume to be ablated. Ellipsoidal ablation volumes can be adjusted up to 16 mm wide and 40 mm long, leading to a macroscopic ablation zone within seconds. Large target volumes are covered with multiple heating events.

Real-time feedback
During treatment, the MRI scanner acquires temperature-sensitive images to monitor local heat distribution and identify critical structures that must not be subjected to heat. The temperature information is used to automatically enhance HIFU delivery parameters, thus creating a feedback loop based on real-time temperature monitoring. This is essential to keep treatment times short while maintaining high-quality care throughout the procedure.

Homogeneous heating
With real-time feedback the system can compensate for local variations in tissue properties, such as inhomogeneous absorption, attenuation, perfusion, and diffusion. Otherwise, these variations can lead to local overheating or insufficient heating. While overheating could pose undesired effects and in addition would lead to increased treatment time, insufficient heating, e.g. near cooling vessels, could potentially leave tissue unablated.



Volumetric heating with feedback creates large yet controlled ablation zones (schematic representation)



Thermal map of 12 mm cell in uterine fibroid therapy

Direct Skin Cooling and **treatment efficiency**

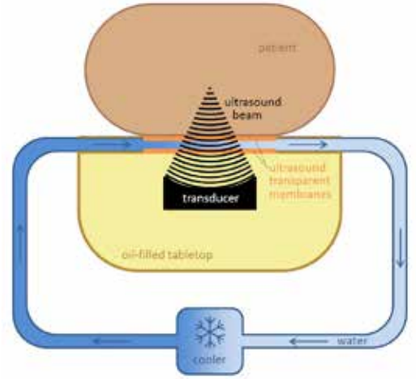
Treatment efficiency is limited by heat accumulating in the skin as well as subcutaneous fat and muscle tissue. Sonalleve MR-HIFU introduces active skin cooling to substantially reduce cooling times between heating events, shorten treatment times, and enhance patient comfort.

DISC – Direct Skin Cooling
The patient's skin over the ultrasound window is kept at a constant temperature of about 20°C. The window in the table is equipped with a double membrane, and cooled water is circulating in-between, providing an efficient heat sink and constant temperature to the patient's skin. To enhance cooling efficiency, patients are positioned directly onto the membrane. Most patients won't require a gel pad.

DMT – Dual Mode Thermometry
Sonalleve offers full workflow integration of a novel fat tissue thermometry based on T2 weighted MR imaging. It is measuring cumulative heating over the whole treatment duration combined with the established Proton Resonance Frequency Shift thermometry for target heating.

Treatment that's efficient as possible
With Direct Skin cooling and Dual Mode Thermometry the system suggests cooling times between heating events that both enhance treatment efficiency and help reduce the likelihood of an adverse event (such as skin lesions). By substantially reducing cooling times, Sonalleve with DISC and DMT minimizes one major contributing factor to the total treatment time.

Good for patients, good for workflows
Patients and caregivers have told us how much they appreciate the cooled skin contact. Fast and easy positioning without a gel pad along with overall reduced treatment are also highlighted again and again.



Constant temperature by design

"As far as my colleagues and I are concerned, HIFU is a fairly important part of our practice. In our opinion, this is a novel step to tumor ablation; it is completely MRI-guided, it allows temperature mapping, it is completely non-invasive and completely computer-controlled. You know exactly what you're doing."

Prof. Dr. M. van den Bosch, interventional radiologist, University Medical Center, Utrecht, the Netherlands

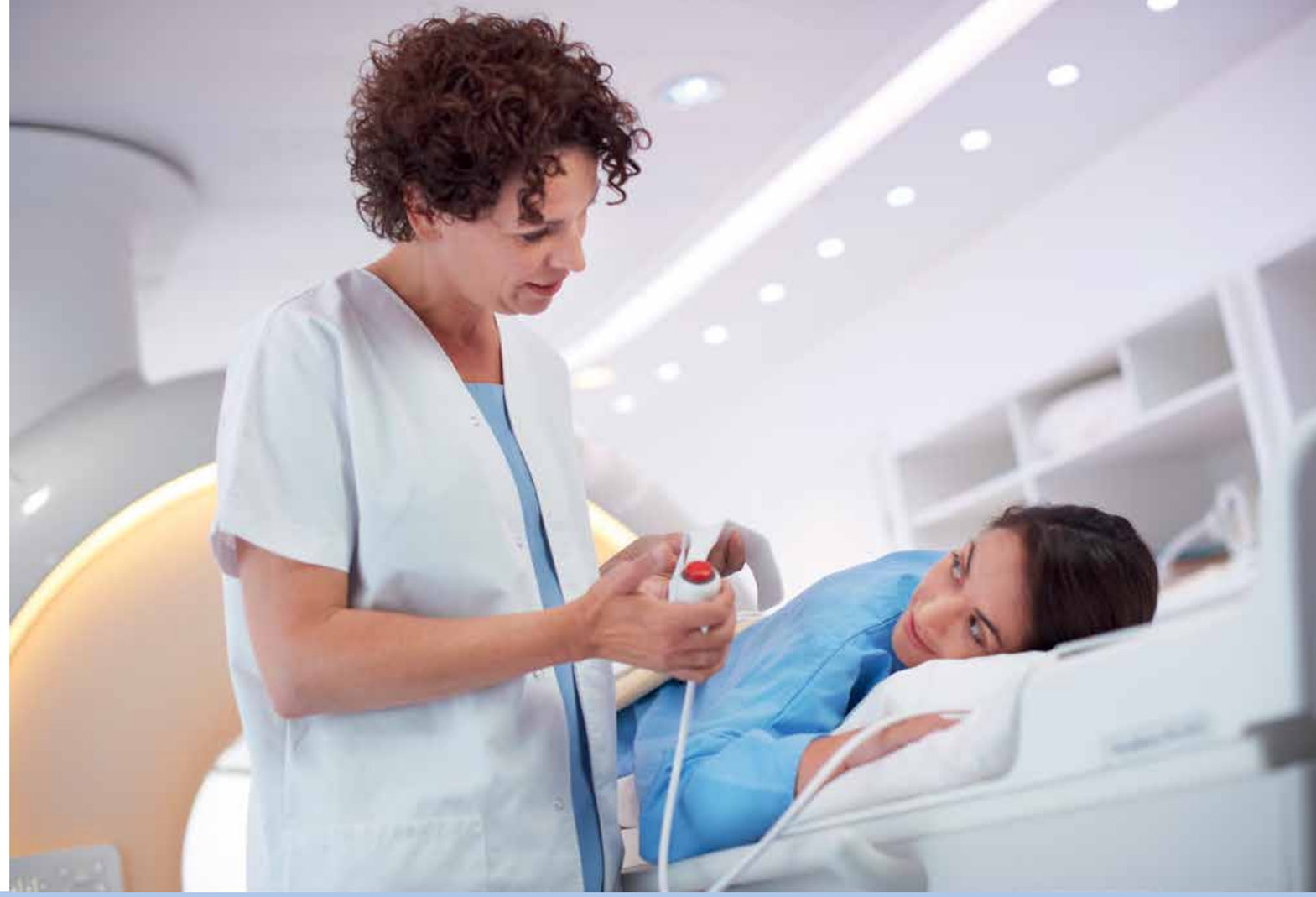
An excellent option from virtually any angle

Looking to improve your patients' quality of life? And expand your institution's therapy portfolio? Consider Sonalleve MR-HIFU. This exciting, innovative technology is patient-friendly, fast, and offers quick recovery for many procedures. And it's flexible enough to offer you a variety of non-invasive therapy options, now and in the future.

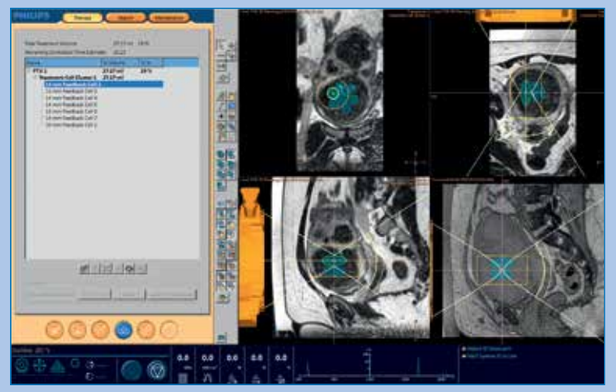
3-step guided workflow
Sonalleve MR-HIFU can be used in regular MRI suites. Your Philips MRI system can easily be upgraded with Sonalleve and you're able to switch between diagnostic and therapeutic use within a few minutes.

Perform a MR-HIFU procedure in three simple steps:

1. Therapy planning
   3D MR images with excellent soft tissue contrast are used to plan the procedure.
2. Non-invasive therapy
   High intensity ultrasound is focused onto the region of interest, which elevates its temperature and causes the tissue to coagulate. This process is monitored and controlled using real-time MR temperature sensitive images which provide feedback during ablation.
3. Therapy verification
   MR imaging is used to assess the procedure.



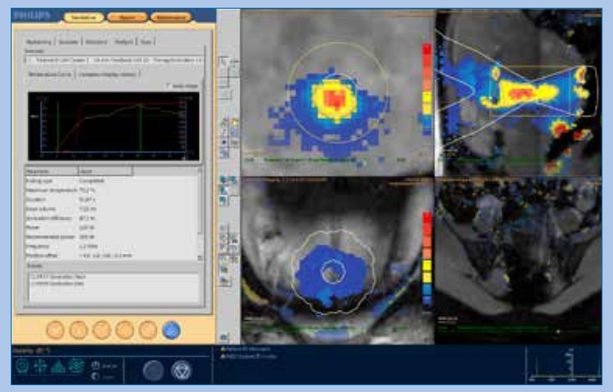
Therapy planning: 3D MRI
The procedure is planned and executed via the separate Sonalleve therapy console. Once the initial 3D MRI planning images are taken, the entire procedure is planned using the extensive 3D planning software on the Sonalleve therapy console. This includes determining the geometry of the ablation volume and heating patterns, as well as the position of all the monitoring slices to guide the procedure.



Easy and intuitive treatment planning based on 3D MR data sets

Non-invasive therapy: temperature maps
When you're carrying out the therapy plan, the Sonalleve therapy console directs the ultrasound transducer and its mechanical positioning. The therapy console also triggers the Philips MRI system to initiate acquisition of temperature-sensitive images which are used to monitor and guide the procedure. These images are displayed as temperature maps. The system provides temperature maps in six planes every three seconds to provide information about treatment progress and monitor critical anatomical structures.

Therapy verification: contrast-enhanced MRI
After the procedure, contrast-enhanced MR images are acquired to visualize the ablated, non-perfused volume. These images can be used to assess the lesion while the patient is still on the table.



Comprehensive overview along with the necessary details required for high-quality care

Clinical advantages
- Easy planning and treatment
- Highly focused volumetric ablation does not damage nearby tissue
- Real-time feedback enhances patient care throughout the procedures
- 3-step guided clinical workflow
- DIrect Skin Cooling and Dual Mode Thermometry for enhanced treatment efficiency

Patient advantages
- Fast, non-invasive therapy
- No surgery, no scars
- Most procedures can be performed on an out-patient basis with short recovery at home
- Patient receives no ionizing radiation
- Procedure can be repeated if needed

Economic advantages
- Out-patient procedures
- Easy switching between diagnostic and therapeutic use of the MR scanner
- Single-vendor solution: HIFU and MR both provided by Philips
- Enables facilities to expand therapy services
- Can help decrease patient length of stays and the costs associated with them

The Philips Sonalleve MR-HIFU therapy system or some of its applications are not for sale in certain countries. To determine availability in your area, please contact your local Philips representative.

This material is not intended for distribution in the U.S.A.

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