NorMIT
Norwegian Centre for Minimally Invasive Image Guided Therapy and Medical Technologies

This issue's research qoute:

«If at first you don't succeed search, search again. That is why we call it research»

-unknown-

NEWSLETTER

SMIT 2021
September 22-24, Oslo, Norway

Oslo University Hospital
The Intervention Centre

OUS Rikshospitalet (photo: Anders Bayer)

Welcome to the 33rd Annual SMIT Conference

Synergies between Healthcare and Technology

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The Intervention Centre, Oslo University Hospital is hosting the 33rd Annual SMIT Conference at the 22nd - 24th of September 2021.

All the NorMIT partners NTNU, SINTEF, St.Olavs Hospital, Oslo University Hospital and University of Oslo are well familiar and have a long history with the iSMIT association and the SMIT conference. Several of the employees in Trondheim and Oslo are members and have had representation in the board since the late 90s, and both have earlier been host of the annual conference.

The 33rd SMIT Conference will have a special focus on topics such as Hybrid Operating rooms, Artificial Intelligence, Innovation in Healthcare, Minimally Invasive Therapy and Intervention, Value-based Healthcare, Robotic Surgery and Automation, Surgical Navigation and Visualization and Health Technology for Third world countries. SMIT2021 will this year also have a special session where NorMIT will be responsible for the content.

iSMIT is cross- and inter-displinary in its nature with an aim to bring together doctors and engineers with a special interest in medical technology and minimally invasive therapy. The conference also strives to bring industry and researchers from both medical and technological disciplines together with the aim to give the industry an excellent showcase of the latest research, knowledge and products within the field of minimally invasive therapy to national and international stakeholders.

This year, conference will be held at Radisson Blu Scandinavia Hotel in Oslo. SMIT2021 Conference will offer workshops and live streaming from our advanced hybrid-ORs at The Intervention Centre at Oslo University Hospital with possibilities for hands-on experiences.

Due to the ongoing COVID-19 pandemic the SMIT2021 Conference will be held as a physical conference combined with an online conference that allows for both in-person and remote delegates to attend. This dual-solution makes SMIT2021 more resilient to potential changes in official health advice and government-imposed restrictions, as well as being a more inclusive conference for attendees that cannot attend in person due to other reasons.

Check out the webpage of SMIT2021: www.smit2021.com

Call for abstracts is already open with a set deadline for submission on the 18th of April, 2021.

We look forward seeing you in Oslo !

On behalf of SMIT2021 organizing committee:

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Researchers at St. Olav's Hospital and NTNU are leading the development of navigation-guided injection of botulinum toxin as a treatment option for treatment-resistant headaches

To the left: Professor Erling Tronvik In the middle: research nurse Irina Aschehoug
To the right: Neurosurgeon Sozaburo Hara

Erling Tronvik is a neurologist and professor at St. Olav's hospital and NTNU. Sphenopalatin ganglion is a nerve knot deep in the face that is suspected to be involved in provoking seizures in cluster headaches. In 2012, an attempt was made to anesthetize this with local anesthesia via the nose of a patient with a severe cluster headache that had no effect of traditional treatment. The effect was short-lived, and Tronvik's group got the idea to try botulinum toxin to inhibit the nerve signals in a way that gave a more long-lasting effect.

The challenge was to get to the nerve node without having to undergo extensive surgery. The goal was to develop an instrument that could control a needle with great accuracy and inject the botulinum toxin directly into the nerve node. An instrument, MultiGuide, an advanced syringe was developed, which connected to a navigation system could perform the task.
We started with this instrument in the operating room, where we went through the nose, with the patient under anesthesia," says Tronvik. "Eventually, we developed the technique so that we could finally perform the injection through the cheek under local anesthesia," he continues.

«The establishment of FOR-NorMIT made it possible for us to acquire navigation equipment that allowed the treatment to be moved out of the operating room and into a doctor's office, and where we, as the first in the world, could publish the first experiences.

The first article we published was the most downloaded from international headache magazines in the last five years, "says Tronvik. This contributed to Tronvik's group receiving more research funding and building on this project.

Clinical studies

As of today, three prospective, randomized studies are underway, one of which is now in the closing phase.

Tronvik's group is collaborating with researchers in London, Valencia, and Milan on a prospective, blinded and randomized study that includes 112 patients with cluster headaches. Here, the Norwegian researchers provide training for the surgeons at the international partners, and travel around with the navigation system in their luggage. An additional navigation system is high on the wish list to simplify everything.
In Norway, a study is underway that includes 170 patients with chronic migraine. The study is funded by Klinforsk and there are four participating centers. In addition to St. Olav's Hospital, these are Oslo University Hospital, Haukeland Hospital in Bergen and Nordland Hospital in Bodø.
In collaboration with the Department of Oral Surgery at St. Olav's Hospital, a study is being conducted in which the effect on atypical facial pain is investigated.
A pilot study on patients with chronic sinusitis in collaboration with the ear-nose-throat department at St. Olav's hospital has been completed and will soon be ready for publication.
Another nerve node, ganglion oticum, has for the first time been blocked by Tronvik's group.

Development of new procedures

At the neurological outpatient clinic, a separate room has been made available, which is shared by St. Olav's hospital and NTNU. New procedures are being developed here that require navigation outside the operating room. The goal is to standardize this type of precision instrument in a new setting. Without access to this type of navigation equipment, this would not be possible. New methods and techniques are tested on models before the testing is carried out on humans.

The treatment and methods used are still to be considered experimental until the ongoing studies have been completed and the results evaluated.

The future

If these studies come out positive, many patients with severe, treatment-resistant headaches will experience a completely new everyday life. This type of high precision will become more common in the future, and can be used to extract biopsies of tumors, and take samples without opening surgically. In the future, navigation technology may also be used to drain cysts inside the body, place sensors and electrodes with high precision into internal organs and deposit drugs in the target organs. This can to a greater extent be performed in an ordinary doctor's office, without burdening the operating rooms.

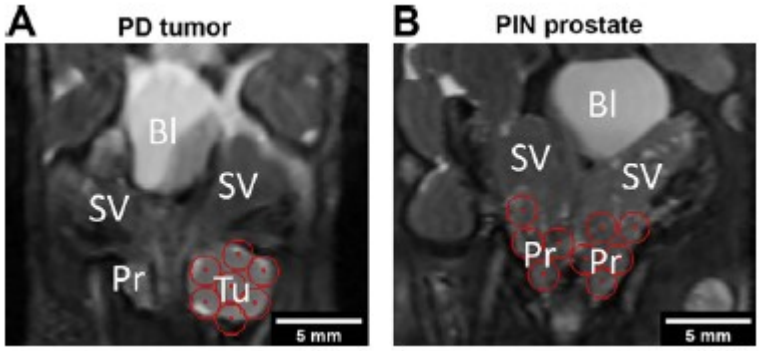
Brainlab Kick Optic Image Guided Surgery System

Book at www.normit.no

MRI-guided ultrasound treatment in mice

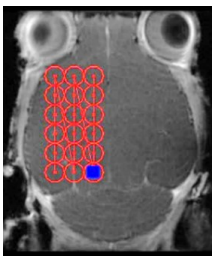
Professor Catharina de Lange Davies, NTNU, Department of Physics

Ultrasound in combination with intravenously injected gas filled microbubbles is shown to improve the tumour uptake of various therapeutic agents such as drugs and nanoparticles in preclinical studies in mice. At NTNU, Department of Physics, we have shown increased tumour uptake of drugs and drug-loaded nanoparticles in tumours growing subcutaneous in mice and the tumour growth was reduced. Next, we wanted to study if we could obtain similar promising results using a clinical more relevant tumour model. We used transgenic mice that spontaneously develop tumours and malignant cells in the prostate. To localize and treat the tumours, MRI-guided focused ultrasound was used. This instrumentation is available through the infrastructure MIT. The results showed large variations among the tumours treated with focused ultrasound in the presence of microbubbles and the nanoparticles loaded with the drug cabazitaxel or treated with the free drug. A larger study is needed, and it is important to understand the reasons for the variations in therapeutic response to optimize and stratify the treatment. However, this is the first study using mice that spontaneously develop prostate tumour to investigate the therapeutic effect of drugs in combination with ultrasound and microbubbles. The study was recently published in Ultrasound in Medicine and Biology 46, 3032-3045, 2020.

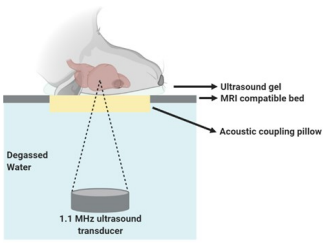


MR images show the prostate with either a well defined tumour (left) or more scattered cancer cells (right). The red circles illustrate where the focused ultrasound was directed. Pr= prostate, SV=seminal vesicle Bl=urine bladder, Tu=tumour

The blood-brain barrier limits the delivery of therapeutic agents to brain tissue, making it difficult to treat various diseases in the brain such as cancer and Alzheimer's disease. Ultrasound in combination with microbubbles has been shown to open the blood-brain barrier temporary and safe. At NTNU, Department of Physics, we have also found that ultrasound and microbubbles increased the permeability of the blood-brain barrier allowing nanoparticles to enter brain tissue. Next, we wanted to study whether nanoparticles targeting the endothelial cells forming the capillary wall would enhance the uptake of the nanoparticles in brain tissue after exposure to focused ultrasound in the presence of microbubbles. MRI-guided ultrasound was used to localize where in the brain we should open the blood-brain barrier. This instrumentation is available through the infrastructure MIT. Nanoparticles binding to the endothelial cells demonstrated a somewhat higher uptake in brain tissue than non-target nanoparticles after treatment with MRI-guided ultrasound and microbubbles. This is new findings, not previously reported and will very soon be published in Ultrasound in Medicine and Biology.



MR image of the brain. The red circles illustrate the ultrasound treated area.

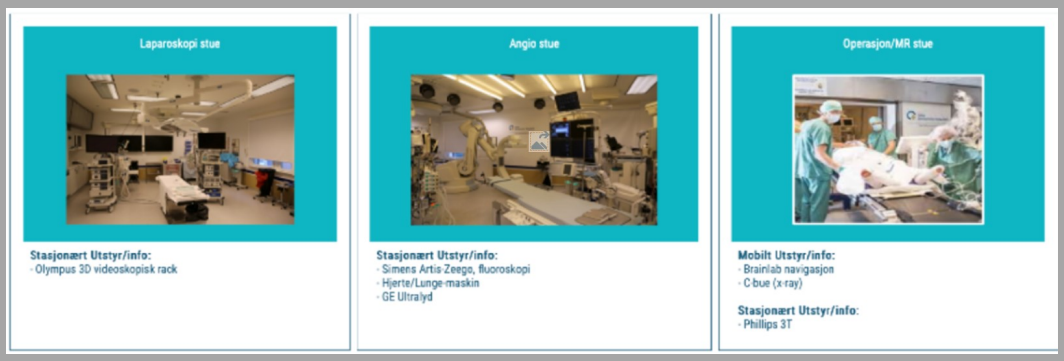


The position of the mice in a «bed» to be placed in the MR scanner, and the ultrasound transducer.

NorMIT infrastructure

Trondheim

Oslo



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