Research Project

Name of Institution and department:

University Hospital Zurich (USZ) – Institute for Diagnostic and Interventional Radiology, Breast Imaging Section

Link to website:

https://www.usz.ch/fachbereich/diagnostische-interventionelle-radiologie/angebot/mammographie/

City and Country of Institution: Zurich, Switzerland

RESEARCH GROUP

Brief description of the research group and of its mission:

The Breast Imaging Unit at the Institute for Diagnostic and Interventional Radiology, University Hospital Zurich (USZ), is a world-leading center for advanced multimodal breast imaging. USZ holds a unique position as the first institution worldwide to operate a dedicated spiral breast CT (Mamma-CT/dBCT) in routine clinical practice, and the first in Switzerland to offer automated breast ultrasound (ABUS). The unit applies a comprehensive multimodal and multidisciplinary approach, offering the full spectrum of breast imaging modalities: standard digital mammography (MG), digital breast tomosynthesis (DBT), contrast-enhanced mammography (CEM), dedicated breast CT (dBCT), handheld and automated breast ultrasound (ABUS), and breast MRI with multiple protocol types including dynamic contrast-enhanced and ultrafast sequences performed in under six minutes. AI-based software is integrated into clinical routine for breast density assessment and diagnostic support. The unit works in close interdisciplinary collaboration with the Department of Gynecology and Pathology through weekly multidisciplinary tumor board (MDT) meetings and performs a high volume of image-guided breast biopsies across all guidance modalities, including stereotactic vacuum-assisted, MRI-guided, and ultrasound-guided core and vacuum biopsies. The mission of the unit is to deliver evidence-based, personalized breast imaging care, to train the next generation of breast imaging specialists, and to generate internationally significant scientific evidence on the comparative performance and clinical utility of advanced breast imaging technologies.

TITLE OF PROPOSED RESEARCH PROJECT

Cross-Modality Correlation in Advanced Breast Imaging: A Comparative Analysis of Mammography, Digital Breast Tomosynthesis, Contrast-Enhanced Mammography, Dedicated Breast CT, and Multiprotocol Breast MRI

OBJECTIVES

- To perform a systematic retrospective cross-modality comparison of imaging findings across mammography (MG), digital breast tomosynthesis (DBT), contrast-enhanced mammography (CEM), dedicated breast CT (dBCT), and multiprotocol breast MRI – including ultrafast and standard dynamic contrast-enhanced protocols – assessing the concordance and correlation of lesion characterization, breast density assessment, and diagnostic classification across modalities.
- To evaluate the incremental diagnostic value of each advanced modality (CEM, dBCT, ultrafast MRI) over standard techniques (MG, DBT), with particular focus on cases of discordant findings between modalities, identifying imaging scenarios in which specific advanced techniques offer clinically meaningful benefit for lesion detection and characterization.
- To synthesize cross-modality findings into a peer-reviewed manuscript, with the primary goal of submission to an international journal within or after the 3-month fellowship period

APPLICANT'S DUTIES

- Systematic retrospective case review of patients who underwent imaging with two or more advanced breast imaging modalities (CEM, dBCT, multiprotocol MRI) at USZ, with structured collection and coding of imaging findings, BI-RADS classifications, and histopathological outcomes under the supervision of the project leaders.
- Cross-modality correlation analysis comparing lesion detection, characterization, and breast density assessment across MG, DBT, CEM, dBCT, and breast MRI protocols, with contribution to statistical analysis, data interpretation, and manuscript preparation as a co-author of the resulting peer-reviewed publication.
- Active participation in the daily clinical workflow of the Breast Imaging Unit, including supervised engagement with all advanced modalities (dBCT, CEM, ultrafast MRI, ABUS), attendance at the weekly MDT jointly held with the Department of Gynecology and Pathology, and observation of image-guided breast biopsy procedures (stereotactic vacuum-assisted, MRI-guided, and ultrasound-guided).

APPLICANT'S BENEFITS

- Co-authorship on a peer-reviewed publication.
- Hands-on clinical exposure to the full spectrum of breast imaging modalities in one of the world's most comprehensively equipped breast imaging departments – including the only dedicated breast CT (Mamma-CT) in worldwide routine clinical use, the first ABUS system in Switzerland, CEM, ultrafast MRI, DBT, and handheld ultrasound – as well as experience with AI-based density software integrated into daily clinical routine.
- Immersion in a high-volume interdisciplinary clinical environment, including weekly MDT meetings jointly held with the Department of Gynecology and Pathology, direct involvement in image-guided breast biopsies across all guidance techniques, and exposure to a broad spectrum of breast pathology in a leading tertiary referral center.

- Project Leader:
  Dr. med. Malwina Kaniewska-Pelczar, Senior Attending Radiologist, Head of Breast Imaging, Institute for Diagnostic and Interventional Radiology, University Hospital Zurich;
  and Prof. Dr. med. Thomas Frauenfelder, Institute Director, Institute for Diagnostic and Interventional Radiology, University Hospital Zurich

- Members:
  Breast section research team including:

  Thomas Frauenfelder, Institute Director
  Malwina Kaniewska, Senior Attending Radiologist
  Ela Ünal, Attending Radiologist
  Lisa Jungblut, Attending Radiologist
  Laura Löbelenz, Attending Radiologist
  Elizabet Nikolova, resident physician
  Mara Thut, resident physician
  Lara Korda, resident physician
  Jonathan Sänger, resident physician
  Jasmin Happe, resident physician
  Fabienne Fancellu, doctoral thesis candidate
  Denise Bos, research staff member
  Davide Cester, physicist
  Catherine Paverd, research staff member