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From Bore To Roar:
Our 1-year Journey with InBore

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The end of 2016:

- First Surface guidance camera was installed with our Varian Truebeam Edge

2017-2018:

- Stereotactic brain tumor treatment
  → With CBCT/kV
- Later, including body stereotactic and curative non-stereotactic brain tumor treatments

2019:

- Installing new Truebeam STx with AlignRT.
- Two Linacs for stereotactic treatments
- Treatment of extremities

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2020:

- Idea of replacing the RPM system with VisionRT
  → Deep Inspiration Breath Hold -breast cancer treatments

2021:

- DIBH treatments with AlignRT
- Integrating surface maps for other treatments (prostate, head and neck, lung…)

2022:

- Operating in two premises
- All linacs are included with the AlignRT system.
- SimRT & InBore as new systems

2023 (& 2024):

- Surface guidance is utilized in all treatments and in all LINACs.
  →Newly implemented workflow
- Training session for InBore system (January 2023)
- Installation of SimRT system to CT
  - Operational at the end of 2023
- Tattoo-free unit from the start of 2024

The Radiotherapy In Oulu Today

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Radiotherapy in Oulu today and before

Oulu's vision of SGRT

Journey with InBore

Future Plans

The Radiotherapy In Oulu Today

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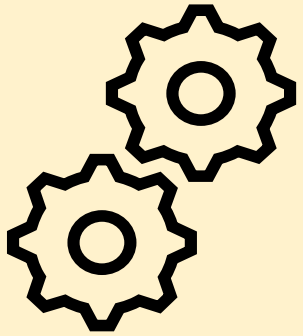
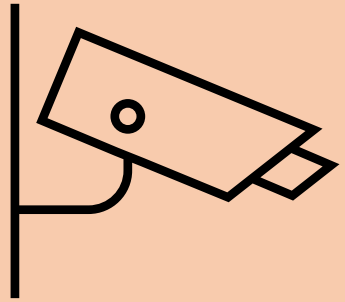


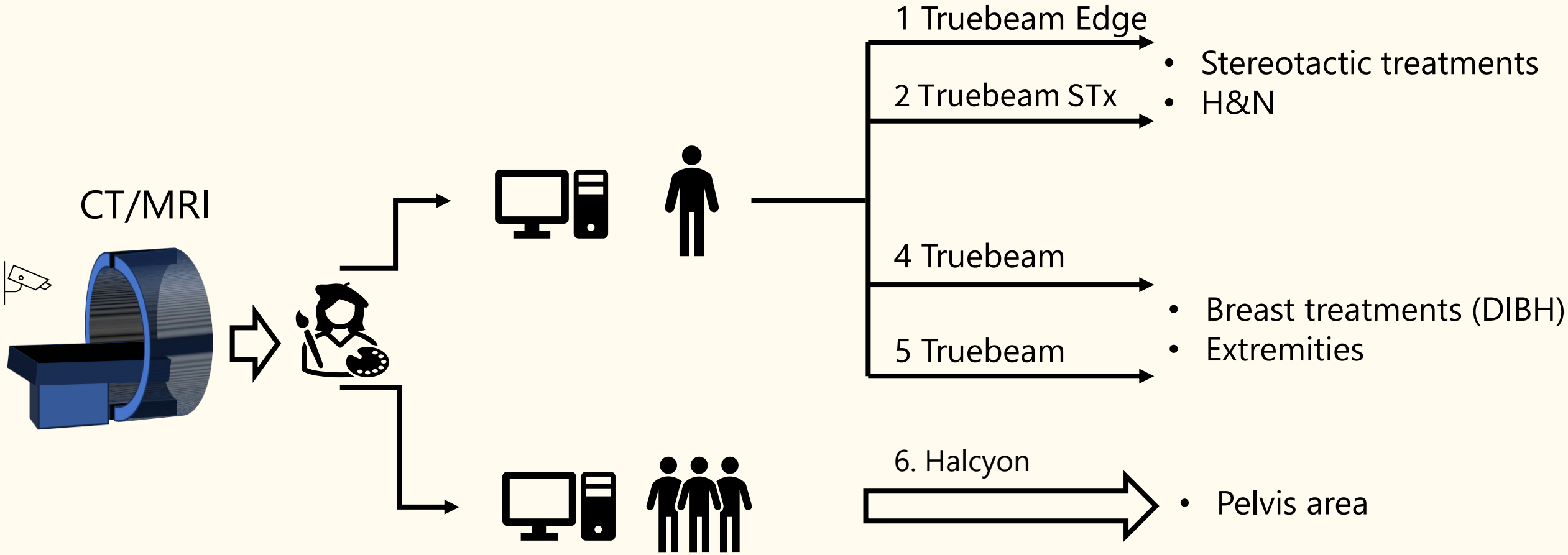
- TrueBeam Edge
- Truebeam STx
- TrueBeam x2
- Halcyon
- Bravos
- Option for 1 Linac

- Siemens Somatom GoOpen Pro
- Siemens Magnetom Vida 3T
- Siemens Biograph mCT



- AlignRT x 4
- AlignRT InBore
- SimRT

Workflow in Oulu



Our vision with Surface-guided radiotherapy

- SGRT is a modern way to give radiotherapy [1,2]
  - Great continuum for Image-guided workflow
  - Increased positioning accuracy [3,4]
  - Accurate tool for detecting blind movements for the human eye
  - Potential to decrease radiation dose and treatment time
  - Possibilities for tattoo- and mask-free treatments

- Our motivation:
  - Similar work environment and workflow in all LINACs
    → Rotating staff and maintaining high skill-level
  - The role of surface guidance as tattoo-free unit
  - Years of experience with postural video

[1] Al-Hallaq HA, Cerviño L, Gutierrez AN, et al. AAPM task group report 302: Surface-guided radiotherapy. *Med Phys*. 2022; 49: e82–e112. https://doi.org/10.1002/mp.15532
[2] Freislederer P, Batista V, Öllers M, et al. ESTRO-ACROP guideline on surface guided radiation therapy. *Radiother Oncol*. 2022;173:188-196. doi:10.1016/j.radonc.2022.05.026
[3]Rudat V, Shi Y, Zhao R, Xu S, Yu W. Setup accuracy and margins for surface-guided radiotherapy (SGRT) of head, thorax, abdomen, and pelvic target volumes. *Sci Rep*. 2023;13(1):17018. Published 2023 Oct 9. doi:10.1038/s41598-023-44320-2
[4] Jursinic P, Jordan K, Chen C. Positions of radiation isocenter and the couch rotation center established by Winston-Lutz and optical measurements. *Tech Innov Patient Support Radiat Oncol*. 2022;21:46-50. Published 2022 Feb 17. doi:10.1016/j.tipsro.2022.01.004

VisionRT InBore

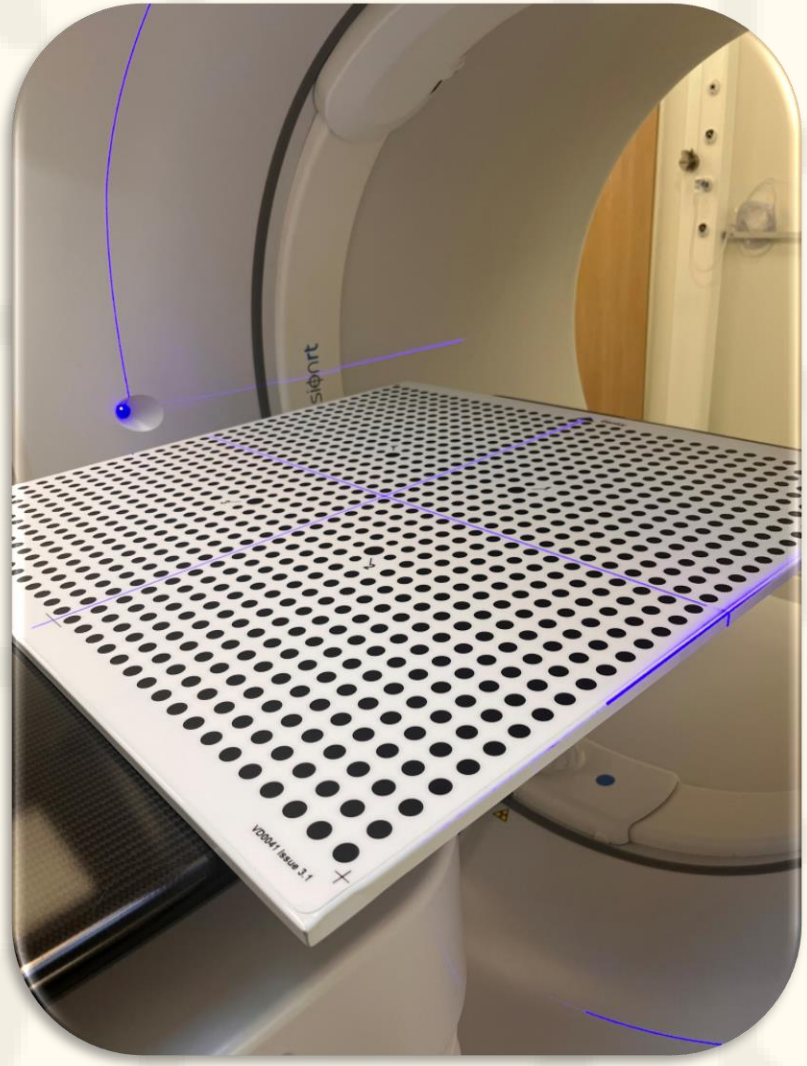
- Solution designed for bore-based linear accelerators
  - Ethos and Halcyon
- Two separated surface guidance camera setups:
  - Outside: Ceiling mounted AlignRT advanced camera pods
  - Inside: Bore-mounted ring camera
- Dual isocenter SGRT solution with 6DoF intrafraction monitoring
- Enables stereotactic and DIBH treatments with SGRT

Main benefits of the system:

- Does not interface with LINACs imaging system
- Low profile system
- Projectors are invisible for the patient
- Easy to detach/setup

Our experiences/opinions: Pros

- Software platform is the same as with other AlignRT systems → **EASY** to use, **EASY** to operate
- DailyQA is required everyday → **SIMILAR** to other AlignRT systems
- InBore allows monitoring patient during the treatment → **CLEAR** view of the patient compared to in-room cameras
- Postural video helps patient setup → **ACCUSTOMED** workflow
- Easy to detach/install during maintenance → **USER FRIENDLY** system, takes couple minutes
- Does not affect CBCT scans → **LOW PROFILE** system
- System calibration is **SIMPLE** and **QUICK**



Our experiences/opinions: Cons and deficits

- Main concern occurs with missing automatic beam-hold technique
  - Can **LIMIT** potential treatments (we don't do DIBH treatments)
- The position of InBore is quite **SENSITIVE**
  - Contact with patients after the treatment, collision during DailyQA, the slight difference with the position after installation
- ACO has not worked
  - System calibration with raised plate, more **LABORIOUS**
- Are there **NOTICEABLE BENEFITS** with the system?
  - Our patient population is quite homogeneous (Pelvic area)

Our considerations: Our discoveries

- Quicker DailyQA → Scanning calibration plate with CT and creating a treatment plan
  - Allows semi-automatic measurement.
  - Used also for system calibration
- Quicker system calibration → Create surface map of the InBore ring with outside camera pods (Idea was invented in France)
  - Position the ring with the outlines, decrease the number of calibrations
  - Can also be utilized if there has been a collision with the ring camera
- Treatment view is utilized with all treatments
  - Better view of the patient, small movements are easier to detect.
- Designed patient population → Pelvic area treatments do not require beam-hold technique

Final words regarding on InBore

- **Pros:** Easy, similar, user friendly, clear, simple, quick & low profile
- **Cons:** Limited, Sensitive, Beneficial?

- Overall, In our minds, InBore has delivered as much as we hoped.
- The system has clear limits in its current state, and there is always the question of how it can benefit a radiotherapy unit.
- Monitoring small movements during the treatment and enabled postural videoing to help patient setup
  - Familiar workflow that we are used to and helps us in our tattoo-free path
- There is a great potential in the future
  - After Beam-hold is enabled, more treatments become available
- If we would now plan to invest in InBore system for our Halcyon, would we get it?
  - **Most definitely!**

Our future visions regarding on SGRT

- Beam-hold technique in InBore → Would allow DIBH treatments with Halcyon
  - Especially with our 5 x 5,2Gy breast treatments → No problems with collision, constant monitoring
- We are **NOT** interested in giving stereotactic treatments with Halcyon
- Implementing SimRT into our workflow
  - After numerous issues, the system is operational at the moment
  - Training sessions were during August 2023 and November 2023
- Reference site collaboration with VisionRT
  - First visit was in February 2024

Warmly welcome to Oulu!

Professionalism with a hint of northern craziness!

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