

Optimized use of MRI in a PSA-based prostate cancer screening program

Akademisk avhandling

Som för avläggande av medicine doktorsexamen vid Sahlgrenska akademien, Göteborgs universitet kommer att offentlig försvaras i Arvid Carlsson Salen, Academicum, Medicinargatan 3, Göteborg den 28 maj, klockan 13.00

av Jonas Wallström

Fakultetsopponent:

Professor Anders Magnusson

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Avhandlingen baseras på följande delarbeten

- I. Kohestani K, **Wallström, J**, Dehlfors N, Sponga O, Månsson M, Josefsson A, Carlsson S, Hellström M, Hugosson J. Performance and inter-observer variability of MRI (PI-RADS version 2) outside high-volume centers.
Scandinavian Journal of Urology 2019; 53:5: 304-311, DOI: 10.1080/21681805.2019.1675757
- II. **Wallström, J**, Geterud K, Kohestani K, Maier S, Månsson M, Pihl C-G, Socratous A, Arnsrud-Godtman R, Hellström M, Hugosson J. Bi- or multiparametric MRI in a sequential screening program for prostate cancer with PSA followed by MRI? Results from the Göteborg Prostate Cancer Screening 2 Trial.
European Radiology, 2021, DOI: 10.1007/s00330-021-07907-9
- III. **Wallström, J**, Månsson M, Axcróna U, Egevad L, Geterud K, Kohestani K, Maier S, Pihl C-G, Socratous A, Arnsrud-Godtman R, Hellström M, Hugosson J. Evaluation of contrast enhancement, lesion area and PSA density in selecting men with PI-RADS 3 lesions for biopsy. Results from the Göteborg Prostate Cancer Screening 2 Trial. *In manuscript.*
- IV. **Wallström, J**, Geterud K, Kohestani K, Maier S, Pihl C-G, Socratous A, Stranne J, Arnsrud-Godtman R, Månsson M, Hellström M, Hugosson J. Outcomes of repeated MRI after 2 years. Results from the Göteborg Prostate Cancer Screening 2 Trial. *Submitted.*

**SAHLGRENKA AKADEMIN
INSTITUTIONEN FÖR KLINISKA VETENSKAPER**



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Abstract

The overall aim of this thesis was to optimize different aspects of the use of MRI in screening for prostate cancer. *Paper 1* was based on preoperative MRI in a prostatectomy cohort. *Papers 2-4* were based on data from the ongoing Göteborg Prostate Cancer Screening 2 Trial, a randomized, population-based, long-term trial assessing screening with PSA followed by MRI in men aged 50-61 years in Gothenburg and surrounding municipalities. Biopsies were used as the reference standard.

In *Paper 1* three non-expert readers retrospectively assigned PI-RADSv2 scores in MRI performed at multiple sites. A fair to moderate reader agreement (k-score 0.41) and slightly lower tumor detection (overall 70%) compared to previous reports highlights the importance of a quality assurance program. In *Paper 2* cancer detection with bpMRI was compared with mpMRI in a prospective, paired diagnostic study. Bi-parametric MRI was non-inferior to mpMRI and should be considered the method of choice as it also reduces room turn over time and saves healthy men exposure of gadolinium contrast agents. In *Paper 3* a retrospective analysis of men with peripheral zone PI-RADS 3 lesions was performed. Multivariable regression models were built to assess contrast enhancement, lesion size and, PSA density (PSAD) as predictors of cancer. Only PSAD was strongly correlated to cancer. Selecting men for biopsy based on PSAD could potentially help significantly reduce the number of biopsies but data was not sufficient to establish a clinically reliable threshold. In *Paper 4* PRECISE scores were retrospectively assigned in a 2-year MRI follow-up of men with first-round negative MRI or positive MRI with negative biopsies. Few men were diagnosed with cancer in the second round and most MRI lesions were of stable appearance. This provides important safety data in support of a follow-up interval of at least 2 years.

Keywords: MRI, prostate cancer, screening