

09-12-2010  
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## Voorstel MDO-opdracht Opleiding Technische Geneeskunde Universiteit Twente

### A. Algemeen

1. Titel MDO-opdracht:

MR guided Laser Thermal Ablation and Treatment Planning in Patients With Prostate Cancer

2. Gegevens instelling/indiener:

Naam indiener:

Jurgen J. Futterer

Instelling/afdeling:  
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Medisch begeleider:  
Dr. J.J. Futterer

Technologisch begeleider (UT):  
Dr. Ir. S. Misra

### B. Faciliteiten

1. Welke faciliteiten zijn nodig voor een adequate uitvoering van de vraagstelling?

Frequent discussion with all partners (dept. of Radiology, clinical physics, and Faculty of Electrical Engineering, Mathematics, and Computer Science).

2. Wat zijn daarbij mogelijke risico's voor de voortgang van de opdracht?

None.

### C. Overige opmerkingen

#### **D. Inhoudelijke informatie MDO-opdracht**

Prostate cancer is a major health issue in aging men. No treatment is required in less aggressive prostate cancer but there is consensus that radical treatment is needed in aggressive prostate cancer. Radical treatment has to start while the tumor is still confined to the gland and has not spread beyond. Potential side effects of radical treatment, such as impotence and incontinence, have a substantial impact on quality of life. Most commonly used radical treatment options are surgery and radiotherapy. Surgical treatment has, besides the immediate operative morbidity, long-term side effects like erectile dysfunction (54-70%) and incontinence (35-46%). Focal therapy for prostate cancer is a nascent treatment strategy. Maximizing cancer control and minimizing morbidity (e.g. urinary continence and potency) is its main goal.

Focal laser ablation is a relatively new technique which was originally developed to treat brain tumors. During this therapy a laser fiber is positioned into the tumor under MRI guidance. When the position of the fiber is correct, laser light is delivered through the fiber and the temperature of the tissue around the tip of the fiber increases. When temperature increases above 60°C the tissue is irreversibly damaged and destroyed. The total ablation process takes about 3 minutes.

Prostate tumors vary in size and location. Ablation of tumors near the neurovascular bundle may result in impotency. Therefore, accurate determination of the laser ablation effect is very important. Until now, there is no information of the actual laser ablation effect in human prostate cancers. Before applying this technique in patients, this effect has to be determined. A simulation model could be developed to simulate and assess the ablation effect in the prostate. The simulation model should take into account: tissue properties such as heat capacity, heat conduction, blood flow and tissue temperature. This would be of great value for the patient because based on this simulation model the physician can plan a tailored treatment for the patient and minimizing the risk of complications.

Assignment:

The purpose of the assignment is the development a model for MR guided of laser ablation in prostate cancer patients. This model will aid in the determination of the amount of laser power and exposure time needed for prostate tumor ablation.

#### **Ondertekening:**

Datum: 19-01-2011  
Naam indiener: Jurgen Fütterer

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