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Engineering precision surgery: Design and implementation of surgical guidance technologies

Oosterom, M.N. van

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Author: Oosterom, M.N. van

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Propositions belonging to the dissertation:

ENGINEERING PRECISION SURGERY

DESIGN AND IMPLEMENTATION OF SURGICAL GUIDANCE TECHNOLOGIES

1. A combination of radio-guided and fluorescence-guided surgery provides a unique hybrid methodology, exploiting 'best-of-both-worlds' with 3D insight of the lesion location (i.e. radio-guidance), while providing real-time and high-resolution visualization during surgical excision (i.e. fluorescence-guidance). *This thesis.*
2. Integration of radioguided surgery with (robot-assisted) laparoscopic surgery helps to localize preoperatively marked lesions. *This thesis.*
3. Navigation has a lot of potential for surgical applications, but should currently always be combined with real-time imaging modalities when applied for soft-tissue anatomies. *This thesis.*
4. Navigation procedures do not replace the surgeon's expertise, but rather improve the procedural accuracy and efficiency by increasing insight in the disease and the anatomies critical for surgery. *This thesis.*
5. Performing surgery solely based on fluorescence guidance is not enough to localize lesions in unknown locations, making preoperative imaging a must. *Adapted from Meershoek et al., J Nucl Med 2019, ePub ahead of print.*
6. Combining the ability of lymphatic mapping to identify micrometastases (<2 mm) with tumor-targeted approaches that pinpoint the location of macrometastases (>2 mm) could provide superior identification of tumor-infiltrated lymph nodes. *Van Leeuwen et al., Nature Rev Urol 2019; 16: 159–171.*
7. In order to continue advancing the hybrid surgical guidance approach, multi- and interdisciplinary teams of basic researchers and surgeons will have to collaborate together, moving forward advances in the optical, (radio-)chemical and engineering fields, to produce new chemical and engineering solutions that will be readily translated into standard surgical procedures. *Adapted from Gambini and Quinn, Clin Transl Imaging 2016; 4:343–351.*
8. The best surgeons armed with the best technology - that they are comfortable with - will achieve the best outcomes for their patients. *Dasgupta and Murphy, BJU Int 2016; 118: 341.*