

Extended Abstract

The potentials for hands-free
interaction in micro-neurosurgery

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Abstract

From the first moment in diagnosis process to the last step of treatment, medical technologies empower practitioners to conduct a successful process. Practitioners, as the main role in this process are the end users of these technologies. In decades, medical procedures benefit from advances in healthcare technologies; yet, beyond the technical aspects, these technologies take advantages from innovations in human-computer interaction research. Either an individual uses a medical device, or there is a combination of several devices and a complex teamwork, the smooth interaction of practitioners with these devices affects the quality of outcome.

As new medical technologies are introduced into the operating rooms, these bring along issues concerning ergonomics and human-factors that affect team collaboration. The mechanisms of team collaboration need to be first understood. Same concept has been applied in micro-neurosurgery. Advances in the surgical microscopes bring more precision to the treatment and empower the surgeon to conduct a successful procedure. However, recent researches indeed reported that the use of the microscope imposes several constraints, both on the surgeon's performance and on the collaborative processes during the intraoperative care. Because the interaction with the surgical microscope is hand-based through the control handgrips it has been observed previously that a source of interruption comes from the needs to adjust the device. On the other hand, the surgical procedure is not confined to the surgeon's work.

The complex teamwork of the OR team member and in particular, the scrub is an essential factor to achieve an error-free operation. It is important to know how the presence of the microscope and constant engagement of the surgeon with it, effects on the work of the nurse and other team members.

Recent Publications 1.H Afkari, R Bednarik, S Makela and S Eivazi (2016) Mechanisms for maintaining situation awareness in the micro-neurosurgical operating room. *Int. J. Hum. Comput. Stud.*; 95: 1-14. 2.S Eivazi, H Afkari, R Bednarik, V Leinonen, M Tukiainen and J E Jaaskelainen (2015) Analysis of disruptive events and precarious situations caused by interaction with neurosurgical microscope.

Acta Neurochir. (Wien); 157: 7. References 1.G Fitzpatrick and G Ellingsen (2013) A review of 25 years of CSCW research in healthcare: Contributions, challenges and future agendas. 22: 4-6. 2.K O'Hara, R Harper, H Mentis, A Sellen and A Taylor (2013) On the Naturalness of Touchless : Putting the Interaction Back into NUI. *ACM Trans. Comput. Interact.*; 20(1): 1-25.

Micro-neurosurgery has been revolutionized by advances in the surgical microscope such as high magnification that have increased a surgeon's ability to have a clear view of the surgical field. High magnification necessitates frequent interaction with the microscope during an operation, and the current interaction technique for positioning and adjusting the microscope introduces risk factors that force a surgeon to remove hands from the operating field. The purpose of this study is to investigate the potential for hands-free interaction in micro-neurosurgery. We present findings from a contextual study of how neurosurgeons interact with the microscope and the surgical team, and discuss the implications of the findings for designing hands-free, especially gaze-based interaction techniques for micro-neurosurgery.

Fortunate are the neurosurgeons who have the opportunity to visit the Department of Neurosurgery at the Helsinki University Central Hospital and receive this delightful volume as a souvenir for it is likely to be one of the most charming books they will ever read about neurosurgery. As the title indicates, Drs. Lehecka, Laakso, and Hernesniemi have written about neurosurgery as performed in Helsinki. However, they have done so much more than that — they have captured the deeply rooted spirit of camaraderie and commitment that has helped build Helsinki into an international center of neurosurgical excellence under the leadership of Juha Hernesniemi and his colleagues. Nor is the term international an overstatement when applied to a department in this far northern clime. Indeed, their list of distinguished visitors reads like an international Who's Who of Neurosurgery.

Every detail of the Helsinki approach to neurosurgery is covered, including how Juha expects his operating room to run to lists of his personal habits and instruments intended to ensure that his coworkers understand how his operations will proceed. The advantages to patients of such a finely tuned team, sensitive to the surgeon's needs and expectation, should never be underestimated. This refined teamwork ensures that neurosurgical procedures are completed in as efficient and safe manner as is possible, thereby optimizing the chances of a good outcome for the patient. Juha's ability to promote such precision teamwork is but one of his amazing talents.