Intraoperative Ultrasound for Spine Surgery

Accurate and efficient registration of pre-operative computed tomography or magnetic resonance images with iUS images are key elements in the success of iUS-based spine navigation. While widely investigated in research, iUS-based spine navigation has not yet been established in the clinic. This is due to several factors including the lack of a standard methodology for the assessment of accuracy, robustness, reliability, and usability of the registration method. To address these issues, Gueziri et al. presented a systematic review of the state-of-the-art techniques for iUS-guided registration in spinal image guided surgery (IGS). The review follows a new taxonomy based on the four steps involved in the surgical workflow that include pre-processing, registration initialization, estimation of the required patient to image transformation, and a visualization process. They provided a detailed analysis of the measurements in terms of accuracy, robustness, reliability, and usability that need to be met during the evaluation of a spinal IGS framework. Although this review is focused on spinal navigation, they expect similar evaluation criteria to be relevant for other IGS applications [1].

Intraoperative ultrasound (iUS) has been applied in spinal surgery for all kinds of diseases [2] [3] ranging from trauma, [4] degenerative diseases, [5] [6] developmental malformations, [7] vascular diseases, [8]. to imaging in spinal tumor surgery

Intraoperative Ultrasound for spinal tumor surgery

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Syringomyelia

Intraoperative ultrasound is often helpful for:

a) localizing the cyst

b) assessing for septations (to avoid shunting only part of cyst)

Controversial,for intramedullary spinal cord tumors [9] favored by some experts. Astrocytomas are usually iso-echoic with the spinal cord, whereas ependymomas are usually hyperechoic.

Transpedicular thoracic discectomy

Intraoperative ultrasound is a simple yet valuable tool for real-time imaging during transpedicular thoracic discectomy. Visualization provided by intraoperative US increases the safety profile of posterior approaches and may make thoracotomy unnecessary in a selected group of patients, especially when a patient has existing pulmonary disease or is otherwise not medically fit for the transthoracic approach [10] [11].

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