

## **A Software-Assistant for Pre-operative Planning and Visualization of Neck Dissections**

### **Purpose:**

Neck dissections are carried out for patients with malignant tumors in the head and neck region. The extent of the intervention depends on the occurrence and location of malignant lesions. To ensure the decision about operability and the surgical procedure of the neck dissection, the occurrence and number of enlarged (and probably malignant) lymph nodes, as well as their location in relation to risk structures have to be assessed and visualized.

Up to now neck dissections are often planned on the basis of axial slices of CT or MRI data. However, the detection of enlarged lymph nodes in 2D data is difficult for surgeons. Thus, it is possible that affected lymph nodes are not recognized and eventually a surgery has to be canceled because of previous misinterpretation of the patient's operability. To support the preoperative planning of neck dissections, 3D visualizations are intended to explore pathologic structures. For this purpose, we developed the NeckSurgeryPlanner (NSP) to support the surgeon's decision.

### **Method and Results:**

All relevant structures need to be segmented in advance. This process is described in Cordes et al. (2006). When the case is loaded into the NSP, number, location and extent of the enlarged lymph nodes and tumors are analyzed. The results are used for an automatic TNM classification and for an adjusted menu. Dependent on the availability of enlarged lymph nodes or infiltrations, the menu allows the surgeon to emphasize the tumor and the lymph nodes greater than 1, 3 or 6cm. Besides, the distance to structures at risk can be displayed. Therefore, the distance is mapped color coded onto the surface of the structure at risk. Distances less than 5mm are colored yellow and distances less than 2mm are colored red.

All structures are displayed synchronously in 2D and 3D. For the currently selected structure the largest extension is displayed in mm. To avoid unwanted occlusions in 3D, the structures can be hidden individually. Once the surgeon has found an interesting point of view, the view can be saved with a short comment and a screenshot. The surgeon has the ability to go back to this view at any time, because all necessary parameters are saved. This is useful for presenting the case at a tumor board.

### **Conclusion:**

The NSP is tended to directly support all therapeutic questions and is established at the ENT department at the University Hospital of Leipzig. As a next step the assistant will be evaluated in detail for a better integration into the clinical workflow, e.g. the correction of the segmentation due to the panendoscopic finding. However, first results show that the interactive 3D presentation leads to a much better understanding of the patient's anatomy.

### **References:**

Cordes et al., Preoperative Segmentation of Neck CT Datasets for the Planning of Neck Dissections. SPIE Medical Imaging. 2006