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Section: CAD

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Abstract Title:
3-D-Panendoscopy

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Abstract Text:
Objective

The treatment of patients with head and neck cancers is more and more challenging in the regard of raising therapeutic options and a growing multidisciplinary approach. The complex anatomy and multifaceted function of the head and neck region, a more precise pretherapeutic imaging is opposed by the clinical reality of the classic panendoscopy and the documentation of the results, which hasn't changed over the last decades.

Complexity in anatomy of the head and neck results in difficulties in the preoperative planning even for well experienced surgeons. The available data show the possible advantages of a computer-assisted diagnosis and therapy planning in head and neck surgery.

The development of a 3-D- panendsocopy based on a patient-specific 3-D- model is the first step to a complete electronic therapy-accompanying patient document.

At present the patient model is virtually generated by the surgeon. The surgeon is obligated to have all available data in mind. Systems for computer-assisted data interpretation (semiautomatic segmentation of image data or detection of cervical lymph nodes) don't exist for daily use.

Up to now, the base of the 3-D- model is limited to the integration of image data derived from CT and MRI images. The former development is a Computer-Aided-Diagnosis (CAD)-software (NeckSurgeryPlanner, University of Magdeburg, Germany), which creates a patient-individual 3-D- model via a semiautomatic segmentation step with subsequent visualisation.

Methods

The datasets typically used for ENT- surgery (CT: slice distances 1 mm or smaller) have been acquired for regular diagnostic planning. On the base of these data sets the 3-D-patient model is generated by segmentation and visualisation.

The improvement of the former segmentation algorithms results in an important reduction of editing time. This moreover provides the base for integration of multitudes of morphologic an functional patient data. These advancements allow for the 3-D-panendoscopy.

3-D-presentations approve better descriptions of small and complex structures (relation cervical lymph nodes to vessels, skull base) and interpretation of the image data (minimal distance to risk structures in neck surgery). Additionally, the integration of non-radiological information is possible (tumour fixation to mandible or prevetrtebral fascia, image documentation of the surface, functional imaging (PET), histological findings).

Results

The newly created 3-D- panendoscopy system originates a clearly improved documentation medium for the patient individual tumour (Fig. 1,2). The deposited TNM-data base facilitates the tumour classification. Especially the 3-D- presentation enables a more reliable evaluation of minimal distances to surgical risk structures and consequently enables better planning of therapeutic procedures (Fig. 3,4).

The development further contains the use of the 3-D- panendoscopy documentation as the base for the integration of the whole data accompanying the patient's therapy (pathology: documentation of instantaneous sections and biopsies; radiotherapy: irradiation planning in relation to former tumour limits.

Conclusion

The 3-D- panendoscopy system sets the start of a individual 3-D-patient model for daily use, which besides image data contains a multitude of functional information.

We are currently working on the construction of software-based models whereupon the entire tumour documentation of a patient is summarized into a digital patient model.

Fig. 1: *Tumor editing by drawing the panendoscopic finding on the virtual pharynx model (endoscopic view) (a). The shape of the tumor model is adapted accordingly (b).*

Fig. 2: *Tumor editing by drawing the panendoscopic finding (e.g. fixation of the thyroid cartilage) on the virtual larynx model (a). The shape of the tumor model is adapted accordingly (b).*

Fig. 3: *The 3D patient model enriched by information available from the panendoscopy (a). The multimodal tumor model based on information from both CT and panendoscopy findings (b).*

Fig. 4: *Therapy planning based on the 3D panendoscopy documentation: relation of the tumor to the larynx substructures (a), and quantification of the tumor size based on multimodal information (b)*

fig.1

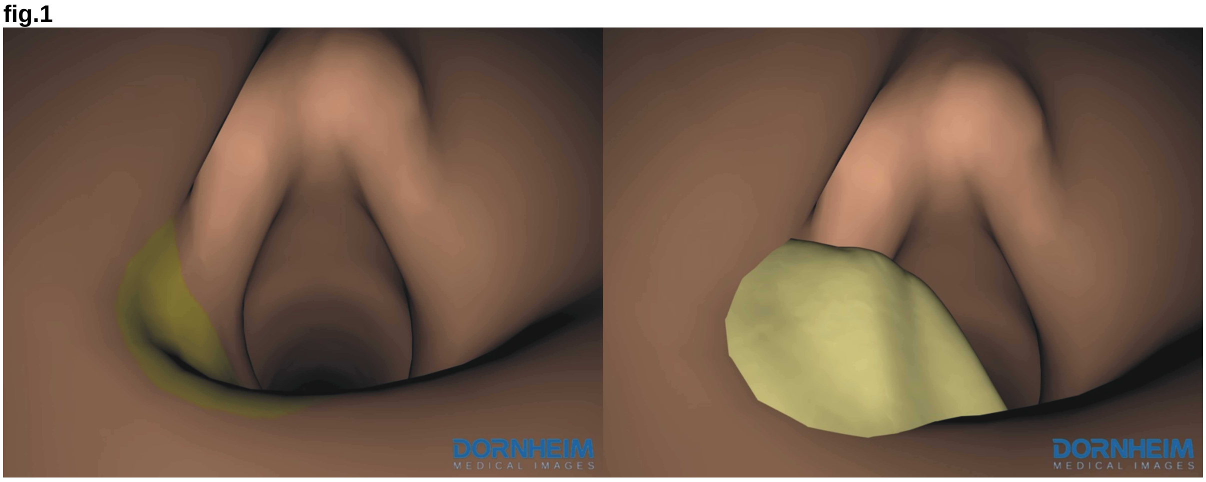


fig.2

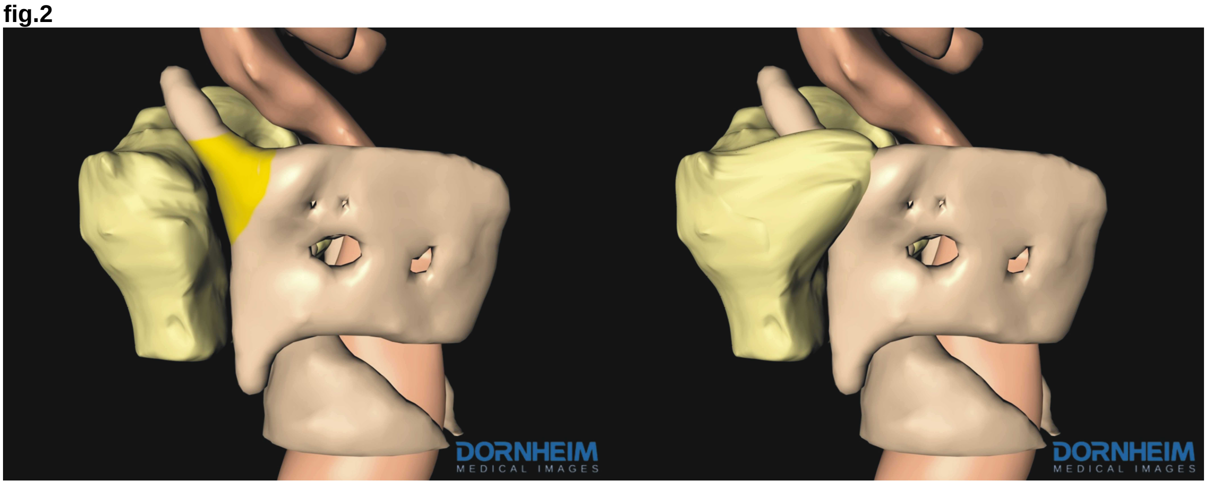


fig.3

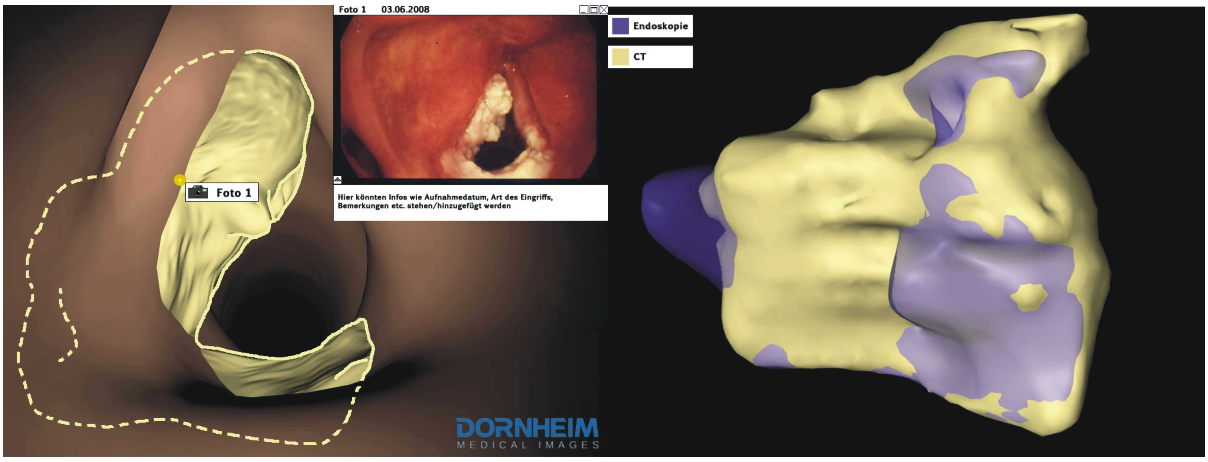
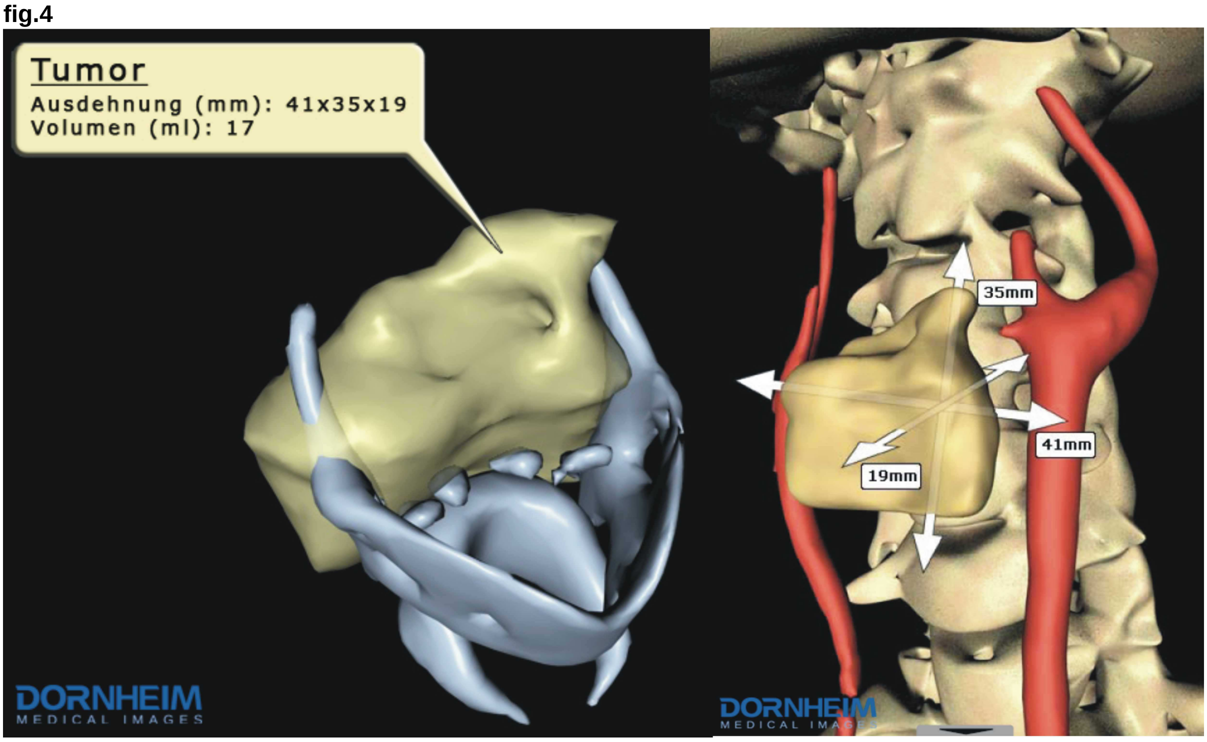


Foto 1
Foto 1 03.06.2008
Hier könnten Infos wie Aufnahmedatum, Art des Eingriffs, Bemerkungen etc. stehen/hinzugefügt werden
Endoskopie
CT

fig.4


Tumor
Ausdehnung (mm): 41x35x19
Volumen (ml): 17
35mm
41mm
19mm