Computer-aided 3D visualization in oto-rhino-laryngology

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Most of the CT and MR data is stored nowdays on digital media. This opens up new possibilities for us to inspect these data. In our department we evaluated the use of the 3D Slicer software, which is free, open source and is being actively developed.
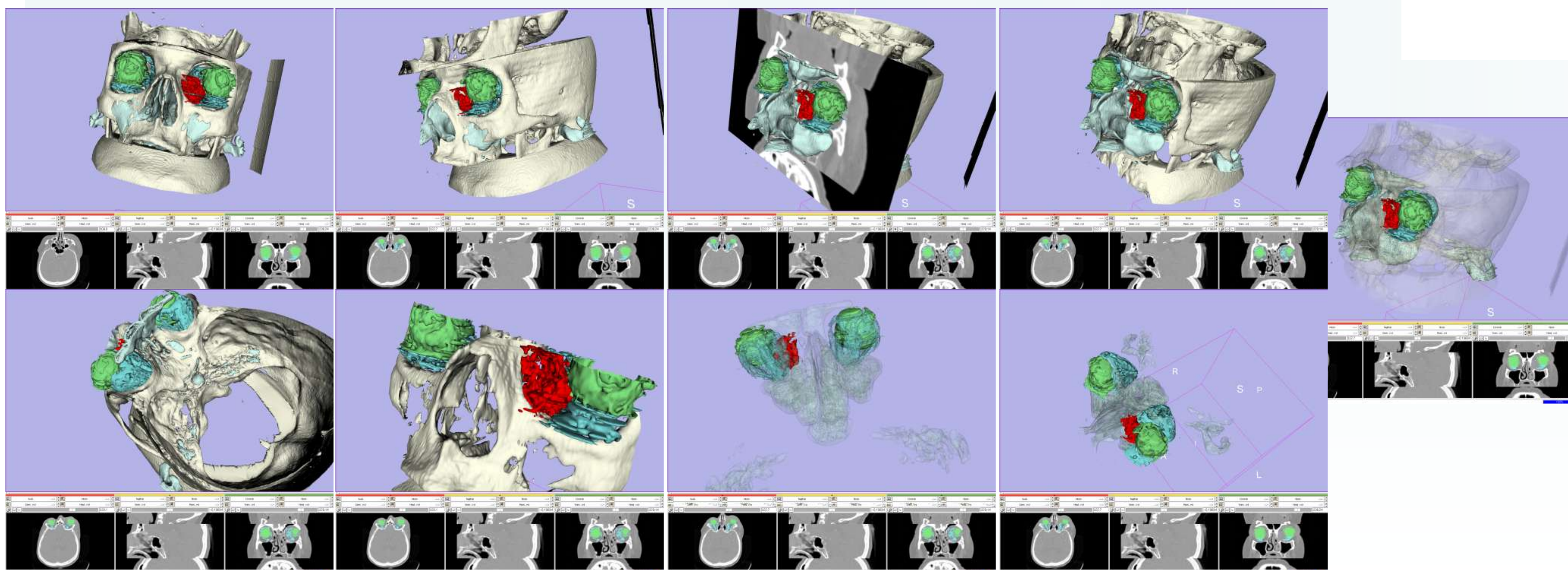
With the help of this tool we can visualize and objectively measure the anatomical and pathological structures' dimensions, and volume, if needed. The software's hardware needs are not exceptionally high as of today's standards. We used a Sun Java Workstation (Sun WZ 2100) with two 2.8GHz Opterons, 4GB of RAM, and an nVidia Quadro FX 3000 3D accelerator card.

By allowing us to turn the anatomical data, found on slices in 2D, into 3D models, we can plan the surgical interventions more precisely, and it also enables us to better estimate the outcomes.

On our poster we present three cases, where we actually used Slicer to visualize the objects in 3D space, and use them for surgical planning where it was adequate. We present some presets and possibilities that can help us to evaluate the reconstructed organs and other anatomical structures.
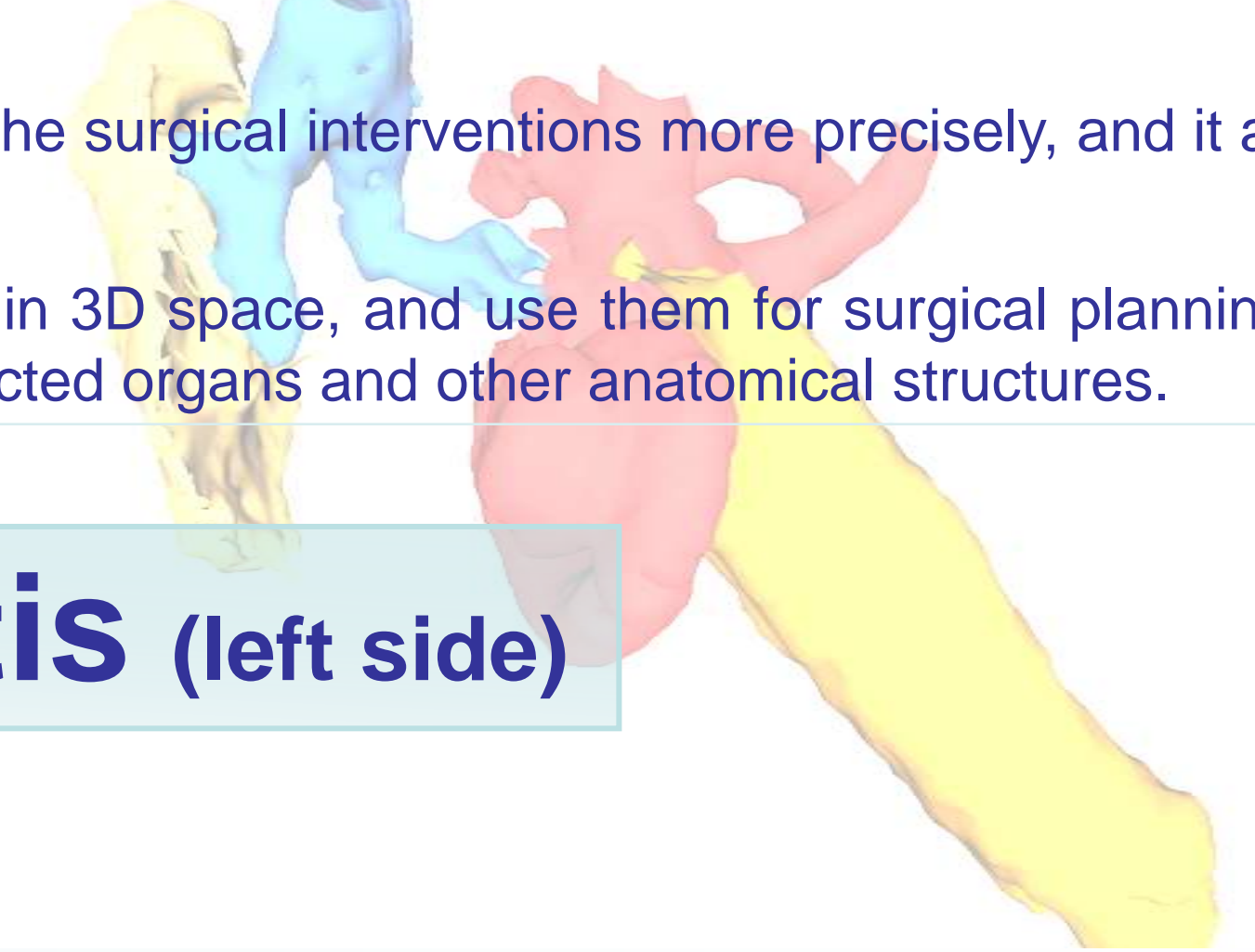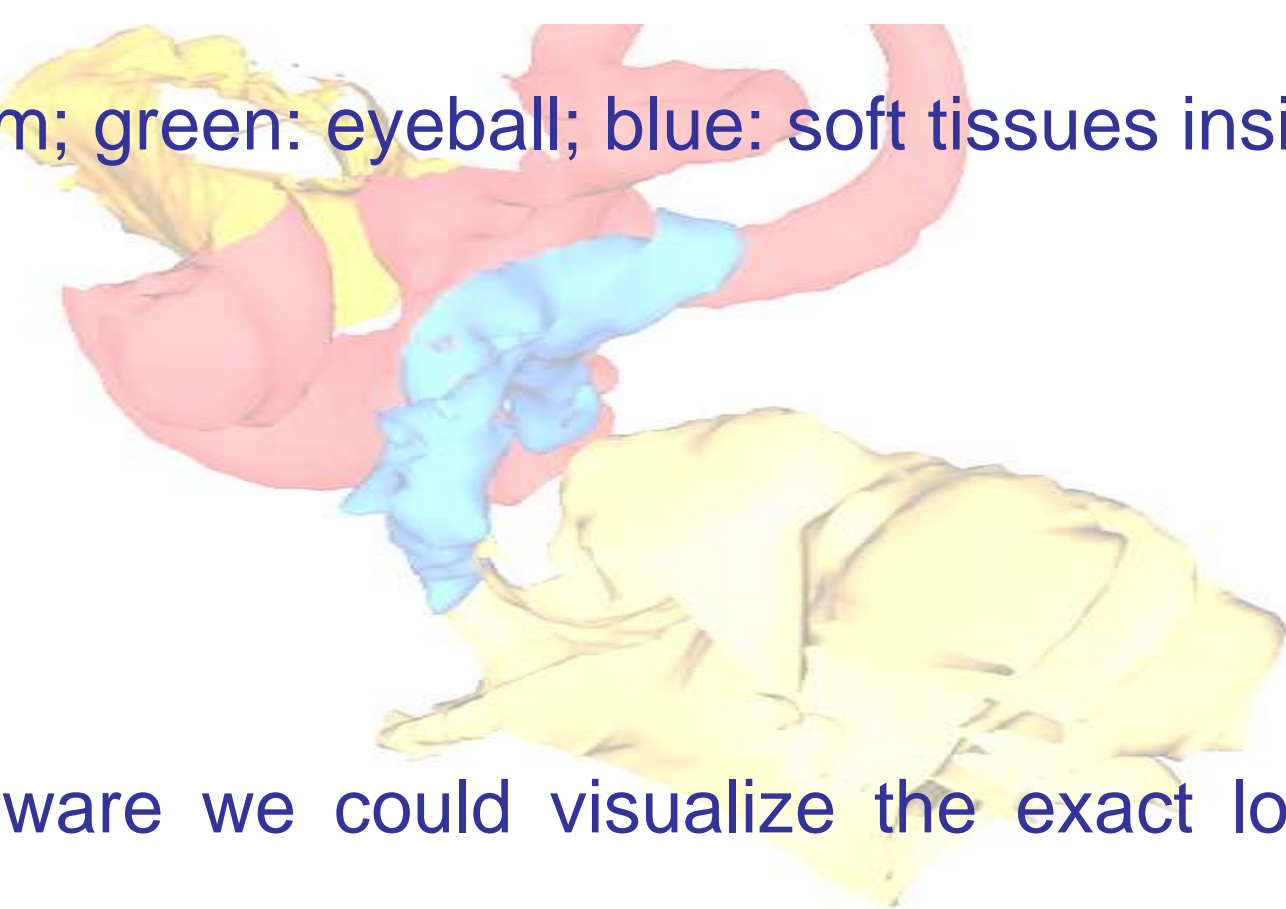
Periorbital abscess – a complication of an acute ethmoiditis (left side)

The exophtalmus is cleary to be seen.

Clipping different objects with CT different planes in the virtual space and recomposing them into one scene again, helps us to locate the actual place and extension of the abcess

The abscess spreads into the periorbital soft tissues, but does not involve any bone.

Approx. volume of the abscess is 1933 mm^3

Legend:

red: abscess; white: cranium; green: eyeball; blue: soft tissues inside the orbita and eye muscles; light blue: air

Maxilloethmoidal tumour (right side)

With the help of the software we could visualize the exact location of the pathological structures.

The optical nerve was not involved.

The eyeball was not infiltrated. The tumour entered into the orbita, but only the periorbital fat is involved medio-inferiorly.
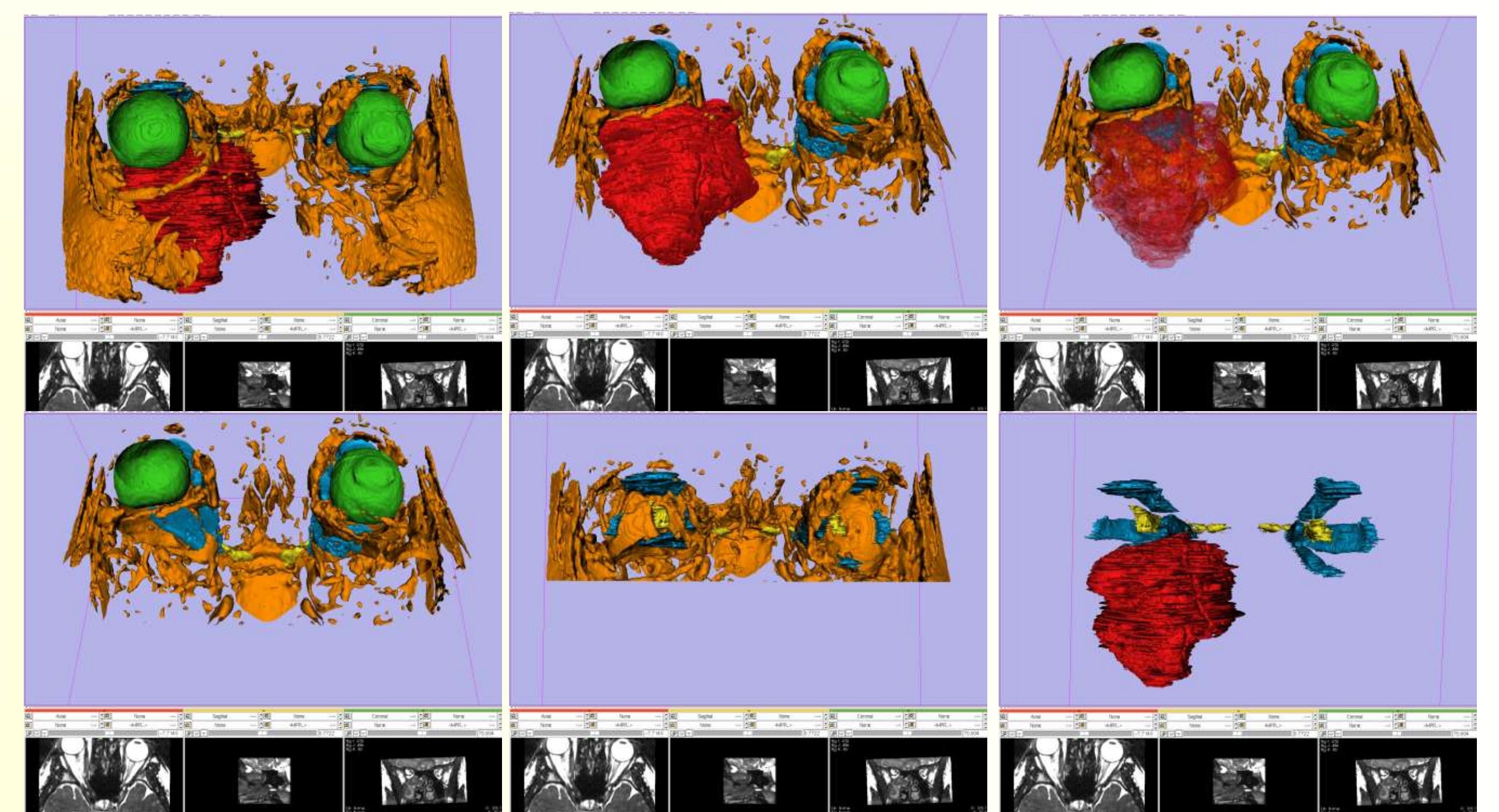
As we can see, the eye muscles and the tissues in the orbita were not infiltrated, but they were somewhat displaced by the volume.

We could estimate, based on the reconstructed images, that the tumour itself is capsulated, and can be removed during surgery.
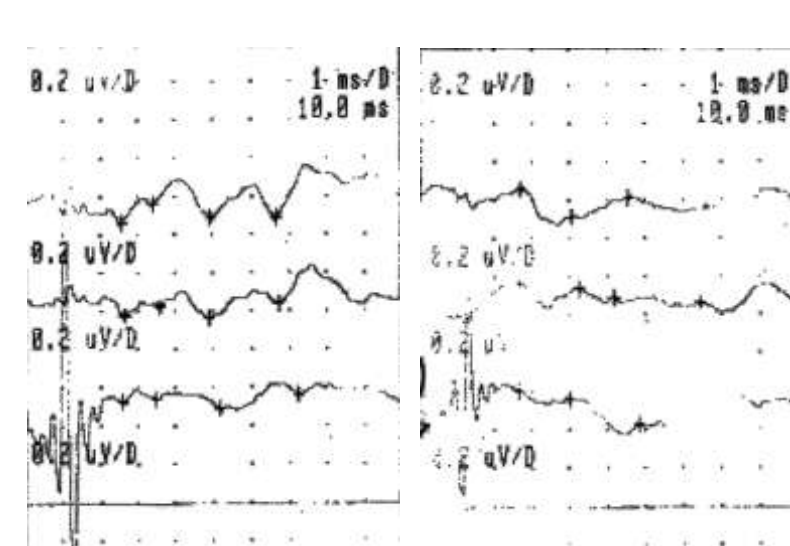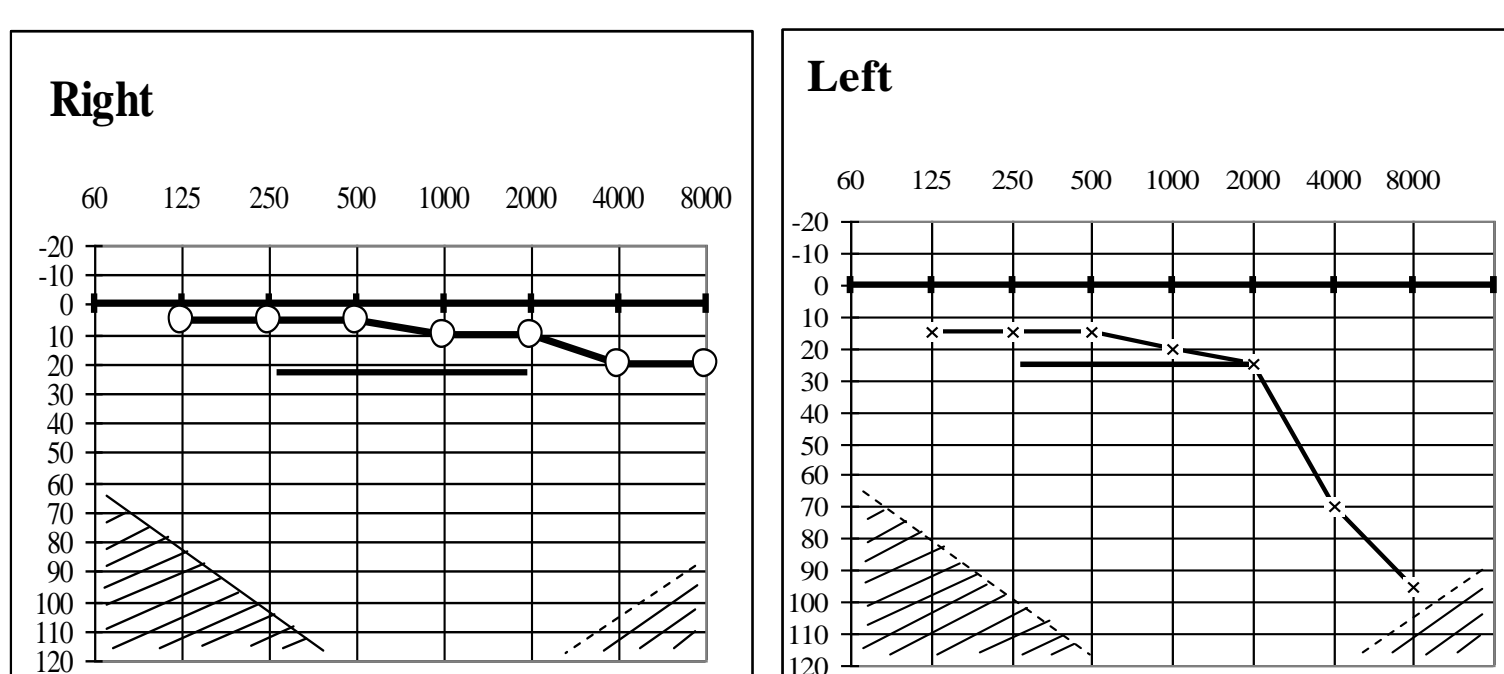
Approx. volume of the tumour is 34372 mm^3

Legend:

red: tumour; orange: cranium (and some other soft tissues); green: eyeball; blue: eye muscles; yellow: optical nerve
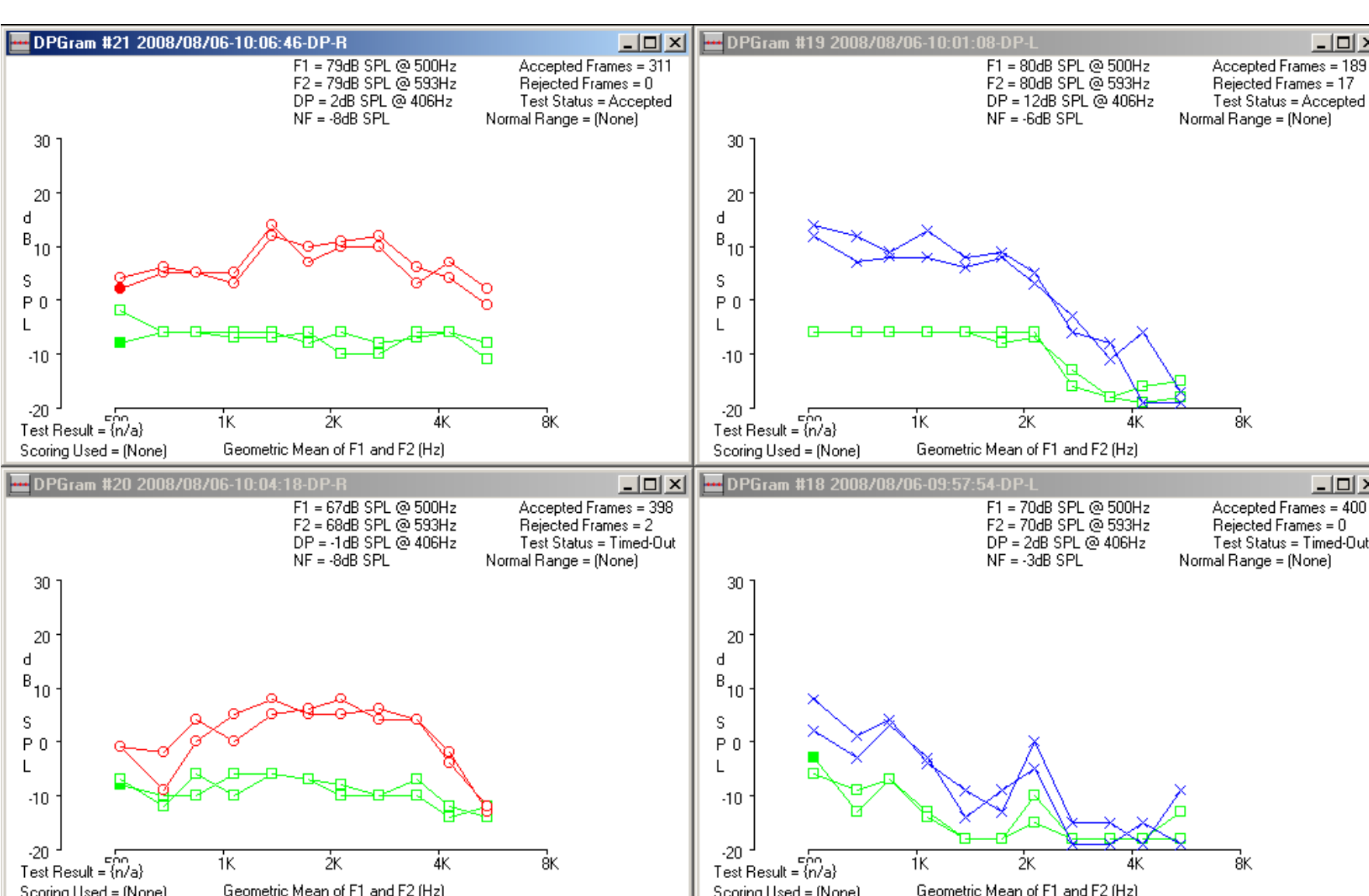
Acoustic neurinoma (left side) and two fronto-temporal arachnoidal cysts

The approximate volume of the neurinoma is about 5300mm^3

Legend:

grey: cerebellum; light green: grey matter; light blue: cysts; dark blue: neurinoma; light yellow: air; yellow: n. VIII; pink: inner ear; orange: eye muscles; green: eyeball