Section: **Segmentierung, Registrierung**

ID: 132

Abstract-Title:
DIAGNOSTIC IMAGING FOR RADIOSURGERY OF ARTERIOVENOUS MALFORMATIONS BILDGEBENDE DIAGNOSTIK FÜR DIE RADIOCHIRURGIE VON ARTERIOVENÖSEN MALFORMATIONEN

Authors:
K. Hamm[1,2]
[1] *HELIOS Klinikum Erfurt*
[2] *Abt. für stereotaktische Neurochirurgie und Radiochirurgie*

Abstract-Text:
Purpose:
Radiosurgery can be considered as a well established option for treatment of arteriovenous malformations (AVMs). The exact application of the therapeutic dose is based on the availability of imaging data sets with superior image quality that can be superimposed by an image fusion algorithm. For follow-up studies the quantitative comparison of the respective image data sets plays an important role, too. Up to now the digital subtraction angiography (DSA) is a mandatory tool for treatment planning and follow-up procedures as well. The aim of this study was to investigate if and in which cases a suitable CT and/or MR angiography procedure can replace the conventional angiography (DSA).
Methods:
For 34 AVM patients various MR data sets have been used together with the stereotactically localized CT and DSA data sets for treatment planning. In order to define the AVM nidus precisely all available MR data sets have been fused onto the CT data set using an automatic image fusion algorithm. The nidus was outlined in both localized DSA projections resulting in the DSA target volume. Subsequently the DSA target volume has been adapted by inclusion of the available CT/MR data sets (localized and/or fused, slice by slice) resulting in the final target volume. Both volumes were finally compared and analyzed. Also all digitally available follow-up studies have been fused for exact comparison purposes.
Results:
In all cases the thin-slice MR data sets (1 mm slice distance) that included T1-weighted series and TOF (time of flight) angiographies have been precisely fused onto the stereotactically localized treatment planning CT. The final target volume was compared with the DSA target volume as follows: In 19 cases the final target volume was larger than the DSA target volume, 6 x smaller and 5 x approximately equal. The difference was significant (Wilcoxon test: Difference<0.0001; t-test: t=3.01, p>0.005). In 4 cases outlining the AVM was not possible without DSA. In 5 patients a two- or three-vessel DSA was needed, since there were different AVM compartiments. In cases where previously a partial embolization has been undergone the use of superimposed CT sets with and without contrast medium was important in order to define the completely embolized partial volumes that were not subject to treatment. The inclusion of the DSA images enabled a better identification of those arterialized venes that did not belong to the nidus. In 6 cases

the MR follow-up studies showed contrast enhancements overlapping the AVM nidus as a result of brain-blood-barrier disturbances (T1 series with contrast). In 7 cases perifocal reactions have been primarily observed (T2 series) 12 months after treatment with rather low clinical relevance.
Conclusion:
By integrating all available imaging modalities the exact 3-dimensional definition of the AVM nidus has been realized safely for all patients. The stereotactic DSA data acquisition remains a crucial tool for safe nidus definition in radiosurgery treatment planning and therefore cannot be renounced presently. It is recommended to establish a quantitative comparison of all MR follow-up studies.

Bild 1/JPG

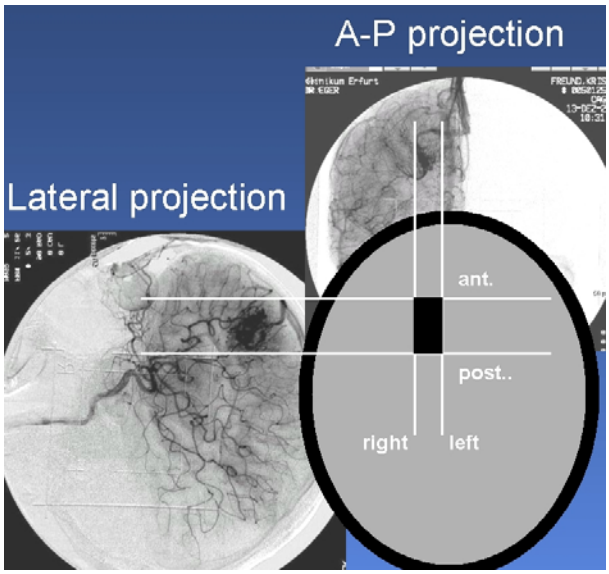

Bild 2/JPG

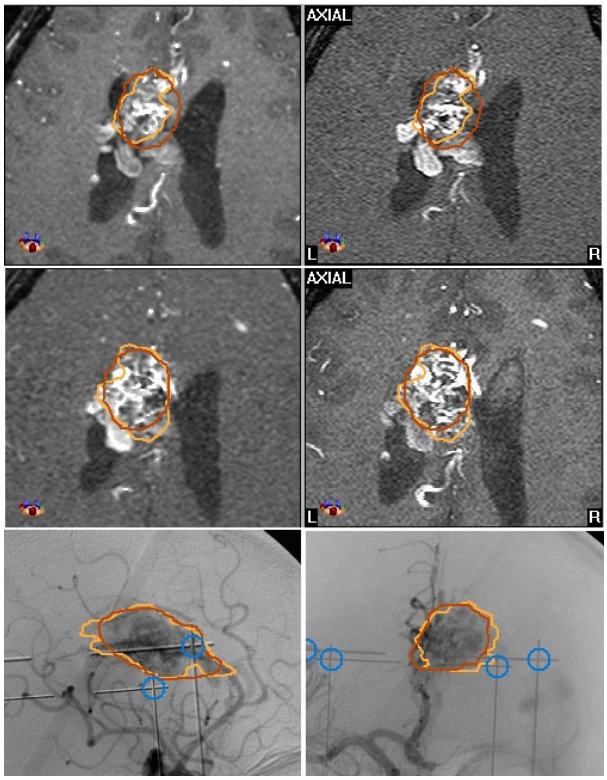

Bild 3/JPG