MR-guided Percutaneous Sclerotherapy of Low-Flow Vascular Malformations: Qualitative and Quantitative Assessment of Therapy and Outcome

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Purpose: To assess the therapeutic procedure and outcome of MR-guided percutaneous sclerotherapy in low-flow vascular malformations, including follow-up evaluation.

Material and Methods: Seventy-six percutaneous sclerotherapy treatments were performed under 'fluoroscopic' guidance on 15 patients with vascular malformations in the head and neck (n=64), spine (n=5), and extremities (n=7). Qualitative assessment analyzed the individual success of the therapy and the occurrence of complications. Quantitative evaluation assessed the duration of minimally invasive MR-guided sclerotherapy in a regression analysis, the ability of MR imaging to depict post-interventional hemodynamic changes within the vascular malformation by calculating changes in the Contrast to Noise Ratios (CNR), and the detection of volume changes on follow-up examinations by volumetric analysis.

Results: All percutaneous sclerotherapy procedures were successfully performed without complications by filling the targeted vascular malformations with sclerosing agent. Induced vascular sclerosis successfully treated the individual predominant symptoms, such as hemorrhage, pain, cosmetic disfigurement, and functional impairment.

Quantitative analysis focusing on the actual interventional duration presented a significant acceleration over the investigated five-year time period, matching a cubic function in the regression curve fit, and taking 31:50±14 min. Induced vascular thrombosis was identified in all treated portions on post-interventional studies by the statistically significant changes in CNR ($p<0.05$) compared to pre-interventional imaging. On follow-up examinations (after 12±6 weeks), a significant shrinkage was observed in the targeted portions (67.2±18.9%).

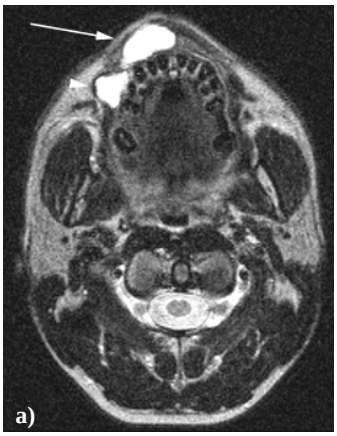
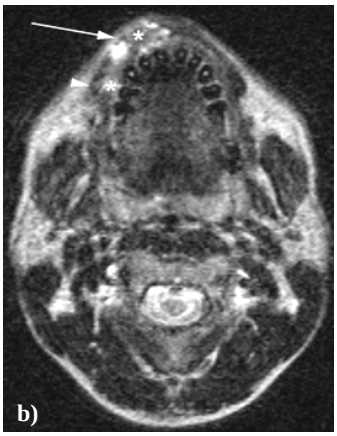


Figure 1: *34-year-old male patient with congenital vascular malformation in the right upper lip.* ***(a)*** *Pre-interventional T_2-weighted MR imaging visualized the cavernous anterior portion (arrow) as well as the lateral portion (arrowhead) of the vascular malformation with high signal intensities without apparent flow voids.* ***(b)*** *Follow-up T_2-weighted MR imaging visualized intravascular thrombus (asterisk) within the larger portion of the vascular malformation (arrow) and complete thrombosis of the smaller portion (arrowhead) with significant overall shrinkage.*



Conclusion: MR imaging succeeds in characterizing congenital vascular malformations as well as localizing a suitable target for sclerotherapy. MR imaging allows the safe guidance and monitoring of minimally invasive sclerotherapy and also permits the verification of therapeutic success post-interventionally and during follow-up examinations.