

Conclusions: The goal in the management of spinal cord AVMs is to obliterate (partially or totally) the SAVM, preserving neurological function and preventing future hemorrhagic events. Partial treatment of spinal AVMs may be sufficient to improve prognosis dramatically. Conservative management, endovascular embolization and/or microsurgical resection are possible treatment modalities. Personalized treatment should consider patient's age, clinical presentation, SAVM angioarchitecture (associated aneurysms or venous varix) and flow (impaired venous drainage or congestion) in order to achieve the best and successful result.

BRAIN AND SPINE 1 (2021) 100307 100352 3D PRINTING IN BRAIN AVM TREATMENT

M. Campello¹, O. Gervasio¹, C. Zaccone¹, G. Caruso¹, P. Versace², L. Frosina², A. Armentano². ¹ Neurosurgery - Great Metropolitan Hospital (GOM), Neurological Dept., Reggio Calabria, Italy; ² Neuroradiology - Great Metropolitan Hospital (GOM), Diagnostics Dept., Reggio Calabria, Italy

Background: The 3D modeling capabilities of modern computational resources allow *in silico* replications of organs and part of them. In neurosurgery the virtualization of a surgical corridor or of the anatomical structures involved in the procedure can be coupled with the 3D print of a specific anatomical part in order to improve the preoperative surgical planning. Aim of this contribution is to expose our workflow using 3D capabilities in the management of ruptured and unruptured brain AVMs. Pertinent literature was also screened for review.

Methods: At our institute, since 2018, we obtain casts of AVMs and their brains in unruptured cases and in ruptured cases when surgery is delayed (i.e. for clinical reasons). 3D models are used during patients counseling and meeting for informed consent, preoperative surgical planning and teaching. We compare patient satisfaction (according to data retrieved from feedback forms) and surgical time to resect nidus malformation in this cohort and in a previous one (i.e. before 2018), homogeneous in number, case mix, clinical features.

Results: Data analysis show a slight improvement in patient satisfaction (80 vs 90% in very good/excellent rate) of and in the speed in nidus resection (around half an hour sparing). Beside these data not strongly significant, what we found really interesting was the improved capability to share expertise with younger colleagues using 3D casts preoperatively and during surgery as well.

Conclusions: Cohorts numbers are limited but these preliminary data are encouraging to implement 3D cast use in the bAVMs treatment workflow as in other neurosurgical domains. Surgical training in bAVM is hampered by small numbers but can be aided by the 3D printing techniques which are practical and produce anatomically accurate models.

BRAIN AND SPINE 1 (2021) 100307 100353 SPINAL AVM: 10 YEARS EXPERIENCE IN A SINGLE CENTRE

M. Cenzato¹, D. Boeris¹, M. Piano², J. Falco¹, D. Colistra¹, A. Debernardi¹, M. Fragale¹, E. Marcati¹, G. Griabaudi¹, E. Fava¹. ¹ Great Metropolitan Hospital Niguarda, Neurosurgery, Milano, Italy; ² Great Metropolitan Hospital Niguarda, Neuroradiology, Milano, Italy

Objective: Surgical nuances, outcome, complications and of a single centre surgical series of Spinal AVMs (type II) treated at Great Metropolitan Hospital Niguarda Niguarda (Milano, Italy) is presented.

Background: Prognosis of spinal AVM is believed poor; half of all patients became severely disabled within few years after the onset of motor symptoms. Hemorrhagic onset is a particularly bad prognostic factor.

Methods: A single centre, retrospective case series review of patients that have been surgically treated in the last 10 years is hereby presented. Preoperative and postoperative MRI and angiograms have been reviewed. Patients have been assessed preoperatively and postoperatively with the Aminoff & Logue scale.

Results: 20 patients out of 53 patients harbouring a spinal vascular malformation (type I and II) have been surgically treated for true spinal cord AVMs (type II). 12 (60%) were intramedullary malformations and 8 (40%) were conus medullaris malformations. The most common presentation was progressive paresis/paralysis. The hemorrhagic presentation was reported in 2 patients.

Under continuous motor and sensory neurophysiologic monitoring, in 18 cases the AVM could gradually be dissected from the surface until a complete excision of the nidus. In 2 other cases the excision was considered too risky and a trapping with an in-situ Laser coagulation of the nidus was performed.

The overall outcomes were 18 with Aminoff & Logue scale Motor score of 2 or less, 1 grade 5 and 1 dead due to extensive venous thrombosis and subsequent SAH.

Conclusions: Pre-operative endovascular reduction, continuous neurophysiological monitoring, intraoperative resection or trapping with Laser in-situ coagulation, and postoperative attention to the veins can lead to good surgical outcome also in these very eloquent AVMs. Due to the relative rarity of the pathology and in consideration of a poor natural history, surgical resection of spinal AVM should be proposed in few referral centres.

BRAIN AND SPINE 1 (2021) 100307 100354 CIGARETTE SMOKING IS MORE PREVALENT IN PATIENTS WITH BRAIN ARTERIOVENOUS MALFORMATIONS COMPARED TO GENERAL POPULATION: A CROSS-SECTIONAL POPULATION-BASED STUDY

A. Pohjola¹, J. Lindbohm², E. Oulasvirta¹, A. Hafez¹, P. Koroknay-Pál¹, A. Laakso³, M. Niemelä¹. ¹ Helsinki University Hospital, Department of Neurosurgery, Helsinki, Finland; ² University of Helsinki, Department of Public Health, Helsinki, Finland; ³ Oulu University Hospital, Department of Neurosurgery, Oulu, Finland

Background: Research on the prevalence of smokers in patients with brain arteriovenous malformation (AVM) remains nonexistent, even though smoking is a well-known risk factor for intracranial aneurysms.

Objective: To examine the prevalence and smoking habits of AVM patients.

Methods: Data on smoking habits were collected with a quality-of-life questionnaire mailed in 2016 to all patients in our large AVM database. These smoking data were supplemented with registry data derived from medical records. The prevalence of smokers was compared to that of the general population, derived from statistics of National Institute for Health and Welfare. Logit transformation of proportions and Student's t distribution were used to calculate the 95% CIs for prevalence estimates.

Results: Of the 384 patients aged over 18 yr on admission, 277 (72.1%) returned the questionnaires in 2016. When compared to age, sex, and admission year matched general population, the proportion of smokers in AVM patients was 48% (CI = 41%-55%) and 19% (CI = 16%-21%) in the general population. The difference increased in older age groups; in those aged 65 to 77 yr, the percentage of smokers reached 73% (CI = 46%-90%), while the corresponding percentage in the general population was 7% (CI = 5%-9%).

Conclusion: We observed considerably higher rates of smoking among AVM patients when compared to age, sex, and admission year matched general population. Our results suggest that in the development of AVMs, the role played by nicotine and other substances in tobacco smoke should be examined. Cigarette smoking could potentially be a common cerebrovascular risk factor.

BRAIN AND SPINE 1 (2021) 100307 100355 EXTERNAL VALIDATION OF BRAIN ARTERIOVENOUS MALFORMATION HAEMORRHAGE PREDICTION AND HAEMORRHAGE PROGNOSTICATION SCORES

B. Taweel^{1,2}, C. Gillespie^{1,2}, G. Richardson^{1,2}, M. Mustafa^{1,2}, T. Ali³, A. Islim^{4,2}, C. Hannan^{5,6}, E. Chavredakis^{2,4}. ¹ Institute of Systems, Molecular and Integrative Biology, University of Liverpool, Liverpool, United Kingdom; ² Walton Centre NHS Foundation Trust, Liverpool, United Kingdom; ³ NHS Tayside Foundation Trust, Dundee, United Kingdom; ⁴ University of Liverpool, Liverpool, United Kingdom; ⁵ Manchester Centre for Clinical Neurosciences, University of Manchester, Manchester, United Kingdom; ⁶ Salford Royal NHS Foundation Trust, Manchester, United Kingdom

Background: To externally assess Brain Arteriovenous Malformation (bAVM) haemorrhage scores, AVICH and ICH for prediction of poor functional outcomes post-bAVM haemorrhage (mRS>2), and the R2ED score for predicting occurrence of AVM haemorrhage.

Methods: Baseline variables were collected for patients diagnosed with MRI/DSA confirmed bAVM at a single tertiary neurosurgical centre between 2007 and 2018. Both the AVICH score and the ICH score were calculated for all AVM-related symptomatic haemorrhage (SH) using modified Rankin Scale scores (mRS) at discharge, and again for mRS at last follow-up, and the R2ED score was calculated for all patients presenting with SH. Performance for all scores was assessed using C-statistics, and calibration plots.