exclusion of 3 included the two with previous small endoleak. However, one who had complete exclusion immediately recur the filling during follow-up. This patient treated with re-dilation of the stent using balloon. Final follow-up angiography showed complete exclusion of all CCFs and revealed good stent patency of the ICA without intra-stent stenosis.

Conclusion Graft-stents should be considered as an alternative option of treating CCFs and preserving the parent artery by arterial wall reconstruction especially in patients with a fistula that cannot be successfully occluded with detachable balloons or coils. Although a larger sample and expanded follow-up are needed, our series shows that covered stents can be used in the treatment of CCFs with symptomatic relief as experience.

Disclosures S. Chung: None. S. Chang: None.

E-069 SUPER-SELECTIVE FISTULA POINT COIL EMBOLIZATION FOR CAROTID-CAVERNOUS ARTERIOVENOUS FISTULA

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Background/Purpose Endovascular treatment of carotid-cavernous fistula (CCF) has evolved over the past two decades from using detachable balloons to Onyx and coil embolization. Nowadays, transvenous coil embolization is the mainstay of CCF management. Obliteration of the cavernous sinus with coils or liquid embolic agent can be time consuming and costly and potentially lead to cranial nerve injury. We report technical aspects and clinical outcome of a transvenous super-selective fistula point coil embolization.

Methods We retrospectively reviewed consecutive patients with CCF who were treated by a single operator in our institution from January 2016 to December 2018. Patients' demographics, type of CCF, endovascular embolization technique and clinical and angiographic outcome were analyzed. Super-selective fistula point embolization is a technique by which microcatheter exploration allows for definition of the fistula location within the cavernous sinus and targeted coiling at this point.

Results A total of 11 patients were identified. All patients had type D dural arteriovenous CCF. Fifty percent of the patients were female. The mean age ($\pm$ SD) of the patients were 61 $\pm$ 13 years. All patients were treated with transvenous super-selective coil embolization of the fistula point (figure-1). The inferior petrosal sinus was used to access the fistula point at the cavernous sinus and superior ophthalmic vein junction in 9 patients. In the remaining 2 patients, the facial vein was used to access the fistula point. Ten patients had complete fistula obliteration in the final angiographic run at the end of the embolization procedure. One patient had small residual fistula which was completely obliterated by further super-selective coiling during follow up angiography. No procedure related morbidity or mortality was observed. All 11 patients had complete resolution of their clinical symptoms. A total of 7 patients had follow up cerebral angiography and 3 patients had follow up MRI/MRA at the 6 to 12 month timepoint which were all indicative of complete obliteration of the CCF.

Conclusions Super-selective transvenous coil embolization of a focal fistula point in patients with CCF is safe and feasible and is associated with excellent durable clinical and angiographic outcome.

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E-070 CURATIVE TREATMENT FOR LOW GRADE ARTERIOVENOUS MALFORMATIONS

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Introduction Low grade, Spetzler Martin (SM) grade I and II arteriovenous malformations (AVM) are often considered safe for surgical resection or radiosurgery. The use of preoperative arteriography with endovascular embolization to reduce surgical risk in these AVMs remains controversial. The authors assessed the safety of combined treatment of SM I and II AVMs with preoperative embolization followed by curative treatment with surgical resection or radiosurgery. Long term functional outcomes were also studied.

Methods Under IRB-approved protocol, retrospective analysis was carried out on all patients with ruptured and unruptured SM I and II AVMs from 2002 to 2017 using a quality assurance database. Details of the endovascular procedures including arterial supply to the AVM, number of branches embolized, embolic agent(s) used, and complications were studied. Baseline clinical and imaging characteristics were compared, and functional status using the modified Rankin Scale (mRS) before and after endovascular and microsurgical/radiosurgery treatments were compared.

Results 258 SM I (36%) and II (64%) AVMs were identified (mean age 38.3 years). 48% of patients presented with hemorrhage, 21% with seizure, 16% with headache, 10% asymptomatic and 5% with a clinical deficit. 90 patients (68%) in the unruptured group and 74 patients (59%) in the ruptured group underwent presurgical embolization ($p = 0.0013$). The mean number of arteries supplying the AVM was 1.44 and 1.41 in the unruptured and ruptured groups respectively. The mean number of arteries embolized was 2.51 in the unruptured group compared to 1.8 in the ruptured group ($p = 0.003$). nBCA and Onyx were the two most commonly used embolic agents. Pre-embolization and post-embolization mRS are shown in tables 1 and 2. Four complications were seen in

Abstract E-070 Table 1 Preoperative embolization outcome in low grade unruptured AVMs

Overall mRS (%)	Pre-embolization	Post-embolization
0-2	90 (100%)	90 (100%)
3	0	0
4	0	0
5	0	0
6	0	0

Abstract E-070 Table 2 Preoperative embolization outcome in low grade ruptured AVMs

Overall mRS (%)	Pre-embolization	Post-embolization
0-2	64 (93.9%)	63 (93.3%)
3	7 (4.3%)	7 (4.3%)
4	3 (1.8%)	4 (2.4%)
5	0	0
6	0	0