

N-Butyl cyanoacrylate

N-Butyl cyanoacrylate (n-BCA, NBCA), a cyanoacrylate ester, is a butyl ester of 2-cyano-2-propenoic acid. It is a clear colorless liquid with a sharp, irritating odor. It is insoluble in water. Its chief use is as the main component of medical cyanoacrylate glues.

It can be encountered under various trade names, e.g. MediBond, MediCryl, PeriAcryl, GluStitch, Xoin, Gesika, VetGlu, Vetbond, LiquiVet, Indermil, LiquiBand, Histoacryl, and others.

Butyl cyanoacrylate (NBCA) - This material is approved by FDA in 2000 for embolization of cerebral arteriovenous malformation. When exposed to an environment containing anions such as blood or water, it polymerizes quickly. Catheters should be flushed with dextrose 5% to prevent premature polymerization within the catheter. NBCA completely occludes vessels and is permanent. However, the polymerization can spread distally or proximally of the intended location.

NHCA vs NBCA: Comparative Summary

Cyanoacrylates are fast-polymerizing liquid embolic agents used in endovascular procedures. The two most used types in neurointervention are:

- **NBCA** = N-butyl cyanoacrylate
- **NHCA** = N-hexyl cyanoacrylate

□ Chemical Structure

- **NBCA**: Shorter alkyl chain (4 carbon atoms)
- **NHCA**: Longer alkyl chain (6 carbon atoms)

→ Longer chains polymerize **more slowly**, allowing greater control.

□ Polymerization Speed

- **NBCA**: Very fast polymerization → hard to control
- **NHCA**: Slower polymerization → more time to reach the nidus

→ NHCA is more **forgiving** during injection.

□ Handling Characteristics

- **NBCA**: Higher risk of **catheter entrapment**, requires rapid and decisive injection

- **NHCA**: Easier manipulation, more predictable penetration, especially when diluted 1:4 with Lipiodol

☐ Target Penetration

- **NBCA**: Often used for **proximal feeder** embolization or high-flow AVMs
- **NHCA**: Better suited for **deep intranidal** penetration due to slower flow and better control

☐ Risk of Non-target Embolization

- **NBCA**: Higher risk due to abrupt polymerization
- **NHCA**: Lower risk with proper dilution and technique

☐ Cost and Availability

- **NBCA**: Widely available, inexpensive
- **NHCA**: Slightly higher cost, less widely available

☐ Common Dilution Agent

- Both are typically diluted with **Lipiodol** to modulate polymerization and increase radiopacity

☐ Clinical Use Cases

Use Case	NBCA	NHCA
High-flow AVMs	☐	⚠
Deep nidus penetration	⚠	☐
Preoperative devascularization	☐	☐
Risky anatomy with tortuous feeders	⚠	☐

⚠ Limitations

- Both are **permanent, non-resorbable**, and carry risk of embolizing healthy tissue
- Require experienced operators
- Neither offers the **plug-and-push** properties of agents like Onyx or PHIL

☐ References

- Murias Quintana E, et al. *Use of NHCA...* Cureus. 2025;17(5):e84290.
- Chapot R, et al. *Neurointerventional embolic agents: a technical and practical overview.*

Middle meningeal artery embolization using diluted n-Butyl cyanoacrylate with concomitant Dextrose 5% injection is associated with a high degree of distal penetration and complete branch occlusion and minimal risk of cranial nerve palsy or other thromboembolic complications¹⁾.

Unsorted

2: Dofuku S, Sato M, Sato D, Kuribara S, Ogawa S, Torazawa S, Ota T. Trans-cell Approach through Closed-cell Stent for Middle Meningeal Artery Embolization in Chronic subdural hematoma recurrence. *NMC Case Rep J*. 2021 Dec 22;8(1):847-850. doi: 10.2176/nmccrj.cr.2021-0307. PMID: 35079558; PMCID: PMC8769449.

3: Musmar B, Adeeb N, Ansari J, Sharma P, Cuellar HH. Endovascular Management of Hemorrhagic Stroke. *Biomedicines*. 2022 Jan 4;10(1):100. doi: 10.3390/biomedicines10010100. PMID: 35052779; PMCID: PMC8772870.

4: Iampreechakul P, Liengudom A, Lertbutsayanukul P, Siriwiwonmas S, Pongpech S. Remote Intramedullary Hemorrhage in the Thoracic Spinal Cord Secondary to a Perimedullary Arteriovenous Fistula of the Distal End of Conus Medullaris Mimicking Filum Terminale Arteriovenous Fistula. *Asian J Neurosurg*. 2021 Sep 14;16(3):638-644. doi: 10.4103/ajns.ajns_185_21. PMID: 34660387; PMCID: PMC8477807.

5: Lin MH, Lai PS, Chang LC, Huang WC, Lee MH, Chen KT, Chung CY, Yang JT. Characterization and Optimization of Chitosan-Coated Polybutylcyanoacrylate Nanoparticles for the Transfection-Guided Neural Differentiation of Mouse Induced Pluripotent Stem Cells. *Int J Mol Sci*. 2021 Aug 14;22(16):8741. doi: 10.3390/ijms22168741. PMID: 34445447; PMCID: PMC8395893.

6: Iampreechakul P, Yaisarn N, Wangtanaphat K, Lertbutsayanukul P, Siriwiwonmas S, Techataweewan N. Filum Terminale Arteriovenous Fistula with Additional Arterial Supply by the Posterior Spinal Artery: A Report of Two Cases. *Asian J Neurosurg*. 2021 May 28;16(2):423-430. doi: 10.4103/ajns.AJNS_528_20. PMID: 34268179; PMCID: PMC8244683.

7: Dossani RH, Waqas M, Rai HH, Baig AA, Cappuzzo JM, Siddiqui AH, Levy EI. Use of N-butyl 2-cyanoacrylate (nBCA) for preoperative tumor embolization. *J Neurointerv Surg*. 2022 Jan;14(1):neurintsurg-2021-017400. doi: 10.1136/neurintsurg-2021-017400. Epub 2021 Jun 17. PMID: 34140284.

8: Chang LC, Chung CY, Chiu CH, Lin MH, Yang JT. The Effect of Polybutylcyanoacrylate Nanoparticles as a Protos Delivery Vehicle on Dental Bone Formation. *Int J Mol Sci*. 2021 May 5;22(9):4873. doi: 10.3390/ijms22094873. PMID: 34062952; PMCID: PMC8125394.

9: Villanova Junior JA, Magalhães MAB, Cereja de Souza TD, Battisti MKB, Engracia Filho JR, Pimpão CT, Müller MO, Arruda P, Capriglione LGA. Polypropylene mesh inhibits post-laminectomy compressive scar formation in rabbits: Histopathological and computational morphometric evaluation. *Neurosci Lett*. 2021 Aug 24;760:135973. doi: 10.1016/j.neulet.2021.135973. Epub 2021 May 21. PMID: 34023408.

10: White TG, Shah KA, Turpin J, Dehdashti AR, Link T, Katz JM, Woo HH. Single institution early clinical experience with the Scepter Mini balloon catheter. *Neuroradiol J*. 2021 Dec;34(6):562-567. doi: 10.1177/19714009211013495. Epub 2021 May 20. PMID: 34014796; PMCID: PMC8649195.

11: Sundararajan SH, Ranganathan S, Shellikeri S, Srinivasan A, Low DW, Pukenas B, Hurst R, Cahill AM. Balloon occlusion as an adjunctive technique during sclerotherapy of Puig's classified advanced venous malformations. *Phlebology*. 2021 Oct;36(9):731-740. doi: 10.1177/02683555211015565. Epub 2021 May 13. PMID: 33983079.

- 12: Shigematsu T, Dier E, Yaeger KA, Morgenstern PF, Glass LD, Kellner CP, Berenstein A. Middle Meningeal Artery Embolization of a Pediatric Patient With Progressive Chronic Subdural Hematoma. *Oper Neurosurg* (Hagerstown). 2021 Aug 16;21(3):E274-E277. doi: 10.1093/ons/opab144. PMID: 33957675.
- 13: Baro V, Gabrieli JD, Cester G, D'Errico I, Landi A, Denaro L, Causin F. Preoperative Devascularization of Choroid Plexus Tumors: Specific Issues about Anatomy and Embolization Technique. *Brain Sci*. 2021 Apr 25;11(5):540. doi: 10.3390/brainsci11050540. PMID: 33922937; PMCID: PMC8146914.
- 14: Asai K, Nakamura H, Watanabe Y, Nishida T, Sakai M, Arisawa A, Takagaki M, Arita H, Ozaki T, Kagawa N, Fujimoto Y, Nakanishi K, Kinoshita M, Kishima H. Efficacy of endovascular intratumoral embolization for meningioma: assessment using dynamic susceptibility contrast-enhanced perfusion-weighted imaging. *J Neurointerv Surg*. 2021 Dec;13(12):1167-1171. doi: 10.1136/neurintsurg-2020-017116. Epub 2021 Mar 15. PMID: 33722964.
- 15: Iampreechakul P, Tirakotai W, Lertbutsayanukul P, Thammachantha S, Siriwiwonmas S. Spontaneous Spinal Osseous Epidural Arteriovenous Fistula with Long Segments of Prominent Epidural Venous Drainage Causing Severe Compressive Thoracic Myelopathy Successfully Treated with Combined Endovascular and Surgical Treatments: A Case Report and Review of the Literature. *Asian J Neurosurg*. 2020 Oct 19;15(4):1041-1049. doi: 10.4103/ajns.AJNS_353_20. PMID: 33708687; PMCID: PMC7869281.
- 16: Nishihori M, Izumi T, Tsukada T, Kropp AE, Uda K, Yokoyama K, Araki Y, Wakabayashi T. Short-segment Internal Trapping for Symptomatic Thrombosed Large Fusiform Vertebral Artery Aneurysms (Bird's Nest Trapping): A Technical Note. *Neurol Med Chir (Tokyo)*. 2021 Apr 15;61(4):284-291. doi: 10.2176/nmc.tn.2020-0329. Epub 2021 Feb 26. PMID: 33642453; PMCID: PMC8048117.
- 17: White TG, Dehdashti AR, Woo HH. Scepter mini assisted angiographic cure of a Vein of Galen Malformation with n-butyl cyanoacrylate. *Interv Neuroradiol*. 2021 Oct;27(5):663-666. doi: 10.1177/1591019921993368. Epub 2021 Feb 20. PMID: 33611967; PMCID: PMC8493341.
- 18: Oh CH, Kim Y, Cho BS, Yi KS. Successful transcatheter arterial embolization for massive hemorrhage from acquired uterine arteriovenous malformation which occurred as a complication of hysterectomy: A case report. *Medicine (Baltimore)*. 2021 Jan 15;100(2):e24052. doi: 10.1097/MD.00000000000024052. PMID: 33466159; PMCID: PMC7808482.
- 19: Nico L, Magro E, Ognard J, Fahed R, Salazkin I, Gevry G, Darsaut T, Raymond J, Gentric JC. Comparing N-hexyl cyanoacrylate (Magic Glue) and N-butyl cyanoacrylate (NBCA) for neurovascular embolization using the pressure cooker technique: An experimental study in swine. *J Neuroradiol*. 2021 Nov;48(6):486-491. doi: 10.1016/j.neurad.2020.12.005. Epub 2021 Jan 5. PMID: 33418056.
- 20: Takai K, Endo T, Yasuhara T, Seki T, Watanabe K, Tanaka Y, Kurokawa R, Kanaya H, Honda F, Itabashi T, Ishikawa O, Murata H, Tanaka T, Nishimura Y, Eguchi K, Takami T, Watanabe Y, Nishida T, Hiramatsu M, Ohtonari T, Yamaguchi S, Mitsuhara T, Matsui S, Uchikado H, Hattori G, Yamahata H, Taniguchi M. Neurosurgical versus endovascular treatment of spinal dural arteriovenous fistulas: a multicenter study of 195 patients. *J Neurosurg Spine*. 2020 Nov 13:1-8. doi: 10.3171/2020.6.SPINE20309. Epub ahead of print. PMID: 33186917.
- 21: Ikezawa M, Izumi T, Nishihori M, Nagashima Y, Nishimura Y, Tsukuda T, Kropp AE, Goto S, Otsuka T, Kato N, Nakano M. Direct Vertebral Artery Puncture During Open Surgery for the Endovascular Treatment of a Recurrent Vertebro-Vertebral Arteriovenous Fistula. *World Neurosurg*. 2021

Feb;146:166-170. doi: 10.1016/j.wneu.2020.10.156. Epub 2020 Nov 3. PMID: 33152497.

22: Catapano JS, Ducruet AF, Nguyen CL, Baranoski JF, Cole TS, Majmundar N, Wilkinson DA, Fredrickson VL, Cavalcanti DD, Albuquerque FC. Middle meningeal artery embolization for chronic subdural hematoma: an institutional technical analysis. *J Neurointerv Surg*. 2021 Jul;13(7):657-660. doi: 10.1136/neurintsurg-2020-016552. Epub 2020 Oct 19. PMID: 33077579.

23: Tanaka Y, Hashimoto T, Yokoyama T, Arai Y, Kikuno M, Sato H, Tsukahara K, Kohno M. [A Rebleeding Case of Carotid Blowout Syndrome after Endovascular Treatment with Covered Stent]. *No Shinkei Geka*. 2020 Oct;48(10):935-940. Japanese. doi: 10.11477/mf.1436204299. PMID: 33071230.

24: Sato S, Niimi Y, Shima S, Moteki Y, Inoue T, Kuwamoto K, Okada Y. A case of pediatric paraspinous arteriovenous fistula with multiple fistulas. *Interv Neuroradiol*. 2021 Feb;27(1):37-41. doi: 10.1177/1591019920957915. Epub 2020 Sep 17. PMID: 32938276; PMCID: PMC7903556.

25: Harada T, Fujita A, Sakata J, Kohta M, Kohmura E. Endovascular Internal Trapping by Low-Concentration N-butyl-2-Cyanoacrylate for a Ruptured Giant Common Carotid Artery Pseudoaneurysm. *Vasc Endovascular Surg*. 2021 Jan;55(1):81-85. doi: 10.1177/1538574420953942. Epub 2020 Sep 2. PMID: 32873222.

26: Hu X, Yang F, Liao Y, Li L, Zhao G, Zhang L. Docetaxel-Loaded Cholesterol- PEG Co-Modified Poly (n-Butyl) Cyanoacrylate Nanoparticles for Antitumor Drug Pulmonary Delivery: Preparation, Characterization, and in vivo Evaluation. *Int J Nanomedicine*. 2020 Jul 28;15:5361-5376. doi: 10.2147/IJN.S249511. PMID: 32801694; PMCID: PMC7395705.

27: See AP, Mohammad MH, Rizko M, Stapleton CJ, Amin-Hanjani S, Charbel FT, Aletich V, Alaraj A. Morbidity and mortality associated with sequential flow reduction embolization technique of cerebral arteriovenous malformations using n-butyl cyanoacrylate. *J Neurointerv Surg*. 2021 Mar;13(3):237-241. doi: 10.1136/neurintsurg-2020-016223. Epub 2020 Aug 14. PMID: 32801122.

28: Higbie C, Khatri D, Ligas B, Ortiz R, Langer D. N-Butyl Cyanoacrylate Transvenous Arteriovenous Malformation Embolization with Arterial Balloon Assistance: Defining Parameters for a Transvenous Approach as a Potential Upfront Treatment Option in Managing Cerebral Arteriovenous Malformations. *Asian J Neurosurg*. 2020 Apr 7;15(2):434-439. doi: 10.4103/ajns.AJNS_357_19. PMID: 32656149; PMCID: PMC7335129.

29: Oh CH, Kim Y, Lee JH, Kim HR, Go SJ. Successful superselective embolization with n-butyl cyanoacrylate for hemorrhage from superficial femoral artery branches following blunt trauma: Three case reports. *Medicine (Baltimore)*. 2020 Jul 2;99(27):e20467. doi: 10.1097/MD.00000000000020467. PMID: 32629630; PMCID: PMC7337482.

30: Triano MJ, Lara-Reyna J, Schupper AJ, Yaeger KA. Embolic Agents and Microcatheters for Endovascular Treatment of Cerebral Arteriovenous Malformations. *World Neurosurg*. 2020 Sep;141:383-388. doi: 10.1016/j.wneu.2020.06.118. Epub 2020 Jun 24. PMID: 32592963.

31: Hou K, Li G, Luan T, Xu K, Yu J. Endovascular treatment of the cavernous sinus dural arteriovenous fistula: current status and considerations. *Int J Med Sci*. 2020 May 1;17(8):1121-1130. doi: 10.7150/ijms.45210. PMID: 32410842; PMCID: PMC7211155.

32: Kuwabara M, Sakamoto S, Okazaki T, Oshita J, Taguchi A, Kurisu K. Pediatric pial arteriovenous fistula located at the bottom of the callosal sulcus presenting with intraventricular hemorrhage: a case report and literature review. *Childs Nerv Syst*. 2020 Dec;36(12):3129-3133. doi: 10.1007/s00381-020-04635-1. Epub 2020 Apr 28. PMID: 32346787.

33: Takai K, Endo T, Yasuhara T, Seki T, Watanabe K, Tanaka Y, Kurokawa R, Kanaya H, Honda F, Itabashi T, Ishikawa O, Murata H, Tanaka T, Nishimura Y, Eguchi K, Takami T, Watanabe Y, Nishida T, Hiramatsu M, Ohtonari T, Yamaguchi S, Mitsuhashi T, Matsui S, Uchikado H, Hattori G, Horie N, Yamahata H, Taniguchi M. Microsurgical versus endovascular treatment of spinal epidural arteriovenous fistulas with intradural venous drainage: a multicenter study of 81 patients. *J Neurosurg Spine*. 2020 Apr 24;1-11. doi: 10.3171/2020.2.SPINE191432. Epub ahead of print. PMID: 32330891.

34: Cuoco JA, Williams EL, Klein BJ, Malaty GR, Witcher MR, Entwistle JJ. N-butyl cyanoacrylate embolization of a traumatic pseudoaneurysm and arteriovenous fistula of the middle meningeal artery. *Radiol Case Rep*. 2020 Jan 20;15(4):321-325. doi: 10.1016/j.radcr.2019.12.009. PMID: 31993092; PMCID: PMC6974703.

35: Maroda AJ, Beckmann NA, Sheyn AM, Eljovich L, Michael LM, DiNitto JM, Rangarajan SV. Trimodal embolization of juvenile nasopharyngeal angiofibroma with intracranial extension. *Int J Pediatr Otorhinolaryngol*. 2020 Mar;130:109805. doi: 10.1016/j.ijporl.2019.109805. Epub 2019 Dec 4. PMID: 31864085.

36: Tokuyama K, Kiyosue H, Hori Y, Nagatomi H. Diploic arteriovenous fistulas with marked cortical venous reflux. *Interv Neuroradiol*. 2020 Jun;26(3):254-259. doi: 10.1177/1591019919894496. Epub 2019 Dec 19. PMID: 31856646; PMCID: PMC7254615.

37: Yamauchi K, Takenaka S, Iida T, Sakai H. A Case of Spontaneous Acute Subdural Hemorrhage Caused by a Dural Arteriovenous Fistula on the Convexity without Cortical Venous Reflux. *Case Rep Neurol*. 2019 Nov 21;11(3):312-318. doi: 10.1159/000504290. PMID: 31824286; PMCID: PMC6902228.

38: Young M, Johnson R, Gordhan A. Acute Formation of a Blunt Trauma-induced Vertebral Artery Arteriovenous Fistula Treated with Endovascular Occlusion of Vertebral Artery. *Cureus*. 2019 Sep 29;11(9):e5801. doi: 10.7759/cureus.5801. PMID: 31728248; PMCID: PMC6827852.

39: Subat YW, Dasenbrock HH, Gross BA, Patel NJ, Frerichs KU, Du R, Aziz-Sultan MA. Periprocedural intracranial hemorrhage after embolization of cerebral arteriovenous malformations: a meta-analysis. *J Neurosurg*. 2019 Sep 13:1-11. doi: 10.3171/2019.5.JNS183204. Epub ahead of print. PMID: 31518979.

40: Hung YC, Mohammed N, Eluvathingal Muttikkal TJ, Kearns KN, Li CE, Narayan A, Schlesinger D, Xu Z, Sheehan JP. The impact of preradiosurgery embolization on intracranial arteriovenous malformations: a matched cohort analysis based on de novo lesion volume. *J Neurosurg*. 2019 Aug 30:1-12. doi: 10.3171/2019.5.JNS19722. Epub ahead of print. PMID: 31470409.

41: Murakami M, Fujiwara G, Maruyama D, Komaru Y, Murakami N. Migration of lipiodol into lateral ventricles after embolization of cerebral arteriovenous malformation: a case report. *Br J Neurosurg*. 2019 Jul 31:1-4. doi: 10.1080/02688697.2019.1648755. Epub ahead of print. PMID: 31364414.

42: Sato H, Miyachi S, Hashimoto A, Kinoshita Y, Wada H, Kamada K, Tanikawa R, Kamiyama H. [Transarterial Embolization of Intraorbital Dural Arteriovenous Fistula: A Case Report]. *No Shinkei Geka*. 2019 Jul;47(7):777-783. Japanese. doi: 10.11477/mf.1436204022. PMID: 31358697.

43: Park KY, Kim JW, Kim BM, Kim DJ, Chung J, Jang CK, Kim JH. Coil-Protected Technique for Liquid Embolization in Neurovascular Malformations. *Korean J Radiol*. 2019 Aug;20(8):1285-1292. doi: 10.3348/kjr.2019.0127. PMID: 31339016; PMCID: PMC6658879.

44: Wang A, Mandigo GK, Feldstein NA, Sisti MB, Connolly ES, Solomon RA, Lavine SD, Meyers PM. Curative treatment for low-grade arteriovenous malformations. *J Neurointerv Surg*. 2020

Jan;12(1):48-54. doi: 10.1136/neurintsurg-2019-015115. Epub 2019 Jul 12. PMID: 31300533.

45: Hiramatsu M, Sugiu K, Hishikawa T, Nishihiro S, Kidani N, Takahashi Y, Murai S, Date I, Kuwayama N, Satow T, Iihara K, Sakai N. Results of 1940 embolizations for dural arteriovenous fistulas: Japanese Registry of Neuroendovascular Therapy (JR-NET3). *J Neurosurg.* 2019 Jun 28;1-8. doi: 10.3171/2019.4.JNS183458. Epub ahead of print. PMID: 31252394.

46: Goyal A, Cesare J, Lu VM, Alvi MA, Kerezoudis P, Brinjikji W, Nasr D, Lanzino G, Bydon M. Outcomes following surgical versus endovascular treatment of spinal dural arteriovenous fistula: a systematic review and meta-analysis. *J Neurol Neurosurg Psychiatry.* 2019 Oct;90(10):1139-1146. doi: 10.1136/jnnp-2019-320648. Epub 2019 May 29. PMID: 31142659.

47: Munich SA, Krishna C, Cress MC, Dhillon GS, Pollina J, Levy EI. Diagnosis and Endovascular Embolization of a Sacral Spinal Arteriovenous Fistula with "Holo-Spinal" Venous Drainage. *World Neurosurg.* 2019 Aug;128:328-332. doi: 10.1016/j.wneu.2019.05.099. Epub 2019 May 20. PMID: 31121368.

48: Shotar E, Al Raaisi A, Lenck S, Premat K, Degos V, Mathon B, Clarençon F, Sourour NA. Injection of N-butyl Cyanoacrylate Through a Dual-Lumen Balloon for Embolization of High-flow Intranidal Fistulas in Brain Arteriovenous Malformations: Technical Note. *Clin Neuroradiol.* 2020 Jun;30(2):313-319. doi: 10.1007/s00062-019-00780-6. Epub 2019 Apr 10. PMID: 30972426.

49: Shakur SF, Brunozzi D, Alaraj A. Glue Embolization with Guide Catheter Dextrose Push of Recurrent Dural Arteriovenous Fistula Previously Embolized with Onyx: Neuroendovascular Surgical Video. *World Neurosurg.* 2019 Jun;126:466. doi: 10.1016/j.wneu.2019.02.181. Epub 2019 Mar 9. PMID: 30862592.

50: Anglani M, Cecchin D, Cester G, Simonato D, Baracchini C, Della Puppa A, Causin F. ¹⁸F-Fluorodeoxyglucose Positron Emission Tomography- Magnetic Resonance Monitoring of Brain Metabolic Changes in a Case of Arteriovenous Malformation-Related Steal Phenomenon Symptoms. *World Neurosurg.* 2019 Jun;126:276-279. doi: 10.1016/j.wneu.2019.02.167. Epub 2019 Mar 9. PMID: 30862580.

51: Brunozzi D, Alaraj A. Embolization of a Complex Facial Arteriovenous Malformation, Balloon-Assisted Flow Arrest, and Controlled n-BCA Injection with Dextrose Push Technique: 2-Dimensional Operative Video. *Oper Neurosurg (Hagerstown).* 2019 Dec 1;17(6):E248. doi: 10.1093/ons/opz029. PMID: 30851033; PMCID: PMC6892379.

52: Saito K, Hino T, Fujita S, Hayashi M, Kubodera T, Wada Y. [Subcortical calcification on CT in Borden type III intracranial dural arteriovenous fistula]. *Rinsho Shinkeigaku.* 2019 Feb 23;59(2):93-97. Japanese. doi: 10.5692/clinicalneurology-001200. Epub 2019 Jan 31. PMID: 30700686.

53: Lin MH, Chung CY, Chen KT, Yeh JC, Lee TH, Lee MH, Lee IN, Huang WC, Yang JT. Comparison between Polybutylcyanoacrylate Nanoparticles with Either Surface- Adsorbed or Encapsulated Brain-Derived Neurotrophic Factor on the Neural Differentiation of iPSCs. *Int J Mol Sci.* 2019 Jan 6;20(1):182. doi: 10.3390/ijms20010182. PMID: 30621332; PMCID: PMC6337453.

54: Shakur SF, Brunozzi D, Alaraj A. Transarterial glue embolization and covered stenting of a large carotid body tumor in the same setting: neuroendovascular surgical video. *World Neurosurg.* 2019 Jan 4:S1878-8750(18)32958-9. doi: 10.1016/j.wneu.2018.12.135. Epub ahead of print. PMID: 30615996.

55: Hockley A, Tso MK, Almekhlafi MA, Lodha AK, Clegg R, Luntley J, Eesa M, Wong JH. Rapid cardiac ventricular pacing to facilitate embolization of vein of Galen malformations: technical note. *J*

Neurosurg Pediatr. 2018 Oct 5;23(1):86-91. doi: 10.3171/2018.7.PEDS1852. PMID: 30485233.

56: Santillan A, Link T, Patsalides A. Spontaneous Arteriovenous Fistula of the Middle Deep Temporal Artery. Vasc Endovascular Surg. 2019 Feb;53(2):145-146. doi: 10.1177/1538574418813744. Epub 2018 Nov 27. PMID: 30482098.

57: Lee CY. Embolization with NBCA for Ruptured Aneurysm Located in the Moyamoya-like Collateral Network Associated with Isolated Middle Cerebral Artery Occlusion. Asian J Neurosurg. 2018 Oct-Dec;13(4):1236-1238. doi: 10.4103/ajns.AJNS_127_17. PMID: 30459904; PMCID: PMC6208264.

58: Watanabe S, Nakahara I, Ohta T, Matsumoto S, Ishibashi R, Nagata I. Vagal Nerve Palsy After Transarterial Embolization of Transverse-Sigmoid Dural Arteriovenous Fistula Using Onyx. J Stroke Cerebrovasc Dis. 2019 Feb;28(2):464-469. doi: 10.1016/j.jstrokecerebrovasdis.2018.10.023. Epub 2018 Nov 10. PMID: 30425023.

59: Fukuda N, Kanemaru K, Hashimoto K, Yoshioka H, Senbokuya N, Yagi T, Kinouchi H. Embolization of a peripheral cerebral aneurysm associated with intracranial major artery occlusion through a transdural anastomotic artery: Case report. Interv Neuroradiol. 2019 Apr;25(2):172-176. doi: 10.1177/1591019918801539. Epub 2018 Sep 19. PMID: 30231796; PMCID: PMC6448377.

60: Dahl RH, Holtmannspötter M, Gutte H, Cortsen M, Hauerberg J, Benndorf G. Snaring of a Glued Microcatheter During Embolization of an Arteriovenous Malformation with N-Butyl Cyanoacrylate. World Neurosurg. 2018 Dec;120:343-348. doi: 10.1016/j.wneu.2018.08.120. Epub 2018 Aug 24. PMID: 30149156.

61: Maejima R, Ohshima T, Miyachi S, Matsuo N, Kawaguchi R, Takayasu M. Neonatal Intracranial Pial Arteriovenous Fistula Treated with Endovascular Embolization: A Case Report. World Neurosurg. 2018 Oct;118:261-264. doi: 10.1016/j.wneu.2018.07.114. Epub 2018 Jul 23. PMID: 30048791.

62: Chen CJ, Norat P, Ding D, Mendes GAC, Tvrdik P, Park MS, Kalani MY. Transvenous embolization of brain arteriovenous malformations: a review of techniques, indications, and outcomes. Neurosurg Focus. 2018 Jul;45(1):E13. doi: 10.3171/2018.3.FOCUS18113. PMID: 29961383.

63: Suyama Y, Wakabayashi S, Kajikawa H, Nakahara I. Dural arteriovenous fistula presenting with acute subdural haematoma showing impending cerebral herniation. BMJ Case Rep. 2018 Jun 27;2018:bcr2017223177. doi: 10.1136/bcr-2017-223177. PMID: 29950494; PMCID: PMC6040469.

64: Przybylowski CJ, Baranoski JF, See AP, Flores BC, Almefty RO, Ding D, Chapple KM, Sanai N, Ducruet AF, Albuquerque FC. Preoperative Embolization of Skull Base Meningiomas: Outcomes in the Onyx Era. World Neurosurg. 2018 Aug;116:e371-e379. doi: 10.1016/j.wneu.2018.04.208. Epub 2018 May 9. PMID: 29751190.

65: Yoon N, Shah A, Couldwell WT, Kalani MYS, Park MS. Preoperative embolization of skull base meningiomas: current indications, techniques, and pearls for complication avoidance. Neurosurg Focus. 2018 Apr;44(4):E5. doi: 10.3171/2018.1.FOCUS17686. PMID: 29606046.

66: Flores BC, See AP, Weiner GM, Jankowitz BT, Ducruet AF, Albuquerque FC. Use of the Apollo detachable-tip microcatheter for endovascular embolization of arteriovenous malformations and arteriovenous fistulas. J Neurosurg. 2018 Mar 23;130(3):963-971. doi: 10.3171/2017.9.JNS17397. PMID: 29570006.

67: Arai S, Shimizu K, Yamochi T, Mizutani T, Okumura H, Nakajo T, Matsumoto M. Preoperative Embolization of Meningiomas: Differences in Surgical Operability and Histopathologic Changes

Between Embosphere and N-butyl 2-cyanoacrylate. *World Neurosurg.* 2018 Mar;111:e113-e119. doi: 10.1016/j.wneu.2017.12.003. Epub 2017 Dec 12. PMID: 29246879.

68: Varadharajan S, Ramalingaiah AH, Saini J, Gupta AK, Devi BI, Acharya UV. Precipitating hydrophobic injectable liquid embolization of intracranial vascular shunts: initial experience and technical note. *J Neurosurg.* 2018 Nov 1;129(5):1217-1222. doi: 10.3171/2017.6.JNS16447. PMID: 29192863.

69: Yamauchi S, Kawakami T, Murata K, Ishiguro T, Ikeda H, Nishio A. Choroid plexus AVM with anomalous origin of the capsulothalamic artery: A case report. *Interv Neuroradiol.* 2018 Feb;24(1):76-81. doi: 10.1177/1591019917739841. Epub 2017 Nov 10. PMID: 29125025; PMCID: PMC5772544.

70: Ishii M, Yamanouchi T, Oshima R, Sato M, Noda T, Maki H, Kito A. [A Case of Dural Arteriovenous Fistula that Developed 21 Months after Cerebral Venous Sinus Thrombosis]. *No Shinkei Geka.* 2017 Oct;45(10):889-895. Japanese. doi: 10.11477/mf.1436203613. PMID: 29046468.

71: Al-Smadi A, Shokuhfar T, Johnston A, Alden TD, Bowman R, Shaibani A. The rare case of a large complex intraosseous cranial arteriovenous malformation with successful multidisciplinary management. *J Neurosurg Pediatr.* 2017 Dec;20(6):591-597. doi: 10.3171/2017.7.PEDS17161. Epub 2017 Sep 29. PMID: 28960171.

72: Lylyk P, Chudyk J, Bleise C, Serna Candel C, Aguilar Pérez M, Henkes H. Endovascular occlusion of pial arteriovenous macrofistulae, using pCANvas1 and adenosine-induced asystole to control nBCA injection. *Interv Neuroradiol.* 2017 Dec;23(6):644-649. doi: 10.1177/1591019917720921. Epub 2017 Jul 20. PMID: 28728535; PMCID: PMC5814065.

73: Suzuki K, Nagaishi M, Matsumoto Y, Fujii Y, Inoue Y, Sugiura Y, Hirata K, Suzuki R, Kawamura Y, Nakae R, Tanaka Y, Hyodo A. Preoperative Embolization for Skull Base Meningiomas. *J Neurol Surg B Skull Base.* 2017 Aug;78(4):308-314. doi: 10.1055/s-0037-1598195. Epub 2017 Feb 15. PMID: 28725517; PMCID: PMC5515656.

74: Orlov K, Gorbatykh A, Berestov V, Shayakhmetov T, Kislitsin D, Seleznev P, Strelnikov N. Superselective transvenous embolization with Onyx and n-BCA for vein of Galen aneurysmal malformations with restricted transarterial access: safety, efficacy, and technical aspects. *Childs Nerv Syst.* 2017 Nov;33(11):2003-2010. doi: 10.1007/s00381-017-3499-6. Epub 2017 Jul 8. PMID: 28689342.

75: Gemmete JJ, Srinivasa RN, Chick JFB. Treatment of Chylous Ascites in a Child after Wilms Tumor Resection with Intranodal Injection of N-Butyl Cyanoacrylate Glue. *J Vasc Interv Radiol.* 2017 Jul;28(7):1067-1069. doi: 10.1016/j.jvir.2017.02.024. PMID: 28645505.

76: Peres CMA, Souza EC, Teixeira MJ, Figueiredo EG, Caldas JGMP. Impact of Associated Nidal Lesions in Outcome of Brain Arteriovenous Malformations After Radiosurgery with or without Embolization. *World Neurosurg.* 2017 Sep;105:643-650. doi: 10.1016/j.wneu.2017.06.044. Epub 2017 Jun 15. PMID: 28625906.

77: Takeshima Y, Ohmori Y, Nakagawa T, Kaku Y, Kuratsu JI, Yano S. Subarachnoid Hemorrhage Because of Distal Superior Cerebellar Artery Dissection in Neurofibromatosis Type 1. *World Neurosurg.* 2017 Sep;105:1036.e15-1036.e19. doi: 10.1016/j.wneu.2017.06.052. Epub 2017 Jun 16. PMID: 28625904.

78: Nakajima N, Fukuda H, Adachi H, Sasaki N, Yamaguchi M, Mitsuno Y, Kitagawa M, Horikawa F,

Murao K, Yamada K. Long-Term Volume Reduction Effects of Endovascular Embolization for Intracranial Meningioma: Preliminary Experience of 5 Cases. *World Neurosurg.* 2017 Sep;105:591-598. doi: 10.1016/j.wneu.2017.06.047. Epub 2017 Jun 15. PMID: 28624563.

79: Sultan A, Mohamed A. Efficacy and Safety of Using N-Butyl Cyanoacrylate in Cranial Fixation Following Trauma and Other Pathologies. *Turk Neurosurg.* 2018;28(3):416-420. doi: 10.5137/1019-5149.JTN.20117-17.1. PMID: 28593627.

80: Kilburg C, Taussky P, Kalani MY, Park MS. Novel use of flow diversion for the treatment of aneurysms associated with arteriovenous malformations. *Neurosurg Focus.* 2017 Jun;42(6):E7. doi: 10.3171/2017.2.FOCUS1755. PMID: 28565984.

81: Gross BA, Moon K, Mcdougall CG. Endovascular management of arteriovenous malformations. *Handb Clin Neurol.* 2017;143:59-68. doi: 10.1016/B978-0-444-63640-9.00006-0. PMID: 28552159.

82: Shakur SF, Brunozzi D, Setabutr P, Hussein AE, Charbel FT, Alaraj A. Transorbital Glue Embolization of a Recurrent Venous Varix Using Real-Time Image Guidance in the Neuroangiography Suite. *World Neurosurg.* 2017 Aug;104:1045.e1. doi: 10.1016/j.wneu.2017.05.014. Epub 2017 May 11. PMID: 28502685.

83: Chung CY, Lin MH, Lee IN, Lee TH, Lee MH, Yang JT. Brain-Derived Neurotrophic Factor Loaded PS80 PBCA Nanocarrier for In Vitro Neural Differentiation of Mouse Induced Pluripotent Stem Cells. *Int J Mol Sci.* 2017 Mar 19;18(3):663. doi: 10.3390/ijms18030663. PMID: 28335495; PMCID: PMC5372675.

84: Minamide H, Hayashi Y, Uchiyama N. [Multiple Tentorial Dural Arteriovenous Fistulas with Acquired Pial Arteriovenous Fistula Presented with Unilateral Eye Symptoms Successfully Treated by Transarterial Embolization and Direct Surgery:A Case Report]. *No Shinkei Geka.* 2017 Mar;45(3):239-245. Japanese. doi: 10.11477/mf.1436203486. PMID: 28297690.

85: Caroff J, Benachour N, Ikka L, Nevoux J, Parker F, Da Ros V, Mihalea C, Iacobucci M, Moret J, Spelle L. 3D-guided direct puncture therapeutic embolization of intracranial tumors. *J Neurointerv Surg.* 2017 Aug;9(8):787-791. doi: 10.1136/neurintsurg-2017-012979. Epub 2017 Mar 1. PMID: 28251915.

86: Alderazi YJ, Shastri D, Wessel J, Mathew M, Kass-Hout T, Aziz SR, Prestigiacomo CJ, Gandhi CD. Internal Maxillary Artery Preoperative Embolization Using n-Butyl Cyanoacrylate and Pushable Coils for Temporomandibular Joint Ankylosis Surgery. *World Neurosurg.* 2017 May;101:254-258. doi: 10.1016/j.wneu.2017.01.086. Epub 2017 Jan 31. PMID: 28153614.

87: Koyanagi M, Kobayashi T, Oda M, Narumi O. Dural arteriovenous fistula in the falx cerebri treated with transarterial embolization using n-butyl cyanoacrylate. *Surg Neurol Int.* 2016 Dec 21;7(Suppl 41):S1057-S1059. doi: 10.4103/2152-7806.196371. PMID: 28144483; PMCID: PMC5234292.

88: Omodaka S, Ogawa Y, Sato K, Matsumoto Y, Tominaga T. Preoperative embolization and immediate removal of a giant pituitary neuroendocrine tumor: a case report. *BMC Res Notes.* 2017 Jan 26;10(1):63. doi: 10.1186/s13104-017-2383-5. PMID: 28126010; PMCID: PMC5270227.

89: Open and endovascular treatment of spinal dural arteriovenous fistulas: a 10-year experience. *J Neurosurg Spine.* 2017 Apr;26(4):519-523. doi: 10.3171/2016.9.SPINE16394. Epub 2017 Jan 20. PMID: 28106525.

90: Morales-Gómez JA, Garza-Oyervides VV, Arenas-Ruiz JA, Mercado-Flores M, Elizondo-Riojas CG, Boop FA, de León ÁM. Hydrocephalus in a patient with an unruptured pial arteriovenous fistula: hydrodynamic considerations, endovascular treatment, and clinical course. *J Neurosurg Pediatr.* 2017

Mar;19(3):307-311. doi: 10.3171/2016.9.PEDS16458. Epub 2017 Jan 6. PMID: 28059677.

91: Schlesinger DJ, Nordström H, Lundin A, Xu Z, Sheehan JP. Dosimetric effects of Onyx embolization on Gamma Knife arteriovenous malformation dose distributions. *J Neurosurg.* 2016 Dec;125(Suppl 1):114-122. doi: 10.3171/2016.6.GKS161502. PMID: 27903195.

92: Watanabe Y, Sandhu D, Warmington L, Moen S, Tummala R. Three-dimensional assessment of the effects of high-density embolization material on the absorbed dose in the target for Gamma Knife radiosurgery of arteriovenous malformations. *J Neurosurg.* 2016 Dec;125(Suppl 1):123-128. doi: 10.3171/2016.7.GKS161545. PMID: 27903193.

93: Woolen S, Gemmete JJ. Treatment of Residual Facial Arteriovenous Malformations after Embolization with Percutaneous Cryotherapy. *J Vasc Interv Radiol.* 2016 Oct;27(10):1570-5. doi: 10.1016/j.jvir.2016.05.027. PMID: 27670993.

94: Ohnishi H, Miyachi S, Murao K, Hiramatsu R, Takahashi K, Ohnishi H, Kuroiwa T. Infiltrated Embolization of Meningioma with Dilute Cyanoacrylate Glue. *Neurol Med Chir (Tokyo).* 2017 Jan 15;57(1):44-50. doi: 10.2176/nmc.tn.2016-0144. Epub 2016 Sep 16. PMID: 27646010; PMCID: PMC5243164.

95: Renieri L, Limbucci N, Mangiafico S. Advances in Embolization of bAVMs. *Acta Neurochir Suppl.* 2016;123:159-66. doi: 10.1007/978-3-319-29887-0_23. PMID: 27637644.

96: Gross BA, Albuquerque FC, Moon K, McDougall CG. Evolution of treatment and a detailed analysis of occlusion, recurrence, and clinical outcomes in an endovascular library of 260 dural arteriovenous fistulas. *J Neurosurg.* 2017 Jun;126(6):1884-1893. doi: 10.3171/2016.5.JNS16331. Epub 2016 Sep 2. PMID: 27588586.

97: Mewada T, Ohshima T, Yamamoto T, Goto S, Kato Y. Usefulness of Embolization for Iatrogenic Dural Arteriovenous Fistula Associated with Recurrent Chronic Subdural Hematoma: A Case Report and Literature Review. *World Neurosurg.* 2016 Aug;92:584.e7-584.e10. doi: 10.1016/j.wneu.2016.05.042. Epub 2016 May 27. PMID: 27241087.

98: Elkordy A, Endo H, Sato K, Matsumoto Y, Kondo R, Niizuma K, Endo T, Fujimura M, Tominaga T. Embolization of the choroidal artery in the treatment of cerebral arteriovenous malformations. *J Neurosurg.* 2017 Apr;126(4):1114-1122. doi: 10.3171/2016.2.JNS152370. Epub 2016 May 6. PMID: 27153173.

99: Bagherpour AN, Rodriguez GJ, Moorthy C, Trier TT, Maud A. Combined surgical and endovascular treatment of complex high-flow conus medullaris arteriovenous fistula associated with Parkes Weber syndrome: case report. *J Neurosurg Spine.* 2016 Aug;25(2):234-8. doi: 10.3171/2016.1.SPINE151156. Epub 2016 Mar 25. PMID: 27015132.

100: Asano S, Hayashi N, Edakubo S, Hosokawa M, Suwa J, Saito Y, Ichi S, Taneda M, Katoh K. Successful perinatal management of a ruptured brain arteriovenous malformation in a pregnant patient by endovascular embolization followed by elective cesarean section: a single-case experience. *JA Clin Rep.* 2016;2(1):21. doi: 10.1186/s40981-016-0045-6. Epub 2016 Aug 11. PMID: 29497676; PMCID: PMC5818847.

101: Fahed R, Clarençon F, Sourour NA, Chauvet D, Le Jean L, Chiras J, Di Maria F. Rescue N-butyl-2 cyanoacrylate embolectomy using a Solitaire FR device after venous glue migration during arteriovenous malformation embolization: technical note. *J Neurosurg.* 2016 Jul;125(1):173-6. doi: 10.3171/2015.5.JNS15145. Epub 2015 Nov 27. PMID: 26613173.

- 102: Heit JJ, Faisal AG, Telischak NA, Choudhri O, Do HM. Headway Duo microcatheter for cerebral arteriovenous malformation embolization with n-BCA. *J Neurointerv Surg*. 2016 Nov;8(11):1181-1185. doi: 10.1136/neurintsurg-2015-012094. Epub 2015 Nov 24. PMID: 26603031.
- 103: Muraoka K, Tomita Y, Kuwahara K, Takahashi Y, Okuma Y, Tanabe T, Meguro T, Hirotsune N, Nishino S. [Responding to Arterial Perforation during Endovascular Neurosurgery]. *No Shinkei Geka*. 2015 Nov;43(11):979-84. Japanese. doi: 10.11477/mf.1436203164. PMID: 26549717.
- 104: Karim AB, Lindsey S, Bovino B, Berenstein A. Oral Surgical Procedures Performed Safely in Patients With Head and Neck Arteriovenous Malformations: A Retrospective Case Series of 12 Patients. *J Oral Maxillofac Surg*. 2016 Feb;74(2):255.e1-8. doi: 10.1016/j.joms.2015.10.012. Epub 2015 Oct 23. PMID: 26549473.
- 105: Åslund AKO, Berg S, Hak S, Mørch Y, Torp SH, Sandvig A, Widerøe M, Hansen R, de Lange Davies C. Nanoparticle delivery to the brain-By focused ultrasound and self-assembled nanoparticle-stabilized microbubbles. *J Control Release*. 2015 Dec 28;220(Pt A):287-294. doi: 10.1016/j.jconrel.2015.10.047. Epub 2015 Oct 28. PMID: 26518721.
- 106: Imai T, Ohshima T, Nishizawa T, Shimato S, Kato K. Successful Preoperative Endovascular Embolization of an Extreme Hypervascular Glioblastoma Mimicking an Arteriovenous Malformation. *World Neurosurg*. 2016 Feb;86:512.e1-4. doi: 10.1016/j.wneu.2015.10.006. Epub 2015 Oct 14. PMID: 26463396.
- 107: Yamamoto T, Ohshima T, Nishihori M, Goto S, Nishizawa T, Shimato S, Kato K. Preoperative embolization of meningiomas with low-concentration n-butyl cyanoacrylate. *Nagoya J Med Sci*. 2015 Aug;77(3):347-53. PMID: 26412880; PMCID: PMC4574321.
- 108: Omodaka S, Endo H, Fujimura M, Niizuma K, Sato K, Matsumoto Y, Tominaga T. High-grade Cerebral Arteriovenous Malformation Treated with Targeted Embolization of a Ruptured Site: Wall Enhancement of an Intranidal Aneurysm as a Sign of Ruptured Site. *Neurol Med Chir (Tokyo)*. 2015;55(10):813-7. doi: 10.2176/nmc.cr.2015-0052. Epub 2015 Sep 15. PMID: 26369871; PMCID: PMC4663032.
- 109: Ono K, Oishi H, Suga Y, Yamamoto M, Nonaka S, Nakajima M, Miyajima M, Arai H. [Case Report of Cerebellar Vermis Arteriovenous Malformation Presenting with Hydrocephalus due to Aqueductal Stenosis]. *No Shinkei Geka*. 2015 Sep;43(9):843-8. Japanese. doi: 10.11477/mf.1436203131. PMID: 26321699.
- 110: Uchikawa Y, Mori K, Shiigai M, Konishi T, Hoshiai S, Ishigro T, Hiyama T, Nakai Y, Minami M. Double Coaxial Microcatheter Technique for Glue Embolization of Renal Arteriovenous Malformations. *Cardiovasc Intervent Radiol*. 2015 Oct;38(5):1277-83. doi: 10.1007/s00270-015-1188-y. Epub 2015 Aug 8. PMID: 26253779.
- 111: Huo X, Jiang Y, Lv X, Yang H, Zhao Y, Li Y. Gamma Knife surgical treatment for partially embolized cerebral arteriovenous malformations. *J Neurosurg*. 2016 Mar;124(3):767-76. doi: 10.3171/2015.1.JNS142711. Epub 2015 Aug 7. PMID: 26252461.
- 112: dos Santos MP, Zhang J, Ghinda D, Glikstein R, Agid R, Rodesch G, Tampieri D, terBrugge KG. Imaging diagnosis and the role of endovascular embolization treatment for vascular intraspinal tumors. *Neurosurg Focus*. 2015 Aug;39(2):E16. doi: 10.3171/2015.5.FOCUS1514. PMID: 26235014.
- 113: Vadlamudi V, Gemmete JJ, Chaudhary N, Pandey AS, Kahana A. Transvenous sclerotherapy of a large symptomatic orbital venous varix using a microcatheter balloon and bleomycin. *J Neurointerv*

Surg. 2016 Aug;8(8):e30. doi: 10.1136/neurintsurg-2015-011777.rep. Epub 2015 Jun 29. PMID: 26122325.

114: Ishihara H, Ishihara S, Niimi J, Neki H, Kakehi Y, Uemiya N, Kohyama S, Yamane F, Kato H, Suzuki T, Adachi J, Mishima K, Nishikawa R. The safety and efficacy of preoperative embolization of meningioma with N-butyl cyanoacrylate. *Interv Neuroradiol*. 2015 Oct;21(5):624-30. doi: 10.1177/1591019915590537. Epub 2015 Jun 26. PMID: 26116646; PMCID: PMC4757340.

115: Vadlamudi V, Gemmete JJ, Chaudhary N, Pandey AS, Kahana A. Transvenous sclerotherapy of a large symptomatic orbital venous varix using a microcatheter balloon and bleomycin. *BMJ Case Rep*. 2015 Jun 24;2015:bcr2015011777. doi: 10.1136/bcr-2015-011777. PMID: 26109623; PMCID: PMC4480093.

116: Woolen S, Gemmete JJ, Pandey AS, Chaudhary N. Targeted epidural patch with n-butyl cyanoacrylate (n-BCA) through a single catheter access site for treatment of a cerebral spinal fluid leak causing spontaneous intracranial hypotension. *J Neurointerv Surg*. 2016 Jul;8(7):e26. doi: 10.1136/neurintsurg-2015-011778.rep. Epub 2015 Jun 5. PMID: 26047904.

117: Woolen S, Gemmete JJ, Pandey AS, Chaudhary N. Targeted epidural patch with n-butyl cyanoacrylate (n-BCA) through a single catheter access site for treatment of a cerebral spinal fluid leak causing spontaneous intracranial hypotension. *BMJ Case Rep*. 2015 Jun 2;2015:bcr2015011778. doi: 10.1136/bcr-2015-011778. PMID: 26038380; PMCID: PMC4460418.

118: Ozdol C, Turk CC, Hazer DB, Yildirim AE, Arat A, Atilla P, Muftuoglu S, Oruckaptan H. Comparison of the Toxicities of Ethylene Vinyl Alcohol Copolymer (EVOH) Preparations, Dimethyl Sulphoxide and N-Butyl 2-Cyanoacrylate on Cerebral Parenchyma in an Experimental Rabbit Model. *Turk Neurosurg*. 2015;25(3):446-52. doi: 10.5137/1019-5149.JTN.12592-14.1. PMID: 26037186.

119: Griauszde J, Gemmete JJ, Farley F. Successful treatment of a Musculoskeletal Tumor Society grade 3 aneurysmal bone cyst with N-butyl cyanoacrylate embolization and percutaneous cryoablation. *J Vasc Interv Radiol*. 2015 Jun;26(6):905-9. doi: 10.1016/j.jvir.2015.01.019. PMID: 26003456.

120: Mascitelli JR, McNeill IT, Mocco J, Berenstein A, DeMattia J, Fifi JT. Ruptured distal AICA pseudoaneurysm presenting years after vestibular schwannoma resection and radiation. *J Neurointerv Surg*. 2016 May;8(5):e19. doi: 10.1136/neurintsurg-2015-011736.rep. Epub 2015 May 11. PMID: 25964373.

121: Orru E, Wyse E, Pearl MS. Fenestration of the supraclinoid internal carotid artery in a patient with a concomitant intracranial arteriovenous malformation. *BMJ Case Rep*. 2015 May 6;2015:bcr2015209733. doi: 10.1136/bcr-2015-209733. PMID: 25948856; PMCID: PMC4434274.

122: Mascitelli JR, McNeill IT, Mocco J, Berenstein A, DeMattia J, Fifi JT. Ruptured distal AICA pseudoaneurysm presenting years after vestibular schwannoma resection and radiation. *BMJ Case Rep*. 2015 May 6;2015:bcr2015011736. doi: 10.1136/bcr-2015-011736. PMID: 25948851; PMCID: PMC4434381.

123: Jagadeesan BD, Grande AW, Guillaume DJ, Nascene DR, Tummala RP. The role of percutaneous embolization techniques in the management of dural sinus malformations with atypical angioarchitecture in neonates: report of 2 cases. *J Neurosurg Pediatr*. 2015 Jul;16(1):74-9. doi: 10.3171/2014.12.PEDS145. Epub 2015 Apr 24. PMID: 25910034.

124: Yoshioka S, Kuwayama K, Satomi J, Nagahiro S. Transarterial N-Butyl-2-cyanoacrylate Embolization of an Intraosseous Dural Arteriovenous Fistula Associated With Acute Epidural

Hematoma: Technical Case Report. Neurosurgery. 2015 Sep;11 Suppl 3:E468-71. doi: 10.1227/NEU.0000000000000773. PMID: 25875581.

125: Fonoff ET, Teixeira MJ, Nascimento CN, Lopez WO. Aesthetically optimal deep brain stimulation technique in patients with alopecia. Neurocirugia (Astur). 2015 Jul-Aug;26(4):206-8. doi: 10.1016/j.neucir.2015.02.004. Epub 2015 Apr 8. PMID: 25861896.

126: Aihara M, Naito I, Shimizu T, Fujimaki H, Asakura K, Miyamoto N, Yoshimoto Y. Preoperative embolization of intracranial meningiomas using n-butyl cyanoacrylate. Neuroradiology. 2015 Jul;57(7):713-9. doi: 10.1007/s00234-015-1521-9. Epub 2015 Apr 7. PMID: 25845812.

127: Labby ZE, Chaudhary N, Gemmete JJ, Pandey AS, Roberts DA. Dosimetric measurements of an n-butyl cyanoacrylate embolization material for arteriovenous malformations. Med Phys. 2015 Apr;42(4):1739-44. doi: 10.1118/1.4915080. PMID: 25832063.

128: Zaidi HA, Kalani MY, Spetzler RF, McDougall CG, Albuquerque FC. Multimodal treatment strategies for complex pediatric cerebral arteriovenous fistulas: contemporary case series at Barrow Neurological Institute. J Neurosurg Pediatr. 2015 Jun;15(6):615-24. doi: 10.3171/2014.11.PEDS14468. Epub 2015 Mar 27. PMID: 25815632.

129: Miyamoto N, Naito I, Shimizu T, Yoshimoto Y. Efficacy and limitations of transarterial acrylic glue embolization for intracranial dural arteriovenous fistulas. Neurol Med Chir (Tokyo). 2015;55(2):163-72. doi: 10.2176/nmc.oa.2014-0223. Epub 2015 Jan 23. PMID: 25746311; PMCID: PMC4533409.

130: Shah A, Choudhri O, Jung H, Li G. Preoperative endovascular embolization of meningiomas: update on therapeutic options. Neurosurg Focus. 2015 Mar;38(3):E7. doi: 10.3171/2014.12.FOCUS14728. PMID: 25727229.

131: Elsenousi A, Aletich VA, Alaraj A. Neurological outcomes and cure rates of embolization of brain arteriovenous malformations with n-butyl cyanoacrylate or Onyx: a meta-analysis. J Neurointerv Surg. 2016 Mar;8(3):265-72. doi: 10.1136/neurintsurg-2014-011427. Epub 2014 Dec 24. PMID: 25540177.

132: Shah KJ, Jones AM, Arnold PM, Ebersole K. Intracranial pseudoaneurysm after intracranial pressure monitor placement. J Neurointerv Surg. 2016 Jan;8(1):e3. doi: 10.1136/neurintsurg-2014-011410.rep. Epub 2014 Dec 17. PMID: 25520265.

133: Shah KJ, Jones AM, Arnold PM, Ebersole K. Intracranial pseudoaneurysm after intracranial pressure monitor placement. BMJ Case Rep. 2014 Dec 12;2014:bcr2014011410. doi: 10.1136/bcr-2014-011410. PMID: 25498805; PMCID: PMC4267071.

134: Suzuki M, Umeoka K, Kominami S, Morita A. Successful treatment of a ruptured flow-related aneurysm in a patient with hemangioblastoma: Case report and review of literature. Surg Neurol Int. 2014 Sep 26;5(Suppl 9):S430-3. doi: 10.4103/2152-7806.141887. PMID: 25324977; PMCID: PMC4199150.

135: Murakami Y, Sato T, Tamura T, Kyojuka H, Yasuda S, Nomura Y, Isosu T, Sakuma J, Fujimori K, Saito K. [A case of newly diagnosed moyamoya disease in a pregnant patient with a ruptured aneurysm of the distal anterior choroidal artery embolized using N-butyl cyanoacrylate]. No Shinkei Geka. 2014 Oct;42(10):961-6. Japanese. doi: 10.11477/mf.1436200013. PMID: 25266588.

136: Pashapour A, Mohammadian R, Salehpour F, Sharifipour E, Mansourizade R, Mahdavi-fard A, Salehi M, Mirzaii F, Sariaslani P, Ardalani GF, Altafi D. Long- Term Endovascular Treatment Outcome of 46 Patients with Cavernous Sinus Dural Arteriovenous Fistulas Presenting with Ophthalmic Symptoms.

A Non-Controlled Trial with Clinical and Angiographic Follow-up. *Neuroradiol J.* 2014 Sep;27(4):461-70. doi: 10.15274/NRJ-2014-10079. Epub 2014 Aug 29. PMID: 25196621; PMCID: PMC4236866.

137: Bruno CA Jr, Meyers PM. Endovascular management of arteriovenous malformations of the brain. *Interv Neurol.* 2013 Sep;1(3-4):109-23. doi: 10.1159/000346927. PMID: 25187772; PMCID: PMC4138962.

138: Dalyai R, Starke RM, Chalouhi N, Theofanis T, Busack C, Jabbour P, Gonzalez LF, Rosenwasser R, Tjoumakaris S. Smoking is a negative predictor of arteriovenous malformation posttreatment obliteration: analysis of vascular risk factors in 774 patients. *Neurosurg Focus.* 2014 Sep;37(3):E3. doi: 10.3171/20145.FOCUS14121. PMID: 25175441.

139: Barber SM, Rangel-Castilla L, Zhang YJ, Klucznik R, Diaz O. Mid- and long- term outcomes of carotid-cavernous fistula endovascular management with Onyx and n-BCA: experience of a single tertiary center. *J Neurointerv Surg.* 2015 Oct;7(10):762-9. doi: 10.1136/neurintsurg-2014-011266. Epub 2014 Aug 18. PMID: 25135442.

140: Chen KW, Kuo MF, Lee CW, Tu YK. Acquired Chiari malformation type I associated with a supratentorial fistulous arteriovenous malformation: a case report. *Childs Nerv Syst.* 2015 Mar;31(3):499-501. doi: 10.1007/s00381-014-2508-2. Epub 2014 Aug 1. PMID: 25081218.

141: Ashour R, Aziz-Sultan A. Preoperative tumor embolization. *Neurosurg Clin N Am.* 2014 Jul;25(3):607-17. doi: 10.1016/j.nec.2014.04.015. Epub 2014 May 20. PMID: 24994094.

142: Suzuki M, Kominami S, Koketsu K, Mizunari T, Kobayashi S, Morita A. Endovascular Repair of a Middle Meningeal Artery Aneurysm after Cranial Surgery. *NMC Case Rep J.* 2014 Jul 3;1(1):6-8. doi: 10.2176/nmccrj.2013-0318. PMID: 28663943; PMCID: PMC5364935.

143: Hayes SB, Johnson JN, Most Z, Elhammady MS, Yavagal D, Aziz-Sultan MA. Transarterial embolization of intractable nasal and oropharyngeal hemorrhage using liquid embolic agents. *J Neurointerv Surg.* 2015 Jul;7(7):537-41. doi: 10.1136/neurintsurg-2014-011101. Epub 2014 May 26. PMID: 24862104.

144: Alaraj A, Dashti R, Mehta NK, Goodin S, Charbel FT, Aletich VA. Augmentation of N-butyl cyanoacrylate embolization of cranial, head, and neck tumors by simultaneous infusion of 5% dextrose solution. *J Neurointerv Surg.* 2015 Jun;7(6):463-70. doi: 10.1136/neurintsurg-2013-011071. Epub 2014 May 7. PMID: 24811743.

145: Zenteno M, Santos Franco J, Moscote-Salazar LR, Lee A. Manejo endovascular de las fistulas durales al seno cavernoso [Endovascular management of cavernous sinus dural fistulas]. *Bol Asoc Med P R.* 2014;106(1):17-24. Spanish. PMID: 24791359.

146: Alaraj A, Behbahani M, Valyi-Nagy T, Aardsma N, Aletich VA. Rare presentation of intracranial vascular blowout after tumor resection and radiation therapy. *J Neurointerv Surg.* 2015 May;7(5):e18. doi: 10.1136/neurintsurg-2014-011192.rep. Epub 2014 Apr 24. PMID: 24763549.

147: Alaraj A, Behbahani M, Valyi-Nagy T, Aardsma N, Aletich VA. Rare presentation of intracranial vascular blowout after tumor resection and radiation therapy. *BMJ Case Rep.* 2014 Apr 19;2014:bcr2014011192. doi: 10.1136/bcr-2014-011192. PMID: 24748141; PMCID: PMC3992549.

148: Paramasivam S, Altschul D, Ortega-Gutierrez S, Fifi J, Berenstein A. N-butyl cyanoacrylate embolization using a detachable tip microcatheter: initial experience. *J Neurointerv Surg.* 2015 Jun;7(6):458-61. doi: 10.1136/neurintsurg-2014-011165. Epub 2014 Apr 8. PMID: 24714611.

- 149: Inoue A, Tagawa M, Kumon Y, Watanabe H, Shoda D, Sugiu K, Ohnishi T. Ethmoidal dural arteriovenous fistula with unusual drainage route treated by transarterial embolization. *J Neurointerv Surg*. 2015 Apr;7(4):e15. doi: 10.1136/neurintsurg-2013-011098.rep. Epub 2014 Mar 28. PMID: 24682847.
- 150: Inoue A, Tagawa M, Kumon Y, Watanabe H, Shoda D, Sugiu K, Ohnishi T. Ethmoidal dural arteriovenous fistula with unusual drainage route treated by transarterial embolization. *BMJ Case Rep*. 2014 Mar 25;2014:bcr2013011098. doi: 10.1136/bcr-2013-011098. PMID: 24667945; PMCID: PMC3975553.
- 151: Gencer ZK, Özkiriş M, Saydam L, Dağlioğlu YK, Sakallioğlu Ö, Kuyucu Y, Polat S, Kanmaz A. The comparison of histological results of experimentally created facial nerve defects repaired by 2 different anastomosis techniques: classic suture technique or tissue adhesives for nerve anastomosis? *J Craniofac Surg*. 2014 Mar;25(2):652-6. doi: 10.1097/SCS.0000000000000605. PMID: 24621715.
- 152: Jordan JA, Llibre JC, Vázquez F, Rodríguez R, Prince JA, Ugarte JC. Predictors of hemorrhagic complications from endovascular treatment of cerebral arteriovenous malformations. *Interv Neuroradiol*. 2014 Jan-Feb;20(1):74-82. doi: 10.15274/INR-2014-10011. Epub 2014 Feb 10. PMID: 24556303; PMCID: PMC3971145.
- 153: Popescu E, Trandafir V, Negru D, Dobrin N, Trandafir D. Hemangioma of the parotid gland: case report. *Rev Med Chir Soc Med Nat Iasi*. 2013 Jan- Mar;117(1):227-32. PMID: 24505920.
- 154: Tsimpas A, Chalouhi N, Halevy JD, Tjoumakaris S, Gonzalez LF, Monteith SJ, Dumont AS, Rosenwasser R, Jabbour P. The use of adenosine in the treatment of a high-flow vein of Galen malformation in an adult. *J Clin Neurosci*. 2014 Jul;21(7):1259-61. doi: 10.1016/j.jocn.2013.11.014. Epub 2013 Dec 13. PMID: 24491583.
- 155: Shen SC, Tsuei YS, Chen WH, Shen CC. Hybrid surgery for dural arteriovenous fistula in the neurosurgical hybrid operating suite. *J Neurointerv Surg*. 2015 Feb;7(2):e6. doi: 10.1136/neurintsurg-2013-011060.rep. Epub 2014 Jan 31. PMID: 24489124.
- 156: Shen SC, Tsuei YS, Chen WH, Shen CC. Hybrid surgery for dural arteriovenous fistula in the neurosurgical hybrid operating suite. *BMJ Case Rep*. 2014 Jan 23;2014:bcr2013011060. doi: 10.1136/bcr-2013-011060. PMID: 24459222; PMCID: PMC3903304.
- 157: Crowley RW, Ducruet AF, McDougall CG, Albuquerque FC. Endovascular advances for brain arteriovenous malformations. *Neurosurgery*. 2014 Feb;74 Suppl 1:S74-82. doi: 10.1227/NEU.0000000000000176. PMID: 24402496.
- 158: Clark S, Powell G, Kandasamy J, Lee M, Nahser H, Pigott T. Spinal dural arteriovenous fistulas—presentation, management and outcome in a single neurosurgical institution. *Br J Neurosurg*. 2013 Aug;27(4):465-70. doi: 10.3109/02688697.2012.752433. Epub 2012 Dec 29. PMID: 24350764.
- 159: Wallace KM, Alaraj A, Aakalu VK, Aletich V, Setabutr P. Endovascular preoperative embolization of orbital hemangiopericytoma with n-butyl cyanoacrylate glue. *Ophthalmic Plast Reconstr Surg*. 2014 Jul-Aug;30(4):e97-100. doi: 10.1097/IOP.0b013e3182a22bd8. PMID: 24317100; PMCID: PMC4111787.
- 160: Tsuruta W, Matsumaru Y, Miyachi S, Sakai N. Endovascular treatment of spinal vascular lesion in Japan: Japanese Registry of Neuroendovascular Therapy (JR-NET) and JR-NET2. *Neurol Med Chir (Tokyo)*. 2014;54(1):72-8. doi: 10.2176/nmc.aa2013-0201. Epub 2013 Dec 5. PMID: 24305018; PMCID: PMC4508696.

- 161: Su IC, terBrugge KG, Willinsky RA, Krings T. Factors determining the success of endovascular treatments among patients with spinal dural arteriovenous fistulas. *Neuroradiology*. 2013 Nov;55(11):1389-95. doi: 10.1007/s00234-013-1285-z. Epub 2013 Oct 10. PMID: 24113713.
- 162: Baltsavias G, Valavanis A. Endovascular treatment of 170 consecutive cranial dural arteriovenous fistulae: results and complications. *Neurosurg Rev*. 2014 Jan;37(1):63-71. doi: 10.1007/s10143-013-0498-2. Epub 2013 Oct 8. PMID: 24101196.
- 163: Takeshita T, Hayashi K, Horie N, Morikawa M, Suyama K, Nagata I. Endovascular treatment of intractable bleeding from a traumatic pseudoaneurysm of the internal maxillary artery. *Neuroradiol J*. 2012 Sep;25(4):469-74. doi: 10.1177/197140091202500409. Epub 2012 Sep 6. PMID: 24029039.
- 164: Blackburn SL, Kadkhodayan Y, Ray WZ, Zipfel GJ, Cross DT 3rd, Moran CJ, Derdeyn CP. Onyx is associated with poor venous penetration in the treatment of spinal dural arteriovenous fistulas. *J Neurointerv Surg*. 2014 Sep;6(7):536-40. doi: 10.1136/neurintsurg-2013-010779. Epub 2013 Aug 13. PMID: 23943815.
- 165: Madsen PJ, Lang SS, Pisapia JM, Storm PB, Hurst RW, Heuer GG. An institutional series and literature review of pial arteriovenous fistulas in the pediatric population: clinical article. *J Neurosurg Pediatr*. 2013 Oct;12(4):344-50. doi: 10.3171/2013.6.PEDS13110. Epub 2013 Aug 2. PMID: 23909618.
- 166: Wang HH, Luo CB, Guo WY, Wu HM, Lirng JF, Wong TT, Lu YH, Chang FC. Preoperative embolization of hypervascular pediatric brain tumors: evaluation of technical safety and outcome. *Childs Nerv Syst*. 2013 Nov;29(11):2043-9. doi: 10.1007/s00381-013-2128-2. Epub 2013 May 4. PMID: 23644575.
- 167: Yamaguchi S, Hamamura T, Ito O, Sayama T, Shimogawa T, Matsukado K, Morioka T. [Thoracocervical giant perimedullary arteriovenous fistula treated with transarterial embolization: a case report]. *No Shinkei Geka*. 2013 Mar;41(3):247-53. Japanese. PMID: 23459523.
- 168: Yao KC, Malek AM. Transpedicular N-butyl cyanoacrylate-mediated percutaneous embolization of symptomatic vertebral hemangiomas. *J Neurosurg Spine*. 2013 May;18(5):450-5. doi: 10.3171/2013.1.SPINE11173. Epub 2013 Mar 1. PMID: 23452246.
- 169: Pierot L, Kadziolka K, Litré F, Rousseaux P. Combined treatment of brain AVMs with use of Onyx embolization followed by radiosurgery. *AJNR Am J Neuroradiol*. 2013 Jul;34(7):1395-400. doi: 10.3174/ajnr.A3409. Epub 2013 Feb 7. PMID: 23391837; PMCID: PMC8051478.
- 170: Sakamoto N, Ishikawa E, Nakai Y, Akutsu H, Yamamoto T, Nakai K, Shiigai M, Tsurushima H, Isobe T, Takano S, Tsuboi K, Matsumura A. Preoperative endovascular embolization for hemangioblastoma in the posterior fossa. *Neurol Med Chir (Tokyo)*. 2012;52(12):878-84. doi: 10.2176/nmc.52.878. PMID: 23269042.
- 171: Niizuma K, Sakata H, Koyama S, Kon H, Chonan M, Sasaki T, Nishijima M, Ezura M, Tominaga T. [Childhood transverse sinus dural arteriovenous fistula treated with endovascular and direct surgery: a case report]. *No Shinkei Geka*. 2012 Nov;40(11):1015-20. Japanese. PMID: 23100391.
- 172: Haliasos N, Brew S, Robertson F, Hayward R, Thompson D, Chakraborty A. Preoperative embolisation of choroid plexus tumours in children: part I-does the reduction of perioperative blood loss affect the safety of subsequent surgery? *Childs Nerv Syst*. 2013 Jan;29(1):65-70. doi: 10.1007/s00381-012-1912-8. Epub 2012 Sep 26. PMID: 23011447.
- 173: Schwyzer L, Yen CP, Evans A, Zavoian S, Steiner L. Long-term results of gamma knife surgery for

partially embolized arteriovenous malformations. *Neurosurgery*. 2012 Dec;71(6):1139-47; discussion 1147-8. doi: 10.1227/NEU.0b013e3182720280. PMID: 22986603.

174: Kominami S, Watanabe A, Kobayashi S, Teramoto A. Ruptured feeder aneurysm associated with cerebellar arteriovenous malformation. *J Nippon Med Sch*. 2012;79(4):296-300. doi: 10.1272/jnms.79.296. PMID: 22976611.

175: Osanai T, Asano T, Terasaka S, Houkin K. [The utility and efficacy of preoperative embolization for hypervascular tumor by NBCA]. *No Shinkei Geka*. 2012 Jul;40(7):599-606. Japanese. PMID: 22728537.

176: Lee KW, Lin YC, Lo CP, Liu CC. Intracerebral hemorrhage following endovascular embolization of brain arteriovenous malformation with a combination of Onyx and n-butyl cyanoacrylate: a case report. *Clin Imaging*. 2012 Jul- Aug;36(4):375-8. doi: 10.1016/j.clinimag.2011.09.003. Epub 2012 Jun 8. PMID: 22726978.

177: Mavrogenis AF, Rossi G, Calabrò T, Altimari G, Rimondi E, Ruggieri P. The role of embolization for hemangiomas. *Musculoskelet Surg*. 2012 Aug;96(2):125-35. doi: 10.1007/s12306-012-0207-2. Epub 2012 Jun 9. PMID: 22684541.

178: Yamanaka K, Yamamoto A, Ishida K, Matsuzaki J, Ozaki T, Ishihara M, Shimahara Y, Nakajima S, Sadamitsu D, Yamasaki M. Successful endovascular therapy of a penetrating zone III jugular bulb injury. A case report. *Interv Neuroradiol*. 2012 Jun;18(2):195-9. doi: 10.1177/159101991201800212. Epub 2012 Jun 4. PMID: 22681736; PMCID: PMC3380399.

179: Lv X, Wu Z, Li Y, Yang X, Jiang C. Hemorrhage risk after partial endovascular NBCA and ONYX embolization for brain arteriovenous malformation. *Neurol Res*. 2012 Jul;34(6):552-6. doi: 10.1179/1743132812Y.0000000044. Epub 2012 May 30. PMID: 22663933.

180: Sahlein DH, Mora P, Becske T, Nelson PK. Nidal embolization of brain arteriovenous malformations: rates of cure, partial embolization, and clinical outcome. *J Neurosurg*. 2012 Jul;117(1):65-77. doi: 10.3171/2012.3.JNS111405. Epub 2012 Apr 27. PMID: 22540403.

181: Chalouhi N, Tjoumakaris S, Gonzalez LF, Dumont AS, Shah Q, Gordon D, Rosenwasser R, Jabbour P. Onyx embolization of a ruptured lenticulostriate artery aneurysm in a patient with moyamoya disease. *World Neurosurg*. 2013 Sep- Oct;80(3-4):436.e7-10. doi: 10.1016/j.wneu.2012.03.030. Epub 2012 Apr 3. PMID: 22484074.

182: Kominami S, Watanabe A, Akimoto M, Kobayashi S, Teramoto A. Superficial temporal arteriovenous fistula as a complication of rhytidectomy. *J Craniofac Surg*. 2012 Mar;23(2):603-5. doi: 10.1097/SCS.0b013e31824cd803. PMID: 22446426.

183: Ghobrial GM, Marchan E, Nair AK, Dumont AS, Tjoumakaris SI, Gonzalez LF, Rosenwasser RH, Jabbour P. Dural arteriovenous fistulas: a review of the literature and a presentation of a single institution's experience. *World Neurosurg*. 2013 Jul-Aug;80(1-2):94-102. doi: 10.1016/j.wneu.2012.01.053. Epub 2012 Jan 31. PMID: 22381858.

184: Cohen JE, Moscovici S, Gomori JM, Eliashar R, Weinberger J, Itshayek E. Selective endovascular embolization for refractory idiopathic epistaxis is a safe and effective therapeutic option: technique, complications, and outcomes. *J Clin Neurosci*. 2012 May;19(5):687-90. doi: 10.1016/j.jocn.2011.08.019. Epub 2012 Feb 23. PMID: 22364712.

185: Paramasivam S, Toma N, Niimi Y, Berenstein A. Development, clinical presentation and

endovascular management of congenital intracranial pial arteriovenous fistulas. *J Neurointerv Surg*. 2013 May;5(3):184-90. doi: 10.1136/neurintsurg-2011-010241. Epub 2012 Feb 19. PMID: 22345143.

186: Murai Y, Kominami S, Yoshida Y, Mizunari T, Adachi K, Koketsu K, Kobayashi S, Teramoto A. Preoperative liquid embolization of cerebellar hemangioblastomas using N-butyl cyanoacrylate. *Neuroradiology*. 2012 Sep;54(9):981-8. doi: 10.1007/s00234-011-0985-5. Epub 2011 Dec 20. PMID: 22179658.

187: Park JH, Park YS, Suk JS, Park SW, Hwang SN, Nam TK, Kim YB, Lee WB. Cerebrospinal fluid pathways from cisterns to ventricles in N-butyl cyanoacrylate-induced hydrocephalic rats. *J Neurosurg Pediatr*. 2011 Dec;8(6):640-6. doi: 10.3171/2011.8.PEDS1190. PMID: 22132924.

188: Berenstein A, Fifi JT, Niimi Y, Presti S, Ortiz R, Ghatan S, Rosenn B, Sorscher M, Molofsky W. Vein of Galen malformations in neonates: new management paradigms for improving outcomes. *Neurosurgery*. 2012 May;70(5):1207-13; discussion 1213-4. doi: 10.1227/NEU.0b013e3182417be3. PMID: 22089754.

189: Munyon C, Chowdhry SA, Cohen ML, Bambakidis NC, Hsu DP. N-butyl 2-cyanoacrylate (n-BCA) embolization of a cerebellar hemangioblastoma. *J Neurointerv Surg*. 2011 Dec 1;3(4):386-9. doi: 10.1136/jnis.2010.004366. Epub 2011 Mar 12. PMID: 21990453.

190: Sharma A, Jagetia A, Loomba P, Singh D, Tandon M. Delayed brain abscess after embolization of arterio-venous malformation: report of two cases and review of literature. *Neurol India*. 2011 Jul-Aug;59(4):620-3. doi: 10.4103/0028-3886.84351. PMID: 21891947.

191: Kashiwazaki D, Ushikoshi S, Asano T, Osanai T, Kuroda S, Houkin K. Endovascular treatment for aneurysms of the posterior cerebral artery: 12 years' experience with 21 cases. *Acta Neurochir (Wien)*. 2011 Nov;153(11):2151-8. doi: 10.1007/s00701-011-1111-5. Epub 2011 Jul 31. PMID: 21805284.

192: Shuster A, Gunnarsson T, Klurfan P, Larrazabal R. N-butyl cyanoacrylate proved beneficial to avoid a nontarget embolization of the ophthalmic artery in endovascular management of epistaxis. A neurointerventional report and literature review. *Interv Neuroradiol*. 2011 Mar;17(1):17-21. doi: 10.1177/159101991101700104. Epub 2011 Apr 18. PMID: 21561554; PMCID: PMC3278025.

193: Mamalui-Hunter M, Jiang T, Rich KM, Derdeyn CP, Drzymala RE. Effect of liquid embolic agents on Gamma Knife surgery dosimetry for arteriovenous malformations. Clinical article. *J Neurosurg*. 2011 Aug;115(2):364-70. doi: 10.3171/2011.3.JNS10717. Epub 2011 Apr 15. PMID: 21495824.

194: Abila AA, Albuquerque FC, Theodore N, Spetzler RF. Delayed presentation of traumatic cerebral and dural arteriovenous fistulae after a BB gun accident in a pediatric patient: case report. *Neurosurgery*. 2011 Jun;68(6):E1750-4; discussion E1754-5. doi: 10.1227/NEU.0b013e31821713fb. PMID: 21389897.

195: Park YS, Park SW, Suk JS, Nam TK. Development of an acute obstructive hydrocephalus model in rats using N-butyl cyanoacrylate. *Childs Nerv Syst*. 2011 Jun;27(6):903-10. doi: 10.1007/s00381-011-1398-9. Epub 2011 Feb 1. PMID: 21286731.

196: Cohen-Gadol AA, Bellew MP, Akard W, Payner TD. The application of n-butyl 2-cyanoacrylate to repair CSF fistulas for 221 patients who underwent transsphenoidal surgery. *Minim Invasive Neurosurg*. 2010 Aug;53(4):207-9. doi: 10.1055/s-0030-1262813. Epub 2010 Dec 3. PMID: 21132615.

197: Morihiro Y, Harada K, Kato S, Ishihara H, Shirao S, Nakayama H, Akimura T, Suzuki M. Delayed

parenchymal hemorrhage following successful embolization of brainstem arteriovenous malformation. Case report. *Neurol Med Chir (Tokyo)*. 2010;50(8):661-4. doi: 10.2176/nmc.50.661. PMID: 20805650.

198: Stiefel MF, Park MS, McDougall CG, Albuquerque FC. Endovascular treatment of hemorrhagic alveolar artery pseudoaneurysm after tooth extraction: a case report. *J Oral Maxillofac Surg*. 2010 Sep;68(9):2325-8. doi: 10.1016/j.joms.2009.12.011. Epub 2010 Jun 17. PMID: 20728037.

199: Knopman J, Zink W, Patsalides A, Riina HA, Gobin YP. Secondary clinical deterioration after successful embolization of a spinal dural arteriovenous fistula: a plea for prophylactic anticoagulation. *Interv Neuroradiol*. 2010 Jun;16(2):199-203. doi: 10.1177/159101991001600213. Epub 2010 Jul 19. PMID: 20642896; PMCID: PMC3277977.

200: Farhat HI, Elhammady MS, Aziz-Sultan MA. N-Butyl-2-cyanoacrylate use in intraoperative ruptured aneurysms as a salvage rescue: case report. *Neurosurgery*. 2010 Jul;67(1):216-7; discussion 217. doi: 10.1227/01.NEU.0000370014.67631.FF. PMID: 20559072.

201: Patsalides A, Smith M, Gobin YP. Intra-procedural aneurysm rupture treated with n-butyl cyanoacrylate embolization: technical note. *J Neurointerv Surg*. 2010 Jun;2(2):145-6. doi: 10.1136/jnis.2009.001180. Epub 2009 Oct 6. PMID: 21990595.

202: Loh Y, Duckwiler GR; Onyx Trial Investigators. A prospective, multicenter, randomized trial of the Onyx liquid embolic system and N-butyl cyanoacrylate embolization of cerebral arteriovenous malformations. Clinical article. *J Neurosurg*. 2010 Oct;113(4):733-41. doi: 10.3171/2010.3.JNS09370. PMID: 20433277.

203: Kim SH, Kwon OK, Jung CK, Kang HS, Oh CW, Han MH, Kim YS, Baik SK. Endovascular treatment of ruptured aneurysms or pseudoaneurysms on the collateral vessels in patients with moyamoya disease. *Neurosurgery*. 2009 Nov;65(5):1000-4; discussion 1004. doi: 10.1227/01.NEU.0000345648.46096.CE. PMID: 19834414.

204: Bakar B, Oruckaptan HH, Hazer BD, Saatci I, Atilla P, Kilic K, Muftuoglu SF. Evaluation of the toxicity of onyx compared with n-butyl 2-cyanoacrylate in the subarachnoid space of a rabbit model: an experimental research. *Neuroradiology*. 2010 Feb;52(2):125-34. doi: 10.1007/s00234-009-0594-8. Epub 2009 Sep 15. PMID: 19756562.

205: Starke RM, Komotar RJ, Otten ML, Hahn DK, Fischer LE, Hwang BY, Garrett MC, Sciacca RR, Sisti MB, Solomon RA, Lavine SD, Connolly ES, Meyers PM. Adjuvant embolization with N-butyl cyanoacrylate in the treatment of cerebral arteriovenous malformations: outcomes, complications, and predictors of neurologic deficits. *Stroke*. 2009 Aug;40(8):2783-90. doi: 10.1161/STROKEAHA.108.539775. Epub 2009 May 28. PMID: 19478232; PMCID: PMC2745321.

206: Sivakumar W, Zada G, Yashar P, Giannotta SL, Teitelbaum G, Larsen DW. Endovascular management of spinal dural arteriovenous fistulas. A review. *Neurosurg Focus*. 2009 May;26(5):E15. doi: 10.3171/2009.2.FOCUS098. PMID: 19408993.

207: Marushima A, Matsumaru Y, Suzuki K, Takigawa T, Kujiraoka Y, Anno I, Matsumura A. Selective arterial embolization with n-butyl cyanoacrylate in the treatment of aneurysmal bone cyst of the thoracic vertebra: a case report. *Spine (Phila Pa 1976)*. 2009 Mar 15;34(6):E230-4. doi: 10.1097/BRS.0b013e31818f8f7c. PMID: 19282730.

208: Berenstein A, Song JK, Tsumoto T, Namba K, Niimi Y. Treatment of experimental aneurysms with an embolic-containing device and liquid embolic agent: feasibility and angiographic and histological results. *Neurosurgery*. 2009 Feb;64(2):367-73; discussion 373. doi:

10.1227/01.NEU.0000335790.91413.64. PMID: 19190464.

209: Agid R, Terbrugge K, Rodesch G, Andersson T, Söderman M. Management strategies for anterior cranial fossa (ethmoidal) dural arteriovenous fistulas with an emphasis on endovascular treatment. *J Neurosurg*. 2009 Jan;110(1):79-84. doi: 10.3171/2008.6.17601. PMID: 18847336.

210: Velat GJ, Reavey-Cantwell JF, Sistrom C, Smullen D, Fautheree GL, Whiting J, Lewis SB, Mericle RA, Firment CS, Hoh BL. Comparison of N-butyl cyanoacrylate and onyx for the embolization of intracranial arteriovenous malformations: analysis of fluoroscopy and procedure times. *Neurosurgery*. 2008 Jul;63(1 Suppl 1):ONS73-8; discussion ONS78-80. doi: 10.1227/01.neu.0000335015.83616.12. PMID: 18728607.

211: Matsuo T, Yanai H, Sugiu K, Tominaga S, Kimata Y. Orbital exenteration after transarterial embolization in a patient with Wyburn-Mason syndrome: pathological findings. *Jpn J Ophthalmol*. 2008 Jul-Aug;52(4):308-313. doi: 10.1007/s10384-008-0563-5. Epub 2008 Sep 5. PMID: 18773270.

212: Ohta T, Gomi M, Oowaki H, Ishikawa M. Chronic venous congestion following embolization of spinal dural arteriovenous fistula. *J Neurosurg Spine*. 2008 Aug;9(2):186-90. doi: 10.3171/SPI/2008/9/8/186. PMID: 18764752.

213: Chagla AS, Balasubramaniam S. Cerebral N-butyl cyanoacrylate glue-induced abscess complicating embolization. *J Neurosurg*. 2008 Aug;109(2):347. doi: 10.3171/JNS/2008/109/8/0347. PMID: 18671652.

214: Ali S, Radaideh MM, Shaibani A, Russell EJ, Walker MT. Persistent trigeminal artery terminating in the posterior inferior cerebellar artery: case report. *Neurosurgery*. 2008 Mar;62(3):E746-8; discussion E746-8. doi: 10.1227/01.neu.0000317327.17225.f8. PMID: 18425001.

215: Shi ZS, Ziegler J, Gonzalez NR, Feng L, Tateshima S, Jahan R, Duckwiler G, Viñuela F. Transarterial embolization of clival dural arteriovenous fistulae using liquid embolic agents. *Neurosurgery*. 2008 Feb;62(2):408-15; discussion 415. doi: 10.1227/01.neu.0000316007.34259.26. PMID: 18382318.

216: Andrade-Souza YM, Ramani M, Beachey DJ, Scora D, Tsao MN, Terbrugge K, Schwartz ML. Liquid embolisation material reduces the delivered radiation dose: a physical experiment. *Acta Neurochir (Wien)*. 2008 Feb;150(2):161-4; discussion 164. doi: 10.1007/s00701-007-1482-9. Epub 2008 Jan 23. PMID: 18213438.

217: Ishihara H, Ishihara S, Kanazawa R, Kohyama S, Yamane F, Ogawa M, Sato A, Tanahashi N. [Transarterial NBCA embolization with transvenous partial outflow obstruction for superior petrosal sinus dural arteriovenous fistula: a case report]. *No Shinkei Geka*. 2007 Dec;35(12):1157-62. Japanese. PMID: 18080515.

218: Sherif C, Gruber A, Bavinzski G, Standhardt H, Widhalm G, Gibson D, Richling B, Knosp E. Long-term outcome of a multidisciplinary concept of spinal dural arteriovenous fistulae treatment. *Neuroradiology*. 2008 Jan;50(1):67-74. doi: 10.1007/s00234-007-0303-4. Epub 2007 Nov 20. PMID: 18026943.

219: Troffkin NA, Given CA 2nd. Combined transarterial N-butyl cyanoacrylate and coil embolization of direct carotid-cavernous fistulas. Report of two cases. *J Neurosurg*. 2007 May;106(5):903-6. doi: 10.3171/jns.2007.106.5.903. PMID: 17542538.

220: Elgazzar RF, Abdulmajeed I, Mutabbakani M. Cyanoacrylate glue versus suture in peripheral

nerve reanastomosis. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2007 Oct;104(4):465-72. doi: 10.1016/j.tripleo.2007.01.019. Epub 2007 May 15. PMID: 17507261.

221: Sheikh BY. Efficacy of acrylate tissue adhesive as vascular repair and hemostatic material. *Ann Vasc Surg.* 2007 Jan;21(1):56-60. doi: 10.1016/j.avsg.2006.08.001. PMID: 17349337.

222: Requejo F, Schumacher M, van Velthoven V. Coating the wall of an injured intracranial carotid artery during tumor removal with n-butyl-2-cyanoacrylate: technical case report. *Neurosurgery.* 2006 Oct;59(4 Suppl 2):ONSE484-5; discussion ONSE485. doi: 10.1227/01.NEU.0000232769.86686.96. PMID: 17041522.

223: Schirmer CM, Malek AM, Kwan ES, Hoit DA, Weller SJ. Preoperative embolization of hypervascular spinal metastases using percutaneous direct injection with n-butyl cyanoacrylate: technical case report. *Neurosurgery.* 2006 Aug;59(2):E431-2; author reply E431-2. doi: 10.1227/01.NEU.0000223503.92392.CE. PMID: 16883157.

224: Kim LJ, Albuquerque FC, Aziz-Sultan A, Spetzler RF, McDougall CG. Low morbidity associated with use of n-butyl cyanoacrylate liquid adhesive for preoperative transarterial embolization of central nervous system tumors. *Neurosurgery.* 2006 Jul;59(1):98-104; discussion 98-104. doi: 10.1227/01.NEU.0000220215.71485.07. PMID: 16823305.

225: Dehdashti AR, Muster M, Reverdin A, de Tribolet N, Ruefenacht DA. Preoperative silk suture embolization of cerebral and dural arteriovenous malformations. *Neurosurg Focus.* 2001 Nov 15;11(5):e6. doi: 10.3171/foc.2001.11.5.7. PMID: 16466238.

226: Ozisik PA, Inci S, Soylemezoglu F, Orhan H, Ozgen T. Comparative dural closure techniques: a safety study in rats. *Surg Neurol.* 2006 Jan;65(1):42-7; discussion 47. doi: 10.1016/j.surneu.2005.04.047. PMID: 16378853.

227: Gailloud P. Endovascular treatment of cerebral arteriovenous malformations. *Tech Vasc Interv Radiol.* 2005 Sep;8(3):118-28. doi: 10.1053/j.tvir.2005.10.003. PMID: 16376787.

228: Niimi Y, Berenstein A, Fernandez PM, Brisman JL, Song JK. Pediatric nonvertebral paraspinal arteriovenous fistulas along the segmental nerve: clinical, imaging, and therapeutic considerations. *J Neurosurg.* 2005 Aug;103(2 Suppl):156-62. doi: 10.3171/ped.2005.103.2.0156. PMID: 16370282.

229: Stephan MJ, Nesbit GM, Behrens ML, Whitaker MA, Barnwell SL, Selden NR. Endovascular treatment of spinal arteriovenous fistula in a young child with hereditary hemorrhagic telangiectasia. Case report. *J Neurosurg.* 2005 Nov;103(5 Suppl):462-5. doi: 10.3171/ped.2005.103.5.0462. PMID: 16302622.

230: Marden FA, Roy SS. Endovascular management of intracerebral and subarachnoid hemorrhage. *Curr Treat Options Cardiovasc Med.* 2005 Jul;7(3):197-209. doi: 10.1007/s11936-005-0048-5. PMID: 16004851.

231: Li TL, Fang B, He XY, Duan CZ, Wang QJ, Zhao QP, Huan QY. Complication analysis of 469 brain arteriovenous malformations treated with N-butyl cyanoacrylate. *Interv Neuroradiol.* 2005 Jun 30;11(2):141-8. doi: 10.1177/159101990501100204. Epub 2005 Oct 25. PMID: 20584493; PMCID: PMC3399714.

232: Gallia GL, Moore C, Jordan L, Gailloud P, Jallo GI. Neonatal cavernous carotid artery aneurysm: case report. *J Neurosurg.* 2005 Apr;102(3 Suppl):332-7. doi: 10.3171/ped.2005.102.3.0332. PMID: 15881762.

- 233: Lesley WS, Thomas MR, Abdulrauf SI. N-butylcyanoacrylate embolization of a middle meningeal artery aneurysm in a patient with neurofibromatosis type 2. *AJNR Am J Neuroradiol*. 2004 Sep;25(8):1414-6. PMID: 15466344; PMCID: PMC7975459.
- 234: Niimi Y, Sala F, Deletis V, Setton A, de Camargo AB, Berenstein A. Neurophysiologic monitoring and pharmacologic provocative testing for embolization of spinal cord arteriovenous malformations. *AJNR Am J Neuroradiol*. 2004 Aug;25(7):1131-8. PMID: 15313696; PMCID: PMC7976537.
- 235: Wang YC, Wong HF, Yeh YS. Intracranial pial arteriovenous fistulas with single-vein drainage. Report of three cases and review of the literature. *J Neurosurg*. 2004 Feb;100(2 Suppl Pediatrics):201-5. doi: 10.3171/ped.2004.100.2.0201. PMID: 14758951.
- 236: Russell SM, Woo HH, Nelson PK. Transarterial Wedged-catheter, Flow-arrest, N-butyl Cyanoacrylate Embolization of Three Dural Arteriovenous Fistulae in a Single Patient. *Interv Neuroradiol*. 2003 Sep 30;9(3):283-90. doi: 10.1177/159101990300900307. Epub 2004 Oct 22. PMID: 20591254; PMCID: PMC3548213.
- 237: Akin ED, Perkins E, Ross IB. Surgical handling characteristics of an ethylene vinyl alcohol copolymer compared with N-butyl cyanoacrylate used for embolization of vessels in an arteriovenous malformation resection model in swine. *J Neurosurg*. 2003 Feb;98(2):366-70. doi: 10.3171/jns.2003.98.2.0366. PMID: 12593624.
- 238: Meisel HJ, Mansmann U, Alvarez H, Rodesch G, Brock M, Lasjaunias P. Effect of partial targeted N-butyl-cyano-acrylate embolization in brain AVM. *Acta Neurochir (Wien)*. 2002 Sep;144(9):879-87; discussion 888. doi: 10.1007/s00701-002-0978-6. PMID: 12376769.
- 239: Shi Z, Huang Z, Zhang Y, Qi T, Chu M, Bao D. Experimental study of Eudragit mixture as a new nonadhesive liquid embolic material. *Chin Med J (Engl)*. 2002 Apr;115(4):555-8. PMID: 12133297.
- 240: Picard L, Da Costa E, Anxionnat R, Macho J, Bracard S, Per A, Marchal JC. Acute spontaneous hemorrhage after embolization of brain arteriovenous malformation with N-butyl cyanoacrylate. *J Neuroradiol*. 2001 Sep;28(3):147-65. PMID: 11894522.
- 241: Duffner F, Ritz R, Bornemann A, Freudenstein D, Wiendl H, Siekmann R. Combined therapy of cerebral arteriovenous malformations: histological differences between a non-adhesive liquid embolic agent and n-butyl 2-cyanoacrylate (NBCA). *Clin Neuropathol*. 2002 Jan-Feb;21(1):13-7. PMID: 11846039.
- 242: Weigle JB, Chaloupka JC, Lesley WS, Mangla S, Hitchon PW, VanGilder JC, Adams HP Jr. Peripheral aneurysms of the lateral posterior choroidal artery: clinical presentation and endovascular treatment: report of two cases. *Neurosurgery*. 2002 Feb;50(2):392-5; discussion 395-6. doi: 10.1097/00006123-200202000-00029. PMID: 11844276.
- 243: Zhao J, Wang C, Wang S, Li J, Sui D, Zhao Y. Combination of intraoperative embolization with surgical resection for treatment of giant cerebral arteriovenous malformation. *Chin Med J (Engl)*. 1999 Mar;112(3):273-7. PMID: 11593566.
- 244: Corsten L, Bashir Q, Thornton J, Aletich V. Treatment of a giant mandibular arteriovenous malformation with percutaneous embolization using histoacrylic glue: a case report. *J Oral Maxillofac Surg*. 2001 Jul;59(7):828-32. doi: 10.1053/joms.2001.24311. PMID: 11429753.
- 245: Tsumoto T, Nakakita K, Hayashi S, Terada T. Bone defect associated with middle meningeal arteriovenous fistula treated by embolization-case report. *Neurol Med Chir (Tokyo)*. 2001

Jan;41(1):42-7. doi: 10.2176/nmc.41.42. PMID: 11218640.

246: Sadato A, Wakhloo AK, Hopkins LN. Effects of a mixture of a low concentration of n-butylcyanoacrylate and ethiodol on tissue reactions and the permanence of arterial occlusion after embolization. *Neurosurgery*. 2000 Nov;47(5):1197-203; discussion 1204-5. doi: 10.1097/00006123-200011000-00037. PMID: 11063114.

247: Hashimoto T, Young WL, Aagaard BD, Joshi S, Ostapovich ND, Pile-Spellman J. Adenosine-induced ventricular asystole to induce transient profound systemic hypotension in patients undergoing endovascular therapy. Dose-response characteristics. *Anesthesiology*. 2000 Oct;93(4):998-1001. doi: 10.1097/0000542-200010000-00021. PMID: 11020753.

248: Ogungbo BI, Nath FP. A technique for dural repair following retromastoid suboccipital craniectomy. *Br J Neurosurg*. 1998 Feb;12(1):45-6. doi: 10.1080/02688699845519. PMID: 11013648.

249: Miyachi S, Negoro M, Okamoto T, Kobayashi T, Kida Y, Tanaka T, Yoshida J. Embolisation of cerebral arteriovenous malformations to assure successful subsequent radiosurgery. *J Clin Neurosci*. 2000 Sep;7 Suppl 1:82-5. doi: 10.1054/jocn.2000.0718. PMID: 11013105.

250: Oowaki H, Matsuda S, Sakai N, Ohta T, Iwata H, Sadato A, Taki W, Hashimoto N, Ikada Y. Non-adhesive cyanoacrylate as an embolic material for endovascular neurosurgery. *Biomaterials*. 2000 May;21(10):1039-46. doi: 10.1016/s0142-9612(99)00278-1. PMID: 10768756.

251: Yokouchi T, Iwabuchi S, Tomiyama A, Samejima H, Ogata N, Goto K. Embolization of scalp AVF. *Interv Neuroradiol*. 1999 Nov;5 Suppl 1:121-6. doi: 10.1177/159101999900505122. Epub 2001 May 15. PMID: 20670552.

252: Pile-Spellman J, Young WL, Joshi S, Duong H, Vang MC, Hartmann A, Kahn RA, Rubin DA, Prestigiacomo CJ, Ostapovich ND. Adenosine-induced cardiac pause for endovascular embolization of cerebral arteriovenous malformations: technical case report. *Neurosurgery*. 1999 Apr;44(4):881-6; discussion 886-7. doi: 10.1097/00006123-199904000-00117. PMID: 10201317.

253: Paulsen RD, Steinberg GK, Norbash AM, Marcellus ML, Lopez JR, Marks MP. Embolization of rolandic cortex arteriovenous malformations. *Neurosurgery*. 1999 Mar;44(3):479-84; discussion 484-6. doi: 10.1097/00006123-199903000-00022. PMID: 10069584.

254: Lefkowitz M, Giannotta SL, Hieshima G, Higashida R, Halbach V, Dowd C, Teitelbaum GP. Embolization of neurosurgical lesions involving the ophthalmic artery. *Neurosurgery*. 1998 Dec;43(6):1298-303. doi: 10.1097/00006123-199812000-00016. PMID: 9848842.

255: Wakhloo AK, Lieber BB, Rudin S, Fronckowiak MD, Mericle RA, Hopkins LN. A novel approach to flow quantification in brain arteriovenous malformations prior to embolization: use of insoluble contrast (Ethiodol droplet) angiography. *J Neurosurg*. 1998 Sep;89(3):395-404. doi: 10.3171/jns.1998.89.3.0395. PMID: 9724113.

256: Shermak MA, Wong L, Inoue N, Crain BJ, Im MJ, Chao EY, Manson PN. Fixation of the craniofacial skeleton with butyl-2-cyanoacrylate and its effects on histotoxicity and healing. *Plast Reconstr Surg*. 1998 Aug;102(2):309-18. doi: 10.1097/00006534-199808000-00003. PMID: 9703064.

257: Wong SH, Tan J, Yeo TT, Ong PL, Hui F. Surgical excision of intracranial arteriovenous malformations after preoperative embolisation with N-butylcyanoacrylate. *Ann Acad Med Singap*. 1997 Jul;26(4):475-80. PMID: 9395814.

- 258: Niimi Y, Berenstein A, Setton A, Neophytides A. Embolization of spinal dural arteriovenous fistulae: results and follow-up. *Neurosurgery*. 1997 Apr;40(4):675-82; discussion 682-3. doi: 10.1097/00006123-199704000-00004. PMID: 9092840.
- 259: Debrun GM, Aletich V, Ausman JI, Charbel F, Dujovny M. Embolization of the nidus of brain arteriovenous malformations with n-butyl cyanoacrylate. *Neurosurgery*. 1997 Jan;40(1):112-20; discussion 120-1. PMID: 8971833.
- 260: Gruber A, Mazal PR, Bavinzski G, Killer M, Budka H, Richling B. Repermeation of partially embolized cerebral arteriovenous malformations: a clinical, radiologic, and histologic study. *AJNR Am J Neuroradiol*. 1996 Aug;17(7):1323-31. PMID: 8871719; PMCID: PMC8338524.
- 261: Puca A, Meglio M, Rollo M, Zannoni GF. Intracranial epithelioid hemangioendothelioma: case report. *Neurosurgery*. 1996 Feb;38(2):399-401. doi: 10.1097/00006123-199602000-00035. PMID: 8869072.
- 262: Wikholm G. Role of transarterial embolization in the management of cerebral arteriovenous malformations. *Acta Radiol Suppl*. 1996;404:1-25. PMID: 8765004.
- 263: Frizzel RT, Fisher WS 3rd. Cure, morbidity, and mortality associated with embolization of brain arteriovenous malformations: a review of 1246 patients in 32 series over a 35-year period. *Neurosurgery*. 1995 Dec;37(6):1031-9; discussion 1039-40. doi: 10.1227/00006123-199512000-00001. PMID: 8584142.
- 264: Masuo O, Okuno T, Ozaki F, Terada T, Nakai K, Itakura T, Komai N. [A case of spinal dural arteriovenous fistula associated with normal pressure hydrocephalus]. *No Shinkei Geka*. 1995 Sep;23(9):825-8. Japanese. PMID: 7566431.
- 265: Murase S, Kaku Y, Yamada J, Nokura H, Miwa Y, Ohkuma A, Yamada H. [Treatment of facial arteriovenous malformation]. *No Shinkei Geka*. 1995 Aug;23(8):733-8. Japanese. PMID: 7666947.
- 266: Watban JA, Rodesch G, Alvarez H, Lasjaunias P. Transarterial embolization of vein of Galen aneurysmal malformation after unsuccessful stereotactic radiosurgery. Report of three cases. *Childs Nerv Syst*. 1995 Jul;11(7):406-8. doi: 10.1007/BF00717406. PMID: 7585669.
- 267: Shi X, Wang Z, Dai J. Endovascular embolization treatment of cerebral arteriovenous malformations (report of 54 cases). *Chin Med Sci J*. 1995 Jun;10(2):96-9. PMID: 7647328.
- 268: Huang Z, Dai Q, Suo J, Liu F, Wang C, Yin W. Percutaneous endovascular embolization of intracerebral arteriovenous malformations. Experience in 72 cases. *Chin Med J (Engl)*. 1995 Jun;108(6):413-9. PMID: 7555249.
- 269: Touho H, Monobe T, Ohnishi H, Karasawa J. Treatment of type II perimedullary arteriovenous fistulas by intraoperative transvenous embolization: case report. *Surg Neurol*. 1995 May;43(5):491-6. doi: 10.1016/0090-3019(95)80096-y. PMID: 7660289.
- 270: Friedman DM, Verma R, Madrid M, Wisoff JH, Berenstein A. Recent improvement in outcome using transcatheter embolization techniques for neonatal aneurysmal malformations of the vein of Galen. *Pediatrics*. 1993 Mar;91(3):583-6. PMID: 8441563.
- 271: Jafar JJ, Davis AJ, Berenstein A, Choi IS, Kupersmith MJ. The effect of embolization with N-butyl cyanoacrylate prior to surgical resection of cerebral arteriovenous malformations. *J Neurosurg*. 1993 Jan;78(1):60-9. doi: 10.3171/jns.1993.78.1.0060. PMID: 8416244.

- 272: Schweitzer JS, Chang BS, Madsen P, Viñuela F, Martin NA, Marroquin CE, Vinters HV. The pathology of arteriovenous malformations of the brain treated by embolotherapy. II. Results of embolization with multiple agents. *Neuroradiology*. 1993;35(6):468-74. doi: 10.1007/BF00602835. PMID: 8377925.
- 273: Touho H, Karasawa J, Shishido H, Yamada K, Shibamoto K. Successful excision of a juvenile-type spinal arteriovenous malformation following intraoperative embolization. Case report. *J Neurosurg*. 1991 Oct;75(4):647-51. doi: 10.3171/jns.1991.75.4.0647. PMID: 1885985.
- 274: Celik H, Caner H, Tahta K, Ozcan OE, Erben A, Onol B. Nonsuture closure of arterial defect by vein graft using isobutyl-2-cyanoacrylate as a tissue adhesive. *J Neurosurg Sci*. 1991 Apr-Jun;35(2):83-7. PMID: 1757807.
- 275: King WA, Hieshima GB, Martin NA. Venous rupture during transvenous approach to a carotid-cavernous fistula. Case report. *J Neurosurg*. 1989 Jul;71(1):133-7. doi: 10.3171/jns.1989.71.1.0133. PMID: 2661739.
- 276: Keng TM, Bucknall TE. A clinical trial of tissue adhesive (histoacryl) in skin closure of groin wounds. *Med J Malaysia*. 1989 Jun;44(2):122-8. PMID: 2696870.
- 277: Samson D. Isobutyl-2-cyanoacrylate. *Neurosurgery*. 1986 Nov;19(5):885. doi: 10.1097/00006123-198611000-00027. PMID: 3785639.
- 278: Kerber CW, Cromwell LD, Zanetti PH. Experimental carotid aneurysms: Part 2. Endovascular treatment with cyanoacrylate. *Neurosurgery*. 1985 Jan;16(1):13-7. PMID: 3974809.
- 279: Pevsner PH, George ED, Doppman JL. Interventional radiology polymer update: acrylic. *Neurosurgery*. 1982 Mar;10(3):314-6. doi: 10.1227/00006123-198203000-00003. PMID: 7070633.
- 280: de Lange JJ, Baerts WD, Pearce C. Intraoperative embolisation of cerebral arteriovenous malformations with isobutyl-2-cyanoacrylate (bucrylate). *Acta Anaesthesiol Belg*. 1982;33(3):211-4. PMID: 6815977.
- 281: Samson D, Dittmore QM, Beyer CW Jr. Intravascular use of isobutyl 2-cyanoacrylate: Part 2 Treatment of carotid-cavernous fistulas. *Neurosurgery*. 1981 Jan;8(1):52-5. doi: 10.1227/00006123-198101000-00010. PMID: 7207773.
- 282: Samson D, Dittmore QM, Beyer CW Jr. Intravascular use of isobutyl 2-cyanoacrylate: Part 1 Treatment of intracranial arteriovenous malformations. *Neurosurgery*. 1981 Jan;8(1):43-51. doi: 10.1227/00006123-198101000-00009. PMID: 7207772.
- 283: Mickey BE, Samson D. Neurosurgical applications of the cyanoacrylate adhesives. *Clin Neurosurg*. 1981;28:429-44. doi: 10.1093/neurosurgery/28.cn_suppl_1.429. PMID: 7032796.
- 284: Papadakis N, Mark VH. Repair of spinal cerebrospinal fluid fistula with the use of a tissue adhesive: technical note. *Neurosurgery*. 1980 Jan;6(1):63-5. doi: 10.1227/00006123-198001000-00009. PMID: 7188790.
- 285: Gelderd JB, Matthews MA, St Onge MF, Faciane CL. Qualitative and quantitative effects of ACTH, piromen, cytoxan and isobutyl-2-cyanoacrylate treatments following spinal cord transection in rats. *Acta Neurobiol Exp (Wars)*. 1980;40(2):489-500. PMID: 6252750.
- 286: Dubois PJ, Kerber CW, Heinz ER. Interventional techniques in neuroradiology. *Radiol Clin North*

Am. 1979 Dec;17(3):515-42. PMID: 394181.

287: Kerber CW, Bank WO, Cromwell LD. Cyanoacrylate occlusion of carotid- cavernous fistula with preservation of carotid artery flow. Neurosurgery. 1979 Mar;4(3):210-5. doi: 10.1227/00006123-197903000-00003. PMID: 460551.

288: Sheptak PE, Zanetti PH, Susen AF. The treatment of intracranial aneurysms by injection with a tissue adhesive. Neurosurgery. 1977 Jul-Aug;1(1):25-9. doi: 10.1227/00006123-197707000-00006. PMID: 355913.

1)

Majidi S, Matsoukas S, De Leacy RA, Morgenstern PF, Soni R, Shoirah H, Rapoport BI, Shigematsu T, Bederson JB, Berenstein A, Mocco J, Fifi JT, Kellner CP. [Middle Meningeal Artery Embolization for Chronic Subdural Hematoma](#) Using [N-Butyl Cyanoacrylate](#) With D5W Push Technique. Neurosurgery. 2022 Mar 2. doi: 10.1227/NEU.0000000000001882. Epub ahead of print. PMID: 35225245.

From:

<https://neurosurgerywiki.com/wiki/> - **Neurosurgery Wiki**

Permanent link:

https://neurosurgerywiki.com/wiki/doku.php?id=n-butyl_cyanoacrylate

Last update: **2025/06/18 07:53**

