

Supplementary Data 1. Use of aneurysm volume quantification methods in journals

No.	Study	Journal	Method
1	Reul et al. ⁸⁰⁾ (1997)	Neurosurgery	2-D assessment
2	Murayama et al. ⁶⁷⁾ (2006)	J Neurosurg	2-D assessment
3	Guo et al. ³⁰⁾ (2011)	Eur J Radiol	2-D assessment
4	Lawson et al. ⁵²⁾ (2011)	Neurosurgery	2-D assessment
5	Zhao et al. ¹²⁰⁾ (2013)	J Clin Neurosci	2-D assessment
6	Zhang et al. ¹¹⁷⁾ (2015)	Exp Ther Med	2-D assessment
7	Dabus et al. ¹⁷⁾ (2017)	J Neurointerv Surg	2-D assessment
8	Nakazaki et al. ⁶⁹⁾ (2017)	Acta Neurochir (Wien)	2-D assessment
9	Gross et al. ²⁹⁾ (2019)	J Neurointerv Surg	2-D assessment
10	Imamura et al. ³⁵⁾ (2019)	World Neurosurg	2-D assessment
11	Sokolowski et al. ⁹⁶⁾ (2019)	J Clin Neurosci	2-D assessment
12	Satoh et al. ⁸⁶⁾ (1997)	Interv Neuroradiol	Ellipsoid method
13	Satoh et al. ⁸⁷⁾ (1998)	Interv Neuroradiol	Ellipsoid method
14	Kawanabe et al. ⁴²⁾ (2001)	Acta Neurochir (Wien)	Ellipsoid method
15	Tamatani et al. ¹⁰⁴⁾ (2002)	AJNR Am J Neuroradiol	Ellipsoid method
16	Cloft and Kallmes ¹⁴⁾ (2004)	AJNR Am J Neuroradiol	Ellipsoid method
17	Sellar et al. ⁸⁸⁾ (2004)	J Neuroradiol	Ellipsoid method
18	Goddard et al. ²⁷⁾ (2005)	AJNR Am J Neuroradiol	Ellipsoid method
19	Kai et al. ⁴¹⁾ (2005)	Neurosurgery	Ellipsoid method
20	Vallée et al. ¹¹⁰⁾ (2005)	Neuroradiology	Ellipsoid method
21	Yagi et al. ¹¹⁴⁾ (2005)	Neurol Med Chir (Tokyo)	Ellipsoid method
22	Gaba et al. ²⁵⁾ (2006)	Stroke	Ellipsoid method
23	Ross and Dhillon ⁸¹⁾ (2006)	Surg Neurol	Ellipsoid method
24	Yamazaki et al. ¹¹⁵⁾ (2006)	Neurol Med Chir (Tokyo)	Ellipsoid method
25	Hirsch et al. ³³⁾ (2007)	J Vasc Interv Radiol	Ellipsoid method
26	Wakhloo et al. ¹¹¹⁾ (2007)	AJNR Am J Neuroradiol	Ellipsoid method
27	Ding et al. ²¹⁾ (2008)	AJNR Am J Neuroradiol	Ellipsoid method
28	D'Agostino et al. ¹⁸⁾ (2009)	Surg Neurol	Ellipsoid method
29	Izar et al. ³⁸⁾ (2011)	PLoS One	Ellipsoid method
30	Smith et al. ⁹⁵⁾ (2011)	Neurosurgery	Ellipsoid method
31	Tsutsumi et al. ¹⁰⁸⁾ (2011)	Neurosurgery	Ellipsoid method
32	Kim et al. ⁴⁴⁾ (2012)	Neurointervention	Ellipsoid method
33	Taussky et al. ¹⁰⁶⁾ (2012)	AJNR Am J Neuroradiol	Ellipsoid method
34	Chun et al. ¹²⁾ (2013)	Clin Neurol Neurosurg	Ellipsoid method
35	Dai et al. ¹⁹⁾ (2013)	J Neurointerv Surg	Ellipsoid method
36	Harada and Moriok ³¹⁾ (2013)	J Neurointerv Surg	Ellipsoid method
37	Khatri et al. ⁴³⁾ (2013)	Neurosurgery	Ellipsoid method
38	Lee et al. ⁵⁵⁾ (2013)	J Korean Neurosurg Soc	Ellipsoid method
39	Speirs et al. ⁹⁸⁾ (2013)	J Neurointerv Surg	Ellipsoid method
40	Jiang et al. ³⁹⁾ (2014)	Cardiovasc Intervent Radiol	Ellipsoid method
41	Lee et al. ⁵⁶⁾ (2014)	Acta Neurochir (Wien)	Ellipsoid method

Supplementary Data 1. Continued

No.	Study	Journal	Method
42	Serafin et al. ⁸⁹⁾ (2014)	Pol J Radiol	Ellipsoid method
43	Cho et al. ¹⁰⁾ (2015)	Neuroradiology	Ellipsoid method
44	Haworth et al. ³²⁾ (2015)	J Neurointerv Surg	Ellipsoid method
45	Zhang et al. ¹¹⁹⁾ (2015)	Turk Neurosurg	Ellipsoid method
46	Ghostine et al. ²⁶⁾ (2016)	Interv Neuroradiol	Ellipsoid method
47	Ishida et al. ³⁶⁾ (2016)	J Neurosurg	Ellipsoid method
48	Ren et al. ⁷⁹⁾ (2016)	Interv Neuroradiol	Ellipsoid method
49	Taschner et al. ¹⁰⁵⁾ (2016)	Neuroradiology	Ellipsoid method
50	Wei et al. ¹¹³⁾ (2016)	Interv Neuroradiol	Ellipsoid method
51	Yin et al. ¹¹⁶⁾ (2016)	Interv Neuroradiol	Ellipsoid method
52	Cloutier et al. ¹⁵⁾ (2017)	Interv Neuroradiol	Ellipsoid method
53	Lang et al. ⁵⁰⁾ (2017)	Clin Neuroradiol	Ellipsoid method
54	Ohshima et al. ⁷¹⁾ (2017)	Nagoya J Med Sci	Ellipsoid method
55	Abi-Aad et al. ¹⁾ (2018)	Neuroradiology	Ellipsoid method
56	Kim et al. ⁴⁵⁾ (2018)	Clin Neurol Neurosurg	Ellipsoid method
57	Lee et al. ⁵⁴⁾ (2018)	Neuroradiology	Ellipsoid method
58	Matsushige et al. ⁶³⁾ (2018)	Interv Neuroradiol	Ellipsoid method
59	Neki et al. ⁷⁰⁾ (2018)	J Neurointerv Surg	Ellipsoid method
60	Sousa et al. ⁹⁷⁾ (2019)	Clin Neuroradiol	Ellipsoid method
61	Suri et al. ¹⁰²⁾ (2008)	J Vasc Interv Neurol	AngioCalc & AngioSuite
62	Simon et al. ⁹⁰⁾ (2010)	J Neurointerv Surg	AngioCalc & AngioSuite
63	Colby et al. ¹⁶⁾ (2012)	J Neurointerv Surg	AngioCalc & AngioSuite
64	Chalouhi et al. ⁹⁾ (2013)	Clin Neurol Neurosurg	AngioCalc & AngioSuite
65	Mascitelli et al. ⁶²⁾ (2013)	J Neurointerv Surg	AngioCalc & AngioSuite
66	Singla et al. ⁹¹⁾ (2013)	Acta Neurochir (Wien)	AngioCalc & AngioSuite
67	Milburn et al. ⁶⁴⁾ (2014)	J Neurointerv Surg	AngioCalc & AngioSuite
68	Osanaï et al. ⁷²⁾ (2014)	Interv Neuroradiol	AngioCalc & AngioSuite
69	Mascitelli et al. ⁶⁰⁾ (2015)	J Clin Neurosci	AngioCalc & AngioSuite
70	Mascitelli et al. ⁶¹⁾ (2015)	J Neurointerv Surg	AngioCalc & AngioSuite
71	Berge et al. ⁷⁾ (2016)	J Neuroradiol	AngioCalc & AngioSuite
72	Griessenauer et al. ²⁸⁾ (2016)	World Neurosurg	AngioCalc & AngioSuite
73	Kaesmacher et al. ⁴⁰⁾ (2016)	J Neurointerv Surg	AngioCalc & AngioSuite
74	Wang et al. ¹¹²⁾ (2016)	J Neurointerv Surg	AngioCalc & AngioSuite
75	Linzey et al. ⁵⁸⁾ (2017)	J Neurointerv Surg	AngioCalc & AngioSuite
76	Popiela et al. ⁷⁸⁾ (2017)	Neurol Neurochir Pol	AngioCalc & AngioSuite
77	Tosello et al. ¹⁰⁷⁾ (2017)	AJNR Am J Neuroradiol	AngioCalc & AngioSuite
78	Ban et al. ⁴⁾ (2018)	Neuroradiology	AngioCalc & AngioSuite
79	Bender et al. ⁵⁾ (2018)	J Neurointerv Surg	AngioCalc & AngioSuite
80	Ilyas et al. ³⁴⁾ (2018)	Clin Neurol Neurosurg	AngioCalc & AngioSuite
81	Park et al. ⁷⁵⁾ (2019)	Acta Neurochir (Wien)	AngioCalc & AngioSuite
82	Zhang et al. ¹¹⁸⁾ (2019)	World Neurosurg	AngioCalc & AngioSuite

Supplementary Data 1. Continued

No.	Study	Journal	Method
83	Kiyosue et al. ⁴⁶⁾ (2002)	Neurosurgery	Workstation
84	Bescós et al. ⁸⁾ (2005)	AJNR Am J Neuroradiol	Workstation
85	Slob et al. ⁹²⁾ (2005)	Neuroradiology	Workstation
86	Slob et al. ⁹³⁾ (2005)	AJNR Am J Neuroradiol	Workstation
87	Fanning et al. ²³⁾ (2007)	Neuroradiology	Workstation
88	Lee et al. ⁵³⁾ (2009)	Interv Neuroradiol	Workstation
89	Ansari et al. ²⁾ (2011)	J Neurointerv Surg	Workstation
90	Clarençon et al. ¹³⁾ (2012)	Neuroradiology	Workstation
91	Knap et al. ⁴⁷⁾ (2013)	Neurol Neurochir Pol	Workstation
92	el-Chalouhi et al. ²²⁾ (2014)	World Neurosurg	Workstation
93	Leng et al. ⁵⁷⁾ (2014)	J Neurointerv Surg	Workstation
94	Larrabide et al. ⁵¹⁾ (2015)	J Neurointerv Surg	Workstation
95	Park et al. ⁷⁴⁾ (2015)	J Neuroimaging	Workstation
96	Sadato et al. ⁸⁴⁾ (2015)	Interv Neuroradiol	Workstation
97	Ito et al. ³⁷⁾ (2016)	Neurol Med Chir (Tokyo)	Workstation
98	Misaki et al. ⁶⁶⁾ (2016)	World Neurosurg	Workstation
99	Sadato et al. ⁸³⁾ (2016)	Neurosurg Rev	Workstation
100	Sadato et al. ⁸⁵⁾ (2016)	PLoS One	Workstation
101	Sluzewski et al. ⁹⁴⁾ (2004)	Radiology	Commercial software
102	Babiker et al. ³⁾ (2013)	J Biomech	Commercial software
103	Kuriyama et al. ⁴⁹⁾ (2013)	Nihon Hoshasen Gijutsu Gakkai Zasshi	Commercial software
104	Takao et al. ¹⁰³⁾ (2014)	AJNR Am J Neuroradiol	Commercial software
105	Damiano et al. ²⁰⁾ (2015)	J Biomech	Commercial software
106	Nair et al. ⁶⁸⁾ (2016)	J Biomech Eng	Commercial software
107	Sugiyama et al. ¹⁰¹⁾ (2016)	Stroke	Commercial software
108	Fujimura et al. ²⁴⁾ (2017)	Annu Int Conf IEEE Eng Med Biol Soc	Commercial software
109	Misaki et al. ⁶⁵⁾ (2017)	Technol Health Care	Commercial software
110	Otani et al. ⁷³⁾ (2017)	Med Biol Eng Comput	Commercial software
111	Umeda et al. ¹⁰⁹⁾ (2017)	PLoS One	Commercial software
112	Piotin et al. ⁷⁶⁾ (2000)	AJNR Am J Neuroradiol	Phantom
113	Piotin et al. ⁷⁷⁾ (2001)	AJR Am J Roentgenol	Phantom
114	Bendok et al. ⁶⁾ (2007)	Neurosurgery	Phantom
115	Chueh et al. ¹¹⁾ (2015)	J Neurointerv Surg	Phantom
116	Sadasivan et al. ⁸²⁾ (2018)	J Neurointerv Surg	Phantom
117	Kono et al. ⁴⁸⁾ (2014)	Neurol Med Chir (Tokyo)	Not mentioned
118	Mascitelli et al. ⁵⁹⁾ (2015)	J Neurointerv Surg	Not mentioned
119	Starke et al. ¹⁰⁰⁾ (2015)	J Neurointerv Surg	Not mentioned
120	Stapleton et al. ⁹⁹⁾ (2016)	Interv Neuroradiol	Not mentioned

Journals from PubMed search were classified by published year and aneurysm volume quantification methods. Although we live in 3-dimensional angiography era, still ellipsoid method is the most used aneurysm volume quantification method

Supplementary References

1. Abi-Aad KR, Aoun RJN, Rahme RJ, Ward JD, Kniss J, Kwasny MJ, et al. : New generation hydrogel endovascular aneurysm treatment trial (HEAT): a study protocol for a multicenter randomized controlled trial. **Neuroradiology** 60 : 1075-1084, 2018
2. Ansari SA, Dueueke EJ, Kanaan Y, Chaudhary N, Gandhi D, Thompson BG, et al. : Embolization of intracranial aneurysms with second-generation Matrix-2 detachable coils: mid-term and long-term results. **J Neurointerv Surg** 3 : 324-330, 2011
3. Babiker MH, Chong B, Gonzalez LF, Cheema S, Frakes DH : Finite element modeling of embolic coil deployment: multifactor characterization of treatment effects on cerebral aneurysm hemodynamics. **J Biomech** 46 : 2809-2816, 2013
4. Ban SP, Hwang G, Kim CH, Byoun HS, Lee SU, Kim T, et al. : Risk factor analysis of recanalization and retreatment for patients with endovascular treatment of internal carotid artery bifurcation aneurysms. **Neuroradiology** 60 : 535-544, 2018
5. Bender MT, Jiang B, Campos JK, Lin LM, Beaty N, Vo CD, et al. : Single-stage flow diversion with adjunctive coiling for cerebral aneurysm: outcomes and technical considerations in 72 cases. **J Neurointerv Surg** 10 : 843-850, 2018
6. Bendok BR, Parkinson RJ, Hage ZA, Adel JG, Gounis MJ : The effect of vascular reconstruction device-assisted coiling on packing density, effective neck coverage, and angiographic outcome: an in vitro study. **Neurosurgery** 61 : 835-840; discussion 840-841, 2007
7. Berge J, Gariel F, Marnat G, Dousset V : PC400 volumetric coils minimize radiation, reduce procedure time and optimize packing density during endovascular treatment in medium sized cerebral aneurysms. **J Neuro-radiol** 43 : 37-42, 2016
8. Bescós JO, Slob MJ, Slump CH, Sluzewski M, van Rooij WJ : Volume measurement of intracranial aneurysms from 3D rotational angiography: improvement of accuracy by gradient edge detection. **AJNR Am J Neuroradiol** 26 : 2569-2572, 2005
9. Chalouhi N, Jabbour P, Tjoumakaris S, Dumont AS, Chitale R, Rosenwasser RH, et al. : Single-center experience with balloon-assisted coil embolization of intracranial aneurysms: safety, efficacy and indications. **Clin Neurol Neurosurg** 115 : 607-613, 2013
10. Cho YD, Jeon JP, Rhim JK, Park JJ, Yoo RE, Kang HS, et al. : Progressive thrombosis of small saccular aneurysms filled with contrast immediately after coil embolization: analysis of related factors and long-term follow-up. **Neuroradiology** 57 : 615-623, 2015
11. Chueh JY, Vedantham S, Wakhloo AK, Carniato SL, Puri AS, Bzura C, et al. : Aneurysm permeability following coil embolization: packing density and coil distribution. **J Neurointerv Surg** 7 : 676-681, 2015
12. Chun YI, Roh HG, Choe WJ, Cho J, Moon CT, Koh YC : Tiny aneurysms treated with single coil: morphological comparison between bare platinum coil and matrix coil. **Clin Neurol Neurosurg** 115 : 529-534, 2013
13. Clarençon F, Piotin M, Pistocchi S, Babic D, Blanc R : Evaluation of stent visibility by flat panel detector CT in patients treated for intracranial aneurysms. **Neuroradiology** 54 : 1121-1125, 2012
14. Cloft HJ, Kallmes DF : Aneurysm packing with HydroCoil embolic system versus platinum coils: initial clinical experience. **AJNR Am J Neuroradiol** 25 : 60-62, 2004
15. Cloutier F, Khoury N, Ghostine J, Farzin B, Kotowski M, Weill A, et al. : Embolization with larger-caliber coils can increase packing density: evidence from the pilot phase of a randomized trial. **Interv Neuroradiol** 23 : 14-17, 2017
16. Colby GP, Paul AR, Radvany MG, Gandhi D, Gailloud P, Huang J, et al. : A single center comparison of coiling versus stent assisted coiling in 90 consecutive paraophthalmic region aneurysms. **J Neurointerv Surg** 4 : 116-120, 2012
17. Dabus G, Hacein-Bey L, Varjavand B, Tomalty RD, Han PP, Yerokhin V, et al. : Safety, immediate and mid-term results of the newer generation of hydrogel coils in the treatment of ruptured aneurysms: a multicenter study. **J Neurointerv Surg** 9 : 419-424, 2017
18. D'Agostino SJ, Harrigan MR, Chalela JA, Nicholas JS, Deveikis SI, Jones TM, et al. : Clinical experience with Matrix2 360 degrees coils in the treatment of 100 intracranial aneurysms. **Surg Neurol** 72 : 41-47, 2009
19. Dai D, Yong-Hong D, Rezek I, Lewis DA, Kallmes DF, Kadirvel R : Healing of saccular aneurysms following platinum coil embolization: lack of improved efficacy with vitamin C supplementation. **J Neurointerv Surg** 5 : 591-596, 2013
20. Damiano RJ, Ma D, Xiang J, Siddiqui AH, Snyder KV, Meng H : Finite element modeling of endovascular coiling and flow diversion enables hemodynamic prediction of complex treatment strategies for intracranial aneurysm. **J Biomech** 48 : 3332-3340, 2015
21. Ding YH, Dai D, Kadirvel R, Lewis DA, Cloft HJ, Kallmes DF : Relationship between aneurysm volume and histologic healing after coil embolization in elastase-induced aneurysms: a retrospective study. **AJNR Am J Neuroradiol** 29 : 98-101, 2008
22. el-Chalouhi N, Jabbour PM, Tjoumakaris SI, Starke RM, Dumont AS, Liu H, et al. : Treatment of large and giant intracranial aneurysms: cost comparison of flow diversion and traditional embolization strategies. **World Neurosurg** 82 : 696-701, 2014
23. Fanning NF, Berentei Z, Brennan PR, Thornton J : HydroCoil as an adjunct to bare platinum coil treatment of 100 cerebral aneurysms. **Neuroradiology** 49 : 139-148, 2007
24. Fujimura S, Takao H, Suzuki T, Dahmani C, Mamori H, Fukushima N, et al. : Effect of catheter positions on hemodynamics and coil formation after coil embolization. **Annu Int Conf IEEE Eng Med Biol Soc** 2017 : 3397-3400, 2017
25. Gaba RC, Ansari SA, Roy SS, Marden FA, Viana MA, Malisch TW : Embolization of intracranial aneurysms with hydrogel-coated coils versus inert platinum coils: effects on packing density, coil length and quantity, procedure performance, cost, length of hospital stay, and durability of therapy. **Stroke** 37 : 1443-1450, 2006
26. Ghostine J, Khoury N, Cloutier F, Kotowski M, Gentric JC, Batista AL, et al. : Endovascular treatment of aneurysms and platinum coil caliber: study protocol of a randomized, controlled trial. **Interv Neuroradiol** 22 : 693-699, 2016

27. Goddard JK, Moran CJ, Cross DT 3rd, Derdeyn CP : Absent relationship between the coil-embolization ratio in small aneurysms treated with a single detachable coil and outcomes. **AJNR Am J Neuroradiol** **26** : 1916-1920, 2005
28. Griessenauer CJ, Adeeb N, Foreman PM, Gupta R, Patel AS, Moore J, et al. : Impact of coil packing density and coiling technique on occlusion rates for aneurysms treated with stent-assisted coil embolization. **World Neurosurg** **94** : 157-166, 2016
29. Gross BA, Ares WJ, Ducruet AF, Jadhav AP, Jovin TG, Jankowitz BT : A clinical comparison of Atlas and LVIS Jr stent-assisted aneurysm coiling. **J Neurointerv Surg** **11** : 171-174, 2019
30. Guo XB, Fan YM, Zhang JN : HydroSoft coil versus HydroCoil for endovascular aneurysm occlusion study: a single center experience. **Eur J Radiol** **79** : e42-e46, 2011
31. Harada K, Morioka J : Initial experience with an extremely soft bare platinum coil, ED coil-10 extra soft, for endovascular treatment of cerebral aneurysms. **J Neurointerv Surg** **5** : 577-581, 2013
32. Haworth KJ, Weidner CR, Abruzzo TA, Shearn JT, Holland CK : Mechanical properties and fibrin characteristics of endovascular coil-clot complexes: relevance to endovascular cerebral aneurysm repair paradigms. **J Neurointerv Surg** **7** : 291-296, 2015
33. Hirsch JA, Bendok BR, Paulsen RD, Cognard C, Campos J, Cronqvist M : Midterm clinical experience with a complex-shaped detachable platinum coil system for the treatment of cerebral aneurysms: TruFill DCS Orbit detachable coil system registry interim results. **J Vasc Interv Radiol** **18** : 1487-1494, 2007
34. Ilyas A, Buell TJ, Chen CJ, Ding D, Raper DMS, Taylor DG, et al. : SMART coils for intracranial aneurysm embolization: initial outcomes. **Clin Neurol Neurosurg** **164** : 87-91, 2018
35. Imamura H, Sakai N, Ito Y, Sakai C, Hyodo A, Miyachi S, et al. : Prospective registry of embolization of intracranial aneurysms using hydrosoft coils: results of the Japanese HydroSoft Registry. **World Neurosurg** **127** : e631-e637, 2019
36. Ishida W, Sato M, Amano T, Matsumaru Y : The significant impact of framing coils on long-term outcomes in endovascular coiling for intracranial aneurysms: how to select an appropriate framing coil. **J Neurosurg** **125** : 705-712, 2016
37. Ito H, Onodera H, Wakui D, Uchida M, Sase T, Morishima H, et al. : Impact of aneurysmal neck position in endovascular therapy for anterior communicating artery aneurysms. **Neurol Med Chir (Tokyo)** **56** : 21-26, 2016
38. Izar B, Rai A, Raghuram K, Rotruck J, Carpenter J : Comparison of devices used for stent-assisted coiling of intracranial aneurysms. **PLoS One** **6** : e24875, 2011
39. Jiang C, Yu Y, Hong B, Fu QL, Liu JM, Huang QH : Stent-assisted coil embolization for the treatment of ruptured aneurysms at the anterior circulation: comparison between HydroSoft coils and bare platinum coils. **Cardiovasc Intervent Radiol** **37** : 935-941, 2014
40. Kaesmacher J, Müller-Leisse C, Huber T, Boeckh-Behrens T, Haller B, Shibani E, et al. : Volume versus standard coils in the treatment of intracranial aneurysms. **J Neurointerv Surg** **8** : 1034-1040, 2016
41. Kai Y, Hamada J, Morioka M, Yano S, Kuratsu J : Evaluation of the stability of small ruptured aneurysms with a small neck after embolization with Guglielmi detachable coils: correlation between coil packing ratio and coil compaction. **Neurosurgery** **56** : 785-792; discussion 785-792, 2005
42. Kawanabe Y, Sadato A, Taki W, Hashimoto N : Endovascular occlusion of intracranial aneurysms with Guglielmi detachable coils: correlation between coil packing density and coil compaction. **Acta Neurochir (Wien)** **143** : 451-455, 2001
43. Khatri R, Chaudhry SA, Rodriguez GJ, Suri MF, Cordina SM, Qureshi AI : Frequency and factors associated with unsuccessful lead (first) coil placement in patients undergoing coil embolization of intracranial aneurysms. **Neurosurgery** **72** : 452-458; discussion 458, 2013
44. Kim BM, Kim DJ, Jeon P, Yoon PH, Lee BH, Lee MS, et al. : Endovascular embolization of intracranial aneurysms using bare platinum Axiom™ detachable coils: immediate and short-term follow-up results from a multicenter registry. **Neurointervention** **7** : 85-92, 2012
45. Kim ST, Baek JW, Lee WH, Lee KS, Kwon WH, Pyo S, et al. : Causes of early rebleeding after coil embolization of ruptured cerebral aneurysms. **Clin Neurol Neurosurg** **174** : 108-116, 2018
46. Kiyosue H, Okahara M, Tanoue S, Nakamura T, Nagatomi H, Mori H : Detection of the residual lumen of intracranial aneurysms immediately after coil embolization by three-dimensional digital subtraction angiographic virtual endoscopic imaging. **Neurosurgery** **50** : 476-484; discussion 484-485, 2002
47. Knap D, Gruszczynska K, Partyka R, Ptak D, Korzekwa M, Zbrozczyk M, et al. : Results of endovascular treatment of aneurysms depending on their size, volume and coil packing density. **Neurol Neurochir Pol** **47** : 467-475, 2013
48. Kono K, Shintani A, Okada H, Tanaka Y, Terada T : Stent-assisted coil embolization for cavernous carotid artery aneurysms. **Neurol Med Chir (Tokyo)** **54** : 126-132, 2014
49. Kuriyama T, Sakai N, Furukawa H, Oonishi K, Okumachi H, Imamura H, et al. : Examination of factors useful for choosing a method to assist coil embolization of unruptured cerebral aneurysm. **Nihon Hoshasen Gijutsu Gakkai Zasshi** **69** : 1232-1240, 2013
50. Lang S, Rösch J, Göllitz P, Kloska S, Struffert T, Doerfler A : Comparison of intracranial aneurysms treated by 2-D versus 3-D coils: a matched-pairs analysis. **Clin Neuroradiol** **27** : 43-49, 2017
51. Larrabide I, Geers AJ, Morales HG, Aguilar ML, Rüfenacht DA : Effect of aneurysm and ICA morphology on hemodynamics before and after flow diverter treatment. **J Neurointerv Surg** **7** : 272-280, 2015
52. Lawson MF, Newman WC, Chi YY, Mocco JD, Hoh BL : Stent-associated flow remodeling causes further occlusion of incompletely coiled aneurysms. **Neurosurgery** **69** : 598-603; discussion 603-604, 2011
53. Lee DH, Arat A, Morsi H, Jou LD, Mawad ME : Embolization of cerebral aneurysms with spherically shaped detachable microcoils (micrusphere microcoil system). A single centre experience. **Interv Neuroradiol** **15** : 29-36, 2009
54. Lee J, Cho YD, Yoo DH, Kang HS, Cho WS, Kim JE, et al. : Does stent type impact coil embolization outcomes in extended follow-up of small-

- sized aneurysms (< 10 mm)? **Neuroradiology** **60** : 747-756, 2018
55. Lee JY, Kwon BJ, Cho YD, Kang HS, Han MH : Reappraisal of anatomic outcome scales of coiled intracranial aneurysms in the prediction of recanalization. **J Korean Neurosurg Soc** **53** : 342-348, 2013
 56. Lee JY, Seo JH, Lee SJ, Son YJ, Cho YD, Kang HS, et al. : Mid-term outcome of intracranial aneurysms treated with HydroSoft coils compared to historical controls treated with bare platinum coils: a single-center experience. **Acta Neurochir (Wien)** **156** : 1687-1694, 2014
 57. Leng B, Zheng Y, Ren J, Xu Q, Tian Y, Xu F : Endovascular treatment of intracranial aneurysms with detachable coils: correlation between aneurysm volume, packing, and angiographic recurrence. **J Neurointerv Surg** **6** : 595-599, 2014
 58. Linzey JR, Griauzde J, Guan Z, Bentley N, Gemmete JJ, Chaudhary N, et al. : Stent-assisted coiling of cerebrovascular aneurysms: experience at a large tertiary care center with a focus on predictors of recurrence. **J Neurointerv Surg** **9** : 1081-1085, 2017
 59. Mascitelli JR, Moyle H, Oermann EK, Polykarpou MF, Patel AA, Doshi AH, et al. : An update to the Raymond-Roy occlusion classification of intracranial aneurysms treated with coil embolization. **J Neurointerv Surg** **7** : 496-502, 2015
 60. Mascitelli JR, Oermann EK, De Leacy RA, Moyle H, Mocco J, Patel AB : Predictors of treatment failure following coil embolization of intracranial aneurysms. **J Clin Neurosci** **22** : 1275-1281, 2015
 61. Mascitelli JR, Patel AB, Polykarpou MF, Patel AA, Moyle H : Analysis of early angiographic outcome using unique large diameter coils in comparison with standard coils in the embolization of cerebral aneurysms: a retrospective review. **J Neurointerv Surg** **7** : 126-130, 2015
 62. Mascitelli JR, Polykarpou MF, Patel AA, Kamath AA, Moyle H, Patel AB : Initial experience with Penumbra coil 400 versus standard coils in embolization of cerebral aneurysms: a retrospective review. **J Neurointerv Surg** **5** : 573-576, 2013
 63. Matsushige T, Sakamoto S, Ishii D, Shinagawa K, Shimonaga K, Hosogai M, et al. : Safety and efficacy of a new outreach distal access catheter, TACTICS, for coil embolization of unruptured intracranial aneurysms. **Interv Neuroradiol** **24** : 482-488, 2018
 64. Milburn J, Pansara AL, Vidal G, Martinez RC : Initial experience using the Penumbra coil 400: comparison of aneurysm packing, cost effectiveness, and coil efficiency. **J Neurointerv Surg** **6** : 121-124, 2014
 65. Misaki K, Takao H, Suzuki T, Nishimura K, Kan I, Yuki I, et al. : Estimated pretreatment hemodynamic prognostic factors of aneurysm recurrence after endovascular embolization. **Technol Health Care** **25** : 843-850, 2017
 66. Misaki K, Uchiyama N, Nambu I, Aida Y, Kamide T, Mohri M, et al. : Optimizing the volume of the initial framing coil to facilitate tight packing of intracranial aneurysms. **World Neurosurg** **90** : 397-402, 2016
 67. Murayama Y, Viñuela F, Ishii A, Nien YL, Yuki I, Duckwiler G, et al. : Initial clinical experience with matrix detachable coils for the treatment of intracranial aneurysms. **J Neurosurg** **105** : 192-199, 2006
 68. Nair P, Chong BW, Indahlstari A, Ryan J, Workman C, Haithem Babiker M, et al. : Hemodynamic characterization of geometric cerebral aneurysm templates treated with embolic coils. **J Biomech Eng** **138** : 021011, 2016
 69. Nakazaki M, Nonaka T, Nomura T, Onda T, Yonemasu Y, Takahashi A, et al. : Cerebral aneurysm neck diameter is an independent predictor of progressive occlusion after stent-assisted coiling. **Acta Neurochir (Wien)** **159** : 1313-1319, 2017
 70. Neki H, Kohyama S, Otsuka T, Yonezawa A, Ishihara S, Yamane F : Optimal first coil selection to avoid aneurysmal recanalization in endovascular intracranial aneurysmal coiling. **J Neurointerv Surg** **10** : 50-54, 2018
 71. Ohshima T, Goto S, Yamamoto T, Ishikawa K : Hemispheric divided coiling technique for coil embolization of middle- and large-sized intracranial aneurysms. **Nagoya J Med Sci** **79** : 505-513, 2017
 72. Osanai T, Bain M, Hui FK : Versatile fill coils: initial experience as framing coils for oblong aneurysms. A technical case report. **Interv Neuroradiol** **20** : 287-294, 2014
 73. Otani T, Ii S, Shigematsu T, Fujinaka T, Hirata M, Ozaki T, et al. : Computational study for the effects of coil configuration on blood flow characteristics in coil-embolized cerebral aneurysm. **Med Biol Eng Comput** **55** : 697-710, 2017
 74. Park KY, Kim BM, Ihm EH, Baek JH, Kim DJ, Kim DI, et al. : Relationship between two types of coil packing densities relative to aneurysm size. **J Neuroimaging** **25** : 415-419, 2015
 75. Park YK, Bae HJ, Cho DY, Choi JH, Kim BS, Shin YS : Risk factors for recurrence and retreatment after endovascular treatment of intracranial saccular aneurysm larger than 8 mm. **Acta Neurochir (Wien)** **161** : 939-946, 2019
 76. Pötin M, Mandai S, Murphy KJ, Sugiu K, Gailloud P, Martin JB, et al. : Dense packing of cerebral aneurysms: an in vitro study with detachable platinum coils. **AJNR Am J Neuroradiol** **21** : 757-760, 2000
 77. Pötin M, Mandai S, Sugiu K, Gailloud P, Rufenacht DA : Endovascular treatment of cerebral aneurysms: an in vitro study with detachable platinum coils and tricellulose acetate polymer. **AJR Am J Roentgenol** **176** : 235-239, 2001
 78. Popiela TJ, Brzegowy P, Łasocha B, Urbanik A : The effectiveness of Penumbra 400 micro-coils in the embolization of large cerebral aneurysms. **Neurol Neurochir Pol** **51** : 304-310, 2017
 79. Ren H, Wei M, Yin L, Ma L, Peng L : Endovascular coiling of small intracranial aneurysms using a very soft bare platinum coil: a comparison of the packing performance of new and old HyperSoft® helical coils. **Interv Neuroradiol** **22** : 26-33, 2016
 80. Reul J, Spetzger U, Weis J, Sure U, Gilsbach JM, Thron A : Endovascular occlusion of experimental aneurysms with detachable coils: influence of packing density and perioperative anticoagulation. **Neurosurgery** **41** : 1160-1165; discussion 1165-1168, 1997
 81. Ross IB, Dhillon GS : Balloon assistance as a routine adjunct to the endovascular treatment of cerebral aneurysms. **Surg Neurol** **66** : 593-601; discussion 601-602, 2006
 82. Sadasivan C, Swartwout E, Kappel AD, Woo HH, Fiorella DJ, Lieber BB : In vitro measurement of the permeability of endovascular coils deployed in cerebral aneurysms. **J Neurointerv Surg** **10** : 896-900, 2018
 83. Sadato A, Adachi K, Hayakawa M, Kato Y, Hirose Y : Effects of anatomic

- characteristics of aneurysms on packing density in endovascular coil embolization: analysis of a single center's experience. **Neurosurg Rev** **39** : 109-114; discussion 114, 2016
84. Sadato A, Hayakawa M, Adachi K, Kato Y, Hirose Y : Use of a new soft and long coil reduces the number of coils to embolize a small aneurysm. **Interv Neuroradiol** **21** : 161-166, 2015
 85. Sadato A, Hayakawa M, Adachi K, Nakahara I, Hirose Y : Large residual volume, not low packing density, is the most influential risk factor for recanalization after coil embolization of cerebral aneurysms. **PLoS One** **11** : e0155062, 2016
 86. Satoh K, Matsubara S, Hondoh H, Nagahiro S : Intracranial aneurysm embolization using interlocking detachable coils. Correlation between volume embolization rate and coil compaction. **Interv Neuroradiol** **3 Suppl 2** : 125-128, 1997
 87. Satoh K, Satomi J, Matsubara S, Nagahiro S : Measurement of volume ratio to predict coil compaction, on aneurysmal embolization. **Interv Neuroradiol** **4 Suppl 1** : 179-182, 1998
 88. Sellar R, White P, Horribine L, Keston P : Initial experience with a new soft stretch-resistant coil. **J Neuroradiol** **31** : 409-412, 2004
 89. Serafin Z, Strzeżniewski P, Beuth W : Predictors of residual flow in embolized intracranial ruptured aneurysms at early follow-up. **Pol J Radiol** **79** : 42-46, 2014
 90. Simon SD, Reig AS, James RF, Reddy P, Mericle RA : Relative cost comparison of embolic materials used for treatment of wide-necked intracranial aneurysms. **J Neurointerv Surg** **2** : 163-167, 2010
 91. Singla A, Villwock MR, Jacobsen W, Deshaies EM : Aneurysm embolization grade: a predictive tool for aneurysm recurrence after coil embolization. **Acta Neurochir (Wien)** **155** : 231-236, 2013
 92. Slob MJ, Sluzewski M, van Rooij WJ : The relation between packing and reopening in coiled intracranial aneurysms: a prospective study. **Neuroradiology** **47** : 942-945, 2005
 93. Slob MJ, van Rooij WJ, Sluzewski M : Coil thickness and packing of cerebral aneurysms: a comparative study of two types of coils. **AJNR Am J Neuroradiol** **26** : 901-903, 2005
 94. Sluzewski M, van Rooij WJ, Slob MJ, Bescós JO, Slump CH, Wijnalda D : Relation between aneurysm volume, packing, and compaction in 145 cerebral aneurysms treated with coils. **Radiology** **231** : 653-658, 2004
 95. Smith MJ, Mascitelli J, Santillan A, Brennan JS, Tsiouris AJ, Riina HA, et al. : Bare platinum vs matrix detachable coils for the endovascular treatment of intracranial aneurysms: a multivariate logistic regression analysis and review of the literature. **Neurosurgery** **69** : 557-564; discussion 565, 2011
 96. Sokolowski JD, Ilyas A, Buell TJ, Taylor DG, Chen CJ, Ding D, et al. : SMART coils for intracranial aneurysm embolization: follow-up outcomes. **J Clin Neurosci** **59** : 93-97, 2019
 97. Sousa EB, Brandão LFS, Tavares CB, Brito JNPO, Kessler IM : Importance of the first coil in the embolization of intracranial aneurysms : a case control study. **Clin Neuroradiol** **29** : 733-740, 2019
 98. Speirs JW, Burke TH, Lee SY, Ala BD : The next generation HydroCoil: initial clinical experience with the HydroFill embolic coil. **J Neurointerv Surg** **5 Suppl 3** : iii72-iii75, 2013
 99. Stapleton CJ, Kumar JJ, Walcott BP, Torok CM, Agarwalla PK, Koch MJ, et al. : The effect of basilar artery bifurcation angle on rates of initial occlusion, recanalization, and retreatment of basilar artery apex aneurysms following coil embolization. **Interv Neuroradiol** **22** : 389-395, 2016
 100. Starke RM, Durst CR, Evans A, Ding D, Raper DM, Jensen ME, et al. : Endovascular treatment of unruptured wide-necked intracranial aneurysms: comparison of dual microcatheter technique and stent-assisted coil embolization. **J Neurointerv Surg** **7** : 256-261, 2015
 101. Sugiyama S, Niizuma K, Sato K, Rashad S, Kohama M, Endo H, et al. : Blood flow into basilar tip aneurysms: a predictor for recanalization after coil embolization. **Stroke** **47** : 2541-2547, 2016
 102. Suri MF, Memon MZ, Qureshi AI : Treatment of unruptured intracranial aneurysms using internally expanding coils. **J Vasc Interv Neurol** **1** : 42-45, 2008
 103. Takao H, Ishibashi T, Saguchi T, Arakawa H, Ebara M, Irie K, et al. : Validation and initial application of a semiautomatic aneurysm measurement software: a tool for assessing volumetric packing attenuation. **AJNR Am J Neuroradiol** **35** : 721-726, 2014
 104. Tamatani S, Ito Y, Abe H, Koike T, Takeuchi S, Tanaka R : Evaluation of the stability of aneurysms after embolization using detachable coils: correlation between stability of aneurysms and embolized volume of aneurysms. **AJNR Am J Neuroradiol** **23** : 762-767, 2002
 105. Taschner CA, Chapot R, Costalat V, Machi P, Courthéoux P, Barreau X, et al. : GREAT-a randomized controlled trial comparing HydroSoft/HydroFrame and bare platinum coils for endovascular aneurysm treatment: procedural safety and core-lab-assessed angiographic results. **Neuroradiology** **58** : 777-786, 2016
 106. Tausky P, Kallmes DF, Cloft H : Mathematic analysis of incremental packing density with detachable coils: does that last coil matter much? **AJNR Am J Neuroradiol** **33** : E74-E75, 2012
 107. Tosello RT, Batista UC, Pereira BJA, Piske RL : Packing density necessary to reach a high complete occlusion rate in circumferential unruptured intracranial aneurysms treated with stent-assisted coil embolization. **AJNR Am J Neuroradiol** **38** : 1973-1977, 2017
 108. Tsutsumi M, Aikawa H, Nii K, Hamaguchi S, Etou H, Sakamoto K, et al. : Early ceasing of intra-aneurysmal contrast opacification during coil embolization in ruptured aneurysms compared with unruptured aneurysms. **Neurosurgery** **69** : 651-658; discussion 658, 2011
 109. Umeda Y, Ishida F, Tsuji M, Furukawa K, Shiba M, Yasuda R, et al. : Computational fluid dynamics (CFD) using porous media modeling predicts recurrence after coiling of cerebral aneurysms. **PLoS One** **12** : e0190222, 2017
 110. Vallée JN, Pierot L, Mont'alverne F, Turjman F, Bonafé A, Bracard S, et al. : Unruptured intracranial aneurysms treated by three-dimensional coil embolization: evaluation of the postoperative aneurysm occlusion volume. **Neuroradiology** **47** : 438-445, 2005
 111. Wakhloo AK, Gounis MJ, Sandhu JS, Akkawi N, Schenck AE, Linfante I : Complex-shaped platinum coils for brain aneurysms: higher packing density, improved biomechanical stability, and midterm angiographic outcome. **AJNR Am J Neuroradiol** **28** : 1395-1400, 2007
 112. Wang C, Ching EC, Hui FK : Aneurysm coil embolization: cost per volu-

- metric filling analysis and strategy for cost reduction. **J Neurointerv Surg** 8 : 541-543, 2016
113. Wei M, Ren H, Yin L : The combinational use of dual microcatheter technique and new hypersoft helical coil for endovascular treatment of tiny intracranial aneurysm with difficult geometry. **Interv Neuroradiol** 22 : 18-25, 2016
114. Yagi K, Satoh K, Satomi J, Matsubara S, Nagahiro S : Evaluation of aneurysm stability after endovascular embolization with Guglielmi detachable coils: correlation between long-term stability and volume embolization ratio. **Neurol Med Chir (Tokyo)** 45 : 561-565; discussion 565-566, 2005
115. Yamazaki T, Sonobe M, Nakai Y, Sugita K, Matsumaru Y, Yanaka K, et al. : Predictors of angiographic changes in neck remnants of ruptured cerebral aneurysms treated with Guglielmi detachable coils. **Neurol Med Chir (Tokyo)** 46 : 1-9; discussion 9-10, 2006
116. Yin L, Wei M, Ren H : Double microcatheter technique for coil embolization of small aneurysms with unfavorable configurations: a comparative study of the aneurysms that are ≤ 3 mm or > 3 mm. **Interv Neuroradiol** 22 : 158-164, 2016
117. Zhang J, Wang D, Li X : Solitaire AB stent-assisted coiling embolization for the treatment of ruptured very small intracranial aneurysms. **Exp Ther Med** 10 : 2239-2244, 2015
118. Zhang K, Wang ZL, Gao BL, Xue JY, Li TX, Zhao TY, et al. : Use of a first large-sized coil versus conventional coils for embolization of cerebral aneurysms: effects on packing density, coil length, and durable occlusion. **World Neurosurg** 127 : e685-e691, 2019
119. Zhang Y, Xing X, Shen X, Zhu X : The volume embolization ratio of intraaneurysmal embolization using Guglielmi detachable coils. **Turk Neurosurg** 25 : 866-872, 2015
120. Zhao R, Shen J, Huang QH, Nie JH, Xu Y, Hong B, et al. : Endovascular treatment of ruptured tiny, wide-necked posterior communicating artery aneurysms using a modified stent-assisted coiling technique. **J Clin Neurosci** 20 : 1377-1381, 2013