

Supplementary Table 2: characteristics of each included cohort

First author, Year of publication	Number of treated patients	Duration of follow- up (person-years)	Mean age (range)	Number of female patients (%)	Number of patients with brainstem CCM (%)	ICH as presenting symptom (%)	Number of patients with multiple CCM (%)
Neurosurgery (n=49)							
Acciarri, 1993 ¹	65	268	27 (0.8-72)	40 (62)	2 (3)	23 (35)	2 (3)
Lunardi, 1993 ²	20	1.67	34 (19-60)	10 (50)	0 (0)	4 (20)	1 (5)
Cohen, 1995 ³	51	254.15	34.9 (1.9-65.5)	29 (57)	0 (0)	11 (22)	4 (8)
Zevgaridis, 1996 ⁴	77	250.25	36.8 (3-72)	41 (53)	0 (0)	0 (0)	-
Di Rocco, 1997 ⁵	24	96	8 (0.5-15) ^b	12 (50)	2 (8)	19 (79)	2 (8)
Chaskis, 1998 ⁶	46 ^a	5.42	-	-	9 (20)	-	4 (9)
Mahla, 1999 ⁷	47	188	37 (12-71)	19 (40)	1 (2)	11 (23)	3 (6)
Attar, 2001 ⁸	35	72.33	33.9 (6-56)	10 (29)	4 (11)	25 (71)	0 (0)
Samii, 2001 ⁹	36	64.5	35.8 (7-64)	18 (50)	36 (100)	36 (100)	2 (6)
Woydt, 2001 ¹⁰	35	4.04	-	20 (57)	2 (6)	12 (34)	-
De Santis, 2003 ¹¹	67	5.58	34.9 (-)	34 (51)	9 (13)	-	6 (9)
Grunert, 2003 ¹²	39	3.25	35 (16-61)	21 (54)	0 (0)	18 (46)	2 (5)
Mathiesen, 2003 ¹³	29 ^a	133.4	-	-	17 (59)	-	-
Murillo-Bonilla, 2003 ¹⁴	21 ^a	1.75	-	-	-	-	-
Wang, 2003 ¹⁵	137	593.67	33.5 (3.5-70)	57 (42)	137 (100)	137 (100)	13 (10)
Faria, 2004 ¹⁶	33	2.75	31.5 (5-70)	13 (39)	5 (15)	5 (15)	3 (9)
Stefan, 2004 ¹⁷	30 ^a	120	39.4 (19-62)	12 (40)	0 (0)	0 (0)	-
Ferrolì, 2005 ¹⁸	52	244.40	38.5 (3-70)	26 (50)	52 (100)	50 (96)	-
Iakovlev, 2005 ¹⁹	35 ^a	144.2	-	-	0 (0)	-	-

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Zotta, 2005 ²⁰	21	1.75	37 (18-65)	9 (43)	0 (0)	4 (19)	1 (5)
Baumann, 2006 ²¹	31	31.00	36.3 (16.8-71.2)	15 (48)	0 (0)	-	1 (3)
Bruneau, 2006 ²²	22	82.32	39.8 (10-66.4)	7 (32)	22 (100)	22 (100)	4 (18)
D'Angelo, 2006 ²³	118	540.83	39 (1.6-90)	42 (36)	0 (0)	49 (42)	28 (24)
Ferroli, 2006 ²⁴	163	652.00	33.4 (17-63)	-	0 (0)	-	-
Jung, 2006 ²⁵	26	58.5	35 (19-59)	9 (35)	0 (0)	6 (23)	0 (0)
Winkler, 2006 ²⁶	40	20.00	36.4 (12-63)	20 (50)	0 (0)	-	-
Ghannane, 2007 ²⁷	39 ^a	6.58	-	-	-	22 (56)	-
Khouri, 2007 ²⁸	20	1.67	- (11-61)	10 (50)	0 (0)	2 (10)	-
Lena, 2007 ²⁹	48	4.00	-	-	-	-	-
Cenzato, 2008 ³⁰	30	15.00	52.0 (4-62)	11 (37)	30 (100)	30 (100)	5 (17)
Huo, 2008 ³¹	71	5.92	27.6 (14-58)	38 (54)	0 (0)	-	-
Jovanovic, 2008 ³²	38	3.17	30.9 (0.5-67)	22 (58)	-	38 (100)	-
Stavrou, 2008 ³³	53	429.30	33.8 (-)	22 (42)	0 (0)	-	3 (6)
Akdemir, 2009 ³⁴	22	33.00	34.5 (2-72)	11 (50)	2 (9)	14 (64)	4 (18)
Bernotas, 2009 ³⁵	87	7.25	42.4 (10-72)	46 (53)	-	23 (26)	11 (13)
Chang, 2009 ³⁶	164	437.33	38.3 (9-72)	107 (65)	0 (0)	69 (42)	21 (13)
Hauck, 2009 ³⁷	44	40.33	37.5 (10-77)	30 (68)	44 (100)	-	6 (14)
Li, 2009 ³⁸	37	66.29	36.5 (18-58)	25 (68)	37 (100)	37 (100)	-
Stadie, 2009 ³⁹	66	5.50	-	-	10 (15)	-	-
Consales, 2010 ⁴⁰	28 ^a	112.00	7.5 (0-17)	14 (50)	5 (18)	20 (71)	7 (25)
Huang, 2010 ⁴¹	22 ^a	88.00	-	-	22 (100)	-	-

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Ohue, 2010 ⁴²	36	36.00	42 (6-65)	24 (67)	36 (100)	36 (100)	6 (17)
Abla, 2011 ⁴³	260	1020.00	41.8 (19-77)	156 (60)	260 (100)	252 (97)	53 (20)
Dukatz, 2011 ⁴⁴	71	100.58	40 (13-69)	33 (47)	71 (100)	70 (99)	5 (7)
Song, 2011 ⁴⁵	80 ^a	336.00	13.1 (0.5-17.9)	32 (40)	13 (16)	38 (48)	6 (8)
Sun, 2011 ⁴⁶	36	37.80	32.8 (10-56)	13 (36)	0 (0)	-	2 (6)
Xie, 2011 ⁴⁷	47	23.50	31.1 (14-52)	20 (43)	1 (2)	-	-
Zhang, 2011 ⁴⁸	40	10.00	34.5 (18-58)	22 (55)	2 (5)	-	4 (10)
Wostrack, 2012 ⁴⁹	45	47.83	50.2 (20-81)	22 (49)	16 (36)	7 (16)	7 (16)
Gamma knife surgery (n=10)							
Kondziolka, 1995 ⁵⁰	47	169.20	39 (-)	23 (49)	27 (58)	47 (100)	-
Kida, 1995 ⁵¹	20	198.00	34 (3-58)	7 (35)	8 (40)	11 (55)	2 (10)
Karlsson, 1998 ⁵²	22	142.62	- (-)	-	6 (27)	16 (73)	-
Liscak, 2000 ⁵³	26	52.00	38 (17-55) ^b	16 (62)	26 (100)	21 (81)	4 (15)
Liu, 2005 ⁵⁴	125	675.00	- (-)	-	49 (39)	112 (90)	13 (10)
Liu, 2005 ⁵⁵	92	337.20	35.4 (-)	33 (36)	-	-	14 (15)
Kim, 2005 ⁵⁶	42	103.60	37.6 (7-60)	19 (45)	-	11 (26)	7 (17)
Kida, 2009 ⁵⁷	84	385.00	38.2 (10-68)	34 (41)	63 (75)	79 (94)	-
Wang, 2010 ⁵⁸	96	412.80	35.4 (4-67)	44 (46)	2 (2)	-	11 (12)
Nagy, 2010 ⁵⁹	113	452.00	37 (2-71)	62 (55)	79 (70)	103 (91)	18 (16)
Linear accelerator (n=2)							
Tsien, 2001 ⁶⁰	21	134.75	41 (7-75) ^b	11 (52)	17 (81)	20 (95)	-
Huang, 2006 ⁶¹	30	149.75	24 (14-79)	16 (53)	7 (23)	22 (73)	6 (20)

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Various treatments (n=2)							
Kim (GKS), 2002 ⁶²	11	24.92	32 (11-49)	6 (55)	5 (46)	10 (91)	-
Kim (LINAC), 2002 ⁶²	11	45.33	36.1 (19-56)	4 (36)	5 (46)	10 (91)	-

CCM, cerebral cavernous malformations; GKS, gamma knife surgery; ICH, intracranial hemorrhage; LINAC, linear accelerator. ^a Number of treated patients was not the same as the total number of included patients
^b We used median, if mean was not available.

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