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Surgery for elderly meningioma

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Abstract

We tried to clarify the results of elderly meningioma based on the literature review. We searched the PubMed database using the terms “meningioma,” “elderly,” and “surgery” for English-language clinical studies and collected related papers published from 2003 to 2018. Twenty-four papers were reviewed and a total number of cases was 10,009. The mean rate of tumor size over 40mm in diameter was 62.8%, 38.9% of location was skull base related, and 30.7% of the cases was asymptomatic cases. The mean mortality of in-hospital, three months and one year after surgery were 2.9%, 5.3%, and 8.7%, respectively. This short review of risk factor analysis emphasized the mortality of elderly meningioma was not so high, after considering the preoperative status and comorbidities. Future research and a prospective randomized study concerning frailty should address the causes and prevention of complications.

Introduction

The increased average life expectancy and more frequent use of diagnostic neuroimaging in recent years have resulted in an increased rate of incidental detection of asymptomatic meningiomas in the elderly all over the world. Although many studies have evaluated the risks and indications of surgery in elderly patients with meningioma, the existing evidence is insufficient. This short review aimed to clarify the current results of mortality and complication in elderly patients with meningioma.

Mortality, complications

Cumulative mortality data are presented in Table 1 [1-24]. Twenty-four studies reported postoperative mortality and complications. Overall, the reported in-hospital, three months and one year mortality rates after surgery ranged from 0% - 6.5%, 0-7.4% and 03-15.7%, respectively. The mean complication rate of brain and general were 21.2 % and 10.3 %, respectively.

The preoperative information of the patients was important, and the mean rate over 40mm tumor size in diameter was 62.8%. The rate of the tumor located in the skull base and related area was 38.9%. The mean rate of asymptomatic case was 30.7% and the mean rate of Karnofsky Performance Scale (KPS) over 80 was 64.3%. The American Society of Anesthesiologists (ASA) physical classification system was most commonly used to assess preoperative physical status, with mean of class I, II, III, and IV were 13.9%, 48.5%, 41.8%, and 4.6%, respectively. The worst preoperative ASA score resulted in the worst mortality

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rate at 1 month after surgery [12]. Four grading scoring systems were used in the literature [3,15,17,25].

There were several grading systems for elderly meningioma. A higher Clinical Radiological Grading System (CRGS) score was associated with lower 1-month mortality. A lower SKALE (Sex, KPS, ASA, tumor Location and peri-tumoral Edema) grading scale score was associated with a higher 1-year mortality rate [9]. The Charlson Comorbidity Score (CCS) was found to correlate positively with in-hospital mortality and complication rates [15]. Higher scores on the Geriatric Scoring System (GSS) were associated with better outcomes, including lower mortality rates at different time points (1 month and 1,3, and 5years), reduced recurrence at 1 year, and better 5-year functional outcomes [14]. The SKALE and KPS scores were the most commonly identified risk factors of death in each age categories although deterioration rates differed among studies.

All 4 grading scoring systems mentioned in this review were found to be associated with mortality; moreover, some were associated with other outcomes. The CRGS/GSS and CCS do not consider patient sex, despite that this factor has been identified as prognostic in recent large series [9,13]. In contrast, SKALE does not incorporate tumor size or preoperative neurological deficits. The CRGS, SKALE, GSS, and CCS all consider comorbidities, whereas the latter does not incorporate the radiological features of the tumor. None of the proposed methods consider changes over time, radiological or physical. In 2012, Schul et al. confirmed the predictive values of total CRGS and SKALE scores regarding 1-year mortality after intracranial meningioma surgery among patients aged 65 years or older [16] but could not reproduce the statistical significance of all component elements.

Surgical risk factors and indications in elderly patients with meningioma

Several recent large studies have suggested increasing age as a prognostic risk factor among patients subjected to intracranial meningioma surgery; [9,12,13,15,26] however, clinical and functional status [5,9,12,13,15,18,27,28] and radiological features [3,9,12,27,29-31] are still more frequently recognized as risk factors. Moreover, the female sex has been associated with better prognosis [3,9,13]. Despite the above risks, the risks of a wait-and-see strategy for elderly patients should not be underestimated, as the patient's medical condition is not likely to improve after diagnosis, and tumor-related mortality has been shown to increase among patients who received conservative treatment compared with that in those who underwent resection [30]. It is unclear whether increasing age truly contributes to increased mortality in elderly patients with slow-growing meningiomas.

The present review observed 1-year mortality rates after meningioma resection of 0–16.2% among elderly subjects with the rate of skull base related location ranged approximately 39%, the mean rate over 40mm tumor size in diameter was 62.8%, the mean rate of asymptomatic case was 30.7% and the mean rate of KPS over 80 was 64.3%, which was comparable with the range of 2%–18% reported for unselected cohorts [32-34]. According to Brokinkel et al. [21], comparisons of median overall survival revealed no significant differences among older patients in their cohort and the reported average life expectancy of a general German population of the same age. In contrast, a distinctly prolonged life expectancy after gross total removal might indicate that with thorough perioperative risk stratification and careful management, maximal safe tumor resection is also beneficial for elderly patients.

Radiation therapy

Small or medium-sized meningiomas may be treated with Stereotactic Radiosurgery (SRS) to achieve comparable long-term tumor control rate as Simpson grade 1 resection [35]. SRS is associated with minimal procedure-related morbidities and is particularly suitable for tumors located in surgically less accessible locations such as the skull base [36,37]. For large sized meningioma, SRS is usually not feasible, and surgical resection is preferred as it relieves mass effect immediately [38].

Conclusion

The current review indicated satisfactory surgical outcomes among elderly patients with intracranial meningiomas, although the risks of surgical complications necessitate careful decision making. This short review of risk factor analysis emphasized the mortality of elderly meningioma was not so high, after the considering the preoperative status and comorbidities. Future research and a prospective randomized study concerning frailty should address the causes and prevention of complications.

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Table 1: Summary of elderly patients with meningioma.

							Age	Tumor Location (%)	Tumor size or volume		ASA Classification (%)				Preoperative condition		Mortality (%)			Complication(%)	
No.	Year	Author	Research Period	Country	No.	F	Min	Skull base related	≥ 4cm in diameter (%)	≥ 40ml (%)	I	II	III	IV	Asymptomatic(%)	KPS ≥ 80 (%)	In-hospital	3M	1Y	Brain	General
1	2005 [1]	Bateman BT et al.	1998-2002	USA	2,304	1,544	70	-	-	-	-	-	-	-	-	-	4	-	-	-	-
2	2005 [2]	Nakamura M et al.	1978–2002	Germany	21	-	70	-	-	-	0	76	24	0	-	-	0	0	4.8	14.3	28.6
3	2005 [3]	Caroli et al.	1999–2000	Italy	90	60	70	91	-	-	-	-	-	-	17	12 (≥ 90)	-	7.8	15.6	-	-
4	2005 [4]	Sonoda Y et al.	1994-2003	Japan	25	17	70	68	-	-	-	-	-	-	20	80	4	-	-	16	0
5	2005 [5]	D'Andrea G et al.	1985 - 2002	Italy	37	29	80	51.3 (> 5cm)	-	-	33	50	17	0	11	62	-	13.5	16.2	2.7	-
6	2006 [6]	Yano S et al.	1989-2003	Japan	54	-	70	-	-	-	-	-	-	-	100	100	-	-	-	11.1	5.6
7	2007 [7]	Boviatsis et al.	1989–2005	Greece	108	71	65	-	-	-	-	-	-	-	-	-	6.5	-	-	13	15.8
8	2007 [8]	Roser F et al.	2003–2004	Germany	43	-	70	-	-	-	0	67	33	0	-	-	0	0	0	30.2	23.2
9	2007 [9]	Sacko O et al.	1990 - 2005	France	74	47	80	46 (≥ 5cm)	-	-	0	30	59	11	-	56.8 (≥ 60)	0	1.4	9.4	6.8	2.7
10	2009 [10]	Rogne et al.	2003 – 2007	Norway	79	-	70	-	-	-	-	-	-	-	-	-	-	-	6.3	-	-
11	2010 [11]	Pirracchio R et al.	2003–2007	France	46	-	70	43.5	-	-	-	-	-	-	-	-	-	-	-	-	-
12	2010 [12]	Patil et al.	1996 – 2006	USA	258	5	70	44.2	-	-	0	9.3	68	22	-	-	-	-	-	29.8	

13	2010 [13]	Cohen-Inbar O et al.	1995–2005	Israel	250	152	65	39.6	38 (≥ 5cm)	-	-	-	-	-	-	-	-	6.8	-	-	-
14	2011 [14]	Cohen-Inbar O et al.	2005–2010	Israel	120	77	65	22.5	38.4 (≥ 5cm)	-	-	-	-	-	-	15	0	5.8	13.7	47.2	4.4
15	2011 [15]	Grossman R et al.	1998–2005	USA	5,717	3,804	65	-	-	-	-	-	-	-	-	-	3.2	-	-	11	6.5
16	2012 [16]	Schul DB et al.	1995-2006	Ger-many	164	125	65	42.7	53	-	3.7	31	60	4.8	4.9	70.1	-	6.7	6.7	49.4	4.9
17	2013 [17]	Konglund A, et al.	2008-2009	Norway	54	35	60	44.5	-	27.8	5.7	55	38	1.9	-	88.9	5.6	7.4	9.3	33.5	11.2
18	2013 [18]	Konglund A, et al.	2003 - 2013	Norway	51	27	80	51	-	-	33.3		59	7.8	43.1	41.2	3.9	5.9	15.7	-	-
19	2015 [19]	Chen ZY et al.	2007-2013	China	86	55	65	9.1	59.3	-	76.7		21	2.3	43	65.1	1.2	1.2	2.3	-	-
20	2015 [20]	Bartek J Jr. et al.	2007-2013	USA	115	-	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	2017 [21]	Brokinkel B, et al.	1994-2009	Ger-many	162	112	65	17	-	-	-	-	-	-	-	-	-	7	-	-	-
22	2017 [22]	Yamamoto J. et al.	2007-2013	Japan	16	12	75	31.2	-	-	-	-	-	-	6.3	56.2	0	-	-	6.3	-
23	2018 [23]	Delgado-Fernández J et al.	2004-2015	Spain	110	74	70	23.6	-	-	0	58	41	0.9	-	-	3.6	-	4.5	25.5	-
24	2018 [24]	Dubran M. et al.	2013-2016	Italy	25	17	80	16	76	-	0	60	40	0	-	84(≥70)	8	-	-	-	-
Total					10,009	6,263															
Mean								38.9	62.8	27.8	13.9	48.5	41.8	4.6	30.7	64.3	2.9	5.3	8.7	21.2	10.3

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