



8 : 가  
 가 4 (20%), 가 16 (80%) ,  
 51 (22 78 ) . (parasagittal  
 area) (sphenoid wing)가 8 (40%) 가  
 (Table 1).  
 (Hitchcock's stereotactic  
 frame)

20 30°  
 CT

가  
 가  
 가  
 , 90 30%  
 가  
 mm 10% 가<sup>7, 8)</sup>  
 3 cm ( 2.0 cm) ,  
 (40 100%) 1  
 가  
 가  
 5 arc (25%) ,  
 , 90 30%  
 가  
 1 (Table 2).  
 mm 10% 가<sup>7, 8)</sup>  
 1 4  
 3 cm ( 2.0 cm) ,  
 9 30 Gy  
 (40 100%) 1  
 가  
 가  
 가  
 5.72 cm<sup>3</sup> (0.78 15.1 cm<sup>3</sup>) ,  
 6 109  
 ( 53 ) . 20  
 6 (30%), (residual tumor)  
 11 (55%),

Table 1. No. of Patients by the Distribution of Tumor Location

Tumor location	No. of patients
Parasagittal	4
Sphenoid wing	4
Tentorium	3
Falcotentorium	3
Tuberculum sellae	2
Cavernous sinus	1
Petrous apex	1
Petroclivus	1
Ventricular trigone	1
Total	20

가 3 (15%) . 14  
 , 8 ,  
 6  
 , 6  
 가  
 6 (30%)

6 1

CT/MRI  
 가  
 , 가 95% (19/20) .  
 가 5  
 가 14 (70%)  
 가 가 1 (5%)  
 가 가 19  
 가  
 9 (45%)  
 , 10 (50%)  
 가 , 1 (5%)

Table 2. Change of Mass Size following SRS\* by Image

Change of mass size	No. of patients (%)
Decreased	5 (25%)
Arrested growth	14 (70%)
Increased	1 (5%)
Total	20

\* SRS : Stereotactic Radiosurgery

Table 3. Clinical Response following SRS\*

Clinical response	No. of patients (%)
Improved	9 (45%)
Stable	10 (50%)
Worsening	1 ( 5%)
Total	20

\* SRS : Stereotactic Radiosurgery

(Table 3).

Year	Author	Grade	Sample Size	Local Control (%)	Recurrence (%)	Survival (%)	Notes
1957	Simpson	(grade I)	5	81%	10	18%, 10	1, 2)
1988	Taylor		10	89%	30%	40	3), 4), 5), 6), 7)
1990	Engenhart		40	89%	30%	40	2) CT MRI, 3) 3 cm
1993	Valentino		72	89%	30%	40	4), 5)
1994	Goldsmith		54 Gy	89%	30%	40	6), 7)
1998	Hakim		5.12 cc	89%	30%	40	8), 9)
1998	Subach		3 cm	89%	30%	40	10), 11)
1998	Chang		55	89%	30%	40	12), 13)
1998	Hudgin		2	89%	30%	40	14), 15)
1998	Kondziolka		2	89%	30%	40	16), 17)
1998	Dziuk		15	89%	30%	40	18), 19)
1998	Condra		11	89%	30%	40	20), 21)
1998	Hakim		5.12 cc	89%	30%	40	22), 23)
1998	Hudgin		3 cm	89%	30%	40	24), 25)
1998	Subach		3 cm	89%	30%	40	26), 27)
1998	Chang		55	89%	30%	40	28), 29)
1998	Hakim		5.12 cc	89%	30%	40	30), 31)
1998	Hudgin		2	89%	30%	40	32), 33)
1998	Kondziolka		2	89%	30%	40	34), 35)
1998	Dziuk		15	89%	30%	40	36), 37)
1998	Condra		11	89%	30%	40	38), 39)
1998	Hakim		5.12 cc	89%	30%	40	40), 41)
1998	Hudgin		3 cm	89%	30%	40	42), 43)
1998	Subach		3 cm	89%	30%	40	44), 45)
1998	Chang		55	89%	30%	40	46), 47)
1998	Hakim		5.12 cc	89%	30%	40	48), 49)
1998	Hudgin		2	89%	30%	40	50), 51)
1998	Kondziolka		2	89%	30%	40	52), 53)
1998	Dziuk		15	89%	30%	40	54), 55)
1998	Condra		11	89%	30%	40	56), 57)
1998	Hakim		5.12 cc	89%	30%	40	58), 59)
1998	Hudgin		3 cm	89%	30%	40	60), 61)
1998	Subach		3 cm	89%	30%	40	62), 63)
1998	Chang		55	89%	30%	40	64), 65)
1998	Hakim		5.12 cc	89%	30%	40	66), 67)
1998	Hudgin		2	89%	30%	40	68), 69)
1998	Kondziolka		2	89%	30%	40	70), 71)
1998	Dziuk		15	89%	30%	40	72), 73)
1998	Condra		11	89%	30%	40	74), 75)
1998	Hakim		5.12 cc	89%	30%	40	76), 77)
1998	Hudgin		3 cm	89%	30%	40	78), 79)
1998	Subach		3 cm	89%	30%	40	80), 81)
1998	Chang		55	89%	30%	40	82), 83)
1998	Hakim		5.12 cc	89%	30%	40	84), 85)
1998	Hudgin		2	89%	30%	40	86), 87)
1998	Kondziolka		2	89%	30%	40	88), 89)
1998	Dziuk		15	89%	30%	40	90), 91)
1998	Condra		11	89%	30%	40	92), 93)
1998	Hakim		5.12 cc	89%	30%	40	94), 95)
1998	Hudgin		3 cm	89%	30%	40	96), 97)
1998	Subach		3 cm	89%	30%	40	98), 99)
1998	Chang		55	89%	30%	40	100), 101)

가

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가

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가

28)

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가

가

29, 30)

,

가

가

가

20, 25)

,

5%

24, 31, 32)

가

1 (5%)

가

가

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가

가

가

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*Abstract*

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Treatment of Intracranial Meningioma with Linac Based Radiosurgery

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**Purpose** : To evaluate the role of linac based radiosurgery (RS) in the treatment of meningiomas, we retrospectively analyzed the results of clinical and follow up CT/MRI studies.

**Methods and Materials** : From the 1988 July to 1998 April, twenty patients of meningioma had been treated with 6 MV linear accelerator based radiosurgery. Of the 20 patients, four (20%) were male and 16 (80%) were female. Mean age was 51 years old (22-78 years old). Majority of intracranial location of tumor for RS were parasagittal and sphenoid wing area. RS was done for primary treatment in 6 (30%), postoperative residual lesions in 11 (55%) and regrowth after surgery in 3 (15%). Mean tumor volume was 5.72 cm<sup>3</sup> (0.78-15.1 cm<sup>3</sup>) and secondary collimator size was 2.04 cm (1-3 cm). The periphery of tumor margin was prescribed with the mean dose of 19.6 Gy (9-30 Gy) which was 40-90% of the tumor center dose. The follow up duration ranged from 2.5 to 109 months (median 53 months). Annual CT/MRI scan was checked.

**Results** : By the follow up imaging studies, the tumor volume was reduced in 5 cases (25%), arrested growth in 14 cases (70%), and increased size in 1 case (5%). Among these responsive and stable 19 patients by imaging studies, there showed loss of contrast enhancement after CT/MRI in four patients. In clinical response, nine (45%) patients were considered improved condition, 10 (50%) patients were stable and one (5%) was worsened to be operated. This partly resulted in necrosis after surgery.

**Conclusion** : The overall control rate of meningiomas with linac based RS was 95% by both imaging follow-up and clinical evaluation. With this results, linac based RS is considered safe and effective treatment method for meningioma.

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**Key Words** : Meningioma, Linear accelerator, Radiosurgery