Accelerated Fractionation In The Treatment of Brain Metastasis From Non-Small Cell Carcinoma of The Lung

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= Abstract =

Purpose : Metastatic cancer to the brain is a major problem for the patients with bronchogenic carcinoma, and most of these patients have a limited survival expectancy. To increase tumor control and / or to decrease late morbidity with possible shortening in over-all treatment period, multiple daily fraction technique for brain metastasis was performed. The author reperesented the results of accelerated fractionation radiotherapy in patients with brain metastases from non-small cell lung cancer.

Materials and Methods : Twenty-six patients with brain metastases from non-small cell lung cancer between 1991 and 1993 received brain radiotherapy with a total dose of 48 Gy, at 2 Gy per fraction, twice a day with a interfractional period of 6 hours, and delivered 5 days a week. The whole brain was treated to 40 Gy and boost dose escalated to 8 Gy for single metastatic lesion by reduced field. Twenty-four of the 26 patients completed the radiotherapy. Radiotherapy was interupted in two patients suggesting progressive intracerebral diseases.

Results : This radiotherapy regimen appears to be comparable to the conventional scheme in relief from symptoms. Three of the 24 patients experienced nausea and or vomiting during the course of treatment because of acute irradiation toxicity. The author observed no excessive toxicity with escalating dose of irradiation. An increment in median survival, although not statistically significant($p>0.05$), was noted with escalating doses(48 Gy) of accelerated fractionation(7 months) compared to conventional treatment(4.5 months). Median survival also increased in patients with brain solitary metastasis(9 months) compared to multiple extrathoracic sites(4 months), and in patients with good performance status(9 months versus 3.5 months), they were statistically significant ($p<0.01$).

Conclusion : The increment in survival in patients with good prognostic factors such as controlled primary lesion, metastasis in brain only, and good perfomance status appeared encouraging. Based on these results, a multi-institutional prospective randomized trial should be initiated to compare the twice-a-day and once-a-day radiotherapy schemes on patients with brain metastasis with careful consideration for the patients' quality of life.

Key Words : Non-small cell lung carcinoma, Brain metastasis, Accelerated fractionation.

INTRODUCTION

Metatases to the brain are seen frequently in 25% to 35% of all cancer patients[1]. Lung carcinoma is the most frequent primary site, accounting for 50% or more of all brain metastases in most series[2]. It has been suggested that the incidence of brain metatases in patients with lung cancer may be increasing. Reasons for the apparent increase include the higher incidence of lung cancer, improved detection by more sensitive CT or MR imaging, the more successful control of the primary sites, and the optimal use of chemotherapy regimen. The anti-cancer drugs may decrease metastases outside the CNS but fails to decrease brain metastases. Rarely, responses are observed with cytotoxic chemotherapy[3].

The diagnosis and management of patients with brain metastases have slowly evolved over the past four decades by improved brain imaging and knowledge of optimal dose fractionation schedules. If the metastasis is solitary and is in a favorable location, such as the anterior frontal region, surgical excision usually is advisable with long term survivors in some series as high as 25%[4].

However, radiation therapy represents the mainstay of therapy for patients with brain metastases. In any case, irradiation is usually advisable to retard growth and relieve symptoms, with continued use of corticosteroids to control edema. Whole brain irradiation is the most effective means for treating the patient with brain metastases with symptom relief occurring in 70 to 90% of patients[5]. Order et al[6] demonstrated the superiority of radiation over surgery for most patients, in particular those with primary sites originating in the lung. However, approximately 50% of patients with brain metastases will eventually die due to progression of their CNS disease during their life time. Escalation of irradiation dose in patients with brain metastasis has not resulted in a corresponding improvement in survival[7]. As result, clinical research to date with regard to brain metastases has concentrated mainly on modifying dose schedules with the goal of optimizing palliation in short time intervals with rapid-high dose fractionation schemes.

Biological observations and clinical experience with multiple daily fractions of irradiation have been encouraging for disease control in a variety of clinical situations[8]. Since approximately 50% of patients with CNS metastases eventually relaspe in the CNS, the RTOG conducted protocols in testing one form of multiple daily fractionated radiation therapy in patients with CNS metatases[9]. The purpose of this trial was to test the toxicity and efficay of accelerated fractionation in brain metastases. Theoretically, accelerated treatment would enhance tumor damage by preventing tumor growth during irradiation and cause no increase in late CNS radiation injury. Analysis of previously conducted trials by the RTOG[10] on patients with CNS metastases has identified a subset of patients with a relatively good prognosis. This group of patients had a median survival of greater than 200 days and constitutes approximately 11% of the patient population who present with brain metastases. This group of patients is characterized by a Karnofsky status of 70–100, an absent or controlled primary tumor, age<60 years and metastatic spread only to the brain[10]. To detect a possible benefit to therapy as well as more accurately detect CNS injury, patients with these characteristic were selected for this trial.

The aim of this study was to identify the prognostic factors that may influence survival in patients with biain metastses of non-small lung cancer. A number of factors may predict the degree of response to irradiation, or its duration. These factors include : age, extent of metastases, number of brain lesion, status of the primary site, and Karnofsky performance status.

MATERIALS AND METHODS

1. Selection of patients

A retrospective study of 24 patients who

were treated from 1991 to 1993 as brain metastases from bronchogenic carcinomas has been undertaken. There were 15 male and 9 female patients with median age of 56 years(range=28–72). They were confirmed as non-small cell lung carcinoma histologically or cytologically. The most common histologic subtype was adenocarcinoma(58%). All of the 24 patients were performed CT or MR scan of brain with single lesion of 9 patients(37.5%) and multiple foci of 15 cases(62.5%). Multiple extrathoracic lesions including brain metastasis were noted in ten patients(42%) of total 24 cases.

2. Treatment

The whole brain was treated to a total dose of 40 Gy in 20 fractions and boost dose escalated to additional 8 Gy for single metastatic lesion by reduced field. Accelerated radiotherapy with a total dose of 48 Gy, at 2 Gy per fraction, twice a day with a interfractional period of 6 hours, and delivered 5 days a week. A response was defined as any definite improvement in neurologic examination and/or CT/MR scan. Complete response to brain irradiation was defined as disappearance of signs and symptoms of brain metastases and normalization of previously abnormal brain CT or MR scans.

3. Follw-up studies

Detailed examinations of the patients were performed at the completion of irradiation every month for the first six months after treatment. Thereafter each patient was required to have an interval history, physical examination with assessment of perfomance status, chest films, neurological assessment to detect any evidence of intracranial metastasis or recurrence, and CT scan as indicated.

4. Statistical analysis

Survival was determined from the initiation of brain radiotherapy. Survival data were calculated using the Kaplan-Meier product limit method. Difference between subgroups were analyzed statistically by means of the log-rank test. Factors evaluated for prognostic significance included the age of patients, extent of the extr-

Table 1. Characteristics of patients with brain metastasis

Characteristics	Conventional(N=53) (1984–1990)	Accelerated(N=24) (1991–1993)
Age		
Median	59yr	56yr
Range	33–85yr	28–72yr
Sex		
Male	37	15
Female	16	9
Extent of disease		
Brain only	28	14
Multiple extrathoracic	25	10
Number of brain lesion		
Single	21	9
Multiple	32	15
Primary site		
Controlled	17	10
Uncoltrolled	36	14
Performance status		
80–100	38	17
less than 70	15	7

athoracic disease, number of metastatic brain lesion, status of the primary lesion, Karnofsky performance status, and response to radiation.

RESULTS

1. Patient characteristics

All patients wo had a CT or MR scan of brain were found to have single or multple metastatic lesions. Twenty-four of the 26 patients completed the radiotherapy. Raiotherapy was interupted in two patients suggesting progressive intracerebral disease : one developed hemiplegia, and the other drowsy mental state. These two patients were considered ineligible for evaluation of the effects of radiotherapy. Clinical characteristics of all patients are listed(Table 1).

2. Response rate

This radiotherapy regimen appears to be comparable to the conventional scheme in relief from symptoms. Three of the 24 patients experienced nausea and/or vomiting during the course of treatment because of acute irradiation toxicity. The author observed no excessive toxicity with escalating dose of irradiation. There were headache and motor weakness in about half patients of brain metastases. Response rate to irradiation according to clinical symptoms from brain metastases are given in(Table 2). Symptomatic relief was achieved in 77% of patients including 43% with a complete response. Of the 16 patients available for follow-up with CT or MR scans, the objective response rate to dexamethasone and radiotherapy was 75%(12/16). The remaining 4 patients(25%) had no response to dexamethasone and radiotherapy, although neurologic symptoms improved in many of these patients.

3. Survival

An increment in median survival, although not statistically significant($p>0.05$), was noted with escalating doses(48 Gy) of accelerated fractionation(7 months) compared to 30 Gy of conventional treatment(4.5 months) shown in(Fig. 1). The median survival of the 14 patients with brain metastasis alone was 9 months versus 4 months for the 10 patients with brain and other extrathoracic sites. This is highly statistically significant difference($p<0.01$) shown in(Fig. 2). The median survival of the 17 patients with good performance status was 9 months versus 3.5 months for the 7 patients with poor performance status. The half-year survival(76.4% versus 28.7 %) was statistically significant difference($p<0.01$). The number of brain metastases(single versus multiple), sex, status of primary site(controlled or not), were not contributed in improving survival, and there were not statistically significant shown in(Table 3).

DISCUSSION

Metastatic brain tumors are a clinically serious problem and a frequent cause of death. It is

Table 2. Clinical presentation and relief of specific symptoms(N=24)

Symptom	Incidence(%)	Complete response(%)	Overall response(%)
Motor weakness	12/24(50)	4/12(33)	10/12(83)
Headache	11/24(46)	6/11(55)	9/11(82)
Mental change	6/24(25)	2/ 6(33)	5/ 6(83)
Cerebellar dysfunction	5/24(21)	2/ 5(40)	4/ 5(80)
Cranial nerve palsy	4/24(17)	2/ 4(50)	3/ 4(75)
Convulsions	3/24(13)	2/ 3(67)	2/ 3(67)
Sensory loss	2/24(8)	1/ 2(50)	1/ 2(50)
Total		19/44(43)	34/44(77)

Table 3. Median and a half-year survivals following accelerated radiation therapy in patients with brain metastases(N=24)

	Median survival(mo.)	Half-year survival(%)	P-value
Accelerated	7	58.3	
Conventional	4.5	32.1	p>0.05
Age<60	7.5	69.2	
Age<60	5	45.5	p=n.s.*
Controlled primary	7.5	63.2	
Uncontrolled primary	5	45.4	p=n.s.
Brain metastasis	9	78.6	
Brain+extrathoracic	4	30.0	p<0.01
Solitary metastases	7.5	60.0	
Multiple metastases	7	55.6	p=n.s.
Performance status=80-100	9	76.4	
Performance status=less 70	3.5	28.7	p<0.01

* n.s. : no significance

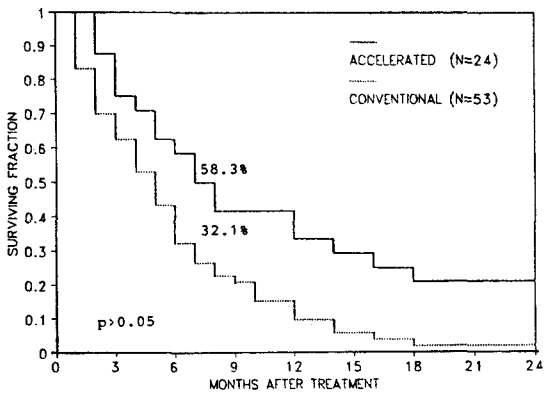

Fig. 1. Survival difference between patients treated with accelerated fractionation and conventional radiotherapy schemes.

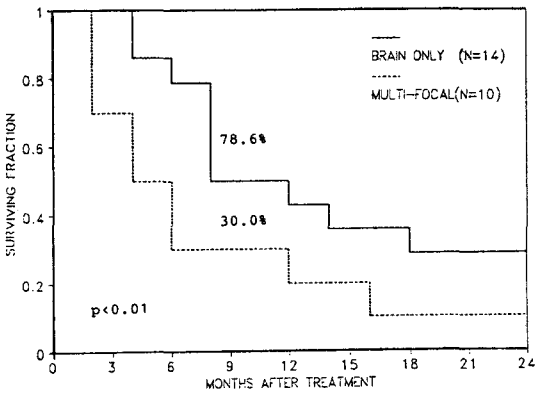

Fig. 2. Survival difference between patients with brain metastasis only and patients with multiple extra-thoracic metastases.

known that the incidence of brain metastases may increase as the population in general lives longer and as other therapies become more successful in controlling disease outside the central nervous system. Tumors of the lung, breast, and digestive tract are responsible for over 80% of cerebral metastases[11]. An initial manifestion as a brain metastasis is common for lung cancer but rare for other cancers. Lung cancer is the most common primary source of brain metastases, representing more than 50% of cases[12]. In authors's cases it was occupied about two-third of total 77 cases with metastatic brain tumors, and the most common subtype of histology was adenocarcinoma. However, in a significant percentage of cases the primary tumor site is unknown at the time of diagnosis. The best diagnostic test for the symptomatic brain metastases of the lung carcinomas is either MRI or CT scan with contrast enhancement. Cerebral metastases are solitary in about 40-50% of patients on CT scan[13]. The incidence of single brain lesion was 39.8% of total 77 patients with brain metastases from lung cancer in present cases. Compared

with CT scans, MRI appears to have a better ability to distinguish hemorrhage from tumor[14].

The treatment of patients with lung carcnoma and brain metastases consists of radiotherapy to control the local metastatic deposit, and of corticosteroid to reduce the surrounding edema and relieve symptoms in most patients[15]. Lack of improvement or exacerbation of symptoms during a trial of steroids can be due to intratumor hemorrhage with intracerebral hematoma. The average survival of patients with cerebral metastases is around 1 month without therapeutic intervention. Estimates of median overall survival of 3 to 5 months with radiotherapy to the whole brain have not changed in 10 years[16]. At least half of patients with brain metastases will die due to eventual failure in the brain. About 40% of patients die not because of brain metastases but because of the systemic disease[17,18].

Whole brain irradiation has been proven the most effective means for treating the patient with brain metastases with symptom relief in 70 -90% of patients[19]. In author's case over half of patients with headache, convulsion, cranial nerve palsy, and sensory loss show a complete response to treatment, but it was not permanent. Radiation therapy is indicated depending on whether the metastases are sinlge or multiple and on whether the primary tumor is advancing or stable. It is very difficult in patients of lung cancer with metastases to evaluate the effect of therapy on survival. Because patients receiving brain irradiation often have extensive disease elsewhere, median survival is only 4 to 6 months. Some subsets of patients with good performance status, controlled primaries, and solitary brain lesions have median survivals of around 12 months[20,21,22,23]. In RTOG 79-16, the median survival of the entire group was 4.2 months[10]. If one had all four favorable prognostic factors(good KPS, absent primary, age less than 60, and no metastatic disease) then the median survival was 7.4 months: One can further define an extremely favorable subgroup with solitary metastases and a controlled primary tumor receiving 70.4Gy who had a median survival of 9.7 months[7].

There is a subset of good-prognosis patients treated with a high-dose accelerated fractionation regimen who may have derived a surivival benefit. To increase late morbidity and/or increase tumor control with possible reduction in over-all treatment time, altered fractionation techniques employing multiple daily fractions are under investigation. Accelerated fractionation schedules have a reduced time-2 or 3 fractions per day-while the number of fractions, the fraction size and the total dose can be left unchanged. In an early study of Biti et al[23], 2Gy per fraction three times a day to a total dose of 30-36Gy in one week's time has been employed with excellent response rates. With this regimen 85% of patients had symptomatic improvement and greater than 45% of patients had improvement for more than 6 months following treatment and with no significant late complications observed. RTOG protocol 85-28 tested in a dose-escalation study 1.6 Gy twice daily to toal doses of 48, 54.4, 64 and 70.4 Gy[9]. Patients with at least three favorable characteristics (high Karnofsky performance status, absence or controlled primary, age<60, or metastases limited to brain)were eligible. Results from that Phase I/II study indicate inferiority of the 48Gy arm compared to the higher dose arms. An accelerated split course regimen of whole brain radiation has been evaluated by Franchin et al[24] which used 3 daily fractions of 160 cGy each for 5 days a week repeated after a 2 week break to a total dose of 48 Gy. The response rate was only 42.5 % and toxicity was tolerate. The author has undertaken a retrospective study comparing standard high-dose fractionation of 30Gy in 10 fractions over 2 weeks to accelerated hyperfractionation to 48Gy at 2Gy per fraction twice daily. The median survival was increased from 4. 5 months to 7 months, and an half-year survival was 32.1% and 58.3%, respectively. It was not statistically different($p>0.05$).

The major purpose of this paper was to com-

pare the result of accelerated hyperfractionation and conventional high fraction radiotherapy of brain metastasis in non-small cell lung cancer patients. Within the limits of this study, the author was unable to detect excessive toxicity with escalating dose of irradiation. The author limited the field size in those patients of single lesion receiving 48Gy because of possible excessive toxicity. Three of the 24 patients experienced nausea and/or vomiting during the course of treatment because of acute irradiation toxicity.

A solitary metastasis localized to an accessible region, with controlled systemic disease, has to be resected before radiotherapy. Surgical treatment can be very effective at quickly relieving the symptom in more than 80% of patients or provide a tissue diagnosis in others[25], Survival in different series averages about 7 months for surgically treated patients ranges from 2 to 20 months[26]. Survival results are influenced by remission duration, neurologic status at time of surgery, and presence of metastses at other sites. Surgery should be followed by whole brain irradiation to prevent the development of other brain metastases. It was demonstrated that combined treatment provided significantly improved survival over surgery alone. In one retrospective study[27] comparing patients treated with surgical resection of a solitary brain metastasis versus surgery plus adjuvant whole brain irradiation, the subsequent brain relapse rate was only 21% in the adjuvant irradiated group versus 85% in the surgery alone group. The median survival increase from 6 to 12 months in patients who receive postoperative irradiation to the skull with doses equivalent to 4000cGy in 20 fractions[27]. Recently, Patchell et al[4] conducted a randomized study of surgery plus radiotherpay versus radiotherapy only in treatment of single metastases to the brain. They demonstrated that the median survival after combined surgery and whole brain irradiation is significantly longer(40 weeks) than after irradiation of brain alone(15 weeks). Noordijk et al[28] reported that selection for treatment of solitary brain metastasis should be bases on extracranial tumor activity status, as well as on age: Patient under 60 years without extracranial tumor activity should have surgery and radiotherapy, because prognosis is better than with radiotherapy alone.

Patients with small solitary brain metastases that are inoperable are candidate for treatment by stereotaxic radiosurgery, in which a large single ablative dose is given to a small volume encompassing the gross disease. The large dose per fraction may be more effective than conventional radiation therapy in more resistant tumors, such as renal cell carcinomas, sarcoma, and melanoma. It appears that control rates of greater than eighty percent can be obtaind with minimal risk of serious complications[29]. Flickinger et al[30] reported a review of 116 patients with solitary brain metastases who underwent gamma knife stereotactic radiosurgery. Median survival was 11 months after radiosurgery and 20 months after diagnosis. Follow-up documented local tumor control in 99 patients(85%), tumor recurrence in 17 patients(15%). Because patients often develop systemic or other intracranial metastases, survival advantage of stereotactic radiosurgery has not been demonstrated. For recurrent brain metastases, studies are in progress concerning brachytherapy with I-125, employed as a supplementary boost after external radiotherapy, in cases of a sinlge brain metastasis with a stable primary tumor[31].

The present results indicate that the two most important prognostic factors in patients with lung carcinoma and brain metastases are performance status and the absence of any metastatic deposits outside of the brain. The author found that age, sex, number of brain lesion, and status of primary site were not prognostically important in patients with non-small cell lung carcinoma and brain metastses. It is clear that the reversibility of the neurologic impairment, as measured by response, is the most important determinant in survival. Knowledge of these potential prognostic factors may be useful in identifying patients who may respond well to treatment

and in stratifying patients who enter future clinical trials. Future diagnostic and therapeutic advance will hopely offer a greater fraction of these patients increasingly effective means of preventing the neurologic complication of metastatic disease.

REFERENCES

1. **Delattre J, Krol G, Thaler H**: Distribution of brain metastases. Arch Neurol 45 : 741–744, 1988
2. **Galluzzi S, Payne PM**: Brain metastases from primary bronchial carcinoma ; A statistical study of 741 necropsies. Br J Cancer 9 : 511–516, 1955
3. **Hidalgo V, Dy C, Hidalgo H, et al**: Simultaneous radiotherapy and cis-platinum for the management of brain metastases. A pilot study. Am J Clin Oncol 10 : 205–209, 1987
4. **Patchel RA, Tibbs PA, Walsh JW, et al**: A randomized trial of surgery in the treatment of single metastases to the brain. New Eng J of Med 322 : 494–500, 1990
5. **Hoskin P, Crow J, Ford H**: The influence of extent and local management on the outcome of radiotherapy for brain metastases. Int J Radiat Oncol Biol Phys 19 : 111–115, 1987
6. **Order SE, Hellman S, Von Essen CF, et al**: Improvement in quality of survival following whole-brain irradiation for brain metastases. Radiology 91 : 149–153, 1968
7. **Hendrickson FR**: The optimum schedule for palliative radiothreapy for metastatic brain cancer. Int J Radiat Oncol Biol Phys 2 : 165–168, 1977
8. **Peters LJ, Ang KK** : Unconventional fractionation schemes in radiotherapy. In DeVita VT, Hellman S, Rosenberg SA, eds. Importances in oncology. Philadelphia, PA: JB Lippincott Co; 1986 : 269–286
9. **Sause WT, Scott C, Krisch R, et al**: Phase I / II trial of accelerated fractionation in brain metastases RTOG 85–28. Int J Radiat Oncol Biol Phys 26 : 653–637, 1993
10. **Diener-West M, Dobbins TW, Phillips TL, et al**: Identifiation of an optimal subgroup for treatment evaluation of patients with brain metastases using RTOG study 7916. Int J Radiat Oncol Biol Phys 16 : 669–673, 1989
11. **Wright DC, Delaney TF, Buckner JC** : Treatment of metastatic cancer to the brain. In DeVita VT, Hellman S, Rosenberg SA., eds. Cancer principles and practice of oncology, 4th edition, Philadelphia, PA : Lippincott; 1993, 2170–2186
12. **Komaki R, Cox JD, Stark R** : Frequency in brain metastases in adenocarcinoma and large cell carcinoma of the lung ; Correlation with survival. Int J Rad Oncol Biol Phys 9 : 1467–1470, 1983
13. **Delattre J, Krol G, Thaler H, et al**: Distribution of brain metastases. Arch Neurol 45 : 741–744, 1988
14. **Russel EJ, Geremia GK, Jhonson CE, et al**: Multiple cerebral metastases : detectability with Gd-DTPA-enhanced MR imaging. Radiology 165 : 609–617, 1987.
15. **Mandell L, Hilaris B, Sullivan M, et al**: The treatment of single brain metastasis from non-small cell lung carcinoma. Surgery and radiation versus radiation therapy alone. Cancer 58 : 641–649, 1986
16. **Baglan RJ, Marks JE** : Comparision of symptomatic and prophylactic irradiation of brain metastases from oat cell carcinoma of the lung. Cancer 47 : 41, 1981
17. **Posner JB** : Management of central nervous system metastases. Sem Oncol 4 : 81–91, 1977
18. **Cairncross JG, Kim JH, Posner JB** : Radiation therapy for brain metastases. Ann Neurol 7 : 529–541, 1980
19. **Hendrickson FR, Lee MS** : The influence of surgery and radiation therpay on patients with brain metastases, Int J Radiat Oncol Biol Phys 9 : 623–627, 1983
20. **Robin E, Bitran JD, Colomb HM, et al** : Prognostic factors in patients with non-small cell bronchogenic carcinoma and brain metastases. Cancer 49 : 1916–1919, 1982
21. **Borgelt B, Gelber R, Larson M, et al** : Ultra-rapid high dose irradiation schedules for the palliation of brain metastases : final results of the first two studies by the RTOG, Int J Radiat Oncol Biol Phys 7 : 1633–1638, 1981
22. **Coia LR** : The role of radiation therapy in the treatment of brain metastases. Int J Rad Oncol Biol Phys 23 : 229–238, 1992
23. **Biti G, Santoni R, Ponticelli P, et al** : Multiple

daily fractionation in cerebral metastases. 3rd European Conference on Clinical Oncology and Cancer Nursing. Stockholm, Sweden, 312 : 1985
24. **Franchin G, Minatel E, Roncadin M, et al** : Accelerated split course regimen in the treatment of brain metastasis. Radiother Oncol 12 : 39-44, 1988
25. **Posner J** : Surgery for metastases to the brain. N Engl J Md 322 : 544-545, 1990
26. **Sundaresan N, Galicich JH, Beattie EJ** : Surgical treatment of brain metastases from lung cancer. J Neurosurg 58 : 666-671, 1983
27. **Smalley SR, Schray MF, Laws ER, et al** : Adjuvant radiation therapy for surgical resection of solitary brain metastasis:Association with pattern of failure and survival, Int J Radiat Oncol Biol Phys 13 : 1611-1616, 1987
28. **Noordijk EM, Vecht CJ, Haaxma-Reiche H, et al** : The choice of treatment of solitary metastasis should be based on extracranial tumor activity and age. Int J Radiat Oncol Biol Phys 24 (suppl) : 146, 1992
29. **Loeffler JS, Alexander E, Kooy HM, et al** : Radiosurgery for brain metastases. Prin and prac Oncol 5 : 3-12, 1991
30. **Flickinger JC, Kondziolka D, Lunsford LD, et al** : A multi-institutional experience with stereotactic radiosugery for solitary brain metastasis. Int J Radiat Oncol Biol Phys 28 : 792-802, 1994
31. **Prados M, Leibel S, Barnett C, et al** : Interstitial brachytherapy for metastatic brain tumors. Cancer 63 : 657-660, 1989

= 국문초록 =

비소세포성 폐암환자의 뇌전이에 대한 급속분할조사법

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목적 : 폐암환자에 있어서 뇌전이는 심각한 문제이며 또한 장기간 생존을 기대할 수가 없다. 종양억제효과를 증가시키는 동시에 만발 장애를 감소시켜 전체 치료기간을 가능한 단축시키기 위하여 비소세포성 폐암화자의 뇌전이에 대한 다분할 조사법인 급속분할조사법을 시행하였다.

재료 및 방법 : 1991년부터 1993년까지 비소세포성 폐암으로 확진되어 뇌전이가 발생한 24명의 환자에게 6시간 간격으로 2Gy씩 하루 2회로 총 48Gy를 전뇌에 조사하였다. 단일 병소는 전뇌에 40Gy 조사후 치료범위를 축소하여 8Gy를 추가하였다. 총 26예중 신경증상이 점차 진행되는 양상을 보인 2명은 방사선치료를 중단하였다.

결과 : 방사선치료 도중에 3명은 급성 방사선효과로 오심과 구토를 호소하였으나, 방사선량 증가로 인한 심각한 부작용은 없었다. 통상적인 치료방법인 2주에 30Gy를 조사한 경우(4.5개월)보다 48Gy의 급속분할조사에 의한 방사선치료법이 중간생존기간을 향상시켰으나(7개월)통계학적 의의는 없었다($p>0.05$). 뇌에 국한된 전이 환자와 활동수행 상태가 양호한 군이 다발성 전이나 활동수행상태가 불량한 군보다 중간생존기간과 반년생존율에 있어서 유의한 증가를 나타내었다($p<0.01$).

결론 : 뇌전이 단독소견과 양호한 활동수행능력 상태등 양호한 예후인자를 가진 환자는 생존기간 향상이 기대된다. 본 연구결과로 환자의 quaility of life를 고려하여 하후 1회 치료법과 2또는 3회치료법을 비교하는 다자간의 전향적인 연구가 필요하리라 생각된다.