

中村太祐

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## 発表演題：Outcomes of Fractionated Stereotactic Radiotherapy for Skull Base Meningiomas

2013/9/27-10/1、アムステルダムで開催された学会に参加し、上記演題を展示発表させていただきました。この学会は2年ごとに開催されるECCO、ESMO、ESTROの合同開催の学会であり、参加者18000人と規模の非常に大きな学会でありました。研究テーマである放射線治療と腫瘍画像に関する講演を主に拝聴いたしました。しかし、「end of life」や「cancer in pregnancy」というような普段の学会では聞けないようなテーマの講演も聴くことができ、非常に有意義な経験だったと思います。

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### Outcomes of Fractionated Stereotactic Radiotherapy for Skull Base Meningiomas

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**Background**  
The management of skull base meningiomas (SBM) is a challenging proposition because SBM often involves cranial nerves. Conventional stereotactic radiosurgery (SRS) has a big advantage of delivering higher doses to tumors within tolerance doses of cranial nerves, if compared with radiotherapy or hypofractionated stereotactic radiotherapy. The response rate to SRS are best for the irregular shape. The purpose of this study is to evaluate the safety and efficacy of FSBT and the response rate change by FSBT.

**Materials and Methods**  
Patients: Consecutive 28 patients with SBMs were treated with FSBT between March 2007 and November 2011.  
Table 1. Patients characteristics  
Table 2. Tumor site  
Table 3. Cranial nerve symptoms

**Treatment**  
All patients were treated by the Novalis system equipped with 6-MV linear accelerator, x3 micro-multifield collimator, Exact system and the Novalis TG Station mounted on the Exact Couch top (Brainlab AG, Feldkirchen, Germany). FSBT was performed by multiple dynamic conformal arcs (DCA), or intensity modulated radiotherapy (IMRT) technique (Figure 1, 2). The FTV was covered by the 95% isodose line of the prescribed dose.  
DCA: conventional arc length  
FTV: conventional arc length  
DCA: DCA + short arc  
FTV: FTV + 2 arcs

**Figure 1. DCA** **Figure 2. IMRT**

**Analysis**  
Local control (LC) was defined by the absence of radiological tumor progression. Local control rate (LCR) and overall survival (OS) were calculated from the start of FSBT by the Kaplan-Meier method. The longest and short-axis diameters were measured by MRI (Figure 3). Paired t-test was used for statistical analysis of reduction ratio of the longest and short-axis diameters (Figure 3). The longest diameter (L) was determined in the X, Y and Z planes. The short-axis diameter (S) was determined on the sagittal plane perpendicular to the maximum diameter in the same plane.

**Results**  
The youngest 11-year-old patient was received 47.6 Gy to the 1.7 Gy fraction size, and the prescribed dose of the remaining 27 patients ranged from 10.2 Gy to 24 Gy in 1.2 Gy to 1.8 Gy fraction size. The median FTV volume is 15.2 cm<sup>3</sup> (range 2.4-95.3 cm<sup>3</sup>). 21 patients were treated by multiple DCA arcs, and 7 patients by IMRT. The median follow-up time was 39 months. All patients achieved the planned FSBT. The 3-year local control and overall survival rates were both 100% (Figure 4). One patient died due to tumor hemorrhage 42 months after the beginning of FSBT (Table 1). The remaining 27 patients were alive with local control during follow-up period. No patients showed progression of cranial nerve symptoms. The symptoms are improved in 9 patients. Paired t-test analysis showed a significant difference between reduction ratios of the longest and short-axis diameters (p=0.044) (Figure 5).

**Figure 4. Kaplan-Meier analysis of local control**

**Table 4. Adverse events**

**Figure 5. Scatter plots of reduction ratio: the longest diameter (left) square and the short-axis diameter (right) square**

**Figure 6. 95% confidence intervals of reduction ratio of the longest and short-axis diameters were 0.21-1.00 and 0.79-0.99 respectively, and there was a significant difference between them. (p=0.044)**

**Discussion**  
Our results demonstrate that FSBT for SBM bring about good local control with preserving cranial nerve functions. All patients achieved the planned FSBT. The longest diameter remains almost unchanged due to the skull base location. Difference in reduction ratios of the longest and short-axis diameters may show that it is insufficient to evaluate response radiotherapy only by the longest diameter.

**Figure 7. (A) Enhanced T1-weighted magnetic resonance image of skull base meningioma before FSBT. (B) Enhanced T1-weighted image of magnetic resonance image 39 months after FSBT.**

**Conflict of interest statement**  
There exists no conflict of interest for any of the authors.