**Prognostic Factors and Diseases-specific Survival Outcome in Patients with Glioblastoma：A Population-Based Study**

Running title: Disease-specific survial outcome in patients with glioblastoma

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Funding:This work was supported by Program of the National Natural Science Foundation of China, grant number 81772680.



Supplementary Figure 1. Annual trend of age-adjusted incidence of glioblastoma (GBM) in all population, males only and females only.

Supplementary table 1. Survival characteristics of different prognostic factors in patients with glioblastoma (GBM).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variable | No. of Patients (%) | Survival | | | |
| Median DSS, m | 1-year DSS | 3-year DSS | 5-year DSS |
| Overall | 4310(100) | 14 | 55.3% | 14.5% | 7.9% |
| Age at diagnosis(years) |  |  |  |  |  |
| <40 | 244(5.7) | 29 | 83.8% | 45.3% | 30.4% |
| 40-65 | 2501(58) | 16 | 62.8% | 15.4% | 8.0% |
| ≥65 | 1565(36.3) | 9 | 38.1% | 7.6% | 3.7% |
| Sex |  |  |  |  |  |
| Female | 1746(40.5) | 14 | 55.6% | 15.9% | 8.5% |
| Male | 2564(59.5) | 14 | 55.0% | 13.5% | 7.5% |
| Marital status |  |  |  |  |  |
| Married | 3002(69.7) | 14 | 56.6% | 14.4% | 7.2% |
| Unmarried | 1308(30.3) | 13 | 52.2% | 14.7% | 9.6% |
| Race |  |  |  |  |  |
| White | 3931(91.2) | 14 | 54.7% | 13.8% | 7.4% |
| Black | 220(5.1) | 16 | 57.8% | 20.1% | 13.6% |
| Other | 159(3.7) | 18 | 66.9% | 22.7% | 11.2% |
| Tumor size(mm) |  |  |  |  |  |
| <30 | 566(13.1) | 16 | 64.1% | 16.3% | 8.5% |
| 30-50 | 1461(33.9) | 14 | 55.9% | 14.9% | 7.7% |
| ≥50 | 2283(53) | 13 | 52.4% | 13.7% | 7.9% |
| Primary site |  |  |  |  |  |
| Frontal lobe | 1311(30.4) | 14 | 54.2% | 15.2% | 9.3% |
| Temporal lobe | 1345(31.2) | 15 | 58.6% | 13.6% | 7.5% |
| Parietal lobe | 795(18.4) | 14 | 57.7% | 14.4% | 7.3% |
| Occipital lobe | 208(4.8) | 13 | 51.0% | 15.8% | 5.2% |
| Overlapping lesion of brain | 651(15.1) | 12 | 48.8% | 14.3% | 6.7% |
| Laterality |  |  |  |  |  |
| Left-origin of primary | 1867(43.3) | 15 | 57.1% | 15.0% | 8.5% |
| Right-origin of primary | 2047(47.5) | 14 | 55.3% | 14.4% | 7.8% |
| Not a paired site | 396(9.2) | 12 | 46.5% | 12.3% | 5.5% |
| Surgery |  |  |  |  |  |
| Yes | 4293(99.6) | 14 | 55.3% | 14.5% | 7.9% |
| No | 17(0.4) | 9 | 37.8% | / | / |
| Radiation and Chemotherapy |  |  |  |  |  |
| Both | 3786(87.8) | 15 | 58.7% | 15.6% | 8.3% |
| Radiation only | 524(12.2) | 8 | 29.8% | 5.9% | 4.7% |
| Radiation sequence with surgery |  |  |  |  |  |
| Prior to surgery | 27(0.6) | 11 | 42.4% | / | / |
| After surgery | 4257(98.9) | 14 | 55.3% | 14.5% | 7.9% |
| Before and after surgery | 26(0.6) | 15 | 56.8% | / | / |
| Year of diagnosis |  |  |  |  |  |
| 2004-2010 | 2384(55.3) | 13 | 52.7% | 13.7% | 7.7% |
| 2010-2015 | 1926(44.7) | 15 | 58.8% | 15.3% | 7.2% |

aAsian or Pacific Islander.

DSS, diseases-specific survival; “/” indicates survival rate could not be calculated.



Supplementary Figure 2. Diseases-specific survival (DSS) analysis of glioblastoma (GBM) stratified by tumor size(A), laterality(B), primary site(C), year of diagnosis(D)



Supplementary Figure 3. Diseases-specific survival (DSS) analysis of glioblastoma (GBM) stratified by surgery(A), radiation and chemotherapy (B), radiation sequence with surgery(C).

Supplementary table 2. Variable coefficients corresponding to the best lambda value selected in Lasso regression

|  |  |  |
| --- | --- | --- |
| Variable | Intercept | Coefficient |
| Age | 40-65 years | 0.68719619 |
|  | 65+ years | 1.18173462 |
| Sex | Male | 0.08265467 |
| Marital status | Unmarried | 0.09077201 |
| Race | Black | -0.11624554 |
|  | Other | -0.20486632 |
| Year of diagnosis | 2011-2015 | -0.08332448 |
| Primary site | Temporal lobe | -0.09285760 |
|  | Parietal lobe | -0.04089820 |
|  | Occipital lobe |  |
|  | Overlapping lesion of brain |  |
| Tumor size | 30-50mm | 0.13210346 |
|  | >50mm | 0.20945424 |
| Laterality | Right - origin of primary | 0.01202159 |
|  | Not a paired site | 0.10370786 |
| Surgery | No | 0.49518212 |
| Radiation and Chemotherapy | Radiation only | 0.56522540 |
| Radiation sequence with surgery | After surgery | -0.21942382 |
|  | Before and after surgery | -0.09743146 |



Supplement figure 4. Association between age at diagnosis and diseases-specific survival (DSS) among glioblastoma (GBM) populations by sex(A), race(B), marital status(C), tumor size(D), adjusted by remaining prognostic factors in multivariable cox regression model, respectively.



Supplement figure 5. Association between age at diagnosis and diseases-specific survival (DSS) among glioblastoma (GBM) populations by laterality(A), surgery(B), radiation and chemotherapy(C), radiation sequence with surgery (D), adjusted by remaining prognostic factors in multivariable cox regression model, respectively.



Supplement figure 6. Association between tumor size and diseases-specific survival (DSS) among glioblastoma (GBM) populations, by age(A), sex(B), race(C), marital status(D), adjusted by remaining prognostic factors in multivariable cox regression model, respectively.



Supplement figure 7. Association between tumor size and diseases-specific survival (DSS) among glioblastoma (GBM) populations, by laterality(A), surgery(B), radiation and chemotherapy(C), radiation with sequence(D), adjusted by remaining prognostic factors in multivariable cox regression model, respectively.

Supplementary table 3. The corresponding risk score of each variable in the nomogram

|  |  |  |
| --- | --- | --- |
| Variable | | points |
| Age at diagnosis(years) |  |  |
| <40 | 1 | 0 |
| 40-65 | 2 | 50 |
| ≥65 | 3 | 100 |
| Sex |  |  |
| Female | 0 | 0 |
| Male | 1 | 7.84 |
| Marital status |  |  |
| Married | 1 | 0 |
| Unmarried | 2 | 8.24 |
| Race |  |  |
| White | 1 | 21.12 |
| Black | 2 | 10.56 |
| Other | 3 | 0 |
| Tumor size(mm) |  |  |
| <30 | 1 | 0 |
| 30-50 | 2 | 9.3 |
| ≥50 | 3 | 18.6 |
| Primary site |  |  |
| Frontal lobe | 1 | 0 |
| Temporal lobe | 2 | 0.87 |
| Parietal lobe | 3 | 1.74 |
| Occipital lobe | 4 | 2.61 |
| Overlapping lesion of brain | 5 | 6.1 |
| Laterality |  |  |
| Left-origin of primary | 1 | 0 |
| Right-origin of primary | 2 | 3.88 |
| Not a paried site | 3 | 7.75 |
| Surgery |  |  |
| Yes | 1 | 0 |
| No | 2 | 52.25 |
| Radiation and Chemotherapy |  |  |
| Both | 1 | 0 |
| Radiation only | 2 | 52.65 |
| Radiation sequence with surgery |  |  |
| Prior to surgery | 1 | 27.18 |
| After surgery | 2 | 13.59 |
| Before and after surgery | 3 | 0 |
| Year of diagnosis |  |  |
| 2004-2010 | 1 | 8.54 |
| 2010-2015 | 2 | 0 |

 Supplement Figure 8. Calibration curves of the nomogram (Figure 4) for 1-, 3- and 5-year diseases-specific survival (DSS) (A, B, C)

Supplementary table 4. Univariate cox regression analysis of diseases-specific survival (DSS) of glioblastoma (GBM).

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | No. of Patients (%) | Hazard Ratio (95% CI) | P Value |
|  |
| Age at diagnosis(years) |  |  |  |  |
| <40 | 244(5.7) |  |  |  |
| 40-65 | 2501(58) | 2.08(1.77-2.44) | **<0.001** |  |
| ≥65 | 1565(36.3) | 3.48(2.95-4.10) | **<0.001** |  |
| Sex |  |  |  |  |
| Female | 1746(40.5) |  |  |  |
| Male | 2564(59.5) | 1.04(0.98-1.12) | 0.209 |  |
| Marital status |  |  |  |  |
| Married | 3002(69.7) |  |  |  |
| Unmarried | 1308(30.3) | 1.06(0.98-1.13) | 0.149 |  |
| Race |  |  |  |  |
| White | 3931(91.2) |  |  |  |
| Black | 220(5.1) | 0.86(0.74-1.00) | 0.058 |  |
| Other | 159(3.7) | 0.73(0.60-0.88) | **<0.001** |  |
| Tumor size(mm) |  |  |  |  |
| <30 | 566(13.1) |  |  |  |
| 30-50 | 1461(33.9) | 1.14(1.03-1.27) | **0.015** |  |
| ≥50 | 2283(53) | 1.20(1.08-1.33) | **<0.001** |  |
| Primary site |  |  |  |  |
| Frontal lobe | 1311(30.4) |  |  |  |
| Temporal lobe | 1345(31.2) | 0.99(0.92-1.09) | 0.987 |  |
| Parietal lobe | 795(18.4) | 1.01(0.91-1.11) | 0.911 |  |
| Occipital lobe | 208(4.8) | 1.10(0.93-1.29) | 0.26 |  |
| Overlapping lesion of brain | 651(15.1) | 1.13(1.00-1.25) | 0.05 |  |
| Laterality |  |  |  |  |
| Left-origin of primary | 1867(43.3) |  |  |  |
| Right-origin of primary | 2047(47.5) | 1.03(0.96-1.10) | 0.487 |  |
| Not a paried site | 396(9.2) | 1.23(1.10-1.39) | **<0.001** |  |
| Surgery |  |  |  |  |
| Yes | 4293(99.6) |  |  |  |
| No | 17(0.4) | 1.76(1.00-3.11) | 0.05 |  |
| Radiation and Chemotherapy |  |  |  |  |
| Both | 3786(87.8) |  |  |  |
| Radiation only | 524(12.2) | 1.97(1.79-2.18) | **<0.001** |  |
| Radiation sequence with surgery |  |  |  |  |
| Prior to surgery | 27(0.6) |  |  |  |
| After surgery | 4257(98.9) | 0.77(0.51-1.15) | 0.196 |  |
| Before and after surgery | 26(0.6) | 0.76(0.42-1.37) | 0.358 |  |
| Year of diagnosis |  |  |  |  |
| 2004-2010 | 2384(55.3) |  |  |  |
| 2010-2015 | 1926(44.7) | 0.89(0.83-0.95) | **0.001** |  |

CI, confidence interval; All statistically significant variables with *P<0.05* are marked with red; Statistically significant *P* values are bolded.



Supplementary Figure 9. Nomograms for predicting the 1- , 3- and 5-year diseases-specific survival (DSS) of glioblastoma (GBM) patients, based on variables selected by univariate cox regression.



Supplementary Figure 10. Calibration curves of the nomogram (Supplementary Figure 9) for 1-, 3- and 5-year diseases-specific survival (DSS) (A, B, C).