**Assessment of Structural Disconnections in Gliomas:**

**Comparison of Indirect and Direct Approaches**

Silvestri E.\*, Villani U.\*, Moretto M., Colpo M., Salvalaggio A., Anglani M., Cecchin D., Corbetta M., Bertoldo A.

\* the two authors equally contributed

**SUPPLEMENTARY MATERIALS**

**2. Supplementary Methods:**

***Relationship between the tumour/lesion size and the similarity of structural disconnection maps***

To assess whether there was a relationship between the comparison metrics and the extension of the input mask, we performed a correlation analysis (Spearman Correlation, significance level 0.05) between *ΔVol,* *Dice* and *Corr* and the volume of the input mask, separately for tumour (T) and tumour plus oedema (T+O) masks. Scatterplots of such analyses were computed to visually inspect such relationships, and the *Simple* *Moving Average* (SMA, 7 points, centerer window) was computed to support the interpretation of possible trends.

**3. Supplementary Results:**

**Supplementary Table 1**: Single patient’s demographical and clinical information. (*Hemi*=involved hemisphere, *T+O volume*=extent of the tumour + oedema segmentation, *T volume*=extent of the tumour segmentation, CC= corpus callosum, F=frontal lobe, L=left, N.A.= not available, O=occipital lobe, P=parietal lobe, R=right, T=temporal lobe, *WT*=wild type, \=not measured)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Patient ID** | **Age** | **Gender** | **Histology** | **Classification** | **IDH1** | **Hemi** | **Lobe** | **T+O volume [cm3]** | **T volume [cm3]** |
| 1 | 74 | M | Diffuse glioneuronal tumour | High grade | \ | L | T | 30 | 5 |
| 2 | 25 | F | Oligodendroglioma | Low grade | mutant | L | F | 53.5 | 39.4 |
| 3 | 43 | M | Glioblastoma | High grade | WT | L | F | 81.1 | 0.4 |
| 4 | 56 | F | Intracranial mesenchymal tumour | Low grade | \ | L | F | 6.8 | 6.8 |
| 5 | 69 | M | Glioblastoma | High grade | WT | L | T | 70.1 | 66.2 |
| 6 | 83 | M | N.A. | N.A. | N.A. | L | P-T | 11.7 | 10 |
| 7 | 67 | F | Glioblastoma | High grade | WT | L | P | 19.4 | 6.7 |
| 8 | 36 | M | Glioblastoma | High grade | WT | B | F- CC  | 128.9 | 51.4 |
| 9 | 58 | F | Glioblastoma | High grade | WT | R | F-insular + splenium CC + P-O | 76 | 73.9 |
| 10 | 74 | M | Diffuse large B-cell lymphoma | High grade | \ | B | F-P + splenium CC | 27.3 | 8.2 |
| 11 | 83 | F | Glioblastoma epitelioid | High grade | WT | L | F-P | 60.8 | 36.6 |
| 12 | 42 | M | Glioblastoma | High grade | mutant | R | F | 139.2 | 123 |
| 13 | 37 | F | Astrocytoma | Low grade | mutant | L | F | 11 | 11 |
| 14 | 56 | M | Glioblastoma | High grade | mutant | L | F | 127 | 88.8 |
| 15 | 59 | M | Glioblastoma | High grade | WT | R | T + splenium CC | 43.1 | 43.1 |
| 16 | 32 | F | Glioblastoma | High grade | WT | R | Thalamus | 78.3 | 53.3 |
| 17 | 64 | M | Glioblastoma | High grade | WT | B | F-insular R + CC L | 67.9 | 54 |
| 19 | 72 | F | Glioblastoma | High grade | WT | R | P-T | 125.1 | 92.8 |
| 20 | 75 | F | Glioblastoma | High grade | WT | L | T | 80.4 | 8.1 |
| 21 | 68 | M | Glioblastoma | High grade | WT | B | F-T-insular + cingulate cortex + splenium CC | 134.2 | 127.5 |
| 22 | 48 | F | Glioblastoma | High grade | WT | R | T + optic tract | 56.4 | 53.4 |
| 23 | 64 | F | Glioblastoma | High grade | WT | R | F | 12.8 | 9.3 |
| 24 | 46 | F | Glioneuronal neoplasm | High grade | mutant | L | F-insular | 83.1 | 83.1 |
| 27 | 77 | M | Glioblastoma | High grade | WT | L | T | 103 | 85.4 |
| 28 | 57 | M | Glioblastoma | High grade | WT | L | O-T  | 50.9 | 43.1 |
| 29 | 49 | F | Glioblastoma | High grade | WT | L | T | 36.8 | 34.5 |
| 30 | 74 | F | Glioblastoma | High grade | WT | L | F | 16.4 | 3.4 |
| 31 | 56 | F | Glioblastoma | High grade | WT | L | T | 6.1 | 6.1 |
| 32 | 49 | M | Glioblastoma | High grade | WT | L | T | 13.1 | 7.8 |
| 34 | 57 | M | Glioblastoma | High grade | WT | R | F | 191.6 | 108.3 |
| 35 | 80 | M | Glioblastoma | High grade | WT | R | O-T | 17.7 | 17.3 |
| 36 | 54 | F | Glioblastoma | High grade | WT | L | T | 25.7 | 24.3 |
| 37 | 36 | F | Not Otherwise Specified | Low grade | \ | R | T | 5.7 | 5.7 |
| 38 | 83 | M | N.A. | N.A. | N.A. | R | P-T-O | 65.3 | 19 |
| 39 | 67 | M | Glioblastoma | High grade | WT | L | F | 49.3 | 48.1 |
| 40 | 51 | M | Multinodular and vacuolating neuronal tumour | Low grade | \ | R | P | 14.9 | 14.9 |
| 41 | 64 | F | Glioblastoma | High grade | WT | R | T-P | 155.9 | 155.9 |
| 43 | 68 | M | Glioblastoma | High grade | N.A. | R | paratrigonal - P | 50.5 | 23.5 |
| 44 | 73 | M | Glioblastoma | High grade | WT | R | F | 122.3 | 44.7 |
| 45 | 57 | F | Glioblastoma | High grade | WT | R | F | 112.4 | 99.5 |
| 46 | 50 | M | Glioblastoma | High grade | N.A. | L | F | 95.1 | 83.3 |
| 47 | 64 | F | Glioblastoma | High grade | WT | R | F | 125.1 | 62.6 |
| 49 | 66 | M | Glioblastoma | High grade | WT | L | F-T- P | 179.2 | 68.5 |
| 50 | 73 | M | N.A. | N.A. | N.A. | B | Splenium CC | 37.3 | 36.9 |

***Relationship between tumour/lesion size and similarity of structural disconnection maps***

Supplementary Figure 1 shows the scatterplot between the extension of the cancerous lesion (both considering only the tumour core (*T*) and including the oedema (*T+O*)) and the similarity metrics. Statistically significant relationships were found for the *Dice* coefficient (rT =0.42 pT=0.004, rT+O=0.55 pT+O=9.5e-05) and for *ΔVol* (rT =0.33 pT=0.03). Nevertheless, the simple moving average showed that all three relationships were highly non-linear and heavily influenced by a limited number of small tumours. Indeed, when lesions were larger than 50 cm3, the linear trend disappeared due to heavy saturation, leading to no major evidence that the size of the lesion plays a fundamental role in the similarity of direct and indirect structural disconnection maps.

**Supplementary Figure 1**: Scatterplots of tumour/lesion size and the similarity measures. The simple moving average is superimposed in red to highlight the trend of the relationships.

