BREAKING DOWN BRAIN CANCER

Brain cancer comprises only 2% of cancers, but is notoriously difficult to treat. Understanding the location of such tumours, as well as the underlying genetics, will help to tackle this devastating disease.

By Julie Gould; infographic by Alisdair Macdonald.

ON THE BRAIN

The highest percentage of all brain tumours that originate in the brain and central nervous system (CNS) are benign growths that occur in the meninges1, a structure consisting of three layers of protective tissue that surround the cerebral cortex. Most malignant primary brain tumours, however, occur in the cerebral cortex1 — with the highest percentage developing in the frontal lobe*.

30%

Frontal lobe
The frontal lobe constitutes almost two-fifths of the human brain. It has a role in modulating many brain functions, including voluntary movement, fluency of speech and expression of emotion. People with a tumour in this area often experience seizures as an initial symptom.

Parietal lobe
The parietal lobe has differing roles in the left and right hemispheres of the brain. Tumours in the left lobe often affect a person’s speech, and those in the right lobe can affect perception of the physical location of body parts and understanding of geographical location.

Temporal lobe
Both hemispheres of the brain contain a temporal lobe. The lobe’s location, close to the ear, means that most of its functions are related to auditory processing. Surgical removal of tumours from the temporal lobe is challenging owing to the region’s complexity.

Brain stem
The brain stem connects the cerebral cortex to the spinal cord. Tumours in the region often affect a person’s ability to walk, speak and swallow, as well as their facial tension and vision.

Cerebellum
Tumours in the cerebellum affect a person’s ability to coordinate voluntary movements such as balance and blinking.

Occipital lobe
The occipital lobe is the smallest lobe of the cerebral cortex. It plays a part in processing visual information. Tumours in this lobe can cause loss of vision, visual disturbances and hallucinations.

LOCAL THREAT

The most common malignant primary brain tumour is a type of astrocytoma (a tumour that forms from glial cells) known as glioblastoma multiforme2. Glioma, a group of tumours that includes astrocytoma, comprises 27% of all tumours, and 80% of malignant tumours2.

FARTHER AFIELD

Up to 30% of people with primary cancers in parts of the body other than the brain will develop brain metastases3. At least twice as many cases of secondary brain cancer as malignant primary brain cancer are diagnosed each year3.

Lung and bronchus
Around 20% of lung cancers spread to the brain — the highest proportion of any cancer type.

*Percentages do not add up to 100% because of rounding.

MALIGNANT TUMOURS

- Glioma
- Glioblastoma multiforme
- Other

- Meningioma
- Melanoma
- Breast (male and female)
- Colon and rectum
- Kidney
- Ovary
- Lung and bronchus

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**BRAIN DRAIN**

Primary brain tumours are treated using a multipronged approach that can involve surgery, radiotherapy or chemotherapy. Yet the long-term outlook and survival rates of people with such malignancies remains poor.

**LOST TIME**

The average years of life lost is a good measure of the extent to which life is cut short by various cancers. This is the sum difference in years between the ages at which people with a particular condition died and the ages to which they would otherwise have lived, divided by the total number who died.

<table>
<thead>
<tr>
<th>Location</th>
<th>Average years of life lost</th>
</tr>
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<tbody>
<tr>
<td>Testis</td>
<td>20</td>
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<tr>
<td>Cervix</td>
<td>15</td>
</tr>
<tr>
<td>Hodgkin’s lymphoma</td>
<td>10</td>
</tr>
<tr>
<td>Brain and nervous system</td>
<td>10</td>
</tr>
<tr>
<td>Breast (female)</td>
<td>10</td>
</tr>
<tr>
<td>Ovary</td>
<td>10</td>
</tr>
<tr>
<td>Uterus</td>
<td>10</td>
</tr>
<tr>
<td>Oral cavity and pharynx</td>
<td>10</td>
</tr>
<tr>
<td>Liver and bile duct</td>
<td>10</td>
</tr>
<tr>
<td>Skin melanoma</td>
<td>10</td>
</tr>
</tbody>
</table>

**LEVEL-HEADED**

Despite improvements in detection and treatment, the number of deaths from brain cancer has remained unchanged in the past three decades.

**MIND THE GAP**

There are differences in the incidences of brain cancer in men and women, regardless of the age of those affected. Researchers are unsure why this might be. About 55% of malignant brain tumours occurred in men, compared with 45% in women, between 2008 and 2012 in the United States. However, only around 36% of non-malignant brain tumours occurred in men, compared with 64% in women, during the same period in the United States.

**AGAINST THE CLOCK**

Brain tumours are classified using a grading system that ranks them from least (grade I) to most (grade IV) aggressive. Early diagnosis is linked to better survival times.