

What is brain cancer and why is it so difficult to treat?

– Robin Grant, Consultant Neurologist

Lesley introduced Robin and described his clinical and research work at the Western General Hospital in Edinburgh.

Robin wanted to incorporate a short workshop exercise and analogy into the session and suggested that we compare cancer to terrorism. How do we spot it and deal with it?

Robin began by providing the aims of his talk and explaining how they would address the session topic'

1. Understand the different types of brain cancer
2. pathways
3. Understand the limits of surgery and radiotherapy and the difficulties presented by the “blood-brain barrier” and tumour cell defences
4. Discuss ways of potentially bypassing the barrier.

Robin went on to outline and explain the variety of types of brain cancer. There are some 140 types (or subtypes) of the disease – one of the reasons it is so difficult to treat. Primary brain tumours arise from cells within the brain. Glioma cell tumours (glioblastoma) are most common. Other tumours arise in structures around the brain.

Secondary tumours are more lump-forming in nature.

There are three different types of Gliomas -

- Astrocytes
- Oligodendrocyte
- Ependymoma

Gliomas account for 25% of brain tumours. Metastases, tumours which have spread to the brain from elsewhere, account for around 50%. Other tumours make up the rest.

Brain and Central Nervous System tumours account for only 2% of all cancers, while 25% of other cancers (lung, liver etc) will spread to the brain.

Robin then introduced the “Terrorist” Group Task

Group 1 – How does terrorism start?

Suggestions – genetic predisposition, family background, passion, triggers,

Group 2 – How do you recognise a terrorist?

Suggestions – unusual or abnormal behaviour, evidence of non-conformance, physical characteristics

Group 3 – How do you stop terrorism?

Isolate, use of intelligence, gather proof, re-educate, extra vigilance.

Robin then drew out the similarities with brain cancer.

How does a brain tumour start?

Stem cells change into progenitor cells then become differentiated cells. Cells are lost control of. Suppressor cells used to police, monitor and destroy rogue cells become ineffective. The cell code has changed.

The cause of this can be complex. It could be innate or hereditary. It could happen for environmental reasons; it could be viral.

Grade 4 tumours show many defects and cell mutations. Tumours with Grades 1-3 show fewer defects and mutated cells

Tumour cells divide and infiltrate other cells (Mytosis)

The brain is complex and tumours can grow anywhere. The frontal lobes determine personality. Other lobes control our different functions.(memory, feelings) .

Low grade tumours will grow at 2-mm per year. High grade varieties typically double in 21 days.

Robin then proceeded to discuss why the disease is difficult to treat.

Surgery has limitations It is not possible to remove around 95% of gliomas.

It is very difficult to remove a brain tumour and get a safe biopsy. It requires highly specialist surgeons.

Why is it so difficult?

The size of tumours and their location make them hard to remove without damaging the brain and impacting on important functions such as speech. Imaging is very important and this is increasingly used during surgery to improve the accuracy of the surgery.

Problems are also presented by the “blood brain barrier” (BBB) which prevents materials in the blood from entering the brain, although techniques are being developed to find ways of transporting chemotherapy drugs across the BBB.

Robin then returned to the Terrorism analogy – how do you stop cancer?

By targeting the stem cells – where things begin to change.

Conventional treatment targets the cells which are already divided and mutated.

We need to identify and target the “activists” – before any mutation (radicalisation) happens.

For example –EGFR amplification in cells is a clue. P53 is another. Testing for these is increasingly important.

Robin then summarised –

- Brain cancer is difficult because –
- There are many and varied abnormalities.
- Time taken for tumours to grow is very short in the case of Grade 4 Glioma
- Surgery is difficult due to impact on other functions
- The brain has an innate resistance to radiotherapy
- Chemo is challenging because of the “blood brain barrier”
- Stem cell treatment is still only theoretical in Glioblastoma
- Cancer has many defence mechanisms.

Peter Rainey, ICPV, May 2013