Overview of Brain Tumours in Alberta

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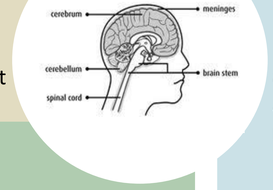
Background

With the International Agency for Research on Cancer recently classifying radiofrequency electromagnetic fields as possibly carcinogenic to humans[1], the linkage of cellphone usage to brain cancer has become a topic of interest in the media and general public. While age-standardized incidence and mortality rates for brain cancer have remained stable in Alberta since 1990[2], it is still appropriate for Alberta Health Services to continue to monitor brain tumours in Alberta due to the recent increase in cellphone usage and the long latency periods associated with cancer.

In order to gain a more comprehensive picture of brain tumours, one must also look at brain metastases as they are common complication of cancer patients, more specifically lung cancer patients. Brain metastases are found in almost 10% of lung cancer patients at the time of diagnosis and approximately 40% of all patients with lung cancer develop brain metastases[3]. This makes the overall study of brain tumours difficult as brain metastases are in fact more common than primary brain tumours themselves.

The lack of standardization across cancer registries on how to code brain tumours also poses a problem as it makes it difficult to compare results across different regions.



Methods

The Alberta Cancer Registry (ACR) is a cancer registry which logs all cases of cancer in Alberta as physicians are mandated to report all cancer diagnoses. The ACR has received the North American Association of Central Cancer Registries gold certification for their high quality of data[4].

Data from the ACR was used to evaluate the differences in brain tumour cases over the past 25 years using different coding definitions. Brain tumour sites were also broken down by sex in order to better understand the situation in Alberta. A summary of brain metastases was produced, while also breaking down brain cancers that metastasized from lung cancer cases by age and sex. This Alberta data was compared to data from the Kentucky Cancer Registry to provide a frame of reference.

It is important to note that the ACR only codes metastases if they are found at the time of diagnosis. Any metastases that may occur after the initial diagnosis will only be recorded in the progress notes and will not be captured when pulling data from the ACR.

Before analysis can begin, differences in how the Central Brain Tumor Registry of the United States (CBTRUS), the Public Health Agency of Canada (PHAC) and International Classification of Disease for Oncology (ICD) define brain tumours must be understood as the site definition for brain tumours may affect the results.

Acknowledgements

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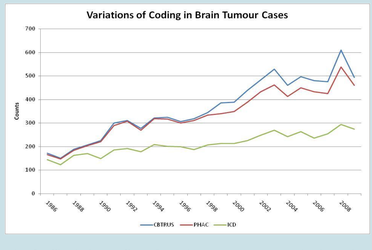
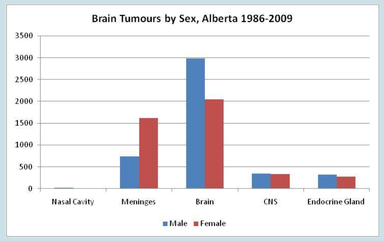
Analysis & Results

The following is a breakdown comparing various brain tumour coding definitions:

- **ICD-O** is the most restrictive method: only capturing brain cancers (c71)
- **PHAC** uses the ICD definition + cancers of the meninges (c70) + spinal cord, cranial nerves, and other parts of the central nervous system (c72)
- **CBTRUS** uses the PHAC definition + cancers of the pituitary glands (c75.1 – c75.3) + olfactory tumours of the nasal cavity [c30.0 (9522 – 9523)]



Using the CBTRUS definition for brain tumours, it is observed that there are more male cases of brain cancer (c71) compared to female cases in Alberta from 1986-2009, however the reverse is true for cancer in the meninges (c70). These findings are consistent with findings elsewhere[5,6].



As expected, brain metastases resulting from lung cancer are also quite common in Alberta. Over 70% of brain metastases coded in the ACR originated from respiratory & intrathoracic organs. Furthermore, brain metastases were discovered at time of diagnosis in approximately 10% of lung cancer cases – similar to the 10% suggested in previous research[3].

The patient profile of those whose lung cancer metastasized to the brain is also very similar to those in Kentucky (comparing 2010 data). The mean age is higher in Alberta (66.3 years) compared to those patients in Kentucky (63.74 years).

Age Breakdown of Lung Cancer Cases with Brain Mets in Alberta (2009 – 2011)

Year of Diagnosis	Count	Mean
2009	250	65.1
2010	211	66.3
2011	191	65.6
Total	652	65.7

Sex Breakdown of Lung Cancer Cases with Brain Mets in Alberta (2009 – 2011)

Year of Diagnosis	Male Count	Male Percent	Female Count	Female Percent
2009	123	49.2%	127	50.8%
2010	103	48.8%	108	51.2%
2011	109	57.1%	82	42.9%
Total	335	51.4%	317	48.6%

The sex breakdown of these patients in Alberta is more volatile as over the past few years, males went from representing 49% of lung cancer cases that metastasized to the brain in 2009 to over 57% of cases in 2011. The sex breakdown in Kentucky falls within this range as 53% of patients who had a brain metastases stemming from lung cancer were male.

Conclusions

Overall, brain tumours in Alberta follow a similar incidence occurrence pattern to findings in other regions – brain cancers are more predominant in males while meningioma is more common in females.

It should be noted that the numbers presented in the graphs and tables are counts. Therefore, as the age-standardized rates in Alberta are stable since 1990[2] the increasing trends over time reflect the aging and growth of the population in Alberta.

Further work must be done in order to fully understand the occurrence and outcomes of brain tumours in Alberta. Information on metastatic brain tumours is limited due to the ACR not coding metastases that occur after the initial diagnosis. As shown in some studies that follow patients through their disease period, up to 40% of lung cancer cases go on to develop a brain metastases[3]. As the ACR is only capturing approximately 10% of these brain metastases, there are many brain cancer cases that are unaccounted for.

Next Steps

In order to better capture the full clinical load of brain tumours in Alberta, brain metastases must somehow be accounted for even though they are not coded in the ACR. Therefore the next step of this research project will be to investigate a method that can accurately estimate the number of brain metastases that occur after initial diagnosis. There are three main sources that may be investigated in order to estimate brain metastases:

1) **Patient Chart Reviews**: Even though brain metastases are not captured in the ACR, they are still recorded in the progress notes of the patient's charts. However it is extremely time consuming to go through each patient's chart in order to gather this information.

2) **Cancer Treatment/Physician Billing Data**: This data can be used to identify patients that do not have a coding of brain cancer in the ACR yet they are receiving a procedure or treatment typically associated with brain cancers. Gaining access to this data may prove to be difficult and detailed treatment info may only be available after 2010.

3) **Death Certificates**: If a death certificate lists brain cancer as a cause of death yet the ACR has no record of a brain cancer, this may be a sign that a brain metastases exists.

References

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