Interphone Studies to Date. An Examination of Poor Study Design Resulting in an Underestimates of the Risk of Brain Tumors

Lloyd Morgan, January 23, 2008

Introduction

INTERPHONE is a 13-country case-control study examining the risk of acoustic neuroma, glioma, meningioma and parotid gland tumors from cellphone use. Eleven studies [1-11] have been published on the risk of brain tumors from cellphone use and two studies on the risk of parotid gland tumors (a salivary gland located near to the ear). [12-13]. Two of the eleven Interphones studies were studies of 5 countries [1,2],
which partially overlap other studies. Therefore this examination focuses on 9 studies for risk of a brain tumor from cellphone use.

That all 11 of the studies showed use of a cellphone provided 'protection' from a brain tumor and reported there was 'no risk' for brain tumors from 'regular' cellphone use, [1-11] is a fraud perpetrated on the public. This should not be a surprise, given that a substantial proportion of the cost of these studies has been paid for by the cellphone industry.

As I will show, there are six major flaws in these studies, five of which underestimate the risk of tumors. Yet, as we will see, and this is very alarming, in spite of these flaws, where the tumors are on the same side of the head where the cellphone was held and the phone was used for 10 year or more, all of the results show a risk of tumors.

Before we examine the flaws I will discuss how you can detect flaws similar to what exists within the Interphone Protocol. First, examine the full set of odds ratios (ORs) within any single study, or better yet, combinations of Interphone studies.

An odds ratio (OR) is a ratio that measures the odds of cellphone radiation exposure for cases compared to controls. In effect, it is the risk of tumors from cellphone use. Cases are subjects with a disease
(in this discussion, brain tumors). Controls are subjects without the disease. Controls are chosen at random, and then matched to the cases by various factors. Typically these factors are age, gender, residential region, education and social economic status (SES).
Reported odds ratios are adjusted for each of the matched factors in order to minimize confounding.

Studies report both the OR and the 95% Confidence Interval (CI). 95% confidence means there is >95% confidence that the result is not due to chance. If the CI spans 1.0 it is said to be non-significant and if it does not span 1.0 it is said to be significant. The reported OR is the most likely value within the CI.

Let's suppose that there is no risk of tumors from cellphone use. What would you expect to find by examining all the ORs reported in a study,
or a set of studies' If there were no risk, then regardless of the significance or non-significance, roughly half of the ORs would be elevated (OR>1.0) and roughly half would not be elevated (OR<1.0).
Further about 95% of the ORs will be non-significant and about 5% of the ORs will be significant. Think about tossing a coin. About half the time heads comes up and about half the time tails comes up. The ratio of heads to tails approaches 1.0 as the number of coin tosses increase.
Findings with OR=1.0 are not counted.

Risk of Brain Tumors from Cellphone Use An examination of the ORs for all brain tumors reported by the 9 Interphone studies found that 65 of the results had an OR>1.0 and 308 had an OR<1.0 (observed ratio=4.7; expected ratio ~1.0).

For significant findings, there were 3 results with OR>1.0 and 50 results with OR<1.0 (observed ratio=16.7;

expected ratio ~1.0). For the 3 results reporting OR>1.0, all had >10 years of exposure with the tumor on the same side of the head where the cellphone was held.

It would appear that when a cellphone is used for >10 years and the tumor is on the same side of the head where the cellphone was used, there is a significant risk of a brain tumor.

As I said in the introduction, to see if a study, or a set of studies, are flawed, all you have to do is to examine the odds ratios. Out of 373 published ORs, 65 are >1.0 (20%) and 308 are <1.0 (80%). The ratio should be close to 1.0, but it is 4.8 (309/65=4.8). As previously noted, of the 271 findings we would expect, about 5% to be significant findings. Yet there are 53 significant findings (14%) when the expected would be about 14 (5%).

A closer examination of all the significant findings for <10 is incredulous. There are 50 significant findings with OR<1.0 and zero significant findings with OR>1.0. A significant OR<1.0 indicates that cellphone use protects the user from brain tumors! There are two possible conclusions to explain this incredulity: either using a cellphone provides protection from brain tumors, or there are major flaws in the studies.

Now let's examine the 6 design flaws in the Interphone studies. Five of these flaws result in an underestimation of risk. Could this be the reason that there are 50 significant finding showing a protection and none showing a risk of brain tumors from cellphone use'

Flaw 1: Selection Bias
The first flaw is called selection bias. It is likely the result of the low percentage of controls that participated in the studies (weighted average of 59%). Think about being randomly selected for a cellphone study. You are told you will be asked to answer a long questionnaire.
If you use a cellphone you are more likely to agree to participate than if you do not use a cellphone. If this happens it is called selection bias. Selection bias will result in an underestimation of risk.

Flaw 2: Inclusion of Tumors Outside the Cellphone's Radiation Plume
The second flaw is the inclusion of all brain tumors without regard to their location. Because the cellphone's radiation plume only penetrates a short distance into the head, nearly all of this radiation is absorbed by the temporal lobe, the acoustic nerve, or the parotid gland (not discussed in this column).

Even when cellphone exposure of one side of the head is considered on the side where the cellphone was held, a substantial portion of half the brain is unexposed (the opposite side is completely unexposed).

The colors in Figure 2 indicate The Specific Absorption Rate (SAR) of is the amount of power absorbed by brain tissue, in this discussion, brain tissue, in Watts per kilogram.

The temporal lobe and the acoustic nerve, the nerve from the ear to the brain (not shown), and the parotid gland, absorb almost all of the cellphone's radiation plume. The plume is only a small portion of the brain and is entirely on the side of the head where the cellphone is used. The depth of the cellphone's radiation plume's penetration is quite shallow. More that 67% of the radiation plume's power is absorbed within an inch (2.54 cm) of the surface of the skull.

Studies that include brain tumors outside of the cellphone radiation plume underestimate the risk of brain tumors.

Flaw 3: Latency Time and Definition of Regular User
The third flaw is the definition of 'regular' cellphone use in relation to a reasonable latency time. 'Regular' cellphone use is defined as use of a cellphone on average once per week for at least 6 months. Exposure within 1 year of the diagnosis date is not considered. The result of this definition, combined with the incredibly fast rate of new cellphone users, is to overweight 'regular' users with, an incredibly large group of short-

term users, far too short a time to expect a tumor to be diagnosed.

Latency time is the time from an exposure to the diagnosis of a tumor.
What we know about the latency time for brain tumors comes from ionizing radiation exposures. Based on ionizing radiation, the latency time for brain tumors is between 25 and 40 years, similar to the latency time of lung cancer from tobacco exposure.

For the 9 Interphone studies, using weighted averages for cases or controls, we see that 0.61% of cases and 10% of controls have used a cellphone for 10 years or more, and 18% of cases and 21% of controls have used a cellphone for 5 years or more.

The result: for a reasonable latency time, it would be unlikely to find any risk of tumors, given the percentage of cases and controls. Yet, as we saw in the Studies on the Risk of Brain Tumors from Cellphone Use section, there is a risk. 'It would appear that when a cellphone is used for >10 years and the tumor is on the same side of the head where the cellphone is used, there is a significant risk of a brain tumor.'

Because such a large percentage of 'regular' users have used a cellphone for an unreasonably short latency time the reported results for <10 years as well as for >10 years (6.3% of cases) are an underestimation of risk.

Flaw 4: Children and Young Adults Are Not Included in Interphone Studies
The Interphone Protocol states that cases be between 30 and 59 years of age. While a few studies have included cases as young as 20, the non-inclusion of <20 year olds results in an underestimation of risk. Why' Because children, with their high rate of cell division, are at higher risk of tumors than adults. As we know there a considerable proportion of cellphone use by children. And, we know that children, especially teenagers, spend more time on cellphones that do adults.

Flaw 5: Cellphone's Radiated Power
It is reasonable to expect that risk of a tumor from a cellphone, after a reasonable latency time, would be the cellphone's power multiplied by cumulative time of use. In the early days of cellphone use all cellphones used analog technology. These always radiated a fixed amount of power (~2 Watts). Analog cellphones use has been totally displaced by digital cellphones. Digital cellphones have a feature called Automatic Power Control or APC. At the beginning of a call the cellphone radiates maximum power (~2 Watts) but quickly reduces the power so the radiated power is sufficient to have a reliable link to the cell tower (AKA masks or base stations). The result is that cellphones radiate far less power in urban areas compared to rural areas. This is because cell phone towers are much closer in urban areas compared to rural areas so the cellphone radiates less power in urban areas and more power in rural areas. When rural and urban cellphones are not reported separately the result is an underestimation of risk.

Flaw 6: Number of Cases Included in a Study
The weighted average time in these 9 studies for a case to be eligible for inclusion in the study was only 2.6 years. When one considers 4 of the 5 previous flaws, it becomes obvious that such a short period of time for eligibility will result in too few cases to resolve these flaws. For example, if tumors were limited only to the exposed region of the brain then there would be far fewer cases; if a reasonably long latency time was included, again there would be far fewer cases; if children had been included there would have been more cases; and, if rural users were to be compared to the far larger number of urban users a much larger number of cases would need to be eligible to participate in the Interphone Study.

Conclusion and Discussion
With five flaws, each independently underestimating the risk of tumors, it is no wonder why the Interphone studies report a large number of results suggesting cellphone use protects the user from having a brain tumor.
The Interphone Study has substantial funding from the cellphone industry. The additional cost to resolve these flaws could have been accomplished if the industry provided more funds. In addition if the participating

countries had anticipated the potential cost of a pandemic of brain tumors, the cost effectiveness of contributing substantially more funds, would have been obvious. Lastly, relying on the cellphone industry funding is equivalent to having the fox guard the hen house.

The cellphone industry will state that there is a 'firewall' between their funds and the research teams who do the studies. While it is true that the cellphone industry provides the funds to another organization (UICC) which then decides on the teams that will do each study, the researchers are aware that most of their funds are coming from the cellphone industry. While I do not doubt the integrity of the researchers, I also believe there in an inherent conflict-of-interest, best described by the saying, 'Don't bite the and that feeds you.'

The fundamental problem is not conflict-of-interest. The fundamental problem is the Interphone Protocol. While I have no evidence, it would appear that the cellphone industry influenced the Protocol, if not actively participating in its creation. The end result is the Protocol is designed to not find any risk. That it has found a risk is sobering!

Tragically, the window of time to do a large, well-designed case-control study is closed. Case-control studies require exposed and unexposed subjects. It is no longer possible to find unexposed subjects.

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