Cell Phones and Cancer: Is There a Connection?

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Editor's Note:

On May 31, 2011 the World Health Organization (WHO) announced their classification of radiofrequency electromagnetic fields emitted from cell phones as "possibly carcinogenic," and more recently published the evidence and rationale supporting their conclusion.[1] Medscape recently spoke with National Institute on Drug Abuse Director (and BlackBerry® user) Nora D. Volkow, MD, about the implications of both the WHO statement and her own research showing that cell phone usage directly affects brain glucose metabolism.[2]

Cell Phones and Cancer: Introduction

Medscape: Hello Dr. Volkow. What was your reaction to the WHO report concluding that electromagnetic fields from cell phones are "possibly carcinogenic?" Do you believe that the available data support this conclusion?

Dr. Volkow: I think that the report was justified on the basis of results that are inconsistent but which cannot be ignored. It seems prudent in this situation -- in which there are some results [linking cell phone use with malignancy] -- to be cautionary. I think that is why they came up with this recommendation.

It wasn't strong evidence, which the authors of *The Lancet* paper discuss. However, they couldn't just dismiss and ignore the findings.

Medscape: I found it interesting that the INTERPHONE study showed that in all exposure groups except that with the highest cell phone exposure, there was actually a reduced or equal incidence of glioma compared with those who'd never used a cell phone. What do you make of this finding?

Dr. Volkow: One could interpret this as implying that cell phone exposure at lower levels is actually protecting against glioma, whereas others would say that it means that long-term exposure is required to induce cancer. So you have both sides of the coin. It highlights how important it is to properly address this question -- to do a study that will be able to answer it definitively.

As *The Lancet* paper discussed, the effects that the researchers are looking for here may not be observable for 20 or 30 years. It could be similar to what was seen with cigarettes and cancer in which several decades of smoking behavior in patients were often necessary to uncover the linkage.

To summarize, there are studies that show [no association between cell phones and cancers] and there are some studies that do show an association.

Time Will Tell

Medscape: Cell phones weren't widely used until the last 10 or 15 years, so you're saying that it might just be too early to tell whether there's an association?

Dr. Volkow: It is clear that even though cell phones have now been out for the past 25 years, the rate of use then was limited to a few people and the amount of use was also limited. It wasn't until much more recently that their use became massively widespread.

In my view, by coming up with a conservative statement, the WHO is saying that we need to be observant and not become too complacent.

Cell Phones as Therapy?

Medscape: Can you give our readers a summary of your recent study linking cell phone use with altered glucose metabolism in the brain?

Dr. Volkow: Yes. We showed a correlation between exposure to electromagnetic radiation from a cell phone (the sound was muted) and increased brain glucose metabolism, which is a marker of brain function, in the areas of the brain closest to the antenna of the cell phone. So there is definitely a physiologic response in the brain to cell phone exposure, which we're attributing to electromagnetic radiation.

Medscape: Your data have shown no specific connection, and you've made no claims about a connection between this increased activity and malignancy. Correct?

Dr. Volkow: No, nothing. I wish! I would love for our data to illuminate this issue, but they don't; no matter how much imagination I use, there is no way of relating our finding to the issue of carcinogenicity. Our data just show that the brain is sensitive to the electromagnetic radiation emitted from cell phones.

Medscape: Your participants did not actually speak or listen on cell phones in order to control for potentially confounding brain activity, but could some of the increased activity have been caused by the brain anticipating and preparing for speech?

Dr. Volkow: Actually, in order to avoid that confounder, each participant had 2 cell phones -- one on each side of the head. Therefore, participants could not know where the signal was coming from. This was because expectations can profoundly affect brain processes. Indeed, that is at the basis of the placebo effect. We are very sensitive to the influence of expectation.

So is cell phone use harmful? We cannot say on the basis of our initial study. We need to look into whether there are long-lasting effects on the brain due to cell phone use and whether these have deleterious consequences. That is a question that remains unresolved.

If there are no negative effects, this could then be a very interesting technology to evaluate as a potential therapy, for example, in cases in which you need to rehabilitate an area of the brain and want to stimulate it.

Medscape: That's a good point because psychiatric and neurologic therapies such as transcranial magnetic stimulation work by applying an electromagnetic field to the brain.

Dr. Volkow: Yes, and this is a very accessible, low-cost technology. For me, the most important thing is to determine whether this type of stimulation is linked with any long-lasting negative consequences, and if it is not, evaluate the potential of this type of electromagnetic stimulation for therapeutic applications.

So What's Next?

Medscape: Do you and your colleagues have any follow-up studies planned?

Dr. Volkow: First, we want to replicate our finding and extend it to determine whether there is any evidence that there may be long-lasting effects. Although the ideal study would be to evaluate participants prospectively, that is very costly and we don't have the resources to do such a study; we will need to address it retrospectively on the basis of previous cell phone exposure.

We will control for exposure on the basis of cell phone records and behavioral questionnaires, but we also want to use different markers in brain imaging beyond just brain glucose metabolism. Among others we want to assess the effects of cell phone exposure on brain functional connectivity.

To do this we will obtain a functional MR map of functional connections before and after cell phone exposure to see whether the areas in which we are observing increases in metabolism are linked to changes in the way that the brain is transmitting information.

Should We Throw Out Our Cell Phones?

Medscape: On the basis of your findings and the WHO report, how do you think clinicians should approach this subject with patients? Should they cut back on cell phone usage -- or better yet, just throw them out?

Dr. Volkow: No, no! I haven't thrown mine out. That would be too deleterious to my life.

An important point that some people have made is that the most dangerous aspect of cell phones is using them while driving or in other inappropriate situations. The other day I found myself texting while walking across the street. I said to myself, "No, I should not be doing this." Regardless of what the data end up showing, this type of behavior is likely the greatest cause of mortality and morbidity related to cell phones.

Therefore, I would explain that although some studies reported an increased risk for malignancy associated with cell phones others did not, so we just don't know. I think it's important to bring

knowledge to people in a way that is comprehensive and accurate and let them make the decisions about how they are going to use technology. Even if there is an association, it's not the end of the world because you can still use your cell phone -- just change the behavior by which you use them. Don't bring them close to your head, and use a headset or the speakerphone option -- anything that keeps the phone way from your head.

However, I would feel confident saying to parents in particular that they should educate their children to avoid using cell phones close to their ears. Due to children's size, the amount of deposition of energy is higher than that in an adult. *The Lancet* paper discusses this.

It also has greater effects on the bone marrow of children. Another aspect that they don't discuss but which is relevant is that the brains of children and adolescents are undergoing very fast developmental changes. Their brains are much more neuroplastic and susceptible to changes triggered by environmental stimuli.

Basically we don't have sufficient knowledge to know how cell phone signals affect brain processes. Why not play it safe? How you modify your behavior depends in part how you handle uncertainty: I am very bad at dealing with uncertainty in regard to potential effects to my brain so I chose to be conservative

Medscape: Has your cell phone usage changed in light of the current evidence?

Dr. Volkow: I haven't decreased the amount of time that I use my cell phone. However, I do try to avoid placing the cell phone to my ear whenever possible. I can't always put it on speakerphone, then everyone would hear my conversations!

References

1. Monograph Working Group. Carcinogenicity of radiofrequency electromagnetic fields. Lancet Oncol. 2011;12:624-625.
2. Volkow ND, Tomasi D, Want G, et al. Effects of cell phone radiofrequency signal exposure on the brain glucose metabolism. JAMA. 2011;305:808-814, 828-829.

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