

# Headlines

Winter 08

A newsletter for brain tumour patients and their families

## MEDICAL UPDATE

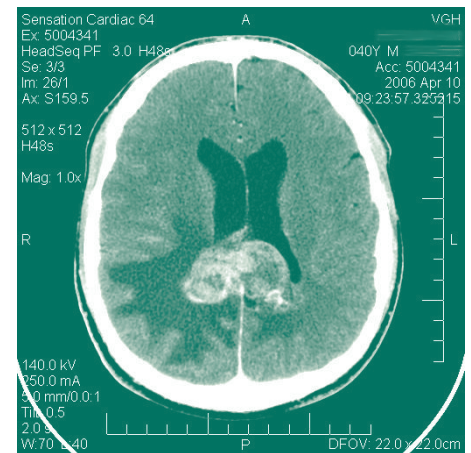
### Brain imaging: Techniques used to visualize brain tumours

**O**BTAINING A CLEAR IMAGE of the brain is complicated by the fact that the brain is enclosed by a bony skull. X-rays provide good images of bones, but not such good images of soft tissue such as brain. The first brain images were performed in the early 1900s through a technique called pneumoencephalography. This required drainage of the cerebrospinal fluid around the brain, and injection of air through holes in the skull. This procedure could highlight the relative densities of the brain and its surroundings, so it was of some help to neurosurgeons, but at a significant risk to the patient. Fortunately, technologic advances have brought us computerized tomography (CT), also known as computerized axial tomography (CAT), and magnetic resonance imaging (MRI) which allow improved images with less risk to patients.

**CT images** are made through a series of x-rays taken through different angles of the head. A computer analyzes and fuses these images into a single three-dimensional view of the brain. They may be more useful than MRIs in certain situations. They are less expensive and much quicker to perform than MRIs, usually taking about 15 minutes. They are also very sensitive to blood within

the brain, so ideal for detecting brain hemorrhage. As a result, they may be one of the first diagnostic tests performed for patients who go to the emergency room with headaches or seizures. Iodinated contrast material is injected intravenously prior to the CT scan to identify aggressive areas of a brain tumour. Some people, especially those with allergies to shellfish, may be allergic to iodine and should not receive the contrast material. Those taking a diabetes medication called Metformin will need to discontinue this medication for a couple of days prior to a contrast-enhanced CT scan, because the combination of Metformin and the iodinated contrast may be harmful to your kidneys.

The **MRI**, developed in the 1980s, is considered the "gold standard" of brain imaging for brain tumours because it provides clear pictures of the brain and differentiates between tumour, swelling and fluid collection. MRI technology takes advantage of the fact that your brain (in fact, your whole body) is largely composed of water. As you may remember from your high school chemistry class, a water molecule is made up of 2 hydrogen atoms and 1 oxygen atom. Hydrogen atoms possess a central nucleus with a positive charge that spins within the atom. It



*This aggressive tumour appears white in the CT image because of the uptake of contrast material. It extends across the band of fibers connecting the right and left sides of the brain, and compresses the ventricles, the black butterfly-shaped area seen in the centre. Extensive swelling appears dark gray around the tumour.*

also has magnetic properties. The MRI machine creates a powerful magnetic field that causes the hydrogen atoms to align themselves in one direction, similar to the needle on a compass. As the nuclei flip from one direction to another, the MRI records signals transmitted from various tissues (blood, bone, brain, cerebrospinal

*continued on page 3*

# Understanding how brain tumours can affect your thinking abilities

## What is cognitive impairment?

Decreases in your thinking abilities are also known as cognitive impairment. The changes can be subtle or obvious, temporary or permanent. Signs of this might include changes or problems with any of the following:

- Attention
- Concentration
- Speed of thinking
- Learning and memory
- Depth perception
- Reading and writing
- Problem solving, organizing, planning, and reasoning
- Speaking and understanding others
- Multi-tasking
- Complex tasks, such as managing finances or driving a car
- Personality or behaviour

## What causes it?

Some people with brain tumours experience changes in their thinking skills, which are most often caused by the tumour itself. The specific cognitive abilities that might be impacted can depend on where the tumour is located in the brain. In addition, treatments for brain



tumours may worsen cognitive function. Other factors, such as stress, depression, and sleeping difficulties can cause or worsen cognitive impairment.

## Why is it important to evaluate changes in thinking?

Unfortunately, cognitive impairment affects a substantial number of individuals with brain tumours, and can interfere with their school, work, relationships, quality of life, and ability to live independently. Occasionally, this impairment can put the individual or others at risk, especially when they are unaware of the changes in their thinking. For example, individuals with cognitive impairment are at an increased risk of motor vehicle accidents, due to the complexity of driving.

## How is it detected?

Severe cognitive impairment may be easily identified, while more subtle forms are best detected by standardized assessments. The most reliable method for detecting cognitive impairment consists of standardized tests administered and interpreted by specialists in neuropsychology (neuropsychology involves understanding people's thinking skills). Other simple, brief assessments may also be performed, and although they may

## Common strategies for reducing the effects of cognitive impairment

- Use compensatory cognitive strategies
- Focus on only one task at a time
- Allow yourself ample time to complete a task
- Work on cognitively-challenging tasks when you have the most energy
- Write names, dates and other important things in a small notebook
- Keep a calendar on the fridge
- Organize medicines in a pill sorter
- Keep mentally active by engaging in mentally stimulating activities, such as crossword puzzles, sudoku, and reading
- Limit alcohol use
- Reduce stress
- Maintain exercise
- Practice good sleep hygiene (see headlines winter 2007 issue)
- Talk to your physician regarding medical treatment

be more convenient for patients, they may not be sensitive enough to detect subtle changes in thinking abilities, or to detail a person's strengths and weaknesses.

## Can problems with thinking be treated?

The treatment of cognitive impairment depends on what causes it. For example, your physician may recommend a new medication or help you to manage depression. In some instances, permanent cognitive impairment cannot be treated, but a person might be able to learn strategies to compensate for the changes in thinking abilities. Examples of treatments are given below, and are

*continued on page 3*

## Potential Causes of Cognitive Impairment

- Brain tumours
- Treatment of brain tumours
  - Surgery, radiation, chemotherapy, steroids, seizure medicines
- Other medications
- Alcohol or illicit drugs
- Seizures
- Stress
- Fatigue
- Depression
- Age-related factors
- Other medical and psychological problems

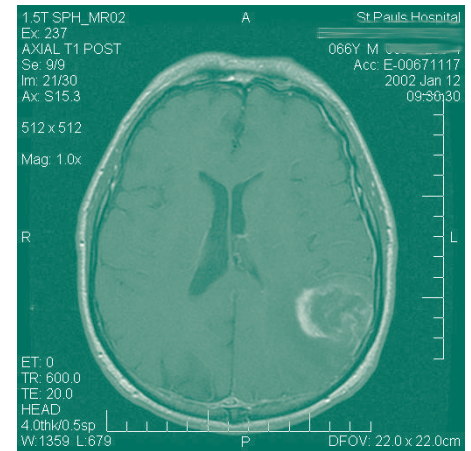
### *Brain imaging: Techniques used to visualize brain tumours* continued from page 1

fluid, etc.) based on the water content in each type of tissue. These signals are translated into a three dimensional radiographic image such as the one shown here. Unlike for x-rays and CTs, there is no exposure to radiation for patients undergoing MRIs.

As with CT scans, the MRI image is sharpened or “enhanced” through the use of a contrast agent. The contrast material used in MRI is called gadolinium. Normally, the brain prevents entry of harmful drugs and other toxins by means of a “blood brain barrier,” a wall of tight connections between the smallest blood vessels and the brain cells. However, aggressive brain tumours require extra energy for the rapid division that their cells undergo. They get this energy by growing a dense network of poorly formed blood vessels that supply nourishment to the tumour cells. These leaky blood vessels impair the blood brain barrier and allow the contrast material to find its way into the brain. As a result, areas of aggressive tumour appear white, or “enhancing,” from leakage of the contrast into the brain.

There are some limitations to MRI’s usefulness. People with pacemakers, surgical clips, or other sorts of metal implants should not undergo MRI examination, because the strong magnetic pull of the MRI machine could dislodge the implant or create a distorted MRI image. An MRI exam may take an hour or more to complete, and requires an individual to lie very still in the MRI scanner throughout that period. For those who suffer from claustrophobia, relaxation therapy, music and other forms of distraction, or even sedation may be required. Both CTs and MRIs are generally avoided during pregnancy and in nursing mothers.

Another type of scan that is sometimes used to image brain tumours is the **positron emission tomography (PET) scan**. PET is a type of “functional imaging,” meaning it provides dynamic information, for example related to metabolic features of the brain, rather than simply information about anatomy. In brain tumour imaging, PET is primarily helpful in differentiating between a “cold” lesion (that is, one that is not actively dividing, such as a low grade tumour, or an area of dead tissue caused by radiation treatment, termed “radiation necrosis”) and a “hot” lesion (for example, an area



*This MRI image shows enhancement at the edge of a tumour on the left side of the brain. There is some mild swelling around the tumour which deforms the shape of the ventricles.*

of more aggressive tumour cells which metabolizes the radioactive sugar medium given through your vein prior to the scan, and appears bright on the scan).

**The timing of scans** is important. The tumour’s response to treatment is not usually immediately clear, and in fact treatment itself may cause swelling that can mimic the effects of an active tumour. Your oncologist will order your scans at intervals that will allow the image seen to be as clearly interpretable as possible.

### *Understanding how brain tumours can affect your thinking abilities* continued from page 2

provided by a team of health professionals, including rehabilitation counselors, physicians, nurses, psychologists, speech therapists and social workers.

### Research

Research in identifying, preventing, and treating cognitive impairment in patients with brain tumours is very active. Examples range from identifying medications that treat cognitive impairment, to developing new techniques of radiotherapy that avoid damaging the memory areas of your brain.

This study is currently available to any patient with a brain tumour or

Health care professionals from the BC Cancer Agency and the BC Mental Health and Addictions Services are jointly running a study comparing two brief cognitive screens to a formal, detailed neuropsychological assessment. By comparing results of these two brief screening tests to the more sensitive neuropsychological assessment, we hope to determine which screening test is better for identifying patients with cognitive impairment. A more sensitive screening test for cognitive impairment may also direct us to the best treatment for the specific impairment.

brain metastases at the Fraser Valley or Vancouver Cancer Centres. If you are interested in participating or would like more information about this study, contact Dr. Robert Olson at 604 877 6000 (ext 5452), [rolson2@bccancer.bc.ca](mailto:rolson2@bccancer.bc.ca), or Maureen Parkinson at 604 930 4000.

### Closing Remarks

Talk to your physician if you suspect cognitive impairment in yourself or a loved one, as there may be treatments for this problem, as well as resources to help you and your family live better with it.

*by Dr. Robert Olson, Radiation Oncology Resident and Dr. Brian Brooks, Researcher and Consultant in Neuropsychology*

**Q** My wife is going to start radiation treatment for a brain tumour in the next month. It sounds like she will be taking chemo at the same time. How can I support her? Should I plan to take off from work for the whole time (6 weeks)? I hear the treatment makes you very tired. We live within walking distance of the cancer agency and she thinks she'll just come on foot by herself, but it sounds like she will be in rough shape. She is a very independent person, but I'm really worried about her. Unfortunately I just started a new job so the timing is pretty bad for me to take off. What should I do, how can I help her, what can we expect...HELP!

**A** There are many ways that you can support your wife while she is having her radiation therapy. Taking time off for the whole six weeks of treatment should not be necessary. There may be certain occasions when you, a family member or friend may wish to accompany your wife. One such appointment is the one for treatment planning. This appointment will include a visit to the mould room where a plastic mask will be made to be worn for your wife's therapy. This mask keeps the head still and in the correct position each day of treatment. The radiation therapists will use the markings on the mask to assist them when they are setting up treatment. Following the mask fabrication, a CT scan will be performed to assist in designing her treatment plan. You can be with your wife when the mask is being made and as the radiation therapists explain each phase of the planning and treatment procedures. After the CT scan the radiation therapists will take you to the radiation therapy treatment machine and orientate you to the department. This process takes about 3 hours and many patients find having a family member at this stage in their journey helpful, as they are faced with a

large volume of information and may be concerned about remembering everything. An extra set of ears can be beneficial in adding clarity and reducing anxiety. During this appointment you will be asked about treatment time preferences, and these will be taken into account as we schedule future appointments.

If your wife is also receiving chemotherapy at the same time as radiation therapy, you may wish to accompany her on the very first day she picks up her medication from the Cancer Centre pharmacy. When she picks up the medication, the pharmacist will discuss management of any potential side effects, and will explain how to take the drug to ensure that your wife receives the correct dose. The pharmacist will also ask about allergies and any other medications or natural health products that your wife may be taking, so it would be helpful for you to be with her for this consult. Your wife will see a medical oncologist during the combined treatment to make sure that she is tolerating it well.

You may also wish to accompany your wife on the first day of treatment. This day can be one of great anxiety for patients, and your moral support will be invaluable. The radiation therapists will be available to give you and your wife additional information and respond to any last minute questions or concerns. You can accompany your wife when the therapists take her into the treatment room and stay with her until they are ready to commence treatment. Seeing the whole process and meeting the therapists will add to your peace of mind and give you a clear understanding of the daily treatment routine. As a result, you should feel more comfortable answering questions from

your wife, family and friends about her treatment.

Your wife will have weekly appointments with her radiation oncologist and you may wish to attend some or all of these. These appointments will be co-ordinated with the radiation

therapy appointments.

At this time you can both discuss any concerns you have about the treatment. One of the advantages of having you both present is that you and your wife can work together to remember issues for discussion and the responses to questions. Some patients like to write down their questions prior to the appointment with the oncologist, so that they don't forget anything.

## Question + answer



Varying degrees of fatigue are experienced by patients, and every person is different. If your wife feels she is able to walk to the clinic she can do so, and may even find the exercise beneficial. However she should have an alternate plan for days when she does not wish to walk in. Friends and family are often looking for ways to help out and are unsure of how they can best assist. I would recommend that you give them the opportunity to help by suggesting they walk to the clinic with your wife, or offer to drive her there. The Canadian Cancer Society volunteer driver service is also available to help with rides, although they require one or two days advance notice. See their website for more information [www.cancer.ca](http://www.cancer.ca), or call 1 800 663 2524. Feel free to ask the therapists for guidance with these and other questions as you and your wife begin her treatments.

*by Lorraine Geddes, Radiation Therapist  
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Editions of *Headlines* are also available as a pdf download at:

[www.bccancer.bc.ca/HPI/CancerManagementGuidelines/NeuroOncology/PatientResources.htm](http://www.bccancer.bc.ca/HPI/CancerManagementGuidelines/NeuroOncology/PatientResources.htm)

If you would like to submit an article, ask a question, or serve on our patient and family advisory board, please contact Rosemary Cashman at [rcashman@bccancer.bc.ca](mailto:rcashman@bccancer.bc.ca) or 604 877 6072 (phone) 604 877 6215 (fax).

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