

Brain Tumors

City of Hope is a new model of cancer center. Here, medical research and clinical care are joined, speeding the application of scientific discoveries to newer, more effective patient treatments. From breakthroughs in basic biology to smarter technologies for diagnosis and therapy, progress at City of Hope is accelerated by the need to offer more positive outcomes to patients everywhere. Our research innovations become advances in clinical care as quickly as possible, because people battling cancer and other serious diseases need better options — now.

Battling Brain Tumors of All Kinds

Many different kinds of tumors can affect the brain. Some are malignant (cancerous) while others are nonmalignant (benign). Malignant tumors can arise within the brain itself, or they may begin in another part of the body and spread to the brain (metastasize). In recent years, advances in surgery, radiation and chemotherapy have improved outcomes for people with brain tumors.

The diagnosis of a brain tumor raises many questions for patients and their families. Yet hope exists, and nowhere is that more true than at City of Hope. Our highly skilled scientists, physicians and allied health professionals are at the forefront of innovation in the fight against this disease.

Advanced diagnostic and surgical techniques, better radiation technologies, and novel chemotherapies and immunotherapies are all being used to stop the growth and spread of brain tumors. In partnership with our patients, we are continually exploring even more effective treatments through clinical research.

Minimally Invasive Surgery

Surgery is commonly used to rid patients of brain tumors. Today, City of Hope surgeons are applying new imaging systems to locate tumors more precisely, so they can be removed with minimal side effects and better results. Now, benign growths that were previously difficult to treat can often be removed safely and completely. And in the case of malignant tumors, more of the cancerous tissue can be eliminated, giving additional therapies an even better chance to work.

Recovery Time

Minimally invasive surgeries can shorten your time in the hospital.



Advanced Techniques at City of Hope Include:

- Intra-operative Cortical Mapping. This technology, employed during an operation, gives the surgeon a computerized map of key brain regions, including speech, motor and sensory centers. By avoiding these critical areas, the risk of neurological damage is minimized while allowing as much of the tumor to be removed as possible.
- Image-guided Surgical Navigation. In certain cases, City of Hope surgeons use this technology to guide the removal of tumors that are difficult to visualize or are located in "high-risk" areas of the brain. Using pre-operative magnetic resonance images, or MRIs, this highly accurate system allows for more complete removal of the tumor.

Brain surgeries involve making an opening in the skull, to access the site and provide space for various instruments. Certain procedures may be performed through an endoscope

 a thin, lighted tube that requires a small opening and accommodates tiny surgical tools. Smaller openings minimize post-operative discomfort and risk of infection. Now, researchers at City of Hope are working to develop a miniaturized surgical system that will allow brain surgeries to be even less invasive, with an even lower risk of complications.

Helical TomoTherapy

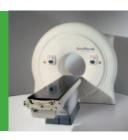
In the past, radiation beams were hard to target precisely, which meant healthy tissues were also damaged during cancer treatment. Today, a new system used at City of Hope takes radiation into the 21st century. The helical TomoTherapy® system couples three-dimensional imaging with innovative intensity-modulated radiation therapy, or IMRT, to target only the tumor, while sparing the healthy tissues around it.

During the procedure, hundreds of pencil-thin beamlets rotate around the tumor from all directions. A concentrated dose of radiation is shaped to match the unwanted growth, delivering the therapy only where it is needed. This innovative technology provides better results, fewer side effects, more rapid recovery and a faster return to normal life.

TomoTherapy is particularly useful in treating children with certain brain cancers. Because it specifically targets the diseased area, it avoids unwanted side effects that were common with earlier radiation technologies. By protecting normal brain tissue, it reduces the risk of long-term cognitive problems.

On Target

City of Hope was the first in the nation to operate two TomoTherapy systems.



Chemotherapy

Chemotherapy — a form of drug therapy — is another strategy used to combat cancers of the brain. Drugs may be given alone, or in combination with surgery and radiation therapy.

Generally, brain tumors are more difficult to treat with drugs than other cancers. This is because most drugs cannot cross the blood-brain barrier, a natural barrier that prevents toxic chemicals from reaching brain cells. However, new drugs are being developed that can either cross the barrier, or can be delivered directly to the brain.

Many patients at City of Hope who are treated with chemotherapy do so as part of a clinical trial. These studies investigate how well a drug, a combination of drugs, or a drug delivery procedure work to stop or slow the cancer's growth. Because City of Hope is a Comprehensive Cancer Center, supported by the National Cancer Institute, we have many clinical trials in progress, and can often offer patients new and promising experimental treatments not available elsewhere.

Immunotherapy

Unlike drugs that act by chemically killing cancer cells or halting their growth, immunotherapy uses the body's own immune system to attack cancer tissue from within. City of Hope scientists are working on several approaches:

- Cellular Immunotherapy. T-cells, the body's primary defense against infection, cancer and other diseases, are first collected from the patient's blood. After being genetically reprogrammed to fight cancer, billions of these cells are grown in the laboratory. Finally, they are put back into the body, where they seek out cancer cells and destroy them. Early phase clinical trials are under way to bring this strategy into the next stage of development.
- Generation 2 T-cells. Sometimes, the body rejects engineered T-cells after they are implanted. Scientists at City of Hope have created what may be a "universal" T-cell

against glioma (an aggressive brain cancer) that avoids triggering such an autoimmune reaction. Ultimately, T-cells produced from just one individual may be able to help thousands of other patients. This strategy is in initial stages of development.

- Generation 3 T-cells. Our researchers are testing ways to add cancer-fighting substances to immune T-cells, making them even more powerful.
- Macrophages, Microglia and Nanotubes. Macrophages are immune cells that protect the body by engulfing foreign and diseased material. Microglia, a kind of macrophage found in the central nervous system, become activated by infection, inflammation and trauma. Now, City of Hope scientists are loading up microglia with microscopic "nanotubes" filled with anticancer substances. As they seek out cancer cells to destroy, these microglia deliver their drug therapies directly to the tumor site.
- Nanoparticles. Microscopic packages called nanoparticles can be filled with anticancer drugs that might be powerful but are hard to use in people because they are difficult to dissolve. Wrapping them in a nanoparticle package allows the chemotherapy drugs to be delivered more effectively. This strategy, in early clinical trials at City of Hope, is being specifically targeted at brain tumors.

Drug Delivery

Immune cells armed with drugs are being tested against cancerous growths.



Tomorrow's Tools

Many of tomorrow's most promising weapons against brain cancer are being developed at City of Hope today.

 Neural Stem Cells. These immature cells give rise to specialized brain tissues. Recently, it was discovered that neural stem cells are naturally drawn to cancer cells. Today, City of Hope researchers are developing ways to use neural stem cells as vehicles that can carry cancer-fighting agents to tumors anywhere in the brain.

- Microdialysis Catheter. To determine how chemotherapy drugs perform within the brain, City of Hope researchers are implanting certain patients with a tiny catheter tube. Through this tube, they can sample the cerebrospinal fluid that surrounds the brain directly. The results will help reveal how drugs work to fight cancer cells in real time, leading to more effective treatments in the future.
- Scorpion Venom. Help can come from unusual places. A synthetic derivative of scorpion venom has the ability to seek out and bind to cancer cells while ignoring healthy, normal cells. Now, scientists are adding therapeutic radiation to scorpion venom for direct delivery to malignant tissue. This concept is currently being investigated in cancer patients. And by using nonlethal radioactive agents, better imaging of brain tumors may be possible as well.

Supportive Care

Our patients also have access to the Sheri & Les Biller Patient and Family Resource Center, which offers a wide array of support and educational services. Patients and loved ones may work with a coordinated group of social workers, psychiatrists, psychologists, patient navigators and spiritual care providers at the center, as well as participate in programs such as music therapy and meditation.

Joining Forces

At City of Hope, our multidisciplinary approach draws upon every branch of science and medicine to find better ways to fight cancer. From molecular biology and genetics to chemistry and physics, we combine new discoveries, innovations and technologies to offer patients the most advanced treatments available.

If you or someone you love has been diagnosed with a brain tumor, do not wait. Contact us today.

To Become a Patient

For more information, or to become a patient at City of Hope, please call 800-826-HOPE or visit us at www.cityofhope.org.

Providing New Hope

City of Hope works to move scientific discoveries rapidly from the laboratory to the clinic, benefiting patients everywhere.



Support the Search

City of Hope's cancer breakthroughs are made possible by the generous donations of compassionate, committed people like you: Individuals who value the way we speed the translation of laboratory research into practical results. We are proud of the support that enables us to innovate and inspire.

Help accelerate the pace of progress against cancer at City of Hope. Join our worldwide network of donors who fuel new discoveries leading to treatments that save lives everywhere. To arrange a donation, please call 800-544-3541.

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