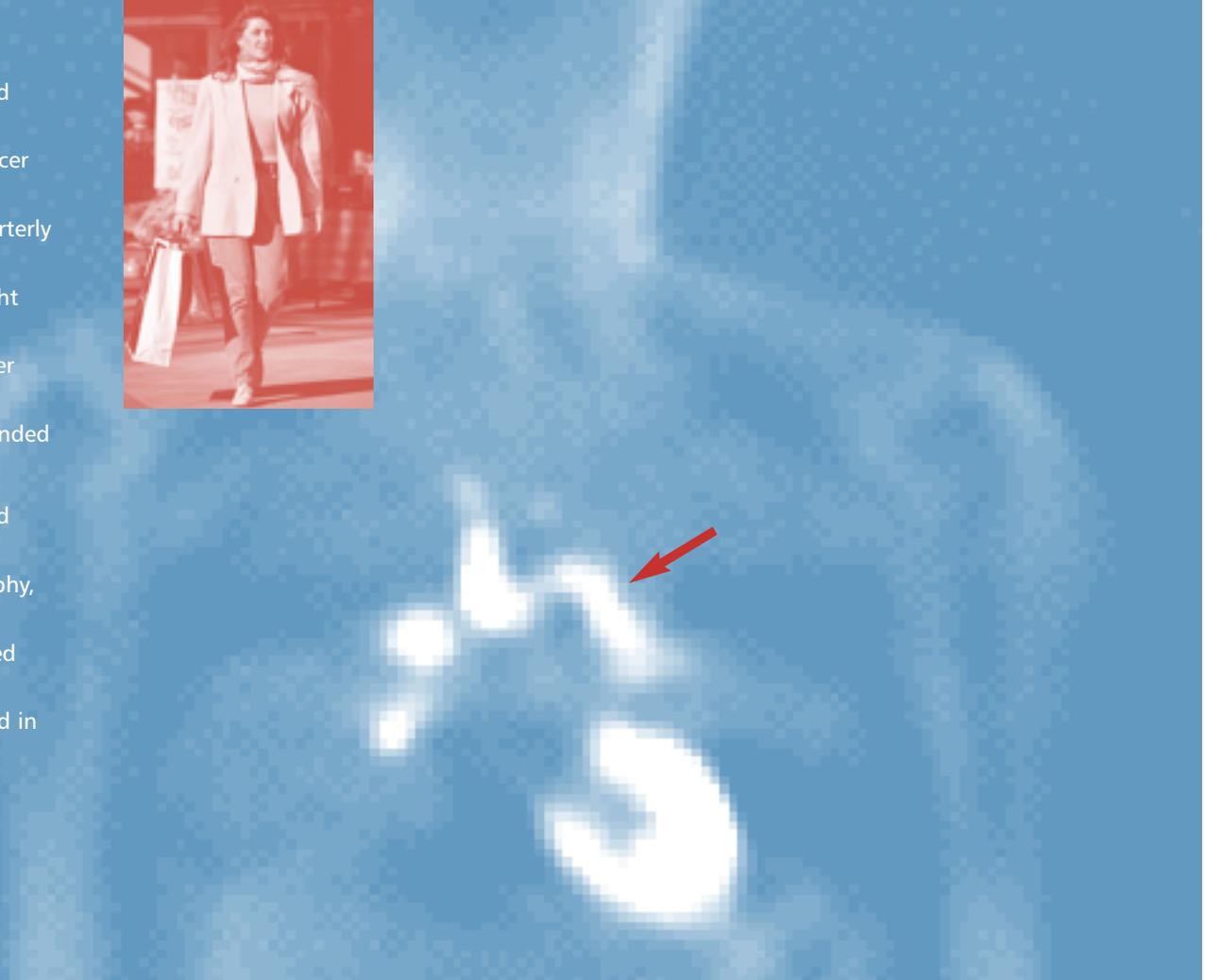
A PET scan image of a human head, showing a bright red spot in the brain, indicating a high concentration of a radioactive tracer. The rest of the brain is shown in shades of yellow and orange.

THE POWER
OF
MOLECULAR
IMAGING

P | E | T

P O S I T R O N
E M I S S I O N
T O M O G R A P H Y

This 34-year old woman had recovered from ovarian cancer and felt fine. Then, her quarterly blood results showed a slight increase in her tumor marker levels. Her doctor recommended an imaging procedure called Positron Emission Tomography, or PET. The PET scan revealed that the cancer had recurred in her chest, and therapy was immediately resumed.



CASE IN POINT

CANCER is one of the major causes of death worldwide.

P|E|T reveals metastatic disease other imaging techniques simply can't detect.

P|E|T helps to diagnose cancer and guides physicians to the most beneficial therapies.

WHAT IS P|E|T ?

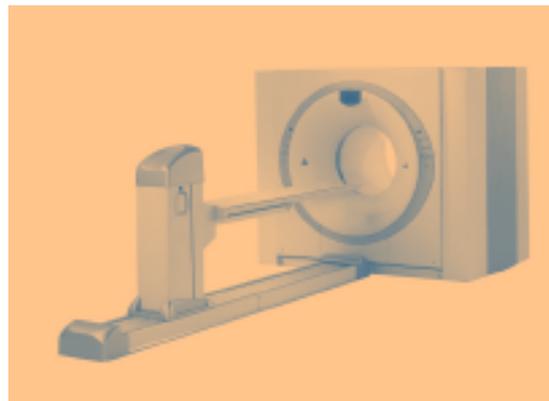


PET is a camera that produces powerful molecular images of the human body's biological functions and reveals the mysteries of health and disease.

- 1 Compounds like simple sugars (glucose, for example) are labeled with signal-emitting tracers and are injected into the patient.
- 2 A scanner records the signals these tracers emit as they journey through the human body and collect in the various organs targeted for examination.

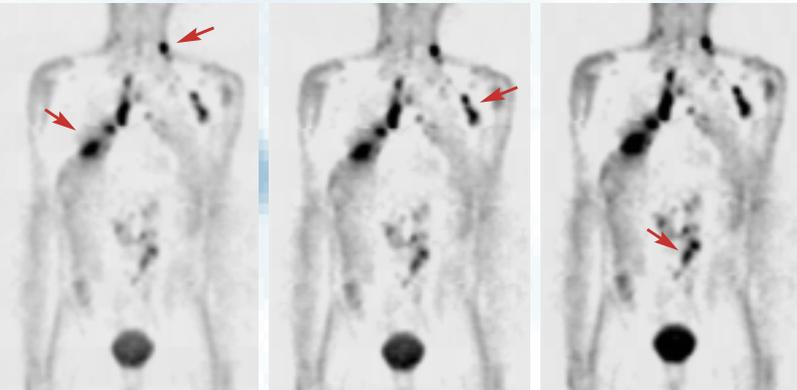
P E T / C T

New imaging technology merges PET and CT into one combined scanning system. The anatomical pictures produced by the CT scanner can be merged with the molecular images from PET. For instance, a tumor evident with CT can be confirmed as either malignant or benign with PET, and physicians can then use these fused images to target more effective therapies.



- 3 A computer reassembles the signals into actual images – the first pictures ever to show biological causes of normal organ function and failure of organ systems in disease.

WHAT CAN PET TELL ME ABOUT CANCER?



The PET scan shows a chain of lymph node tumors in the neck, chest and abdomen. Why are these

WHERE IS THE TUMOR?

tumors so visible? The patient is injected with a glucose tracer. Although glucose is used by all cells, more glucose is used by cells with increased metabolism. Because cancer cells are highly metabolic and use more glucose than neighboring cells, they are easily seen on the PET scan.

IS THE TUMOR BENIGN OR MALIGNANT?

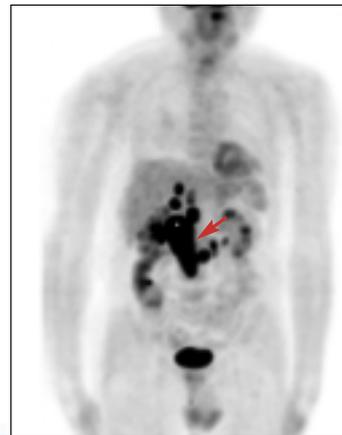
The high glucose metabolism of these Hodgkin's Lymphoma lesions indicates that

they are malignant. Armed with this knowledge, the physician is able to determine the best method for treatment.

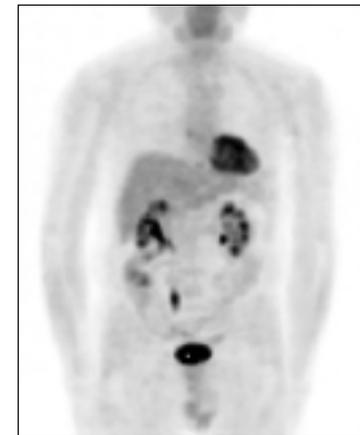
IS MY TREATMENT WORKING?

After chemotherapy, a PET scan proves that the cancer treatment has been effective.

Pre-chemotherapy, Staging PET, March, 2002



Post-chemotherapy, PET, July, 2002



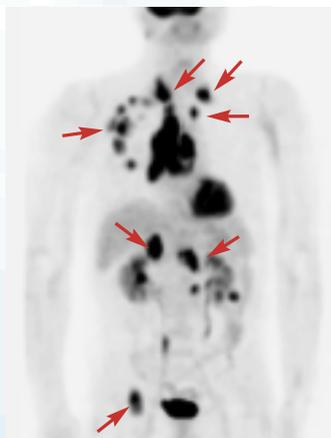
Update: This patient underwent chemotherapy and the subsequent PET scan showed no evidence of disease.

| LUNG CANCER

| COLORECTAL CANCER

| BREAST CANCER

| PROSTATE CANCER



A lesion is found on a chest x-ray, and a PET scan is performed to see if it is benign or malignant. The PET scan reveals that the

HAS THE CANCER SPREAD? lesion is malignant and also shows that metastases have spread to the left lung, abdomen and bones. PET can follow the course of the cancer through the body and accurately show the extent of the disease.

CANCER FACTS & PET

8.9 million living Americans have a history of cancer, and 1.3 million new cancer cases will be diagnosed this year. Peer-reviewed literature supports and clinical data demonstrates that PET is effective in the diagnosing and staging of most of these cancers.

CANCER DEATHS BY SITE

SITE	DEATHS
Lung	163,700
Colorectal	57,100
Breast	40,200
Prostate	28,900
Pancreatic	30,000
Female Reproductive	26,800
Lymphoma	24,700
Malignant Melanoma	9,800
Hodgkin's	1,300

(Cancer Facts and Figures 2003, American Cancer Society)

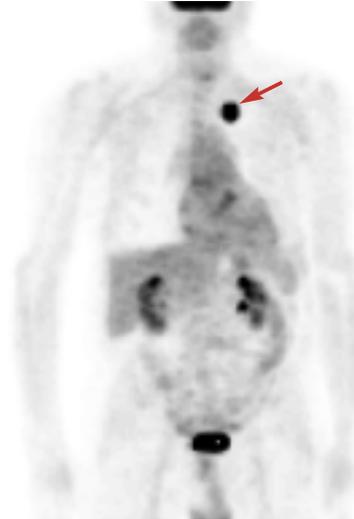
LUNG CANCER

New Cases 185,800/yr
Deaths 163,700/yr

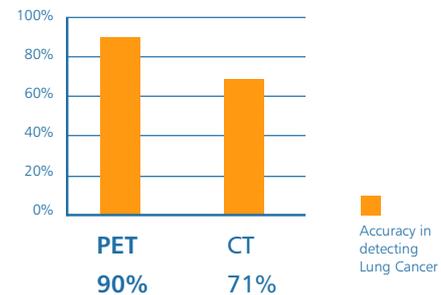
My 56-year old husband had a shadow on his chest x-ray, and his doctor can't tell if it's a benign or malignant lesion.

Prior to PET: Your husband would have undergone a needle biopsy or have had a portion of his lung removed to determine if the lesion was benign or malignant. If the lesion was malignant, he would have had CT scans and possibly more surgery.

With PET: The PET scan revealed a malignant lesion in the right lung. However, the cancer had not spread. Surgery was performed and all cancer was removed.



HOW DOES PET COMPARE?



(Peterman et al., N. Engl. J. Med 2000)

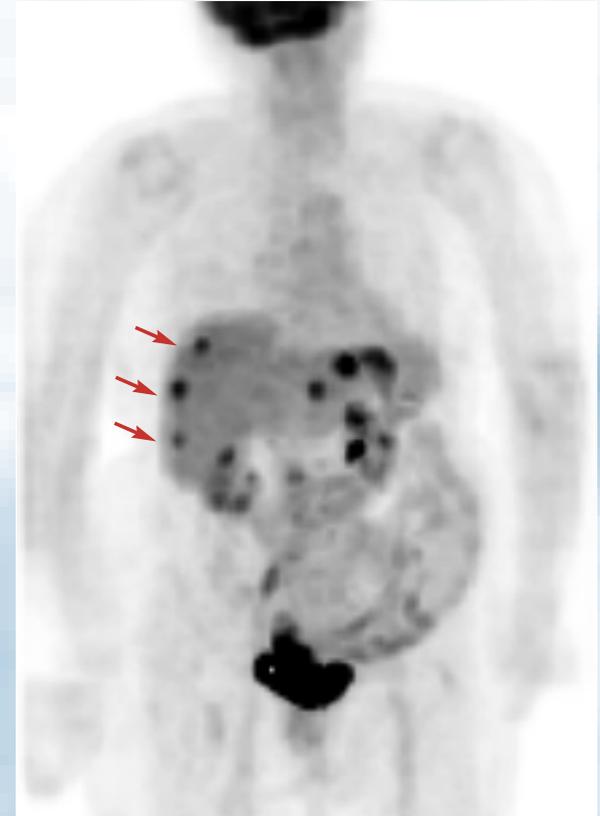
COLON CANCER

New Cases 147,500/yr
Deaths 57,100/yr

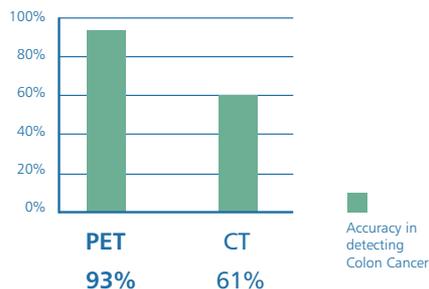
My 72-year old mother has a history of rectal cancer. Lately, her serum CEA levels have increased. Her doctor ordered a CT scan, but it was negative. Does my mother have a recurrence of the disease?

Prior to PET: CT scans would have continued periodically until the tumors were large enough to be detected, or a diagnostic laparotomy would have been performed to determine the source of the rising CEA levels.

With PET: With a rise in CEA tumor marker levels or if your mother is symptomatic, a PET scan should be the first diagnostic study to be performed. If the PET scan is positive, the same scan will also show the extent of the recurrent disease, indicating which surgical, radiation or medical treatment would benefit your mother most.



HOW DOES PET COMPARE?



(Huebner et al., JNM 2000)

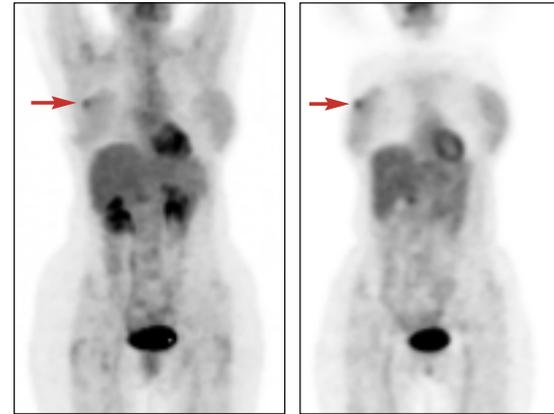
BREAST CANCER

New Cases 212,600/yr
Deaths 40,200/yr

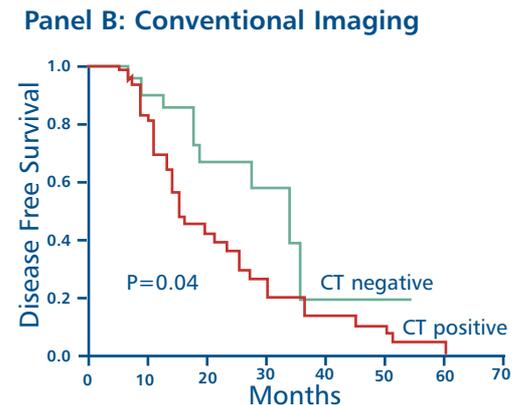
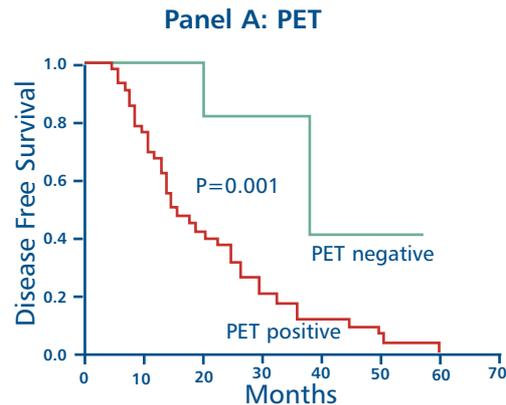
My 36-year old wife has breast cancer.
She had a lumpectomy one year ago. Recently,
she developed symptoms that concern us.

Prior to PET: Her doctor would have ordered a CT scan of the chest, mammogram, and perhaps a bone scan to search for possible recurrent disease. However, many anatomic imaging tests may not show recurrent disease at this stage.

With PET: Your wife had a single PET scan of the entire body that revealed recurrent disease of the right breast (arrow).



HOW DOES PET COMPARE?



(Vranjesvic et al., JNM 2002)

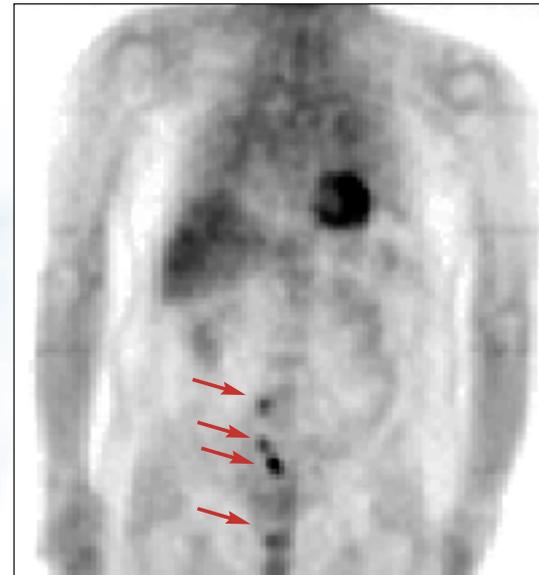
PROSTATE CANCER

New Cases 220,900/yr
Deaths 28,900/yr

My 72-year old father has prostate cancer. Four years ago he had a radical prostatectomy, but recently his PSA level has been rising.

Prior to PET: Your father would have undergone a bone scan, a CT scan and a monoclonal antibody scan which may have shown no evidence of metastasis.

With PET: If the cancer has recurred, the PET image will demonstrate intense glucose metabolism in the site of pelvic lymph node metastases. The PET findings will also show the presence of metastases in any other areas, such as bone or lung.



Update:

Although your father was considering radiation therapy for presumed local recurrence, the PET scan showed the cancer had spread. His physician was able to counsel him that he would not benefit from radiation therapy, and treatment for systemic disease was initiated.

CANCER AND PET

The most dangerous aspect of cancer is how it spreads throughout the organ systems of the body.

PET is a medical imaging modality that inspects all organ systems of the body to search for cancer in a single examination.

WHAT CAN PET

TELL ME ABOUT

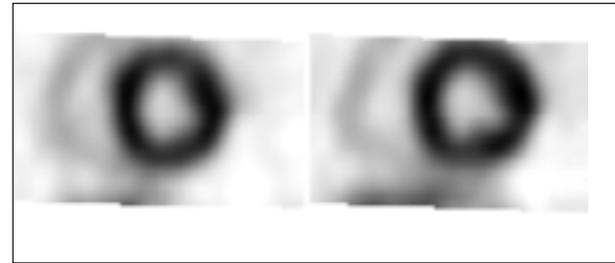
HEART DISEASE?

DO I HAVE CORONARY ARTERY DISEASE?

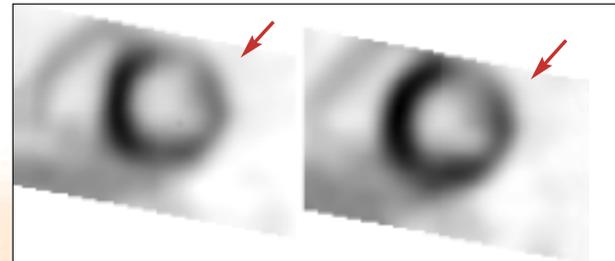
PET is the most accurate test to reveal coronary artery disease or rule out its presence. The PET

images show inadequate blood flow to the heart during stress undetected by other non-invasive cardiac tests.

REST



STRESS



45-year old patient with occasional chest discomfort. The PET scans show significant coronary artery disease.

PET is the gold standard to determine the viability

CORONARY ARTERY DISEASE

CARDIAC TRANSPLANTATION

BYPASS SURGERY

**I HAVE HEART FAILURE SYMPTOMS!
SHOULD I BE TREATED BY EITHER
TRANSPLANT OR BYPASS SURGERY?**

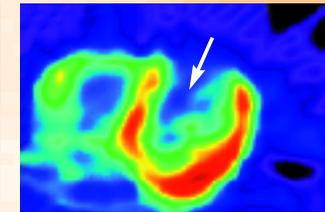
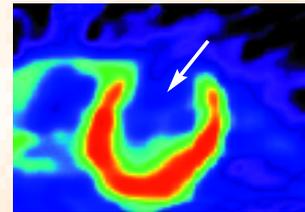
PATIENT 1: These PET scans reveal that both blood flow and metabolism are absent in a large area of the heart. The absence of metabolism indicates that the tissue is dead, so a cardiac transplantation would be the treatment of choice.

PATIENT 2: These PET scans reveal that blood flow is markedly reduced in a large area of the heart, but metabolism is maintained. Because metabolism indicates that the tissue is still alive, cardiac transplantation is not necessary for this patient. However, bypass surgery would improve the function of the heart.

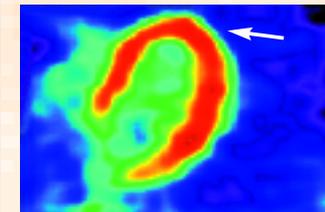
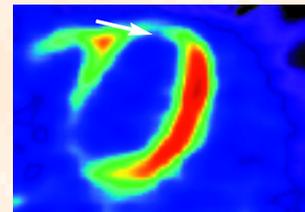
BLOOD FLOW

METABOLISM

PATIENT 1
(Transplant)

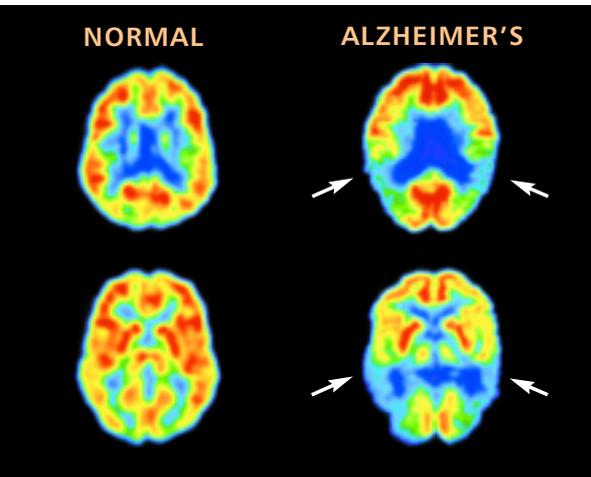


PATIENT 2
(Bypass)



of heart tissue for revascularization.

WHAT CAN PET TELL ME ABOUT BRAIN DISORDERS?



PET images of the brain will show if you have Parkinson's disease. A labeled amino acid called F-DOPA is used with PET to see if your brain has a deficiency in dopamine synthesis. If it doesn't, then you do not suffer from Parkinson's, and your tremor will be treated differently.

IF I HAVE A FEELING OF TREMOR IN MY MUSCLES, DO I HAVE PARKINSON'S DISEASE?

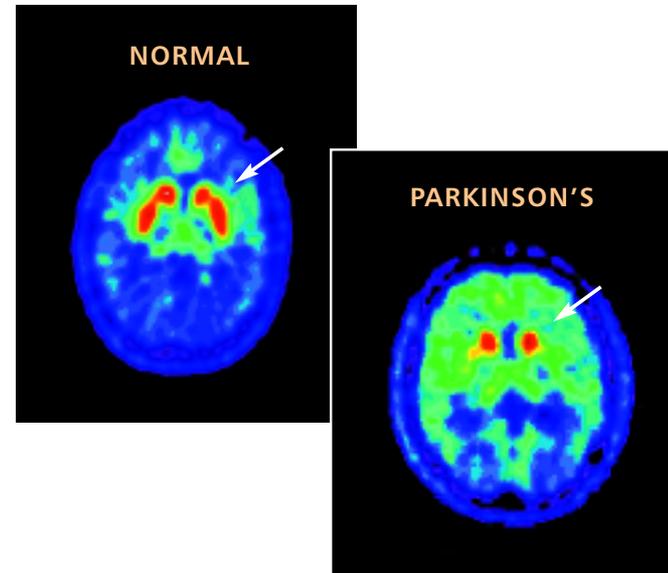
PET to see if your brain has a deficiency in dopamine synthesis. If it doesn't, then you do not suffer from Parkinson's, and your tremor will be treated differently.

PET scans show a very consistent diagnostic pattern for Alzheimer's disease, where certain regions of the brain have

MY DOCTOR SUSPECTS MY HUSBAND MAY HAVE ALZHEIMER'S DISEASE. WHAT CAN PET TELL US?

decreased metabolism early in the disease (see arrows). In fact, this pattern often can be recognized several years before a physician is able to confirm

the diagnosis and is also used to differentiate Alzheimer's from other confounding types of dementia or depression.



| ALZHEIMER'S DISEASE

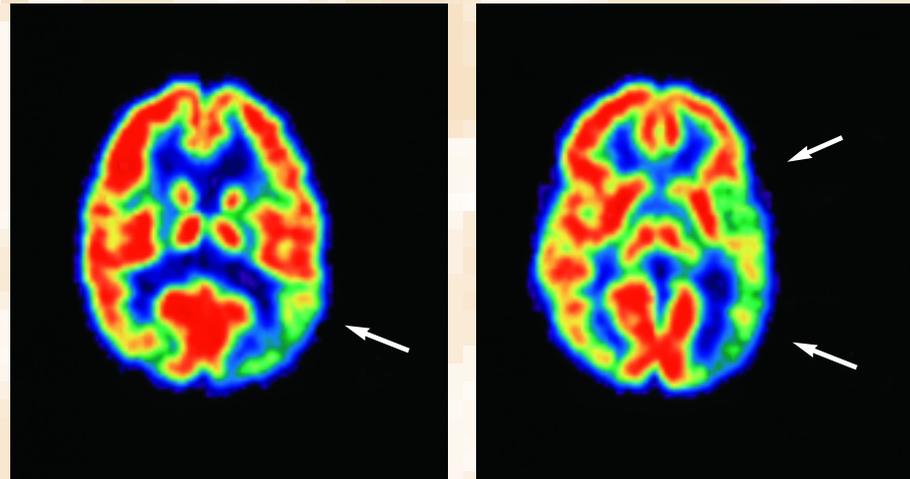
| PARKINSON'S DISEASE

| SEIZURE DISORDERS

IF MY CHILD HAS SEIZURES, AND IF MEDICAL THERAPY DOESN'T WORK, CAN PET HELP?

PET images of the brain identify regions of reduced glucose metabolism, pinpointing the epileptogenic tissue.

Surgical techniques are now available to successfully remove the tissue, leading to a definitive cure of the seizure disorder in 80% of these children.



The PET scan showed abnormal glucose metabolism in the back of the right hemisphere (see arrows). Following surgical removal of the dysfunctional brain area, the child was seizure-free.

P|E|T FACTS

IN A WORLD OF LIMITED RESOURCES, **PET** SAVES TIME, SAVES MONEY, AND, MOST IMPORTANTLY, SAVES LIVES.

PET can effectively pinpoint the source of many of the most common cancers, heart disease and neurological disorders like Alzheimer's disease, eliminating the need for redundant tests and diagnostic surgical procedures. **PET** is a powerful, proven diagnostic imaging modality that displays the biological basis of function in the organ systems of the human body unobtainable through any other means.

PET is safe.

PET can tell whether a tumor is benign or cancerous.

PET shows all the organ systems of the body in a single exam, so it can indicate whether or not cancer has spread.

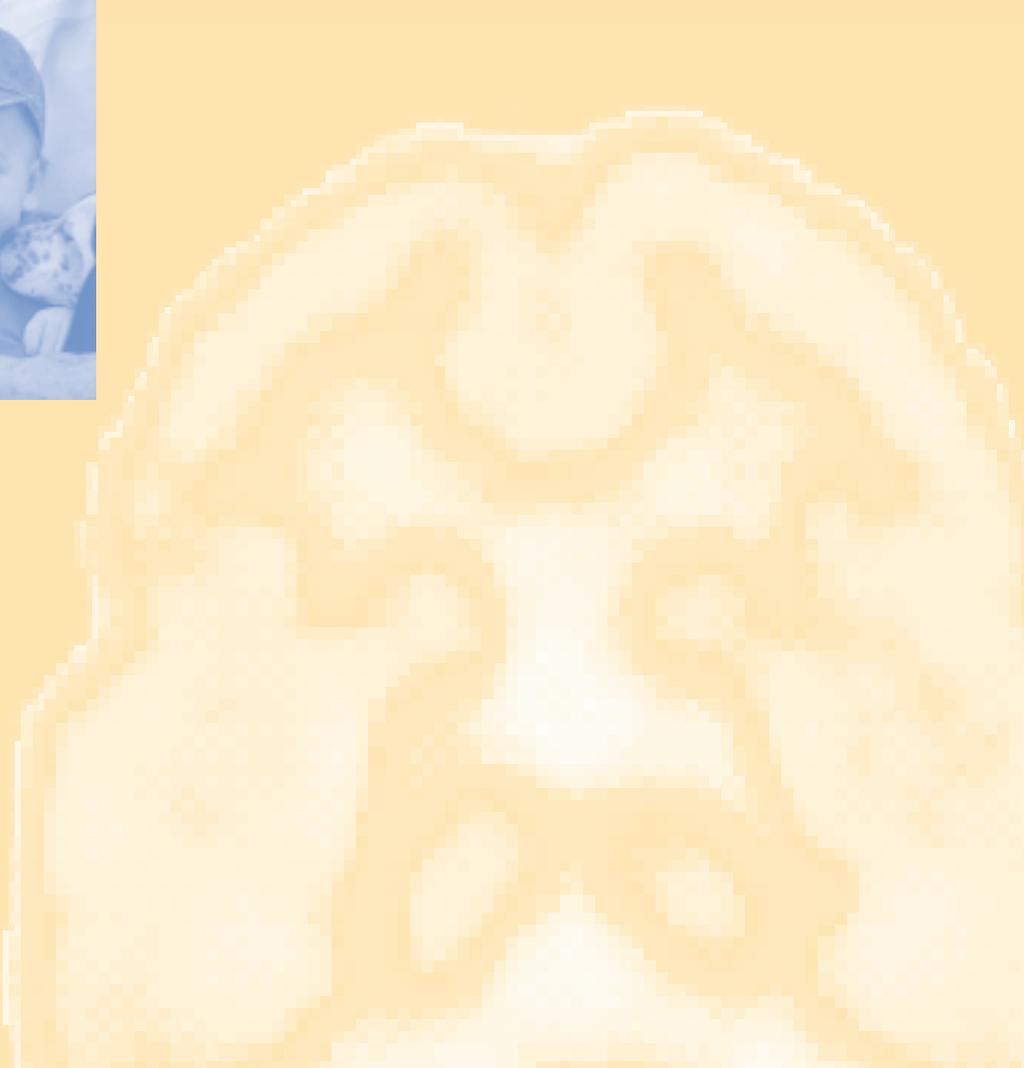
PET diagnoses disease often before it shows up on other tests.

PET shows the progress of disease and how the body responds to treatment.

New, combined **PET/CT** scanners provide physicians with both anatomical and molecular images in the same test.

Medicare now covers **PET** imaging for many cancer indications, such as lung, breast, colorectal, head and neck and esophageal cancer, lymphoma and melanoma. Coverage is also available for epilepsy, and heart disease.

This child had a brain tumor that was surgically removed. Radiation therapy followed. Subsequently, an MRI scan revealed a change in the structure of his brain near the surgical site, but could not reveal if the structural change was the result of scar tissue or tumor re-growth.



P|E|T proved the structural change was scar tissue and not a tumor.

P|E|T is the only metabolic tool powerful enough to accurately image and measure the metabolic function of cancer.

P|E|T saved this child from unnecessary surgery, and his family was spared the emotional trauma of further diagnostic evaluation.

"While developing the first PET scanner in 1973, I believed it would become a remarkable medical research tool that would allow us to watch, study and understand the biology of human disease. After all, the basis of PET imaging is biological, and the basis of disease is also biological. This belief was confirmed during the next two decades, as medical scientists around the world used PET to make many extraordinary discoveries about the brain, the heart and cancer.

"Simultaneously, amazing discoveries occurred in biology, as scientists forged their way to the genetic core of cells that determine how the organ systems of our bodies function. Ultimately, the search for and identification of the original molecular errors of disease and their correction within the genetic makeup of the cell has created a new vision of medicine.

"PET is part of that new vision. Firmly based upon the scientific discoveries and technical advances of the worldwide PET research programs, PET is the imaging technology of the new molecular medicine."

Dr. Michael E. Phelps

Norton Simon Professor

Chair, Department of Molecular
& Medical Pharmacology

Director, Institute of Molecular Medicine

Chief, Division of Nuclear Medicine

David Geffen School of Medicine at UCLA

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