Interventional Quarter ISSUE 1 - March 2010

Intervention IQ

Your portal to modern medicine

The Political Threat to MRI Development

Recruiting Interventional Radiologists

Vertebroplasty: What the Studies Failed to Mention

Understanding Cancer

Strength in Unity: Multi-disciplinary Cancer Care

A Focused Approach - Non-Invasive Therapy

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A Welcome from the Editor

Dear Readers,

Welcome to the second edition of Interventional Quarter! Once again, we bring you an interesting mix of interviews, reports, updates and tit bits from the world of interventional medicine.

Our leading theme for this issue is the realm of cancer care. This is important for several reasons - with our aging population and industrialised society, cancer has become ever more prevalent, and is thus a key concern for medicine generally. Added to that, interventional innovations have shown themselves to be suitable for treating many oncologic conditions, and this has started us down an exciting road of medical discovery. Oncology is fast becoming a key part of interventional medicine, and is thus a topic worthy of our attention. World renowned interventional oncologist, Riccardo Lencioni, has acted as editorial advisor for this issue, and we are grateful to him and our many expert contributors.

As it is such a broad and multifaceted field, we have decided to dedicate two editions of Interventional Quarter to examining this subject. The one you hold in your hands seeks to give a general understanding of the condition itself in its many forms, and give an introduction to the various treatments that are available and how multidisciplinary collaboration is making impressive progress. Our second issue on oncology, which will be published in June, will look more closely at the involvement of interventional medicine specifically, showing how IR techniques have revolutionised cancer treatment. Contributions from leading experts in cancer care will show the importance of patient selection, how personalised treatment is becoming a reality, and the remarkable results of cutting-edge developments.

But this edition contains more than that - as always, we examine the political, social and economic issues that continue to shape our work, and bring you news of new technologies and research.

Needless to say, we welcome your input and feedback. This is your magazine, and we aim to promote interaction and cooperation within medicine. So please send any comments, news or suggestions to us at info@intervention-iq.org.

We wish you pleasant reading!

Professor Jim A. Reekers
Editor-in-Chief

General Information

Interventional Quarter is published three times a year. To add an address to the mailing list, please contact info@intervention-iq.org or refer to www.intervention-iq.org.

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An invitation to our readers

IQ is your magazine, and we would welcome your views and your news. Readers who wish to comment on any of the issues raised (or who would like to raise any of their own) are most welcome to submit letters to the Editor. Likewise, if you have any promotions, awards, honorary lectures or other tit-bits you'd like to share with the interventional community, please send them to us by post or by email.

We look forward to hearing from you!
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Contents

Understanding **Cancer**

What is Cancer?

Cancer is a word that we are all familiar with, but most of us are less familiar with the facts behind the condition. It is estimated that one in three of us will be afflicted with cancer in our lifetime[1], and so is something we should all be aware of - but are we really aware? What is cancer, what are the risk factors, and what are the treatment options available? We take a closer look at the pioneering role interventional radiology is taking in the battle against perhaps the most feared and poorly understood of diseases.

"What we do not understand, we cannot control."
Charles Reich

www.who.int/cancer/en
www.cancerresearchuk.org
www.cancer.gov
www.cirse.org
www.esmo.org
www.ilca-online.org
www.ecco-org.eu

Cancer … is in fact a class of diseases

It is important to realise that "cancer", though often spoken of as an absolute, a proper noun, is in fact a class of diseases. The word reverberates in our head like a death sentence, but not all cancers will progress to being terminal, and cancerous growths can manifest themselves in many different forms. While it is important to take cancerous growths seriously, and many lives have been lost to it, there have also been studies which suggest many of us may experience cancerous growths that do no harm, or even shrink or disappear on their own[2].

Cancer could be defined as a malfunctioning of tissue growth regulation.
The body's cells constantly grow and divide to replace old and damaged cells. When cells replicate and renew themselves, there is always the possibility of error. The body has error correction and prevention measures to cull any malfunctioning cells. But these measures can fail, usually when exposed to carcinogens (cancer-encouraging substances), injury (physical, heat etc.), or inhospitable environments (e.g. hypoxia - oxygen deprivation of tissue). Normal control is lost, and the cells grow and divide uncontrollably.

What differentiates cancer from other benign (harmless) growths are three malignant properties - *uncontrolled growth, invasion of adjacent tissue*, and sometimes *metastasis* (spreading to other locations via lymph or blood). Most cancers take the form of tumours, but some, like leukaemia, do not. Any living organism can develop cancer, and it can affect any age group, but its risk increases with age - 64% of newly diagnosed cancers occur in people over 65 years of age[3].

When errors do occur, they can be self-amplifying, and can progress at an exponential rate. For example, a mutation of endocrine machinery (chemical message senders) can cause the mutant cell to send error-causing signals to other cells, passing the erroneous "message" on indefinitely, or a mutation may cause affected cells to migrate and disrupt healthy cells.

This is one of the reasons cancer can be so hard to treat - if 10 million cancer cells are targeted, and even 10 survive, these surviving cells can continue to replicate or spread or send error messages, starting the whole cycle over again - a vicious cycle that ironically parodies the survival of the fittest.

1 *www.macmillan.org.uk*
2 *www.nytimes.com/2009/10/27/health/27canc.html?_r=1&ref=health*
3 *www.macmillan.org.uk*

What causes cancer?

Cell mutation can happen for a number of reasons, due to carcinogens or random errors in DNA replications, or are inherited.

Carcinogens
One of the most important, in modern terms, is the effect of carcinogens - substances which cause or increase likelihood of cancer. Cancer has always been with us, but its vastly increased occurrence in the modern world is credited to our increased exposure to carcinogens. Some of these are mutagens, which cause DNA mutations, such as asbestos or tobacco smoke, which contains over 50 known carcinogens, and is considered responsible for one in three cancer deaths in the developed world, and one in five worldwide. Other substances, such as alcohol, do not change DNA structure, but may stimulate the rate of cell division, which allows less time for the cell's repair mechanisms to do their work, increasing the chance of mutant cells reproducing.

Viruses
Viruses are responsible for 15% of human cancers worldwide, e.g. the human papillomavirus (cervical cancer), hepatitis B and hepatitis C virus (liver cancer). They are considered the second greatest cancer risk factor to humans after tobacco smoke.

Ionising Radiation
Mutation can also occur from ionising radiation (UV light from sun increasing the risk of melanoma etc.), and radon gas. According to the UK's annual mortality statistics for 2008, pilots and aircrew suffer from higher levels of skin cancer than other professions.

Diet
As a result of diet, gastric cancer is more common in Japan, and colon cancer in the USA, with immigrants developing the risk of the new country, often within one generation - which precludes genetic predisposition from the equation. Grilled meat increases stomach cancer risk, and other studies suggest fats, sugars, refined carbohydrates, and red or processed meat increase the risks.

>

Viruses … are considered the second greatest cancer risk factor to humans after tobacco smoke

>

Inherited Mutations
Most forms of cancer are sporadic, but some inherited predispositions have been identified - inherited mutations in the genes BRCA1 and BRCA2 are linked with an elevated risk of breast and ovarian cancer, and colorectal cancer, uterine cancer, gastric cancer, ovarian cancer and retinoblastoma (cancer of the retina, affecting young children) can also be inherited.

Other causes include:

- **Hormonal excesses**
  Example: excess oestrogen, also from birth control pills, could lead to endometrial cancer.
- **Immune system deficiency**
  Example: HIV.
- **Transmission during pregnancy**
  This is rare.
- **Donated organs**
  Rare - issue graft rejection caused by MHC incompatibility means transmission is unlikely.
- **Vitamin D deficiency**
  Exposure to UV light increases cancer risk - but it also raises the body's vitamin D levels, which may in turn reduce cancer risk. This shows the difficulty in effectively reducing cancer risk, as there are so many conflicting factors.

Symptoms

There are three groups of cancer symptoms:

- **Local symptoms:**
  include lumps or swelling, pain, bleeding, ulceration or jaundice.
- **Symptoms of metastasis:**
  include enlarged lymph nodes, enlarged liver, coughing, bone pain or fracturing.
- **Systematic symptoms:**
  include weight loss, fatigue, poor appetite, wasting (cachexia), anaemia, excessive sweating or specific symptoms of an active cancer, such as hormonal changes or thrombosis.

A patient whose cancer is detected in the early stages stands a significantly better chance of survival

Diagnosis

There are three main routes by which cancer can be detected - due to symptoms, as a result of screening, or by genetic testing. Should any of these avenues suggest cancer, a biopsy is required to diagnose it.

Screening

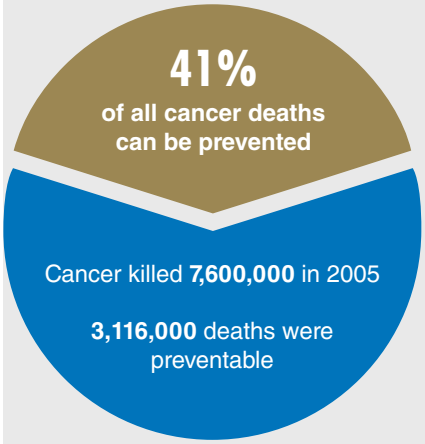
Screening can take a number of different forms. Self-examination can often detect the first sign of a cancerous growth, and many doctors recommend that their patients carry out breast or testicular self-examination regularly. This is only useful for a restricted number of cancers - patients are not in a position to self-examine for lung cancers, for example.

There are different tests that can indicate different cancers, for example, blood tests looking for antibodies or abnormalities, or physical exams. Digital rectal examination checks for prostate or rectal cancer, colonoscopy or testing of faeces for blood can detect colorectal cancer, and Pap smear tests gather a sample of cells from the neck of the cervix for examination for cervical cancer.

Radiological imaging is frequently used to detect abnormal tissue mass. Some techniques are routinely offered to "at risk" groups, such as mammograms (x-ray of breast tissue) for women above a certain age (usually post-menopausal). CTs are recommended for smokers in the US. Other recent developments in diagnostic radiology include 3D applications such as virtual colonoscopy (CT or MRI imaging of the colon) and the PET scan (positron emission tomography, where FDG radionuclides are introduced to the body and are tracked and used to visualise inside the body using computer reconstruction).

There has been controversy over whether the risks of screening outweigh the benefits, as demonstrated by November 2009's highly disputed U.S. Preventive Services Task Force recommendation on mammography. Critics of universal screening cite the high numbers of false positives, the high costs in relation to the low level of detection, and so-called "incidentalomas" - growths found not due to symptoms, but by chance, and which may be no danger to patients, but lead to unnecessary and even dangerous therapy being pursued. Even diagnostic measures can have negative side-effects - prostate biopsy may cause bleeding or infection. However, it is also recognised that a patient whose cancer is detected in the early stages stands a significantly better chance of survival (five times better than late stage cancers), so it is a difficult call for health providers and patients to make.

Cervical cancer screening is generally thought to have the best results - it is inexpensive, the risk factors are known (viral infection, spread by sexual contact), and it progresses slowly.



Leading Modifiable Risk Factors

Smoking
Alcohol
Poor Diet & Overweight
Unsafe Sex
Physical Inactivity

- *Danaei G, Vander Hoorn S, Lopez AD, Murray CJ, Ezzati M. Causes of cancer in the world: comparative risk assessment of nine behavioural and environmental risk factors. The Lancet 2005; 366:1784-1793*
- *https://apps.who.int/infobase/report.aspx?rid=126*

Genetic Testing

This is often available for high risk individuals (i.e. those with inherited cancers in their family), and detects cancer-related genetic mutations.
A person's DNA is tested, usually through a blood sample, or another body fluid or tissue. While it does not diagnose cancer itself, it identifies if an individual carries a gene mutation linked to increased cancer risk, and can demonstrate if the individual will benefit from enhanced surveillance, chemoprevention drugs, or risk-reducing surgery (e.g. pre-emptive mastectomy - surgical removal of breast tissue). In the UK, this testing is available under NHS funding to all women with a family history of breast cancer.

Preventative Treatment

There are several medications available that can be used preventatively. Chemoprevention drugs work by inhibiting certain trigger factors, such as hormones. These medications are only used in patients deemed at high risk, which is usually established by genetic testing. Women with a genetic predisposition towards developing breast cancer may benefit from medication containing selective oestrogen receptor modulators (SERM), such as tamoxifen or raloxifene. Another drug, Finasteride, a 5-alpha-reductase inhibitor, lowers the risk of prostate cancer, and COX-2 inhibitors reduce the risk of developing colon polyps.

Currently, there are also several vaccinations available against cancer-related viruses, such as HPV, which can lead to cervical cancer, and Hepatitis B, which can cause liver cancer.

Biopsy

Any suspect case must be confirmed histologically, i.e. by a pathologist examining a tissue biopsy specimen under a microscope. A biopsy involves removing a sample of the suspect tissue for this purpose and is usually carried out by an interventional radiologist or a surgeon. Biopsy is important not only to detect if the growth is benign or malignant (cancerous), but also to identify the type of cancer present (if malignant). Determining the stage of cancer and its grade (how much it differs from normal tissue) can help doctors define the prognosis and choose a suitable therapy.

Open Surgical Biopsy

Ten years ago, open surgical biopsy (under general anaesthetic) was the most common method of obtaining this sample. This is still performed when the entire lump should be removed in one go, which is known as an excisional biopsy. Furthermore, if a lump can be clearly felt, it is also likely to be carried out by a surgeon.

Less Invasive Biopsy

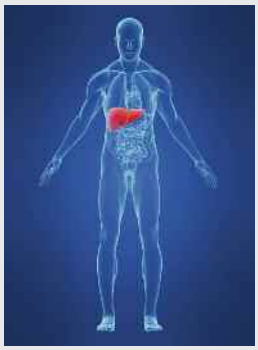
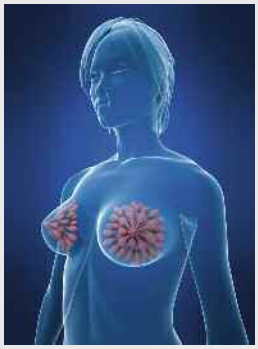
Nowadays, however, less invasive procedures are generally favoured and biopsies are usually done using needles. If the location of the problem tissue is less accessible or certain, an interventional radiologist will perform the procedure under image guidance (e.g. x-ray, ultrasound).

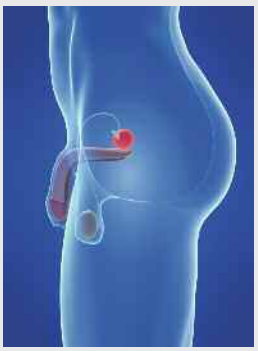
- **Fine Needle Aspiration** involves the physician in question inserting a fine needle into the suspect site and extracting cells or fluid, which will then be sent to a pathologist for examination.
- **Core Needle Biopsy** is carried out in much the same way, only a larger, hollow needle is used. This is used to remove a small but solid sample of tissue. As the needle is larger, local anaesthetic is generally used, and this method is more likely to cause bruising, but this is usually minor if it occurs, and complications are rare.
- **Vacuum Assisted Biopsy** is essentially the same as Core Needle Biopsy, but with vacuum assistance to help gather the sample tissue.

Other forms of biopsy are also used for taking samples of suspected skin cancer, such as curettage or punch biopsy.

Cancer Types

The following cancer types are commonly treated using minimally invasive procedures:

Cancer Type	Description
Liver cancer 	The liver is the biggest organ in the body, and is particularly prone to metastasis from other sites, given its role as the body's detoxifier. It can also, of course, develop primary cancers. It can be problematic to treat, given it is mostly located under the ribs. ***Types:*** HCC - hepatocellular carcinoma, hepatoblastoma, cholangiocarcinomas (bile duct cancers), angiosarcomas and hemangiosarcomas (rare). ***Symptoms:*** Abdominal mass, abdominal pain, jaundice, nausea, other liver dysfunction. ***Interventional Treatment:*** Thermoablation, chemoembolisation.
Lung cancer 	Lung cancer is the most common cause of cancer death, primarily as a result of smoking, but can also be caused by exposure to radon gas (present in ground rock in some areas), asbestos or viruses. It was uncommon before smoking, and only recognised as a disease in 1761 (although unspecified lung disease had long been common in silver miners, who had high exposure to radon). It is a common site for breast cancer metastasis. ***Symptoms:*** Shortness of breath, coughing (including coughing up blood), weight loss, hoarse voice, dysphagia (difficulty in swallowing). ***Interventional Treatment:*** Radiofrequency ablation, thermal ablation.
Breast cancer 	Breast cancer can affect both sexes, but is 100 times more frequent in women. Counting both sexes, it is the second most common cancer type, accounting for 10.4% of all cancer incidence. The currently accepted staging scheme for breast cancer is the TNM classification - the Tumour itself, whether it has spread to lymph Nodes, and whether there are any metastases to locations other than the breast and lymph nodes. ***Symptoms:*** Lump on the breast, changes in breast size or shape, or of the nipple. Occasionally present in later stages: weight loss, fever, chills. ***Interventional Treatment:*** Radiofrequency ablation, laser therapy.
Kidney cancer 	Kidney cancer accounts for just fewer than 2% of all cancers. The two main forms it takes are renal cell carcinoma (RCC) and urothelial cell carcinoma (UCC). There are five hereditary syndromes associated with RCC, and other risk factors include smoking, obesity, high blood pressure and long-term dialysis. At the time of diagnosis, 25-30% of patients have metastasis. RCC is one of the most lethal genitourinary tumours. ***Symptoms:*** Blood in the urine, a lump or pain in the side, weight loss, fever and fatigue. Many patients experience no symptoms, and tumours are often found incidentally while imaging for other complaints. ***Interventional Treatment:*** Radiofrequency ablation, cryoablation. Chemotherapy and radiotherapy are generally ineffective at curing kidney cancer, and many patients are not eligible for surgery due to underlying medical conditions, making minimally invasive options preferable.

Cancer Type	Description
Bone cancer 	The adult body has 206 bones for structure, support, movement, protection, blood production (marrow) and control of proteins and nutrients. Most bone tumours are metastatic, and primary bone tumours are more common in young males. ***Symptoms:*** Loss of bone density, structural issues, pain (initially only at night/with activity). Occasionally: fever, chills, night sweats, weight loss (more common following metastasis). ***Interventional Treatment:*** Radiofrequency ablation, vertebroplasty.
Colorectal cancer 	Colorectal cancer (of colon, rectum or appendix) is the third most common form of cancer, and the third biggest cause of cancer death in the West. The estimated lifetime risk (US) is 7%. Age is a major risk factor, as it is uncommon in under-50s without previous family history or personal history of cancer. It can also be influenced by diet, smoking, physical inactivity, other bowel complaints, certain viruses and alcohol. Colorectal cancer may also invade the bladder or female reproductive tract and commonly spreads to liver. ***Symptoms:*** If tumour located close to anus: change in bowel habit or stool appearance (narrowing of stool, red/black colour). In case of chronic occult bleeding: anaemia (constitutional symptoms), weight loss, fever, thrombosis. ***Interventional Treatment:*** High intensity focused ultrasound (HIFU).
Prostate cancer 	The prostate is a gland in the male reproductive system, which helps make and store seminal fluid. Cancer of the prostate tends to develop in men over 50 (average age of diagnosis is 70), and while the specific causes are unknown, genetics, diet, race, lifestyle and medications may factor. It is a slow-growing cancer. Accordingly, there is debate surrounding the suitability of routine screening programmes, as it is estimated that many of those diagnosed and treated receive no benefit. In many cases, "watchful waiting" is the treatment of choice. ***Symptoms:*** Pain, difficulty urinating, erectile dysfunction. Many patients experience no symptoms and patients die from unrelated causes (often without knowing they had it). ***Interventional Treatment:*** Cryoablation, high intensity focused ultrasound (HIFU), robotic radical prostatectomy, laparoscopy. It is hoped that minimally invasive treatments can reduce the likelihood of incontinence and/or erectile dysfunction.
Complications	As cancer is an invasive disease, it can cause many complications. Growths can press on nerves, causing intense pain; cancers can metastasise to blood vessels, leading to internal bleeding; tumours can obstruct vessels, impeding their functions and preventing normal drainage form organs such as the bladder or gall bladder, which can lead to infection or organ failure; therapies can cause blood clots and reduced blood flow. For all of these complications, interventional radiology can help. ***Interventional Treatment:*** Embolisation, catheter drainage, stenting, blood clot filters, thrombolysis, shunting.

Explanation of interventional treatments to be found on the following pages.

Cancer Treatment - Therapies & Medications

There is no single treatment for all forms of cancer and physicians must choose what is appropriate for the patient from the range of options available. Recent advancements in cancer research have lead to a better understanding of the nature of the disease, and with that, of the best way to combine treatments. This has lead to more focused care (drug combinations, therapy combinations), as well as the possibility of gene therapy.

The treatments outlined on the following pages are used alone or in combination to fight cancer.

Interventional radiology is also adapting older therapies, combining them with new, more localised delivery systems. Please see ***intra-arterial chemotherapy*, magnetic chemotherapy*, gene therapy*** and ***robot-assisted surgery* and overleaf for more extensive IR techniques***.

Chemotherapy

Suitable for most forms of cancer. Difficulties administering to brain tumours due to blood-brain barrier.

There are more than 50 cytotoxic (cancer-killing) drugs in use. These target rapidly dividing or growing cells, but while effective against cancer, they can also kill healthy cells, especially hair, blood-forming cells and cells lining the digestive system.
Some can be taken as tablets or capsules, but they are mostly administered by I.V. drip, and often given in combination of two, three or more. The drugs take effect system-wide and can cause side-effects, which often include nausea, vomiting, hair loss, infection and fatigue. Recent advances in cancer studies have allowed more effective combinations that have fewer side-effects, and therapies such as **focused ultrasound** which may allow drugs to be administered locally (see page 56).

Intra-arterial chemotherapy also avoids system-wide treatment, administering the drugs directly to the site via catheter. It uses only 5% of drugs normally prescribed, yet the results are as good or better. As a local treatment, it avoids systematic illness between treatments. At present, it is only used as a last resort, but promising results may make it a primary treatment. *In August 2009, Great Ormond Street Hospital in London released successful results in 12 children with retinoblastoma. New York Presbyterian Hospital used microcatheters to perform similar procedures on brain tumours in autumn 2009, with positive initial results.*

Magnetic chemotherapy is still in development. Nanomagnets (nanometre = distance fingernail grows in one second) are stem cells tagged with microscopic particles containing iron. Scientists have succeeded in steering these, using an external magnetic field and image guidance, to target some conditions in rats. As nanoparticles are already approved for use in humans by the FDA (US), human trials could begin within three to five years. By using this technique to tag antibodies or viruses, cancerous tissue could viably be targeted. This procedure can be used to target, and with MRI, to observe cell behaviour.

Hormonal Therapy

Suitable for hormone-dependent cancers, e.g. breast, prostate, ovarian.

Hormone therapy drugs - effective against cancers that depend on hormones to grow and spread. These drugs reduce levels of certain hormones, hindering the cancer growth. This can also cause side-effects, including mood swings and decreased sexual desire. Cancers may become resistant to the drug. Similar outcomes can be achieved by surgical removal of certain glands or organs. The drugs are usually prescribed in conjunction with other therapies, such as chemo- or radiation therapy.

Biological Therapy

Biological therapy drugs - "biological response modifiers" (BRMs) - seek to stimulate and enhance the body's own immune system to fight cancer, or reduce the side-effects of treatment. These can include:

- monoclonal antibodies (artificial antibodies, which may carry a radioactive molecule);
- genetically altered cells with enhanced immune defences or drug-delivery properties;
- vaccines (early stages);
- gene therapy (see overleaf);
- EGFR (epithelial growth factor receptor) inhibitors, which curtail cell growth by interfering with chemical messengers.

*Gene Therapy**

There are numerous research projects in progress to find ways to use genetic alteration to fight cancer, either by:

- activating the patient's own immune system (a de facto vaccine);
- replacing faulty genes with healthy ones;
- genetically making cancer cells more susceptible to chemotherapy agents; or
- combining antibodies and cytotoxic drugs within a liposome, so it targets the cancer specifically.

There are many possibilities, and some projects are showing excellent potential. Interventional radiology is expected to play an important part in administering these treatments.

Other Medication

- Chemotherapy drugs;
- Corticosteroids - are anti-inflammatory medicines, which are synthetic versions of the natural steroid cortisol. Can be used as a form of chemotherapy to kill cancer cells. They can also relieve pain and swelling, and improve appetite;
- Pain medications;
- Radiosensitisers - make the cancer cells more susceptible to radiation therapy;
- Retinoids - are substances that help regulate the work of genes as cells grow and divide, potentially preventing or treating cancers, but are also associated with serious side-effects when used by pregnant women, such as birth defects;
- Nexavar (Sorafenib) - used to treat renal cell carcinoma and hepatocellular carcinoma. Molecular (kinase) inhibitor. It is the only medication approved for use in liver cancer in Europe, and the only drug that has been proven to increase patient's life expectancy.

Radiotherapy

Rarely used before surgery, as it increases the risk of wound problems, but is commonly used after surgery to tackle positive margins (presence of cancer cells at the edge of a biopsy sample, e.g. breast cancer).

The use of high energy x-rays to destroy cancer cells. It is generally given during daily sessions over five to seven weeks (fractionation). It mostly causes little harm to healthy cells, but can have side-effects, depending on the area treated, the most common of which is fatigue, but also loss of appetite, and damage to surrounding skin, soft tissue or organs. It can also be applied by means of implants, which may be fractionated or permanent seeds which deliver slowly until they become inactive (e.g. brachytherapy, balloon brachytherapy). A new therapy, **stereotactic body radiation therapy (SBRT)**, involves just three outpatient sessions that last one hour each, which is not as exhausting as traditional radiotherapy.

Cancer Treatment - Surgery

Surgical Techniques

Surgical removal of tumour still considered optimal treatment, and used whenever possible, but often in combination with other therapies to shrink or impair cancer for improved surgical success.

Used when cancer is in one area and has not spread. When possible, only the tumour is removed - this is called a lumpectomy. Lymph nodes may also be removed, if the cancer has spread to them. The most extreme form is removal of large portions of affected tissue, such as a mastectomy (surgical removal of breast tissue). If it is discovered or suspected that any cancer cells remain (positive surgical margins), follow-up with radiotherapy may be needed.

Robot-assisted surgery* is currently in development. Much of this would be done under image guidance. Researchers hope that robot-assisted surgery will minimise incisions and provide greater accuracy.

Cancer Treatment - Active surveillance

Watchful Waiting

Used for slow-growing, non-threatening cancers (e.g. prostate).

Where cancers are progressing slowly, and treatment could have negative side-effects, doctors may simply observe the cancer until there is a need for treatment.

Please turn overleaf for minimally invasive procedures under image guidance.

Cancer Treatment - Interventional Oncology

Minimally Invasive Procedures under Image Guidance

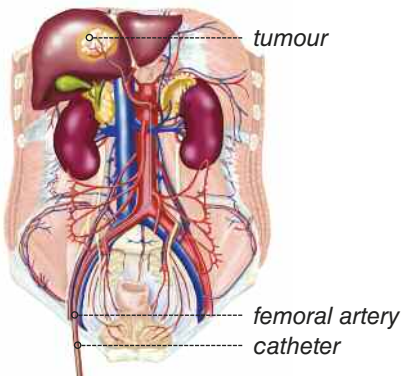
Interventional radiology began its work in oncology decades ago, but since then the level of involvement has grown incredibly.

Indeed, the field has progressed so much that the term "interventional oncology" has been coined to cover the range of procedures offered, and it is fast becoming the fourth arm of cancer treatment.

Embolisation Techniques

Transarterial Embolisation

Embolisation blocks (embolises) the blood supply to the tumour. This is done by inserting a catheter into the femoral artery through a small nick in the groin, and feeding it under image guidance to the problem area. The catheter then delivers tiny clotting agents (plastic particles, coils, gelfoam, etc.) directly to the area to stop the blood flow to a tumour causing it to eventually shrivel and die. This is carried out under local anaesthesia.



Transcatheter Arterial Chemoembolisation (TACE)

Most commonly used for liver tumours, particularly when the liver has multiple masses.

Chemoembolisation uses the same process as standard embolisation, but the materials used are different. The clotting agents are dosed with cancer-fighting drugs. As the drugs are delivered locally, rather than system-wide, doses up to 200 times stronger than conventional chemotherapy can be used. These can remain active in the tumour for a month, treating the tumour and blocking blood supply simultaneously.

Yttrium-90 Radioembolisation

Used palliatively to treat primary and metastatic liver tumours, particularly good for multiple, scattered tumours. Suitable for use in both patients without cirrhosis, and those whose cirrhosis is not too advanced, as good liver function is required (e.g. Child-Pugh A or B).

Radioembolisation is another application of embolisation, but in this instance, it uses radioactive microspheres. The beads become lodged in the vessels feeding the tumour(s), and the radiation emitted causes cell death. The radioactive isotope Yttrium-90 is used, as its penetration averages 2.5mm in tissues, meaning that the radiation only treats the tissue it is lodged in, and not the healthy surrounding tissue. This also means that a higher dosage of radiation can be given.

As this radiation is applied internally, it is also referred to as (selective) internal radiotherapy. It has relatively few side-effects, compared with standard treatments, with fatigue for seven to ten days following the procedure being the most common.

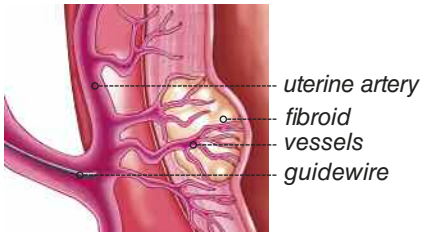


Figure 1: A guidewire is inserted in the uterine artery that is providing blood supply to the fibroid.

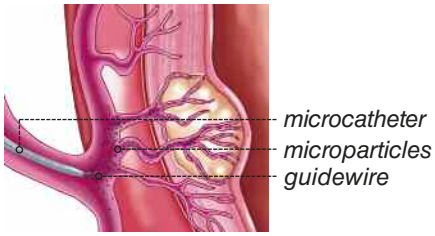


Figure 2: A microcatheter is glided over the guidewire so that contrast material as well as embolic agents can be simultaneously injected.

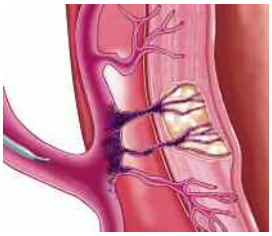


Figure 3: These embolic agents are attracted by the high flow of the tumour and then obstruct the vessels, thereby cutting off the blood flow to the fibroid, causing it to shrink.

Ablation Techniques

Radiofrequency Ablation (RFA)

Commonly used in the treatment of cancers of the lung, liver, kidney, and bone.	Radiofrequency ablation is a minimally invasive treatment in which tumours are killed using high frequency alternating currents which emit heat. The treatment has been proven to be safe and effective and can be repeatedly used on both primary and metastatic tumours. The RFA procedure consists of a needle-like RFA probe being inserted into the tumour, where the intense heat it emits, ablates the tumour. The treatment targets the tumour only without affecting the surrounding healthy tissue.

Cryoablation

Commonly used for cancer of the lung, liver, breast, kidney, and prostate.	Cryoablation is the use of extreme cold to destroy diseased tissue such as tumours. In cryoablation, a probe is inserted into the tumour through a small nick in the patient's skin and an extremely cold gas (approximately -40°C or less) in then circulated around the tumour in intervals. This process of repeatedly freezing and thawing the tumour causes it to burst as it swells and shrinks. Ice crystals also form in the microvasculature of the tumour, blocking its blood supply. Again, the treatment targets the tumour only without affecting the surrounding healthy tissue. Following the procedure, dead tissue is cleared by the patient's immune system and there is some evidence to show that the process also stimulates the immune system to attack any remaining cancer cells.

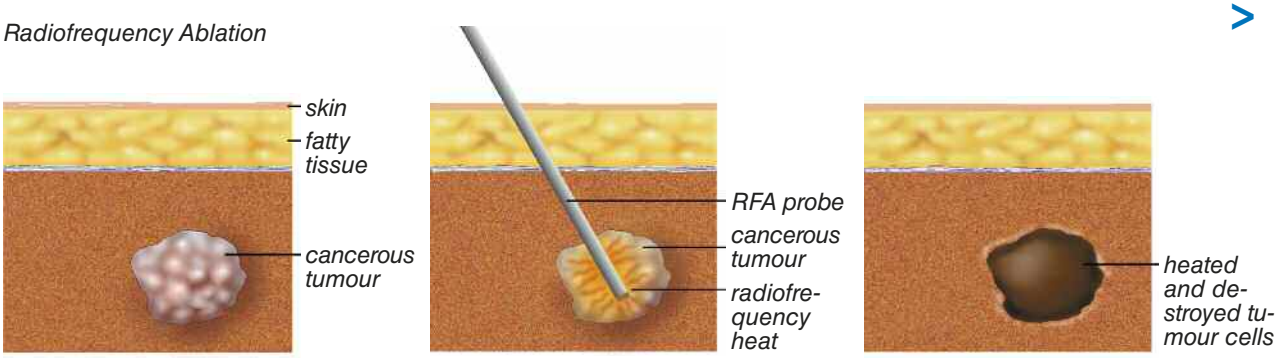
Microwave Ablation

Has shown great potential in the treatment of cancers of the liver, lung, and kidney as well as bone metastases.	Microwave ablation is the most recent development in the field of tumour ablation. The treatment, which uses electromagnetic microwaves to destroy cancerous cells, is, once again, highly precise and does not cause damage to healthy surrounding tissue. Other advantages of microwave ablation include the fact that multiple lesions can be treated at the same time and larger tumours can also be treated. In microwave ablation, a thin microwave antenna is placed directly into the tumour under image guidance (typically Ultrasound). A microwave generator then emits an electromagnetic wave through the antenna. The electromagnetic microwaves cause the cells in the tumour to spin and create intense heat, which in turn kills the cancerous cells.

Irreversible Electroporation (IRE)

Used for the ablation of tumours in soft tissue.	Irreversible electroporation (IRE) is a novel interventional treatment for the ablation of soft tissue cancers. Electrical pulses are applied across cancerous cells, thus irreversibly damaging the membranes of the cells and creating small openings. This increased porosity, destroys the cell's ability to maintain its inner environment (homeostasis), and they die as a result. The non-thermal nature of IRE means that it can be used close to blood vessels and nerves. It is also highly precise and healthy surrounding tissues are left undamaged. A device which is currently being used in America for the safe and effective IRE ablation of soft tissue cells is the Nanoknife from Angiodynamics.

Radiofrequency Ablation



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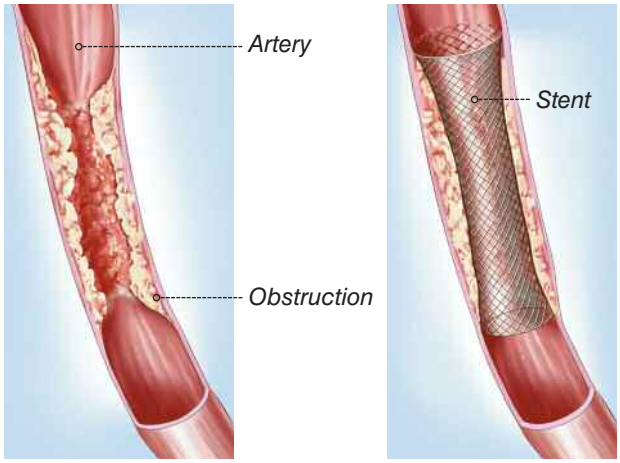
Stenting and Palliative Treatment

Tumours can sometimes intrude into various ducts and vessels of the body, consequently obstructing and sometimes blocking off the food, fluids and waste products that flow through them. In such cases, stents can be used palliatively as a means of relieving the patient of the negative symptoms that can arise, thus improving their quality of life.
An example of this can be found in a palliative treatment for Superior Vena Cava Syndrome (SVCS). SVCS is a disease in which the blood flow through the superior vena cava becomes obstructed, usually by a cancerous growth. A stent is placed in the narrowed part of the SVC enabling blood to flow more freely. This in turn alleviates the patient's symptoms which include venous distension, facial swelling, headaches and shortness of breath.
Stents can be used to hold open obstructions in numerous other ducts and vessels in the body including obstructions of the oesophagus, bronchus and also colorectal obstructions.



Interventional oncology offers patients not just the possibility of more effective treatment, but also of reduced side-effects and better quality of life

Why IR is Gaining Ground

Cancer is a diverse class of diseases that requires an equally diverse treatment approach. Recent advances in the fundamental understanding of the complexity of specific cancers have allowed doctors to provide more effective combinations of therapy and medication. Cancer is a fundamental disorder at cellular level, and treatment is, rightly, an interdisciplinary undertaking, drawing on the expertise of histologists, surgeons, oncologists, geneticists, radiologists and others. It is as a part of this arsenal that interventional radiology can play a significant role.

Interventional Oncology
Interventional radiology began its work in oncology decades ago, but since then, the level of involvement has grown incredibly. In the early 80s, existing procedures were solely used to treat the complications of cancer or the side-effects of treatment. Haemorrhaging from surgery or metastatis to blood vessels was staunched by embolisation; blocked bladders, both gall and standard, were drained by catheters, preventing infection or organ failure; stents held open blocked vessels and organs; blood clots caused by therapy were stabilised or removed by filter placement and thrombolysis; blood flow was increased by shunting - all performed under image guidance.

This work was valuable progress in itself. But in the last decade or so, the focus has moved from treating complications to treating the tumours themselves. Indeed, the field has grown so much that the term "interventional oncology" has been coined to cover the range of treatments offered, and it is fast becoming the fourth arm of cancer treatment.

Multidisciplinary Approach
At this point, interventional oncology is being used primarily as a palliative or adjunctive therapy. In this capacity, it offers the patient significant pain relief, and other therapists a greater chance of success, and this is a positive step forward for everyone. However, given that patient access to interventional radiology is often restricted by administrative structures or poor knowledge of its benefits, it is natural to wonder what its clinical impact could be if patients were referred to the discipline earlier.

Surgical removal is still considered the most definitive tumour treatment, and if interventional oncologists wish to gain referrals at an earlier stage, the burden of proof is on them to demonstrate that their techniques are a suitable alternative to surgery. This can only be done with rigorous trials and clinical data, and while many trials are underway, there is much evidence to be gathered before interventional oncology can become a primary curative treatment. Currently, it is cases that are not suitable for surgical resection or cases that have not responded to chemo- and radiotherapy that are referred to interventional radiology, but this in itself shows that interventional oncology does offer opportunities to patients who have run out of options, and the future of the discipline looks set to be an exciting one.

Interventional radiologists' expertise in minimally invasive procedures and their utilisation of imaging modalities can provide eligible patients with less aggressive therapy op-

tions. Only when this ability is given recognition by other disciplines, and when interventionists demand a more active clinical role, will patients' access to these ground-breaking techniques improve. In many clinics, such recognition and responsibilities have already been achieved, but there is room for improvement in many quarters, and physicians of all walks should always be aware of the patient care opportunities that can result from interdisciplinary collaboration.

The Important Role of Pain Relief

The palliative and adjunctive role that IR currently plays is nonetheless impressive, and in reality, the vast majority of oncological work generally is palliative. True cures constitute the minority of cancer patient outcomes. Interventional radiology is already established as a vital diagnostic tool - in deep or occult tumours, it offers a safe and accurate option for biopsy. Although surgical removal of the tumour is generally accepted to be the best solution, this is often not possible, whether due to the tumour's size, location, or the fact that there are simply too many tumours in an organ for removal to be feasible. Sometimes, a patient is too weak to be a surgical candidate. In these cases, interventional oncology plays a valuable role.

> In the last decade or so, the focus has moved from treating complications to treating the tumours themselves

Tumours (especially bone tumours) can spread into or press on surrounding nerves, causing intense pain. This not only reduces quality of life for the patient, but can lower their tolerance for cancer treatments. Thermoablation can significantly shrink, or even kill, a tumour, which may make surgical removal possible, extend survival time, or provide pain relief for the patient. Chemoembolisation can be an effective treatment in cases where an organ has multiple tumours, e.g. in liver treatment.

It is also a wonderful example of how different medical elements can be combined to provide optimal care - in combining the advantages of chemotherapy and embolisation, the patient is offered a promising treatment that has far fewer side-effects and requires fewer trips to the hospital. Novel angiographic drug-delivery systems offer targeted chemotherapy release. As these treatments are all minimally invasive and localised, they are often suitable for patients too weak to undergo surgery, providing much needed pain relief and improvement in quality of life. While these techniques, too, have their limitations and exclusion criteria, they do provide another valuable weapon in the cache of cancer treatment options.
These techniques and others have been successfully used to treat a number of different cancers. Great results have been achieved in treating liver, lung and bone cancer (by thermal ablation and chemoembolisation), and breast, kidney, prostate, colorectal and brain cancer have also responded positively to interventional treatment.

Health Economics

What is particularly noteworthy is the fact that many of these procedures can be performed on an outpatient basis, reducing hospitalisation time and the associated costs and discomforts. In an era when cancer rates are increasing and the population is aging, this may offer a practical and cost-effective solution for treating increasing patient numbers. This may become a vital element of cancer care - with an aging population, medical costs are expected to rise while taxable age groups are expected to decline. As such, therapy will have to be affordable. There are currently many different therapeutic drugs available, but as cancer is not a single disease, but a widely varied one, generic drugs tend not to be very effective. While pharmaceutical companies have had success in developing specific drugs, these, due to the restricted nature of their usage, tend to be very expensive. Healthcare payers may be simply unable to meet these high costs, and so the ideal solution would be a treatment type that can be applied to many different cancers. Although interventional oncology equipment is not cheap, it could be a wise investment, and may ultimately represent an affordable therapy option.

Future Therapy

Interventional oncology's future role is not merely limited to cost-saving - its potential for future therapy is also impressive. Recent breakthroughs in treating brain tumours with microcatheters[1] may lead to an effective, standardised treatment for an often incurable cancer type. Developments such as magnetic therapy hold enormous promise, and advances in nanotechnology may open exciting possibilities for the discipline. These will be examined more closely in our next issue. While these may be some way off, therapies such as high frequency focused ultrasound (see page 56) and electroporation (covered in the next issue) will have a more immediate effect on cancer therapy. In fighting an ever-varied, ever-evolving class of disease such as cancer, doctors must seek to outwit the cells they fight. For this, a wide arsenal of weapons is needed, from which effective combinations can be chosen. In this sense, interventional oncology represents a giant step forward for cancer care, not only by offering effective, established procedures, but also by being as versatile as its opponent. Interventional oncology is constantly evolving to meet new and bigger challenges, and the methods in development show enormous promise. By combining these existing and future treatments with other medical innovations, more sophisticated therapies can be devised, providing both patient and physician with a brighter prognosis. By facilitating localised drug administration, by avoiding general anaesthetic and by minimising surgical incision, interventional oncology offers patients not just the possibility of more effective treatment, but also of reduced side-effects and better quality of life.

[1] *Breaching a Barrier to Fight Brain Cancer, New York Times, 16 November 2009*

Strength in Unity
Multidisciplinary Cancer Care

Interventional Quarter speaks to Dr. Thierry de Baère about the Institut Gustave Roussy and his views on IR's role in the multidisciplinary cancer care team.

The Institut Gustave Roussy has emerged as one of Europe's leading centres for cancer treatment and prevention. What do you feel is the secret behind its success?
The institute has research, teaching and patient care all on one site. This allows patients easy access to innovative treatments and keeps physicians aware of and eager for new treatment options.

As an avid ice hockey player, you surely appreciate the value of teamwork. How important is it to take a team approach in cancer care?
One of the major qualities of the Institut Gustave Roussy since its establishment is the multidisciplinary committee of physicians. The committee, which is made up of members from all specialities and sub-specialities, meets physically at least once a week to discuss patient cases and referrals. Any major changes in the course of therapy for patients are discussed at these committee meetings. As we all know that a cancer cure is very unlikely to occur from a single treatment, and in most cases combined therapy will be needed, these meetings allow very reactive face-to-face discussions in order to plan the course of treatment for patients. In addition, physicians obviously learn a lot from each other during these meetings. It is also worth noting that certain French laws have recently made discussing patient files in multidisciplinary meetings (RCP = Réunion de Concertation Multidisciplinaire) mandatory for decisions on cancer treatment. However, this has been standard practice at the Institute Gustave Roussy for more than 40 years.

The staff of the Institut Gustave Roussy is made up of specialists from various medical fields. What, in your opinion, is the main advantage to the patient of having such a diverse group of specialists under one roof?
The advantage is access to all the latest forms of treatment and to physicians who are well trained and informed in their own fields. Patients can change physicians during the course of their treatment and to avoid getting "lost" along the way, there is always a referring physician who is specifically assigned to each patient.

The Institut Gustave Roussy is one of the only cancer care centres in Europe to have an in-house IR unit. How did the IR unit come to be included in the Institut Gustave Roussy and what do you feel IR brings to the field of oncology?
The founder of the unit was Professor Alain Roche in 1990, who moved to the Institut Gustave Roussy from a nearby university hospital. I joined in 1991 at the end of my residency. Extraordinary support also came from Director Thomas Turz and Financial Director Bertrand Martin who enabled investments to be made into expensive imaging systems at a time when reimbursement was not so well managed. Support also came from surgeons such as Dominique Elias, an internationally renowned liver surgeon who understood from an early stage the advantage of combining IR and surgery for the benefit of the patients. Moreover, the committee for digestive tumours, and most notably its head Michel Ducreux, was among the more cooperative medical oncologists.

> Support also came from surgeons ... who understood from an early stage the advantage of combining IR and surgery for the benefit of the patients

IRs are frequently referred patients for whom all other treatment options have failed. How do you feel this effects the treatment IRs can offer these patients?
15 years ago, this population of patients was normally exclusively referred to IRs. Today, they still represent roughly 50% of our practice at the Institut Gustave Roussy. We do have patients in first line treatment for TACE in HCC or neuroendocrine tumours. We also place intra-arterial ports for intra-arterial hepatic chemotherapy as a first line treatment of liver-only metastatic patients who are not surgical candidates. The "salvage therapy" patient still remains a major challenge, but any positive results are rewarding to the physicians and very helpful for the patient.

Who is responsible for referring patients to the IR unit of the Institut Gustave Roussy?
We have internal referrals from surgeons and medical oncologists. External referrals to the IR unit from specialists outside the hospital are playing an increasingly important role. We see several "new patients" in consultations every week. These patients are referred either from small private centres or from large university hospitals which do not have interventional oncology programmes, namely for lung radiofrequency.

The Institut Gustave Roussy places great emphasis on the value of pain management in improving patients' quality of life. How important is the role that IR plays in pain management?

We have a programme of palliative care, namely on pain palliation. Although, at first glance, this may seem less attractive than a cure, it is very rewarding to the physician and even more importantly, it is extremely helpful to the patient. Bone pain management is where IR plays a major role. We were part of a multicentre study on bone radiofrequency ablation for pain palliation published as early as 2004 in the "Journal of Clinical Oncology".

Oncology is a field that is continually making breakthroughs in treatment, but equally, one that many feel to be far from finding a cure. What was it that drew you to the complex field of interventional oncology and has kept you at it for so many years?
Breakthroughs and progress are obvious in oncology. Survival is improving in many cancer diseases but as is stated, the field is becoming more complex because treatment strategies now offer combined therapy. In some cases where the cancer is chronic and incurable, we can offer treatment when it is needed. I can think of many patients with lung or liver metastases or HCC that I have treated three to five times over a period of five to seven years.
We can preserve the patient's quality of life significantly by avoiding systemic therapies and their side-effects. If we think about diabetes, nobody is cured, but treatment is given when it is needed.

External referrals to the IR unit from specialists outside the hospital are playing an increasingly important role

We are aware that you are also an exhibiting scrap metal sculptor. While the connection between creativity and sculpting is obvious, how important is creativity to the IR?
IR, and in particular interventional oncology, is rapidly evolving through new technologies that have to be quickly adapted to various clinical scenarios. Consequently, both research and patient care in this field requires creativity to explore the borders of new treatment applications - for example, how to use a technique made for one organ on another. Creativity is also needed to define new treatment flow charts and the role of IR in multidisciplinary treatment.

T.U.

The Vitals

Dr. Thierry Jacques de Baère is the head of the Interventional Radiology Unit in the Diagnostic Imaging Department of the Institut Gustave Roussy.

He is an active member of numerous scientific societies and committees such as the Société Française de Radiologie (SFR) and the Cardiovascular and Interventional Radiological Society of Europe (CIRSE). Dr. de Baère has also been guest speaker and lecturer at a number of universities and conferences across Europe, America and the Middle East.

Dr. de Baère has published numerous peer-reviewed publications on vascular and interventional radiology and has been on various review boards including the editorial and review board of the "Journal of European Radiology" and "CardioVascular and Interventional Radiology".

His pastimes include ice hockey, paragliding and scrap metal sculpture. He is married with two children and lives in Paris, France.

Institut Gustave Roussy
Founded in 1921, the renowned Institut Gustave Roussy is a European leader in comprehensive cancer treatment. It houses specialists from medical fields including general surgery, anaesthesiology, clinical pharmacology and psychology. The Institut Gustave Roussy is one of the only institutions of its kind in Europe to have an in-house IR unit. In 1994, the institute pioneered gene therapy for lung cancer by holding the first ever European trial.

The IGR in numbers:
368 beds
2,300 members of staff (care, research and teaching)
207 certified physicians
887 professional caregivers
300 research scientists
2800 students
14 basic research units
2800 students, researchers and physicians trained per year
43,000 patients treated annually

The IR Unit of the Institut Gustave Roussy carries out over 2,000 procedures annually, with 2,497 in 2009.

www.igr.fr

Lessening the Impact of Chemotherapy

Chemotherapy can take a harsh toll on the body of an adult cancer patient, with side-effects including nausea, fatigue, hair loss and intense pain. Children often react even more sensitively to chemotherapy than adults. While chemotherapy drugs are normally infused intravenously, physicians at the Great Ormond Street Hospital have used novel intra-arterial infusions to help reduce the impact of the drugs on children. The procedure, which was carried out on children with a form of eye cancer known as Retinoblastoma, involved passing a catheter from a small nick in the child's groin to the ophthalmic artery, which directly supplies the eye with blood. Accessing the tumour intra-arterially, rather than intravenously allowed the physicians to infuse as low as 5% of the typical chemotherapy drug dosage. Physicians at the Great Ormond Street Hospital have also used a special antibody known as CD45 to clear the bone marrow of children with leukaemia who were considered too weak for chemotherapy.
www.ich.ucl.ac.uk

Small but Mighty!

Sometimes, the most powerful things come in the tiniest of packages. One example of this can be found in Massachusetts, where researchers have developed a novel cancer fighting nanoparticle known as BIND 014. The nanoparticles, which have a diameter 1000 times smaller than that of a human hair, consist of the chemotherapeutic drug decetaxel (taxotere) coated in a protective polyethylene shell. Once injected into the patient, the nanoparticles make their way to the tumour where they begin their work to destroy it. The shell is of particular importance as it protects the nanoparticles from the patient's immune system thus sparing patients from the adverse effects that most chemotherapy drugs cause. The treatment is currently being used for prostate cancers and clinical trials are planned for 2010.
www.bindbio.com

Worldview

IR Clinic in Peru

The past decades have seen interventional radiology spread to an increasing number of countries around the world and clinics are becoming more common place even in low income countries. Nestled in the district of San Isidro in Lima, lies an example of such a clinic - the Brazzini Interventional Radiology Institute. Founded by Dr. Augusto Brazzini, a prominent physician in Peru, the institute is one of very few in South America to offer patients cutting edge interventional oncological treatments. In a country where an estimated 32,000 people died in 2005 as a result of cancer, the work of the institute is undoubtedly vital.
www.brazzini.com.pe

Cancer Research and Training in Africa

Around 72% of deaths from cancer occurred in low and middle income countries in 2007, where patients often lack access to basic cancer care. In Africa, the threat that cancer poses often gets overlooked compared to other communicable diseases such as HIV/AIDS. To help raise more awareness on cancer, the non-profit African Organization for Research and Training in Cancer (AORTIC) was founded during the 1980s in Lomé, the Republic of Togo. The organisation is dedicated not only to raising awareness of cancer but also to cancer research, training and prevention. Made up of cancer care workers and scientists from Africa and around the world, the organisation runs on the voluntary support of its members. AORTIC is also responsible for the AORTIC conference, one of the most important cancer conferences on the African continent.
http://africa.aortic.org

A New Use for HIFU

When the research into the High Intensity Focused Ultrasound (HIFU) was released in the 1940s, it came well ahead of its time. It would take another 54 years before HIFU, a non-invasive ablative technique that uses sound waves to heat up and kill cancers, would be cleared for clinical use. Today, HIFU is being used by IRs around the world but its use is normally limited to a few types of cancer. However, a recent advance in HIFU treatment came in November 2009, when physicians in London carried out the first ever rectal tumour HIFU ablation. Patients treated reported experiencing significant relief from their symptoms and improved quality of life. This new advance in HIFU raises hopes of its future application for more forms of cancer.

www.imperial.nhs.uk

Teenagers in the Lime Light

Puberty is often a difficult chapter in the life of a growing child. In between childhood and adulthood, teenagers often feel misunderstood and ignored. For teenagers with cancer, this problem is often amplified. However, a group in Australia and New Zealand is working to provide teenagers and young adults living with cancer with the support and encouragement they need to fight the disease. The members of the group, known as CanTeen, include young cancer patients and their siblings who come together to form a peer support group where patients can get inspiration and learn from the valuable experiences of others. With plenty of camps, workshops and social events, CanTeen allows patients to simply have fun - a notion that often gets overlooked in light of a diagnosis of cancer.

www.canteen.org.au - www.canteen.org.nz

Hope for HCC Patients in Pakistan

Hepatocellular carcinoma (HCC) is currently among the top ten most common malignancies that affect men and women around the world. Around 75-80% of HCC cases occur in Asian countries[1], where many are often too poor to pay for adequate treatment. In Pakistan, a hospital which was founded by the country's legendary cricket team captain Imran Kahn is offering treatment to patients with HCC as well as other cancers, irrespective of their financial situation. The hospital was founded in 1994 in memory of Khan's mother, Shaukut Kahnum, who died of cancer. Funded by donations, the multidisciplinary hospital offers state of the art equipment and its own IR suite. The radiology department, which carries out over 100,000 procedures a year, also offers patients access to RFA and TACE.

www.shaukatkhanum.org.pk

Treating Cancer - One Segment at a Time

Tomotherapy is one of the newest developments in radiation therapy and combines the precision of computer tomography with the effectiveness of radiation beam therapy. The technology of tomotherapy, which involves applying radiation to the tumour in "segments", was first used in America but soon spread to other parts of the world. In South-East Asia, the first clinic to offer patients tomotherapy treatment was the Mount Elisabeth Hospital in Singapore. Based on data collected during the course of 2008, the cancer programme of the clinic boasted a 100% survival rate for breast cancer patients after one year and many of the patients treated with tomotherapy found the treatment to be both quick and effective.

www.parkwaycancercentre.com - www.parkwayhealth.com

An Ethiopian Model of Cancer Care

While breast cancer survival rates are on the increase in high income countries, in many low income countries, survival rates remain low due to poor management and the lack of adequate infrastructure. In 2005, a six-year pilot project was launched by Axios international with the aim of improving the management of breast cancer treatment in Ethiopia. The project was carried out in Tikur Anbessa, the main referral hospital in Addis Ababa, and saw the development of clinical guidelines for breast cancer treatment and palliative care. Patient management systems were put into place, drugs were donated and vital mammographic and ultrasound equipment were installed. By late 2008, the success of the project became clear as a total of 3,634 patients were screened, diagnosed or treated and many were being monitored for follow-ups. The project stands as a model of effective cancer care management for low income countries around the world.

www.axios-group.com

[1] *Gary L. Davis et al. Hepatocellular Carcinoma: Management of an Increasingly Common Problem. Baylor University Medical Centre Proceedings. 2008;21(3):266.*

5 minutes with...
Dr. Hedvig Hricak

IQ spoke to the internationally renowned radiologist and medical innovator about her work in oncology, and the crucial role of radiology and interventional radiology in cancer treatment.

It is no wonder that Dr. Hedvig Hricak has gained global respect and admiration in all walks of her professional life.

The first female appointed and current Chair of the Radiology Department of the Memorial Sloan-Kettering Cancer Centre (MSKCC) in New York, chairperson and president of various societies and boards, author of numerous books and peer-reviewed research papers, recipient of countless awards, visiting professor in more than 30 institutions worldwide, and the list goes on. These achievements mirror her dedication to excellence in science and medicine.

Dr. Hricak has always been active in the field of oncology; either as an educator, as a researcher or in clinical practice. Her research work is interdisciplinary in nature and looks into minimally invasive methods for improving cancer diagnosis, treatment, and follow-up care. Her outstanding clinical work and commitment to the field of oncology have repeatedly earned her a place on New York Magazine's list of the city's best doctors and in the Castle Connolly publication "America's Top Doctors". There seems no end to what Dr. Hricak can accomplish.

Although your medical experience has been broad, oncology seems to be the recurring theme of your work. This is often seen as one of the most challenging fields of medicine - what inspired you to get so involved in it?
My primary field of interest was and is imaging, but the more I learned about it, the more I came to realise what a key role it plays in oncology, and what potential it has in this field. Imaging is crucial to delineating the type and extent of cancer, selecting and planning the best treatment and following its effects. To be involved along the whole treatment process is a very interesting and rewarding experience, and it is something that is quite easy and natural to develop a passion for.
As an imaging specialist, the broad range of clinical possibilities offered by oncology also provides many research opportunities. It is a field where imaging research spans from humans to molecules - and by revealing the mechanisms of cancer at the molecular level, imaging is also playing an important role in advancing molecular medicine. It is also a field that exemplifies the need for multidisciplinary research, something that I feel is central to good medical practice.

While you are not an interventional radiologist yourself, you have done much work in developing minimally invasive diagnostic, staging and follow-up procedures. Why is minimally invasive medicine of such interest to medical innovators? Ideally, what role should it play in oncology?
The advances in minimally invasive medicine have been among the greatest successes in healthcare. They reduce complications, shorten or eliminate hospital stays and are increasingly being applied in surgical interventions. The demand for image guidance for biopsy and therapy is becoming more and more important. At this particular time, image-guided minimally invasive therapies are used predominantly for metastastatic disease, but I am certain that treatment of primary tumours by interventional radiologists will increase in the near future.

> Advances in minimally invasive medicine have been among the greatest successes in healthcare

In your position as Chair of Radiology at a renowned cancer centre, how do you ensure that minimally invasive treatments are available to patients?
At MSKCC, interventional radiology has made monumental advances. Our IR service is universally respected and increasingly used. One of the keys to increasing its importance and visibility has been making sure that IR physicians are part of a well-organised clinical service that includes clinics and necessary support staff. Our IR physicians examine and follow their patients in IR-assigned out-patient clinics, and they also have admitting privileges.

Oncology is a field that is continually making breakthroughs in treatment, but equally, one that many feel to be far from finding a cure. What areas of oncology do you think show the most promise?
It is, indeed, a very dynamic and exciting branch of medicine, and given the advances already made and the level of involvement from quite brilliant researchers, I feel certain that a number of breakthrough innovations will be introduced shortly. Advances such as genetic and pharmacodiagnostic testing, knowledge of tumour biology

and DNA microarray technology mean we are truly entering the era of personalised medicine. An area of particular promise is targeted therapy, and even more so targeted therapy combined with targeted imaging - the field referred to as theranostics.

Radiology in the US is suffering something of a backlash during proposals for budget cuts. How might this affect oncology?
The budget cuts are still being discussed in Congress as well an in the US federal administration. Both profess that they wish to support oncology research. Given how integral imaging is to all areas of cancer treatment, any cuts to radiology could have serious implications for oncology. The future is uncertain, but hopefully the impact will be minimal.

In recent years, some doubt has been cast as to the effectiveness of routine cancer screening, e.g. mammography in the over-50s. Opponents cite false positives, high costs and the so-called "incidentalomas". Do you feel that routine screening programmes are beneficial?
The success of screening mammography has been documented and acknowledged in many peer-reviewed scientific publications, and only recently, research by the Medical College of Georgia established that mortality from breast cancer is higher in areas where mammography centres are not available. New diagnostic methods such as MR spectroscopy, positron emission mammography (PEM) or ultrasound elastography could reduce the need for biopsies of detected lumps, reducing still further the potential for negative outcomes of screening. PSA screening for prostate cancer also has opponents, yet such screening has greatly reduced the number of men diagnosed with advanced prostate cancer. In spite of the ongoing controversy, I do believe that screening programmes are beneficial.

You have been repeatedly included in both New York Magazine's list of the city's best doctors and in America's Top Doctors, but many radiologists feel that they are lacking clinical responsibility and recognition. Why is it important for radiologists to be clinically involved?
Biomedical imaging has assumed a vital role in determining how medicine is practiced today. Particularly in oncology, it is important to have regular meetings of all those involved in patient management, with radiologists participating in decision-making. There is an increasing need to guard against the danger of radiologists communicating findings only from isolated reading rooms with PACS. As it is, most patients are not aware that image interpretation is performed by radiologists.

You have a great passion for interdisciplinary and international collaboration. Why is this important for your work and why is it important for medicine?
Today, significant advances can only be made through the intense and continuous collaboration of medical specialties. Furthermore, close collaboration with basic scientists is essential, as it is the road to breakthroughs. As for international collaboration, with current communication tools, talented scientists and leading research-oriented clinicians in many countries can easily join forces to advance medicine in a more coordinated and efficient way.

> One of the keys to increasing its ... visibility has been making sure that IR physicians are part of a well-organised clinical service

Dr. Hricak is currently researching the exciting field of reporter genetic systems development, which tags specific cells so they can be tracked by optical or PET imaging. We asked her to tell us more about her ground-breaking research and how these reporter genes could help tackle cancer.

Gene expression imaging provides exciting opportunities to advance the in vivo study of genetics and tumour biology. However, its clinical translation will be slow, at least initially, and confined to very few situations. For example, at MSKCC it will be used in the near future to assess experimental therapies for metastatic prostate cancer that rely on genetically targeted T-cells.
PET imaging of prostate-cancer-specific T-cells marked with a reporter gene will help address questions about T-cell migration and homing to the tumour target as well as the long-term viability and cytolytic activity of the T-cells. Such reporter gene imaging may also allow early prediction of tumour response.

The problem in applying gene expression imaging more broadly lies not in the capabilities of the marker genes, but in the need for genetic alteration of cells of interest. Often, tumour cells deep within the body are the targets for a genetic transformation. A major obstacle in gene therapy is the need to selectively transfer the therapeutic gene to tumour cells without injuring normal tissues. Given the unfortunate outcomes of past gene therapy trials, in which normal tissues were injured, scrutiny of gene expression imaging has intensified. Injection of a reporter gene systemically for imaging alone is unlikely. The use of dual probes in preclinical research allows us to perform experiments with two different modalities, such as optical imaging and PET, or PET and MRI, depending on the probe design.

C.M.

A Focused Approach
Non-Invasive Therapy

High Intensity Focused Ultrasound

Minimally invasive medicine is offering patients less painful options that cause fewer complications - but what if medicine could become completely non-invasive? For some conditions, this is already the case…

Concept
We are all familiar with the excellent images of soft tissue and body cavities that ultrasound can offer, but not many are aware that it has other clinical applications too. Ultrasound energy can pass through skin, muscle, fat and other soft tissues without causing any damage, making it a very safe imaging procedure. However, scientists realised that if this energy is focused (much like sunlight through a magnifying glass), heat can be generated on a very small area, raising some interesting clinical possibilities.

Applications
The basic concept has a number of applications. The most common use at this stage of development is the use of heat to destroy tissue, known as thermal ablation. If the beam is focused so that temperatures exceed 56°C, problem tissue, such as fibroids or tumours, can be killed. As it is important to target only the problem tissue, the procedure is planned and guided by another imaging modality, most commonly MRI (a procedure known as MRgFU, or MR-guided Focused Ultrasound), but also ultrasound (USgHIFU - Ultrasound-guided High Intensity Focused Ultrasound).

> It reduces the need for follow-up or lengthy delays during surgery

Benefits
As it is MRI or US guided, the tumour's outline can be traced very precisely, allowing the physician to easily distinguish between tumour and healthy tissue, something that the naked eye cannot easily do. This is a major advantage, as it reduces the need for follow-up or lengthy delays during surgery. It offers pinpoint accuracy, as the MRI's thermal feedback allows the physician to judge the heat delivery in real time, ensuring that healthy tissue is not damaged. The ultrasound beam will pass through other structures, but it is only within the targeted areas that sufficient heat will be generated to cause damage, making complications extremely unlikely.

Current Treatments
Focused ultrasound ablation is currently being used worldwide to treat uterine fibroids. In Europe, it is also being used to treat painful bone metastases. Clinical trials are underway to see if it can be applied to other tumours, such as breast, brain, prostate, liver, kidney and pancreatic tumours, as well as its use in treating stroke, epilepsy and movement disorders. The procedure currently used for treating fibroids lasts 2-3 hours, and while painless, lying still for so long in an MRI machine can be an uncomfortable experience for patients. Light sedatives and painkillers are given to relieve this discomfort, and if necessary, the procedure can be interrupted and resumed at a later stage (in procedures using ionising radiation sources, such as CT, this would not be possible). The absence of upper limits also allows for repeat procedures.

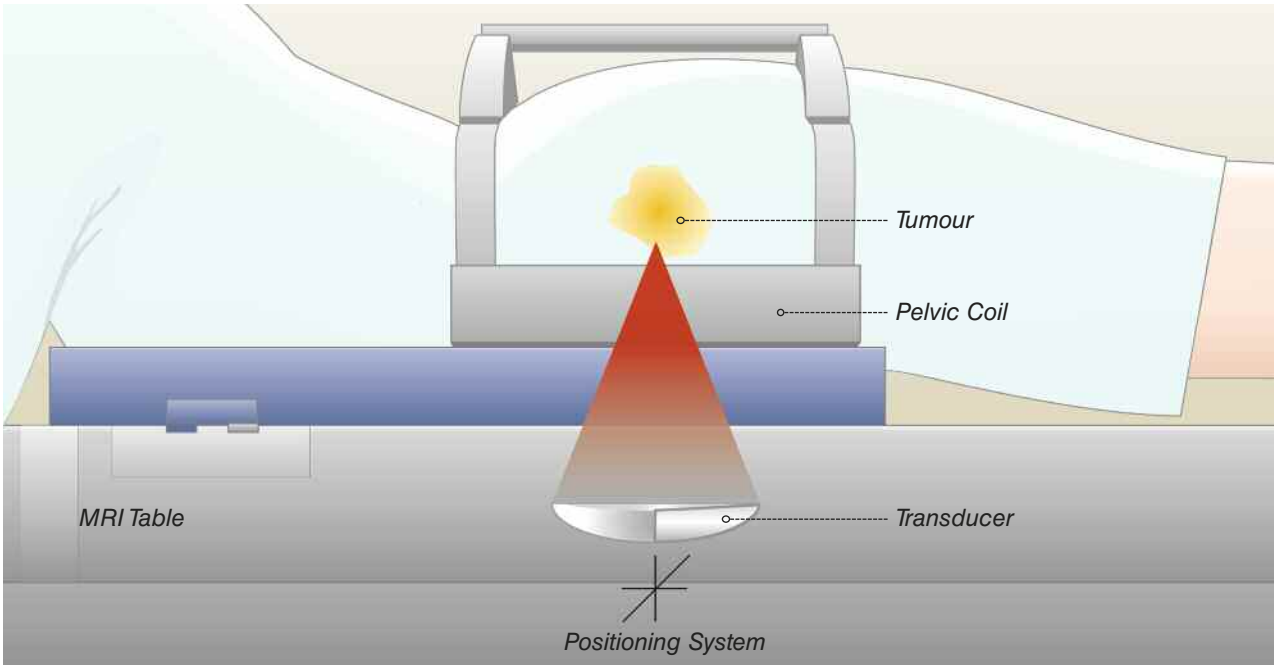
> A new era of non-invasive medicine

Exceptions
Of course, it is possible that due to a fibroid or tumour being located too close to sensitive organs, such as the intestine or bowel wall, that it will not be a good candidate for this treatment. It is important that the treatment does not affect adjacent organs, and if this is likely, it is too great a risk to take. This is why image guidance is so vital. MRI allows for accurate planning of the procedure, establishing if it is suitable and where must be targeted.

Research
Likewise, certain locations are difficult to target.

- **The liver**, for example, is located largely beneath the ribcage, which ultrasound is not capable of penetrating, and companies such as Insightec are looking to develop an applicator that can aim between the ribs. A more difficult obstacle to overcome is the fact that the liver moves during breathing, which may render the liver unsuitable for this treatment.
- **The brain**, too, is difficult to access through an intact skull, and companies are looking to develop specialised "helmet" applicators that are adjusted to correct the ultrasound distortion that it causes. This was successfully achieved for the first time in September 2009 at the Children's Hospital Zurich, and further studies are underway. The role of ultrasound in brain treatments could also mean that the blood-brain barrier could be temporarily broken, allowing drugs through to treat problems.

MR-guided Focused Ultrasound (MRgFU)



Potential
This leads us to the other possibilities this therapy offers. Heat can be combined with other therapies to form a more effective treatment, such as hyperthermia treatments (low-level heating combined with radiotherapy or chemotherapy) or to activate or enhance delivery of drugs.

This is still undergoing research, but could revolutionise cancer treatment

Traditional chemotherapy involves subjecting the whole body to aggressive therapy, in the hope that the strength of the treatment would be sufficient to kill the malignant cells, but not so strong that the healthy cells of the body cannot resist. While having immense success therapeutically, this systemic treatment has unpleasant side-effects for the patient.

So, efforts are being made to localise treatment. By administering the drugs in a temperature-sensitive "skin", the medicine can be tracked through the body using imaging technology - and when it reaches the right spot to be treated, ultrasound heat can be used to trigger the medicine to burst, releasing the drugs only where they are needed. In this way, drugs up to ten times stronger can be used, as they are not released system-wide. This is still undergoing research, but could revolutionise cancer treatment.

Future
Although much research is still required, this treatment has many advantages, not least the fact that non-invasive surgery will free patients from long hospital stays, pain, scarring, infection, general anaesthesia and other surgical complications - even more so than many other interventional procedures already do. As it does not use x-rays, there is no exposure to ionising radiation, and no upper limit to accumulated acoustic energy, making repeated treatment of the same target possible. This breakthrough technology may pave the way for a new era of non-invasive medicine.

C.M.

www.insightec.com
www.diagnosticimaging.com/display/article/113619/1477965

The Growing Field of Interventional Oncology

The word cancer can bring out the ostrich in us. Uncomfortable truths often have that effect. Seen as something inevitable, unavoidable or incurable, most of us just don't want to hear.

Ironically, the more we hear and understand, the more we can overcome it. Knowledge is power, as a wise man once said. And this is especially true in medicine, where early detection and appropriate treatment can bring miraculous results. One of the latest miracles to emerge in oncology is the application of minimally invasive therapies - interventional oncology, the potential of which, to improve quality and length of life, is gaining recognition worldwide.

In light of its increasing importance, oncology societies and interventional radiology societies are making efforts to promote awareness and development of these techniques, and to cater for the growing number of physicians practising them. The most important event in Europe this year is ECIO - the European Conference on Interventional Oncology, organised by the CIRSE Foundation, which is the educational arm of the Cardiovascular and Interventional Radiology Society of Europe.

Following the success of the first ECIO, the decision was made not merely to repeat the congress, but to expand upon it. Following the precedent set, this year's congress has invited experts in the field to share their knowledge and introduce new findings, through a combination of lectures, hands-on workshops, showcases and discussion panels.

Stepping boldly forward, a central feature of this year's congress is the Referring Physician Programme. This is a strategic initiative to enable non-radiologists to experience the potential of IR firsthand, and see how it can be best incorporated into the oncologic treatment portfolio. By inviting interventionists to bring their clinical colleagues, whether oncologist, surgeon, or hepatologist, greater links can be forged between multidisciplinary colleagues. It is hoped that this will lead to a greater exchange of information and cooperation among medical disciplines, and ultimately to more efficient patient care.

In this spirit, ECIO 2010 will also feature partnership workshops with some of the most significant cancer societies, ESMO (European Society for Medical Oncology), and ILCA (International Liver Cancer Association). These societies are highly active and influential in cancer research and awareness, and their participation only confirms the prominent role interventional oncology is playing in cancer treatment. The sessions held in conjunction with these societies hope to dually give attendees insights into the latest developments in cancer research and results of state of the art radiology procedures, and to act as a forum, enabling the exchange of information, debate and constructive dialogue.

ECIO will take place in Florence, April 21-24. Further information can be found at www.ecio2010.org.

www.ecio2010.org
www.cirse.org
www.esmo.org
www.ilca-online.org

Interventional Oncology Trials

Trial: a study carried out with the purpose of testing a new medical treatment on a defined group of people. The results are compared with a group that are treated using another method and/or a control group.

A Phase II Randomized, Double-blind, Placebo-controlled Study of Sorafenib or Placebo in Combination with Transarterial Chemoembolization (TACE) Performed with DC Bead and Doxorubicin for Intermediate Stage Hepatocellular Carcinoma (HCC)

Contact
Bayer Clinical Trials, Bayer HealthCare Pharmaceuticals Inc.
Date opened
March 2009
Status of trial
Recruiting
Description
This study will look at whether the drug sorafenib, in combination with chemotherapy delivered directly into the tumour using beads (DC Bead), will slow the progression of the disease. The beads used with the chemotherapy will slowly release the chemotherapy reducing the adverse effects that normally occur with chemotherapy.

Cryoablation or External-Beam Radiation Therapy in Treating Patients with Painful Bone Metastases

Contact
Dr. Matthew R. Callstrom, Mayo Clinic, Rochester, MN, US
Date opened
February 2008
Status of trial
Recruiting finished, data to follow
Description
This trial aims to examine how effective cryoablation is in comparison to external-beam radiation therapy in treating patients with painful bone metastases.

Percutaneous Renal Tumor Cryoablation Followed by Biopsy

Contact
Dr. Stephen Soloman, Memorial Sloan-Kettering Cancer Center, New York, NY, US
Date opened
November 2009
Status of trial
Recruiting
Description
This study will test cryoablation's effectiveness in killing kidney cancer cells. After investigators destroy the kidney cancers using cryoablation, they will follow up with the patient every 5-7 months to make sure the cryoablation worked and that the cancer was destroyed.

Please note that this does not constitute an exhaustive overview of Interventional Oncology Trials. If you are aware of a Trial or Registry which may be of interest to our readers, please feel free to contact us at info@intervention-iq.org.

Phase 3 Study of ThermoDox with Radiofrequency Ablation (RFA) in Treatment of Hepatocellular Carcinoma (HCC)

Contact
Dr. Ronnie T. Poon, Queen Mary Hospital, University of Hong Kong, HK
Date opened
February 2008
Status of trial
Recruiting
Description
The purpose of this study is to determine whether ThermoDox, a thermally sensitive liposomal doxorubicin, is effective in the treatment of non-resectable hepatocellular carcinoma when used in conjunction with radiofrequency ablation (RFA).

Sorafenib ± Y-90, a Pilot Study

Contact
Dr. Laura Kulik, Northwestern University, Chicago, IL, US
Date opened
February 2009
Status of trial
Enrolling by invitation
Description
A research study to determine the safety, efficacy, and tolerability of Therasphere® (also known as Y-90, or Y-90 Therasphere) combined with or without sorafenib (Nexavar®), in patients with hepatocellular carcinoma (HCC, or liver cancer), awaiting liver transplantation.

Sorafenib as Adjuvant Treatment in the Prevention of Recurrence of Hepatocellular Carcinoma (STORM)

Contact
Bayer Clinical Trials Contact, Bayer HealthCare Pharmaceuticals Inc.
Date opened
June 2008
Status of trial
Recruiting
Description
To evaluate the efficacy and safety of sorafenib versus placebo in the adjuvant treatment of hepatocellular carcinoma (HCC) after potentially curative treatment (surgical resection or local ablation).

IQ takes no responsibility for the content of the individual trials; please refer to their Source (www.clinicaltrials.gov) for further information.

www.intervention-iq.org
www.clinicaltrials.gov
www.who.int/trialsearch/default.aspx
http://clinicaltrials.mayo.edu

Vertebroplasty:
What the Studies Failed to Mention

Two studies[1] on vertebroplasty that were released in August last year, sparked outrage among many physicians and patients alike. The studies misleadingly claimed that vertebroplasty, the gold standard interventional treatment for vertebral compression fractures, was ineffective. While news of the studies spread almost instantly around the world, most reports failed to inform audiences about the grave limitations they held. Limitations which many would argue render much of what the studies claim as deceptive and even false.

They were not properly controlled
Both studies claimed to have had a "control group", which received a placebo. However, what the "control group" really received was a form of treatment known as a facet injection. Facet injections relieve back pain by injecting painkilling agents in between the joints of the vertebrae. As a result, patients in both the "control group" and the interventional group reported significant reductions in their pain levels. Thus, the studies did not prove vertebroplasty's *ineffectiveness*, but rather proved the *effectiveness* of both treatments.

Not enough patients were enrolled
In order for the findings of these studies to be considered "significant", an adequate number of patients needed to be enrolled. Both studies reported that they were unable to enrol as many patients as originally planned. Had enough patients been enrolled, statistics on pain reduction in the groups receiving vertebroplasty could have been higher. This problem was further compounded in the Buchbinder study by the fact that half of the hospitals who were initially included in the study dropped out of the trial early on.

> Half of the hospitals who were initially included in the study dropped out of the trial early on

Low crossover rate of vertebroplasty patients was not highlighted
All patients in the Kallmes study were allowed to crossover and have the other treatment after one month. Almost half of those in the "control group" chose to crossover but only 12% of vertebroplasty patients crossed over. This indicates that 88% of those who underwent vertebroplasty were, indeed, content with the treatment they received.

> This indicates that 88% of those who underwent vertebroplasty were, indeed, content with the treatment they received

Vertebroplasty could have been an inappropriate treatment for some patients
Vertebroplasty is a palliative treatment that is used specifically for vertebral compression fractures (VCFs). However, back pain can result from a number of conditions, not only VCFs. One of the study limitations listed by Kallmes et al. was the fact that some of the patients who were still in pain following their vertebroplasty treatment could have been experiencing pain for reasons other than VCFs. "...the persistence of pain after vertebroplasty or fracture may indicate causes of pain other than fracture[2]." For the patients who were experiencing pain for reasons other than VCFs, vertebroplasty was not the appropriate treatment for them.

Patients were not selected appropriately
In an interview with IQ about the Buchbinder and Kallmes studies, Professor Afshin Gangi (Strasbourg, France) argued that patient selection in the studies was not carried out appropriately. "A physician must examine a patient first to determine if vertebroplasty is suitable for them. This is an important point within the guidelines for vertebroplasty. Without following these guidelines, you cannot accurately compare vertebroplasty to any other technique. It may not have been suitable for the patient to begin with!" In addition to this, Prof. Gangi also shed light on another limitation of the patient selection process of the studies: "In the large majority of cases, we do not treat patients with fractures that are older than six to eight weeks. However, both studies included patients with fractures that were six months to one year old. A recent MRI is also crucial for proper patient selection. We require evidence of marrow oedema from the MRI before performing vertebroplasty."

Conclusion
Following their release, the studies were praised by United States President Obama, as being crucial for the reduction of unnecessary healthcare costs. Many saw

the studies as important for ensuring the informed choice of patients with VCFs. But can a study with such severe limitations really be seen as a trustworthy source on which to base healthcare decisions? Prof. Gangi was shocked at the release of such poorly designed studies and went on to describe how his patients reacted to them: "Since the release of these papers, we have been inundated with letters from patients expressing their need to tell the public what the studies claim to prove is simply not true. Both patients and clinicians have shown great support for the procedure. Our next step should be to prove that vertebroplasty works - we need to release more accurate studies and do more research."

For the patients who were experiencing pain for reasons other than VCFs, vertebroplasty was not the appropriate treatment for them

The studies claim that vertebroplasty is not effective but the rising number of patients who undergo successful vertebroplasty interventions each year paints a very different picture. Vertebroplasty works. It has lead to thousands of patients worldwide living free from the excruciating pain caused by VCFs. It is highly unfortunate that many pain-ridden VCF patients could be discouraged from undergoing vertebroplasty, a procedure that could significantly improve their quality of life.

1 David F. Kallmes et al. A Randomised Trial of Vertebroplasty for Osteoporotic Spinal Fractures. New England Journal of Medicine. August 2009;361 (6): 569-579 and Rachelle Buchbinder et al. A Randomised Trial of Vertebroplasty for Painful Osteoporotic Vertebral Fractures. New England Journal of Medicine. August 2009;361 (6):557-568.

2 David F. Kallmes et al. A Randomised Trial of Vertebroplasty for Osteoporotic Spinal Fractures. New England Journal of Medicine. August 2009;361 (6):578.

3 James N. Weinstein. Balancing Science and Informed Choice in Decisions about Vertebroplasty. The New England Journal of Medicine. August 2009; 361 (6):616-621.

What is vertebroplasty?

- Vertebroplasty is a minimally invasive treatment for vertebral compression fractures (VCF).
- In vertebroplasty, an interventional radiologist injects a special cement mixture into the fractured bone thus stabilising it and relieving the patient of the associated pain.
- VCFs are the result of fractures in the vertebra which lead the bone to collapse and become distorted, which in turn causes pain.
- VCFs are a common symptom and are a result of osteoporosis as well as cancer.
- It is estimated that around 1.4 million people suffer from VCFs each year[3].
- Vertebroplasty was first used in France in the 1980s and has been widely used around the world ever since.

Fractured vertreba

Quick setting bone cement injected into fractured vertreba

The Vertos II trial provides scientific evidence of the effectiveness of vertebroplasty in acute vertebral fractures. IQ received the following excerpt from Prof. A. Gangi and Dr. William A. Clark as a preview of what the study, to be published in CardioVascular and Interventional Radiology, will encompass:*

"The recent randomised controlled trials cannot be regarded as definitive evidence on the efficacy of vertebroplasty. Both trials selected an inappropriate group of patients who were unlikely to benefit from the procedure. Inpatients were effectively excluded, and Kummel's disease was not mentioned in either study. The trials were thwarted by recruitment difficulties, imaging deficits in the Kallmes trial and technical shortfalls in Buchbinder trial. The only deduction that can confidently be drawn from these trials is the futility of applying vertebroplasty to patients with healed vertebral fractures."

** Yet to be published at time of printing*

T.U.

Safety First! How It Often Isn't

Patient Safety Training - an Essential Therapy Element

Image Gently Campaign

The Image Gently Campaign is run by the Alliance for Radiation Safety in Pediatric Imaging, and seeks to reduce children's unnecessary exposure to ionising radiation in medicine. Between the 1980s and 2006, radiation exposure of children from imaging has risen 600%. Children are particularly at risk for cumulative exposure, as they may undergo multiple procedures during their lifetime. In the US, interventional radiology is the third largest contributor after CT and nuclear medicine, and accounts for a fifth of all imaging-based ionising radiation.

Recommendations:
1) "Child-size" the technique
2) Step lightly on fluoroscopy pedal
3) Consider ultrasound or MRI where possible

> Often non-radiology clinicians are genuinely not aware that radiological procedures can lead to such injuries

Recent scandal, Cedar-Sinai Hospital (CA, USA)

During the summer, it was discovered that incorrect settings on a perfusion CT machine had inadvertently exposed 206 stroke patients to eight times the standard ionising radiation dose. The patients were being assessed to characterise ischemic stroke and select candidates for endovascular or intra-arterial clot removal therapy. The high dose level was only discovered when a patient complained of hair loss.

A custom perfusion CT protocol was found responsible - attempting to produce less noisy images, technicians increased mA settings, not realising that the embedded default settings of that model differs from a standard machine. The FDA identified shortcomings of the CT quality assurance programme used at the hospital, and indicated that such a situation could easily arise elsewhere. Facilities are strongly encouraged to review their protocols and be aware of dose indices.

The common foxglove is more than just a beautiful flower - as children, our mothers warn us against going near them, as they are a deadly poison. However, it is also true that they have valuable medicinal properties, and have been used for centuries in treating heart complaints. So the lesson that we learn is that with certain substances, there is a fine line between being dangerous and being beneficial, and this difference must be carefully monitored by the professional. That, and don't eat foxgloves.

Interventional radiology is a dynamic field of medicine. It has treated a huge number and variety of ailments, and helped countless people. But like foxgloves, radiology can be a fickle friend if you do not have a thorough scientific understanding of it.

Ionising radiation can have serious side-effects. At the birth of x-rays, these effects were not well understood, and caused some serious radiation burns. Science has learned from its mistakes, and diagnostic radiology devices now deliver low doses that are safe, although it does still entail a slightly elevated cancer risk two years from exposure, but which is typically low compared with normal incidence of cancer. However, the field of radiology has progressed past its initial diagnostic function, and therapeutic radiology often seeks to harness the destructive power of ionising radiation. This is an exciting step in medicine, but while developing at such a speed, are we in danger of using methods we do not fully understand?

The important difference between interventional procedures and, say, a diagnostic x-ray, is that these procedures are much lengthier, and involve much higher doses of ionising radiation. In most cases, the absorbed dose of these procedures is low and causes no side-effects, but in rare cases, this exposure can cause some damage to patients. Usual causes are long exposure, high-dose, performing multiple procedures or having no dose-monitoring devices. Certain conditions can sensitise patients, and everyone differs slightly in their sensitivity, which cannot be predicted beforehand. Thick-bodied patients need higher doses, which increase exposure.

This damage is generally caused at the site of beam entry, as radiation is absorbed as it passes through the body. As such, the site of entry receives 100% dose, and the point of exit receives a considerably lighter dose. One way this damage manifests itself is through hair loss, but this is usually temporary, although hair may grow back thinner or a different colour. A more frequent side-effect is erythema.

Erythema is a red rash on the skin that can appear three to four weeks after the radiology procedure was performed. This is due to damage of cells in the basal layer of the epidermis. It can cause itching and discomfort, and in severe cases, progress to ulceration two to three months after the initial exposure. In very rare cases, these ulcers

have degenerated into ischemic dermal necrosis - death of the skin tissue.

Mild erythema is very rare - severe cases even rarer. As such, many non-radiologists who perform interventional procedures may not even be aware of the potential for these complications to arise, unless they have received extensive radiology training. Many patients who develop these symptoms are misdiagnosed - the delay in the appearance of symptoms can lead to a lack of association by both the patient and the general practitioner whose help they seek. It simply does not occur to either that a normally safe procedure carried out a month before could be to blame. Usually it is put down to sunburn or an allergy, and the treatment given does not help.

In other cases, burns can appear much sooner. This is most frequently caused by an unnecessary body part being in the beam, such as an arm or breast. This causes radiation output to increase, and the arm also receives an intense dose because of its proximity to the source. This can lead to mild radiation burns, burns requiring skin grafts, or even tissue necrosis. These burns are often not recognised as being caused by radiation, and are put down to electrical or thermal burns (faulty grounding pads, pressure wound due to defibrillation pad, etc.).

The major issue is that of responsibility: clinicians have a responsibility to both be aware of and inform the patient of any risks that are entailed. However, many patients who acquire these injuries are not warned about the possibility. Furthermore, some patients find their injuries dismissed as being someone else's fault, as often non-radiology clinicians are genuinely not aware that radiological procedures can lead to such injuries, and deny any liability.

This underlines the need to have interventional procedures standardised. The procedures have such good results that many (very skilled and admirable) surgeons are adapting them, but without sufficient radiology training, it can, in rare cases, lead to mismanagement. Ionising radiation can bring wonderful benefits, but in unskilled hands, it can be a dangerous thing.

The following recommendations from the Image Gently Campaign can help minimise the occurrence of and the distress caused by such injuries:
Before:
- Review medical history for sensitising factors or previous procedures (if so, check for signs of previous low-grade injury)
- Counsel patient on risks (see below)

During:
- Monitor dose levels, keep them as low as possible
- If necessary, postpone the procedure or seek assistance

After:
- Advise patient if the procedure was long or the dose high
- Ask patient to report skin changes

Smart Card Scheme

In April 2009, the International Atomic Energy Agency proposed the "Smart Card" - an electronic record of a patient's medical exposure to ionising radiation, which could be integrated with existing medical cards. The aim is to remind doctors of the need to keep doses as low as feasibly possible, and to reduce unnecessary treatments. It is also meant to encourage patients to ask questions and make informed decisions about treatment.
Imaging generally, and CT in particular, is experiencing a boom, despite the fact that a CT scan entails roughly 500 times the average radiation dose of a standard chest x-ray. Several sources have indicated that many of these may be unnecessary. Overuse is due partially to a rising demand from patients who feel safer having a complaint "thoroughly" diagnosed and partially to over-prescription from doctors who may not be aware of the possible risks or are subject to patient-satisfaction incentives.

This underlines the need to have interventional procedures standardised

Developing Countries

The IAEA sponsored a study (2006-2008) in 55 hospitals in Africa, Asia, and Eastern Europe. In the past three years, 30% of the countries surveyed had experienced a 100% increase in interventional procedures, with workloads equalling or surpassing those in the developed world, and paediatric workload often reaching adult levels. It also found that many procedures are carried out above the current dose reference level.

Some 505 patients were monitored. About 20% of patients measured with dosimetry tape were above the 2 Gy threshold - 2% of these received 6-10 Gy. Testing with KAP metres found that 62% of angioplasty procedures were above European dose reference levels, and could be optimised. Researchers noted that cardiologists in particular were unaware of dose levels generated, a situation which is also found in developed countries, and recommended that developed countries should not become complacent about auditing dose levels.

For further reading suggestions on this topic, please refer to the "Reading and References" section of the IQ website.

www.intervention-iq.org

C.M.

Recruiting Interventional Radiologists

Interventional radiology is a popular subject among medical students around the world, however, few of them eventually go on to pursue a career in the field. IQ reporter, Tochi Ugbor, spoke to medical students and junior doctors to find out what was stopping them from choosing to specialise in IR.

It was 10:07 a.m. when Jack walked into the café where I sat waiting for him. He is a lively and talkative medical school entrant, clad in oversized jeans and sport shoes. He apologised for being late and I subsequently thanked him for accepting to do an interview on what influences medical students' career choices. As we began the interview, I was surprised to find that Jack already had a clear idea of what he wanted to specialise in despite not having had a single class yet.

Medical students' career choices are based on a complex blend of factors. Their decisions not only define their future professional lives, they also define the future of medical specialties like interventional radiology. A study in 2006 found that although IR is a popular career choice for junior doctors, very few eventually go on to study it[1].

"From day one of medical school"
When I suggested that his decision on what to specialise in might change by the end of his undergraduate studies, Jack fervently disagreed. A 2009 survey showed that Jack is probably right as 50-75% of the medical students questioned went on to specialise in what they chose initially[2]. In another interview, Natalie, a self-assured junior doctor from Hungary, enthusiastically told me about her chosen field of specialisation - Obstetrics and Gynaecology. "I just fell in love with the specialty from day one of medical school!" Over six years after that first day of medical school, Natalie, who is now a junior doctor in England, is still adamant on specialising in her chosen field.

The importance of the first few years of medical school cannot be denied. IR's cutting edge nature and its use of innovative techniques give it an appealing edge for many students. But a lack of exposure to IR, especially in the early phases of medical education often means that students are left unaware of this. Introducing the students to IR early requires forging enough space for IR within the radiology core curricula of European medical schools. It also means ensuring that enough time is allocated to interventional and not only diagnostic radiological topics.

To tackle this, a significant step has been made with the development of 'A European Interventional Radiology Syllabus' by CIRSE (Cardiovascular and Interventional Radiological Society of Europe). It is a comprehensive overview on what should be contained in IR training and underlines why support is needed to ensure that IR is sufficiently covered at medical schools.

"How can radiology be *interventional*?"
Jack took a long pause when I asked what he thought interventional radiology was. It seems that my question managed to silence the otherwise talkative young man. Eventually, after giving up, he answered that he knew what radiology was but did not quite comprehend how it could be "interventional". Jack's lack of knowledge of IR is understandable as he has yet to have his first medical lecture. But what happens when the question I asked Jack draws a similar blank from a medical school graduate? In a recent survey, 66% of the final year students interviewed believed they had either poor or no knowledge of IR[3]. This lack of knowledge undoubtedly has an effect on the student's willingness to choose IR as a medical specialty.

Substantial efforts have already been made to raise awareness about IR. Many of these have lead to notable achievements such as the recent establishment of the IR Division within the Radiology Section of the UEMS (European Union of Medical Specialists). However, more must be done to ensure that these efforts are effectively communicated to the general public and also to prospective IRs.

> 66% of the final year students interviewed believed they had either poor or no knowledge of IR

"They do the procedures and then leave"
Marie, a witty medical school graduate living in the heart of busy London, made me laugh with all the stereotypical impressions she did of doctors from different specialties - the arrogant surgeon, the dull general practitioner, the antisocial diagnostic radiologist. She was also quick to point out how these are mere stereotypes that did not hold true in many cases. I asked her what she felt the stereotypical IR was like and after a moment of thought she responded that "they simply do the procedures they are asked to do and then they leave!" Sadly, this stereotype of IRs is not always far from the truth.

Though clinical practice in IR is being constantly improved, IRs often find themselves in situations where they lack the appropriate clinical infrastructure or support from their hospital management. Whether this stems from a passive approach from the IR or a lack of awareness or understanding from the administration, much can be done to improve IR's situation. Enhanced clinical practice not only avoids unnecessary difficulties for the discipline but it can also encourage some students to choose IR as a career.

Enhanced clinical practice not only avoids unnecessary difficulties for the discipline but it can also encourage some students to choose IR as a career

"Trying on possible selves"

As Marie explained why she chose to specialise in Neurology, she commented on how she had never wanted to become a Neurologist because she thought the field was dull and overly complicated. It was her neuroscience lecturer, a physician who she described as "funny", "highly intelligent" and "anything but dull" who changed her mind. "He really made you feel like the brain was the most amazing organ in the body!" For Marie, her neuroscience lecturer became her role model. Numerous studies have shown that a positive role model is an important factor in helping junior doctors decide on their eventual career. A study released in 1997 described how role models allow medical students to see how life working in their chosen specialty would be, a process described in the study as "trying on possible selves[4]." These role models can be anyone from family members who are physicians or, as in Marie's case, charismatic lecturers.

One does not need to look back to the days of Dotter, Rösch and Grüntzig to find great role models - a large number of inspirational interventional radiologists are around today. But the shortage of IRs in medical school teaching posts means that students often do not come into contact with them. Results from a survey found cardiologists and vascular surgeons to be the predominant sources of information on minimally invasive techniques for students[5]. The importance of IRs becoming more directly involved in medical teaching cannot be underestimated. Recognising this, many IRs have started to push for more student rotations through radiology departments. There, students can receive first-hand experience of what it means to be an IR.

The future of IR

Jack, Natalie, Marie and the countless number of other medical students and trainee doctors around the world are the future of medical professions. Although the three colourful characters interviewed are by no means representative of all medical students and trainee doctors, their comments still give a good insight into some of the areas that must be improved in order to attract more students to take on careers in IR. While it may be too late to persuade junior doctors like Marie and Natalie to specialise in IR, medical school entrants like Jack are still impressionable and open to the idea.

So at the end of our interview, Jack listened attentively as I explained what an exciting field IR was and how it provided innovative solutions to medical problems that other disciplines had trouble solving. I described the advanced tools that he could use, the challenging procedures that he could perform and the patients he could help. I then asked Jack if he would ever consider a career in IR, "It actually sounds like something I may be interested in. I would definitely like to find out more!" he beamed, and I felt a small sense of triumph.

Many IRs have started to push for more student rotations through radiology departments. There, students can receive first-hand experience of what it means to be an IR

1 *Anthony A. Nicholson et al. Whatever Happened to the Class of 2000? An Outcome Survey of Potential Interventional Radiologists. Clinical Radiology 2006; 61:706-709.*

2 *Ian M. Scott et al. Whether or Wither Some Specialties: A Survey of Canadian Medical Student Career Interests. BMC Medical Education 2009;9:57.*

3 *Sum Leong et al. A Survey of Interventional Radiology Awareness Among Final Year Students in a European Country. Cardiovascular and Interventional Radiology. 2009;32:623-629.*

4 *Jeffery H. Burack et al. A Study of Medical Students' Specialty- Choice Pathways: Trying on Possible Selves. Academic Medicine. June, 1997;72:6:534-541.*

5 *Sum Leong et al. A Survey of Interventional Radiology Awareness Among Final Year Students in a European Country. Cardiovascular and Interventional Radiology. 2009;32:623-629.*

www.cirse.org
www.uems.net

One Size Does Not Fit All

The Political Threat to MRI Development

The Proposal
In December 2002, a health and safety proposal was made in the European Commission. This proposal sought to protect workers in heavy industry from excessive exposure to electromagnetic fields (EMF), which can cause pain, dizziness and twitches. It was a sensible suggestion, but did cause a few delegates to tentatively raise the question: will this affect medical MRI usage? They were assured that it would not, and in April 2004, the directive was accepted and a transposition deadline of 30 April 2008 was adopted by the EU.

The Problem
The problem with this was that these few delegates had been right to question its impact on MRI. In fact, the directive is so restrictive, it could hamper MRI use significantly. As outlined above, this directive was aimed at heavy industry, and specifically sought to "avoid known acute adverse health effects in workers[1]." As Dr. Stephen Keevil points out in the Institute of Physics Report[2], this does not refer to potential problems that might be caused, but to clinically recognised side-effects. In the case of MRI, these new limits are precautionary, and based on very limited, non-MRI related data.

The Evidence
Of the roughly 500 million exams that have been carried out in the last 25 years, there have only been negligible problems - UK data from 2005 establishes that 0.004% of scans have adverse effects, and only 1% of the 0.004% is caused by direct EMF effect[3]. Existing regulations protect patients and staff from projectiles, potential tissue heating and PNS (peripheral nerve stimulation), and this new directive does nothing to improve patient care - in fact, it will make it substantially worse, and expose more patients to unnecessary and potentially harmful ionising radiation from other imaging modalities, especially in relation to interventional radiology, which is looking to increasingly use MRI to reduce radiation dose levels. Given that anaesthesia and close clinical proximity will be prevented by this directive, it is precisely the most vulnerable patients (young, old, frail) that will be prevented from receiving the gentlest imaging possibilities.

The Campaign
The threat that this directive poses to MRI only came to the attention of medical bodies when it had already been agreed upon, and since then, various European, national and scientific interest groups have joined forces to have the directive repealed. They have succeeded in having their concerns acknowledged by the European Commission, but the political cogs that were set in motion in 2004 are hard to stop. So far, a reprieve has been won until April 2012, but if MRI is to continue in its present state, a legal amendment must be agreed upon at EU level by mid 2010. Given the nature of EU bureaucracy, that is a very short deadline, especially given the varied interests involved. This directive also applies to industry, where such regulation is needed to protect workers, and trade unions are not going to accept the directive being repealed entirely. A compromise is necessary, and though campaigners are hoping for an exemption for MRI, it may still result in MRI's present and future being restricted.

MRI:
- Safer - free from hazards of ionising radiation
- Unrivalled quality - excellent at imaging soft tissue
- Unique information - demonstrates body's mechanical and physiological properties
- Excellent potential for IR - can visualise borders of tumours
- Low risk - in use for over 25 years; negligible evidence of ill-effects

Endangered scenarios:
- Interventional MRI
- Some functional MRI - research on deaf-blind studies
- Imaging of children - nurse-supervised to avoid anaesthesia
- Anaesthetised patients or those who require monitoring
- Research applications
- Servicing and maintenance of MRI machines

Solutions:
- Retention of existing exposure limit values (ELVs)
- New ELVs based on latest recommendations
- Exemptions for specific cases / MRI generally (Alliance for MRI position)
- Non-binding action, voluntary agreements
- Repeal of directive

Political barriers to solution:
- European Parliament / Commission elections of 2009 mean new relationships need to be established
- Six member states have already transposed directive into national law
- New member states have lower national EMF exposure limits - may be difficult to persuade
- Influential role of trade unions within the EU - seek to protect existing directive
- Deadline - everything must be agreed at EU level and by 27 members states - solid amendments are needed by mid 2010 if they are to alter the directive

A petition to ensure a timely response from the European Commission as well as further information can be found at www.alliance-for-mri.org.

C.M.

1 *Keevil, S. MRI and the Physical Agents Directive - Institute of Physics Report. November 2008.*
2 *ibid*
3 *Keevil, S. Policy options for amendment of Directive 2004/40/EC: assessment of impact on magnetic resonance imaging (MRI). February 2009.*

HEPAR Study
Radioactive Holmium Microspheres for Radioembolisation of Liver Tumours

Intra-arterial radioembolisation with Yttrium-90 (^{90}Y) microspheres is increasingly used for palliative treatment of primary and secondary liver tumours [1, 2]. Holmium-166 (^{166}Ho) microspheres have been developed as an alternative to ^{90}Y-microspheres [3, 4].

Why Holmium-166?

- In contrast to ^{90}Y, the radiation that ^{166}Ho emits allows for tracing with Single Photon Emission Computed Tomography (SPECT), which is able to provide true 3D information of blood flow, primarily.
- In addition, holmium is strongly attracted by a magnetic field which enables visualisation with Magnetic Resonance Imaging (MRI).
- Finally, ^{166}Ho microspheres can be injected in a mixture with a contrast agent to ensure constant visualisation and early recognition of the decrease, stoppage or backflow during injection [5, 6].

Comprehensive preclinical studies in animals have demonstrated that ^{166}Ho radioembolisation has a favourable toxicity profile and is clearly destructive to cancer cells [6-8].

Current Status of HEPAR

As a first step towards clinical implementation, a "first-time-in-man" safety study has been recently started on radioembolisation with ^{166}Ho microspheres in patients with liver metastases.

In this prospective study, 15-24 patients with unresectable, chemorefractory liver metastases will be included for treatment with ^{166}Ho radioembolisation in cohorts of 3 patients with consecutive cohorts receiving consistently increasing doses of ^{166}Ho.

Expected Findings

Based on the preclinical studies, it is expected for ^{166}Ho radioembolisation to have a toxicity profile comparable to that of ^{90}Y. The additional imaging possibilities of ^{166}Ho microspheres may however improve the overall safety of the procedure and reduce radioembolisation treatment time in clinical practice.

For more information, please contact:

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8 *Vente M.A.D., De Wit T.C., Van den Bosch M.A.A.J., et al. Holmium-166 poly-microsphere radioembolisation of the liver: technical aspects studied in a large animal model. Eur Radiol 2009 [Epub ahead of print].*

Trials and Registries

Trial: a study carried out with the purpose of testing a new medical treatment on a defined group of people. The results are compared with a group that are treated using another method and/or a control group.

Registry: a (retrospective) collection of data about a certain treatment or illness. Using the compiled data, conclusions can be drawn about effectiveness of a particular treatment method.

Pain Management

Balloon Angioplasty Versus Xpert Stent in CLI Patients XXS Study

Contact person
Dr. Gunnar Tepe, University of Tuebingen, DE
Date opened
September 2007
Status of trial
Recruiting
Source
www.clinicaltrials.gov

Description
This is an investigator-initiated study. It will be performed as a prospective, randomised, controlled multi-centre trial to evaluate the safety and efficiency of Xpert stents compared to PTA in patients with chronic distal artery occlusions or stenosis undergoing catheter revascularisation.

Morphine After Radiofrequency Ablation of Painful Bone Metastases in Patients with Cancer

Contact person
Dr. Florence Dixmerias, Institut Bergonié, Bordeaux, FR
Date opened
October 2007
Status of trial
Recruiting
Source
www.clinicaltrials.gov

Description
This phase II trial is studying how well morphine works after radiofrequency ablation of painful bone metastases in patients with cancer.

www.intervention-iq.org
www.clinicaltrials.gov
www.who.int/trialsearch/default.aspx
http://clinicaltrials.mayo.edu

The Intra-Drug Eluting Stent (DES) Restenosis Study (CRISTAL)

Contact person
Dr. Bernard Chevalier, Centre Cardiologique du Nord, Saint Denis, FR
Date opened
March 2006
Status of trial
Active, not recruiting
Source
www.clinicaltrials.gov

Description
A prospective, randomised, multi-centre comparison of the Cypher Select™ sirolimus-eluting stent and balloon re-angioplasty for treatment of patients with intra-des restenosis.

UFE & UAE

Fertility After Uterine Artery Embolisation for the Treatment of Leiomyomas (EFU)

Contact person
Dr. Jean Pierre Pelage, Hôpital Poissy St Germain En Laye, FR
Date opened
February 2009
Status of trial
Recruiting
Source
www.clinicaltrials.gov

Description
The main goal of this study is to evaluate spontaneous fertility after uterine leiomyoma embolisation in women between 18 and 40 years old.

Uterine Artery Embolization and Pelvic Floor Symptoms

Contact person
Dr. Clifford Y. Wai, University of Texas Southwestern Medical Center, Dallas, TX, US
Date opened
January 2009
Status of trial
Recruiting
Source
www.clinicaltrials.gov

Description
The objective of this study is to determine whether women who are already receiving treatment for their fibroids demonstrate improvement in urinary symptoms and sexual dysfunction as well.

Uterine Fibroid Treatment: Magnetic Resonance Imaging-guided Ultrasound Surgery (MRgFUS) Versus Uterine Artery Embolisation (UAE)

Contact person
Dr. Elizabeth A. Stewart, Mayo Clinic, Rochester, MN, US
Date opened
October 2009
Status of registry
Recruiting
Source
www.clinicaltrials.gov

Description
Primarily, this study aims to compare the safety and effectiveness of two standard fibroid treatments: MRI guided ultrasound surgery (MRgFUS) and uterine artery embolisation (UAE). Both treatments are approved by the Food and Drug Administration (FDA) for women who do not plan to become pregnant. Secondly, this study aims to better understand which symptoms bother women with fibroids the most. Understanding and addressing the symptoms of clinically-significant uterine fibroids is important in order to optimise treatment outcomes and control healthcare costs.

Vertebroplasty and Kyphoplasty

Clinical Evaluation of the Crosstrees Pod™ in the Treatment of Pathologic Fracture of the Vertebral Body (Levels T4 - L5) in Adult Patients

Contact person
Sean R. Gemmill, MS, RAC, Director of Clinical Affairs Crosstrees Medical, Boulder, CO, US
Date opened
June 2009
Status of trial
Recruiting
Source
www.clinicaltrials.gov

Description
The clinical trial is being conducted to evaluate the performance of the Crosstrees System in reducing pain and decreasing the risk of cement leakage associated with vertebroplasty and kyphoplasty.

Please note that this does not constitute an exhaustive overview of Trials and Registries. If you are aware of a Trial or Registry which may be of interest to our readers, please feel free to contact us at info@intervention-iq.org.

IQ takes no responsibility for the content of the individual trials; please refer to their Source for further information.

Comparative Study of Balloon Kyphoplasty and Conservative Treatment (TRAUMAA1-2-3)

Contact person
Dr. Jean-Denis Laredo, Hôpital Lariboisiere, Paris, FR
Date opened
December 2007
Status of trial
Recruiting
Source
www.clinicaltrials.gov

Description
A study comparing two treatments in acute stable traumatic vertebral fractures (types A1, A2 and A3.1 in MAGERL Classification). The two treatments are: conservative orthopaedic management consisting of brace and pain medication and percutaneous balloon kyphoplasty. This may restore part of the vertebral height loss due to the fracture and facilitate the injection of the cement with low pressure.

Percutaneous Vertebroplasty: Prophylactic Treatment of Adjacent Vertebra

Contact person
Dr. Øivind Gjertsen, Dr. Per Hj Nakstad, Nevroradiologisk avdeling Ullevål Universitetssykehus HF Oslo, NO
Date opened
April 2008
Status of trial
Not yet recruiting
Source
www.clinicaltrials.gov

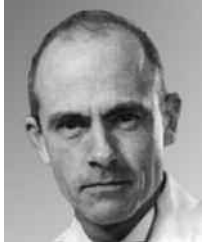
Description
The purpose of the study is to determine if prophylactic vertebroplasty of unfractured vertebrae adjacent to the treated fractured vertebrae can reduce the rates of re-fracture in adjacent vertebrae.

Stereotactic Body Radiation Therapy and Vertebroplasty in Treating Patients with Localized Spinal Metastasis

Contact person
Dr. Robert D. Timmerman, Simmons Cancer Centre, Dallas, TX, US
Date opened
February 2009
Status of trial
Recruiting
Source
www.clinicaltrials.gov

Description
This phase II trial is studying how well giving stereotactic body radiation therapy together with vertebroplasty works in treating patients with localised spinal metastasis.

The Early Days of IR



Charles Dotter *1920 - 1985*
© Dotter Interventional Institute, Oregon Health and Science University

Andreas R. Grüntzig *1939 - 1985*
© Deutsche Gesellschaft für Kardiologie, DGK

Marketing is the key to any successful business venture. No matter how good a product is, if you can't convince people to try it, it may never take off. This is no less true of medical procedures - in fact, it may be even more crucial. People may be prepared to take a gamble and put an unknown breakfast cereal in their shopping trolley, but few would be prepared to take such a risk with their health and safety.

Charles Dotter was more than a medical innovator; he was also a strong personality. This had an immense impact on public and professional perception of his new techniques. Stories abound of his various escapades, many of which could honestly be termed madcap.

Dotter was a huge fan of the great outdoors, and would spend weekends and holidays hiking. When you or I go hiking, we might put on some sturdy shoes, pack a sandwich and a flask of tea, and have a good brisk walk up a hill. When Dotter went hiking it was a more adventurous affair, and not necessarily one that took place during daylight hours. Many of those naïve enough to accompany him returned pale and trembling, never to set foot on any kind of incline again. During one incident, he and his wife were stranded on a particularly impassable piece of cliff face for 24 hours before being rescued - after that, only his dog would go with him. By all accounts, he was a man who liked fast cars and daring plane tricks: a born stunt-man, who lived to push the limits.

This pencil drawing by Charles Dotter proudly hangs in the Dotter Interventional Institute. Reproduced by kind permission of the Dotter Interventional Institute, Oregon Health and Science University

This sense of adventure was present in his professional work too, which proved to be both a boon and a burden. This willingness to try new things and take risks was part of what allowed him to both come up with new ideas and have the confidence to try them out. He would invent devices that would make his ideas workable, and build his own tools in his kitchen or garage. By taking these leaps of imagination and faith, he gave life to a whole new branch of medicine.
He was also aware of the importance of public relations. He was one of the first to warn that interventional radiologists must be clinically involved, and deal with their patients face to face. This is still one of the greatest problems IR faces, almost 50 years after its beginnings. He was willing to be the face of IR, and courted media attention, gaining valuable attention by being publicly seen doctoring sick elephants and penguins from the local zoo.

However, this media attention didn't always work in his favour, and a Life Magazine feature which unfortunately christened him "Crazy Charlie" was many people's introduction to interventional radiology. This article, and others, made references to his more eccentric behaviour and highlighted the non-conventional side of his work, which was, in reality, the key to its success. But this made others nervous, particularly when they heard anecdotes of off-the-wall medical demonstrations. In one such incident, Dotter gave a short lecture to medical students on how it would be both feasible and safe to place a catheter into the heart chambers and how he thought the graphs would look. He then wheeled a large monitor in, and rolled up his sleeve to reveal that, all the while, he had had a catheter in his heart. He then plugged himself into the monitor and took the students on a catheter-guided tour of his heart. These kinds of stunts were intended to show the safety of his procedures, but the dramatic wildness of such gestures put the frighteners on people who expected doctors to be serious, safe and scientific.

However, the face of percutaneous transluminal angioplasty got a make-over in the 1970s, with the public arrival of a Swiss cardiologist, Andreas Grüntzig. Grüntzig had adapted Dotter's techniques some years before, and had developed the first balloon catheter capable of dilating peripheral arteries. In February 1978, the Lancet published the impressive results from his first five balloon cases, and the medical world responded with unprecedented warmth. Part of this was due to his outward persona - he came across as being a serious-minded, cautious medical professional, who backed his research with data and careful analysis. He was the kind of doctor that people felt was trustworthy, and his seriousness lent an air of authority to the discipline. His high profile and technical developments added momentum to the progress of interventional procedures, and the opposing yet complimentary twin personalities of Dotter and Grüntzig brought angioplasty into the public eye. The stage was set for great things.

With thanks to Fred Keller for insights and information

C.M.

What's in store

Coming up in Issue 2, July 2010

Intervening in Cancer

... The Quarter's Focus

Interventional Oncology
Image-guided, minimally invasive therapy for cancer

We have brought you the theory behind the procedures, now we show you the results.

Cancer is one word for over 200 types of disease that can occur in over 60 organs of the human body. It is just as unlikely for one word to appropriately define the range of diseases as it is for one course of treatment to successfully treat it. We show how Interventional Oncology can provide palliative and lifesaving solutions to debilitating and life threatening conditions.

The next issue of IQ completes the 2010 cancer series with an in-depth look at the discipline, featuring unbiased accounts from the interventional oncologists, referring physicians and patients. Current as well as future methods of Interventional Oncology will be presented clearly and openly.

Exclusive Reports & Interviews from the European Conference on Interventional Oncology 2010

If you are interested in contributing to IQ, please contact info@intervention-iq.org

Also featured:

- **Paediatric Interventions**
- **The Situation of IR in the UK**
- **IR and Emergency Medicine**