Laser Stereotaxy: New Paths in Brain Tumour Therapy

A new dimension in the treatment of deepseated brain tumours has been opened up with the advent of high-precision laser stereotaxy — a technique that delivers laser light to the precise site of the tumour to destroy it.

Computer-aided laser stereotaxy, the result of years of systematic laser application research, provides access to the brain via miniscule drill-holes. When combined with special diagnostic systems using various imaging methods such as X-rays, magnetic resonance or positron emission, laser stereotaxy can play a key role in treating tumours without opening the organ.

The laser light results in localised heating of the tissue or thermotherapy. Interstitial thermotherapy (ITT) is one way of treating tumours as they are sensitive to heat unlike healthy cells.

Inspite of the progress made in microsurgery and laser applications, operating deep-seated brain tumours still offers considerable risk to the patient as the inneregions in the brain contain the centres of regulation and delicate pathways that control the body's motor activity.

Tumours located deep beneath the cerebral cortex present another problem: they make it difficult even for experienced neurosurgeons to maintain three-dimensional orientation and human vision cannot always clearly determine the border between the brain tumour and healthy tissue.

If a brain tumour is slow growing, benign and not clearly demarcated an operation might have to be avoided altogether due to the danger of post operative damage.

Besides, benign brain tumours are only moderately sensitive to radioactivity, with the average survival time of patients amounting to less than two years when radioactive isotope seeds are implanted in the tumour.

Stereotactic laser operations offer a way out as they help surgeons reach the tumour by means of a positioning instrument. A computer calculates the positioning coordinates where the incision or cut has to be made and afterwards, a special light guide measuring one millimetre in diameter and mounted on a sterotactic frame is inserted into the centre of the tumourvia a small hole drilled through the bone.

Contrary to interstitial radiotherapy, stereotactic interstitial laser exposure can be directly measured and controlled by magnetic resonance imaging (MRI).

Germany's MBB has developed a new fibre transmission system that delivers laser light of varying power to the precise site of the tumours to destroy them. These new systems may comprise bare fibres diffusely emitting fibres, frosted sapphire tips and circumferentially emitting fibres.

These systems help in interstitial thermotherapy, a non-open method of destroying tumour by providing laser-induced heat.

The different fibre systems vary in emission characteristics, power density at the fibre-tissue interface, flexibility, tissue adhesion and compatibility in magnetic resonance diagnostics.

The ideal imaging method for ITT is magnetic resonance tomography because of its high resolution which allows accurate diagnosis and precise observation of the course of the treatment.

Bare fibres have a relatively small cross-sectional area which increases the risk of burning the tissues.

Diffusely emitting fibre tips have glass caps measuring approximately one millimetre in diameter, which emit laser light in a diffuse, radial manner. Compared to the bare fibre, it results in very low fibre density at the fibre-tissue interface which eliminates the possibility of burning or carbonising the surrounding tissue. Also, the maximum transmittable laser power is approximately one watt, which is not enough to coagulate large areas.

On the other hand, sapphire tips, with a power of upto three watts, can be used for interstitial applications, but here their use is limited by the relatively large diameter of the sapphire tip and the cooling required at the optical fibre-sapphire tip.

Besides, a metal connection between the sapphire and the optical fibre makes it difficult to monitor the therapy.

A new special ITT light guide developed at MBB attempts to eliminate the difficulties encountered with each of these systems. The guide emits light in a guided circumferential manner to deliver sufficient laser power of three to 10 watts for coagulation. The non-metallic fibre tips require no cooling.

Other advantages of this new light guide is that it can help disintegrate tumours under simultaneous MRI control, eliminates tissue adhesion by virtue of a special composite used as the cap material, reduces heat loss between two neigh-bouring ITT fibres and several ITT fibres can be used simultaneously to treat larger tumours.

In order to save time, several ITT fibres are connected to a laser unit by means of an optical switch. Rapid switching results in the entire laser energy to be coupled with each single fibre for a short while.

To save energy, the entire laser energy is distributed and simultaneously coupled into several ITT fibres, says an MBB report.

The technique has already been tried in the University Clinic of Neurosurgery in Dusseldorf patients with low-grade tumours in the brain. The treatment using the ITT light guide, which could be monitored by MRI, clearly and irreversibly destroyed a portion of the tumour.

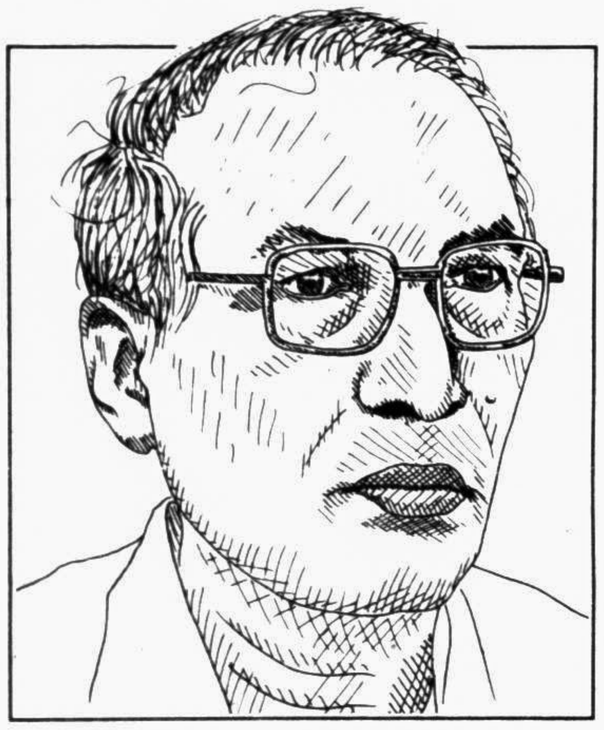
Laser-induced ITT has tremendous potential in the treatment of deep-seated brain tumours, scientists report. The therapy can be monitored by magnetic resonance imaging and there are few chances of causing damage to the patients during treatment.

The technique can also be applied to eliminate therapy-resistant foci of epilepsy.

International group research projects are already underway in cooperation with universities in Boston, Groaz, Tokyo, Munich and Dusseldorf.

— *PTI Feature*

Rural health depends most on supply of clean water. —Shasthya Tathaya.



DR HUDSON SILVA

Thanks to him 25,000 can see

THIRTY years ago, in an operating theatre at the Victoria Memorial Eye Hospital in Colombo, Sri Lanka, medical student Hudson Silva was watching his first corneal transplant operation.

The technique — removing from a blind patient the cornea, or tissue, covering the front surface of the pupil of the eye, and then replacing it with the cornea freshly removed from the eye of a dead person — had already been practised by ophthalmologists for several years.

It was a relatively simple operation and could successfully restore normal vision to someone suffering from corneal blindness, a condition where the normally transparent cornea has become shrivelled and opaque due to some form of damage.

Corneal blindness is common and accounts for 20-25 per cent of all the world's cases of blindness. The major problem with restoring vision to such people, however, was not the lack of skilled personnel to operate or even of equipment, but the lack of adequate corneas for transplanting.

Hudson Silva well remembers the eye surgeon performing the operation that day complaining how difficult it was to find adequate donor material.

Silva was struck by what he thought might be a way of helping obtain more corneas for use in transplant surgery.

He sat down that weekend and wrote an article for Sri Lanka's national Sunday newspapers, suggesting that people pledge to donate their eyes on their death and advocating a system to arrange for the surgical removal and storage of eyes on the death of these volunteers.

As often happens, that one small step by young Silva resulted in a giant leap in the war against human blindness. His original article drew some 400 enthusiastic responses, with people writing in to the paper offering to give their eyes on their death in order to save the sight of others.

Among Sri Lanka's predominantly Buddhist population, one of the better known of the Jataka Stories, which describe the lives of the Buddha in his 550 previous reincarnations, is the story of King Sivi.

In this tale, the Buddha was born into the world as King Sivi, an Indian ruler. When one day a blind Brahmin priest sought help to regain his sight, King Sivi willingly commanded that his own eyes be removed and transplanted into the priest's empty eye sockets.

Silva's article had struck a responsive chord in a people whose strong Buddhist heritage made them an ideal donor group.

Having been the originator of the idea, and being greatly encouraged by the response he had evoked, he felt obliged to see it through.

In 1961, Silva, by then a qualified doctor, formed the Eye Donation Society, an organisation through which he could put his brainchild into effect.

That same year, the first pair of donated eyes was used to restore the sight of a Sri Lankan engine driver, who was able to return to his job with 20/20 vision only a few months after the operation.

Among the 40 founding members of the Eye Donation Society who signed a pledge to donate their eyes was Dr Silva's own mother. Two years later, her son was able to fulfil her request, removing her eyes when she died and using them to restore the gift of vision to someone else.

Today, more than half a million Sri Lankans, including President Ranasinghe Premadasa, have signed consent forms offering their corneas to be used for transplant operations.

In nearly thirty years of existence the Eye Donation Society — together with its sibling, the Sri Lanka International Eye Bank — has provided over 25,000 corneas for transplantation.

The Eye Donation Society has some 300 branches scattered throughout the country, and news travels fast in Sri Lanka's small, closely knit society.

As soon as one of the branches hears of the death of a donor, it informs the Eye Bank. Since donor eyes must be removed within four hours of death, the Bank has a team of doctors and medical technicians on call 24 hours each day to collect the pledged eyes.

In a 15-minute operation (called enucleation), team members remove the eyes and place them in a cold saline solution containing antibiotics. Wads of cotton wool are placed into the empty eye sockets, and once the eyelids are closed over the wads, the dead body looks perfectly natural.

When the Society first commenced operations, the medical "team" consisted solely of Dr Silva — who, on being informed of the death of a donor, would set out regardless of the time of day or the distance to bring the donated eyes back.

Success begets success, however, and today he has motivated several doctors and specially-trained technicians, who man the central Eye Bank in Colombo as well as five other collection centres in Sri Lanka's major cities. Even today, Dr Silva still goes out himself to collect donor eyes.

Once the eyes are brought to the Eye Bank, they are stored in a refrigerator at 4 Celsius, under which conditions they can be kept for 304 days and are made available to eye surgeons both at home and abroad.

The national airline, Air Lanka, takes donor eyes in special temperature-controlled containers free of charge on its commercial flights to destinations around the world.

At present, the Eye Bank sends a monthly quota of donor eyes to doctors and hospitals in nearly 60 countries. Currently, more than 2,000 eyes are provided annually for the benefit of blind persons overseas.

The services of the Eye Bank are provided free of charge for the 200-300 Sri Lankans who undergo corneal transplantation each year. Overseas recipients pay a modest charge for the service, and this is often paid by philanthropic organisations or the governments in their own countries.

Thanks to Dr Silva, donations from foreign governments, NGOs and grateful recipients have helped provide a fully equipped, modern Eye Bank building and vehicles.

Thirty years after he saw his first corneal transplant and was moved to write his original article, Hudson Silva's pioneering work has earned him numerous honours, bestowed by governments from Pakistan to Japan.

— GEMINI NEWS

Thousands Bank on a Man of Vision

More than 25,000 people in various different countries today see the world through Sri Lankan eyes. Gemini News Service reports on how the vision of a medical student has led to this small island leading the world in giving "the greatest gift of all." by Sanjiva Wijesinha

Deadly Herb Eases Pain of Arthritis

BEIJING : A sinister herb with deadly connotations is being used experimentally to treat a form of arthritis and a severe skin infection.

The plant, *Tripterygium wilfordii*, is regarded with fear and awe in the areas where it is found because of its strong toxicity. Some even call it *Ba Bu Dao*, or "instant death" for anyone who eats it.

But doctors curious about its curative effects on certain forms of leprosy and skin diseases were astonished to discover that it could also give relief to patients suffering from rheumatoid arthritis and systematic lupus erythematosus, a fatal skin infection.

The plant is commonly known as *Lei Gong Teng*. It grows in the provinces south of the Yangtze river such as Zhejiang, Fujian, Anhui, Jiangxi and Hunan. It also grows in Taiwan.

Some locals call it *Shan Pi Shuang*, or wild arsenic. Farmers have long used its juice to kill vegetable pests. But people had kept cautiously away from the poisonous herb until the 1970s when doctors began tapping its medicinal values.

In 1973, a research team headed by Dr Lu Xieyu of the Institute of Dermatology, Chinese academy of Medical Sciences, began studying the herb as an aid in treating rheumatoid arthritis.

"We took the cue from an earlier medical symposium where I learned that some doctors in Fujian province used a decoction of the plant to treat leprosy reactions and rheumatoid arthritis with fairly good effect," Dr Lu says.

In 1978, Dr Lu and his colleagues extracted a substance called *tripterygium multiglycoside* from the plant. They found the substance effective in treating rheumatoid arthritis and systematic lupus, a skin disease which affects internal organs and which can be fatal.

"We then had no idea as to what ingredient in the herb holds the diseases in check," Dr Lu says. Though the herbal preparation passed technical appraisal in 1982, identification of the effective ingredient in it still baffled researchers.

Then, in 1987, they identified the active ingredient as tripchlorolide, a chemical compound. Dr Lu and his colleagues believe the effect of the compound lies in checking abnormalities in the body's immune system.

In 1990, a group of independent medical experts affirmed the herbal medicine's curative effects for rhumatoid arhtritis and systemic lupus erythematosus. It was also found to be effective in treating nephritis, hepatitis B and leprosy reactions.

There are about four million Chinese suffering from rhumatoid arthritis and systemic lupus erythematosus. "We feel it is a rewarding undertaking to be able to do something to mitigate the sufferings of these patients," says Jin Zhanghong, entrepreneurial director of the No. 2 Xinchang Pharmaceutical Factory which mass produces the herbal medicine in tablet form.

The Xinchang factory began producing the medicine — now called Tripterygium Multiglycoside — in 1988. By 1990, it was turning out 60,000 100-tablet bottles. Output is expected to reach 100,000 bottles this year.

As the demand for the medicine increased the government invested US$230,000 in the factory. Annual output is projected at 500,000 bottles in the next few years. The Chinese Ministry of Public Health has given the green light for the exporting of the medicine by the Zhejiang Provincial Technology Import and Export Corporation.

Last November, the factory received a mail order from the United Nations Special Programme of Research, Development and Research Training in Human Reproduction. The reason : the medicine may be a potential male contraceptive.

One of the early beneficiaries of the tablet was Teng Yongli, 47, a rheumatoid arthritis patient. Mrs Téng is a teacher at the Centre Conservatory of Music in Beijing who had been crippled by rheumatoid arthritis for 25 years.

Perpetual pain in the joints made her life a misery. Visits to hospitals brought no relief and she was bedridden for many years. "I took all kinds of medicine, to no avail. Gradually, I lost confidence," she recalls.

In May 1990, her husband brought her some of the *tripterygium multiglycoside* tablets. After she took them, the swelling in her joints gradually subsided, their stiffness eased and the pain lessened.

"It's a vast improvement, beyond my wildest expectations," says her husband Chen Xianxin who is an editor at the Xinhua News Agency.

She was able to leave her bed and go shopping after taking the medicine for two months. She has stopped the treatment but can still leave her bed and go out. But she says she does not feel as well as a year ago.

Clinical tests have indicated that the medicine reduces the white blood cells in some patients. These patients are advised to stop using the drug for a period until their condition calls for another dose.

"I'm going to resume taking the medicine if my conditions get any worse," she says.

Her remark indicates the level of efficacy of the medicine. It does not provide a cure. But it seems, for many sufferers, to be the best treatment available now.

— Depthnews

Diarrhoea *PREVENTIVE MEASURES*

DIARRHOEA generally is caused by germs. Faeces of diarrhoea patients carry innumerable germs. Anyone ingesting these germs through food or water may get diarrhoea. The presence of patients with diarrhoea in a family or neighbourhood is likely to result in others being infected if precautions are not taken. The following simple measures should be taken to prevent the spread of diarrhoea.

1. Handwashing :

Wash hands with soap or ash and clean water after going to the toilet, wash hands well with soap and clean water before eating, or handling food, and before feeding a child. An older family member should wash the hands of young children.

2. Defecation Habits :

Do not defecate or wash the anus near a pond or river, as this may contaminate the water. After defecating each time, the stool should be covered by ash or mud to prevent spread of germs.

A designated place that cannot contaminate the water source should be used for defecation. Efforts should be made to install a sanitary latrine. This is available at a reasonable price from both govt. and private sources. It can be cleaned with a small amount of water. This also helps to reduce the number of flies. Each family member, especially children, should be taught to use the latrine properly. When sanitary latrines are not available, pit hole latrines can be installed away from ponds, canals, rivers or tubewells. Never wash soiled clothes in a pond or river. Instead, wash clothes away from the source of water, somewhere they cannot contaminate the water source.

3. Disposal of Babies' Stool :

Babies' stool should be regarded as harmful as that of the adults and should be disposed of promptly and properly. Such stool can be disposed in the sanitary or pit hole latrines.

4. Use of Clean Water :

Water should be collected from the cleanest available source, preferably from tubewell, and, stored in a clean container. If tubewell water is not available then water from alternative source should be boiled and cooled before use. It should be poured directly to other clean containers to avoid contamination. The use of halogen tablets and alum (phitkiri) in proper quantity is also advocated. In a pitcher (kalash) containing 10 seers of water, 5 gram (one tea spoonful) of alum are to be added and wait for 3 to 5 hours before use.

5. Feeding :

• continued breast-feeding acts as a preventive measure.

• Supplementary feeding should be given to a baby when its mother fails to produce enough breast milk.

• For babies on milk formula, ORS should be given in addition to the milk feed, when diarrhoea occurs.

• Milk should be boiled and all cooked foods should be eaten while hot or thoroughly reheated before eating.

• Keep food covered, to prevent contamination by flies and dust.

• Vegetables and fruits, eaten raw, should be washed with safe water.

6. Immunization against Measles :

Children should be immunized against measles as soon as possible after 9 months of age. Children suffering from measles are very susceptible to diarrhoea.

In summary, the preventions of diarrhoea can be aimed by following the guidelines of personal and domestic hygiene including water and sanitation practices, and improvement in food habits.