No. 02

CUSTOMER MAGAZINE FOR
SURGICAL MICROSCOPY & TECHNOLOGY

reSOLUTION

Helping Children to be Born Healthy

Foetal Surgery with the Leica HM500

"It's Easy to Neglect One's Own Health"

Ergonomics in Ophthalmic Surgery

Integrating Neurosurgical Images in Patients' Medical Records

The DICOM Solution

EDITORIAL

Dear Readers,

As a doctor, you look after the health of other people every day and carry a great responsibility for the wellbeing of your patients. It's easy to forget your own health. Do you really always make sure to keep fit and eat a healthy diet? Do you take the time to adjust the instruments you use to your individual height so that you can work for hours without feeling pain or losing concentration? At Leica Microsystems, we know the importance of ergonomic posture for your achievement potential – and therefore for the success of the operation. This issue of reSOLUTION tells you what you can do to improve your personal comfort at the microscope. By the way, the interview with the physiotherapist prompted us to readjust office chairs and monitors, too.

Even for experienced doctors, every birth and every new life is a small miracle. However, if an abnormal development puts a foetus at risk, modern surgical techniques can save the life of the child in pregnancy or during birth. We talked to a foetal surgery specialist to find out how useful the head-mounted microscope is for these tricky operations.

Integration has long been a keyword in medical technology. Innovations, and in particular standardisations are becoming more and more important for data processing in hospitals. The benefits of integrating microscope images into hospitals' IT systems are just one example dealt with in this issue.

We hope this has aroused your curiosity for reading the articles and that you will also find the other topics featured in this issue interesting.

Have fun reading!

Anja Schué
Communications & Corporate Identity

Angel Viosques
Marketing Manager Surgical Europe

CONTENTS

Foetal Surgery with the Leica HM500

Helping Children to be Born Healthy

Dr. Kirstin Henze, Leica Microsystems

Flexibility during surgery, quality of optics and documentation and analysis facilities are among the benefits that Dr. Javier Márquez from Seville appreciates most about the Leica HM500 headmounted microscope. Dr. Márquez is Chairman of the Neurosurgery Service of the Virgen del Rocio hospital in Seville – Spain's number one hospital going by the number of operations performed. Prior to this, he headed the paediatric neurosurgery section there and made a name for himself in foetal microsurgery. Márquez is responsible for several interdisciplinary research projects and has authored an impressive number of publications mainly on documentation, imaging and data management in diagnostics and surgery. Dr. Márquez operates with the Premium Surgical Microscopes for Neurosurgery Leica M720 OH5 and Leica M520 OH3 with fluorescence and the Leica MS2 and recently purchased a headmounted microscope.

Márquez first used the Leica HM500 in his special field of foetal microscopy, to be more precise Ex-Utero Intrapartum Treatment surgery (EXIT), i.e. surgery performed during the birth process. Before the 26th week of pregnancy already, the foetus had been diagnosed by ultrasonography as having a Congenital Diaphragmatic Hernia (CDH), a defect of the diaphragm that leads to viscera, sometimes even liver or stomach, penetrating into the thorax and causing underdevelopment of the lung and severe respiratory problems. For EXIT surgery Márquez supports Dr. Guillermo Antignolo, who is the leader of the team of gynaecologists.

The mortality rate for newborns with CDH is 75 per cent – including the cases that do not receive therapy due to not being diagnosed in time. In many cases, CDH is accompanied by further anomalies such as congenital heart defects or hydronephrosis. Neither the great advances in neonatal care of the last few years nor prenatal in utero repair nor foetal tracheal occlusion have been able to attain a breakthrough in reducing the high mortality rate. Ex-Utero Intrapartum Treatment surgery, on the other hand, has significantly improved the chances of healing and survival.

Dr. Javier Márquez, Chairman of Neurosurgery Service at Virgen del Rocio hospital in Seville, Spain appreciates the benefits of the headmounted surgical microscope for foetal neurosurgery.

EXIT: between birth and independent breathing

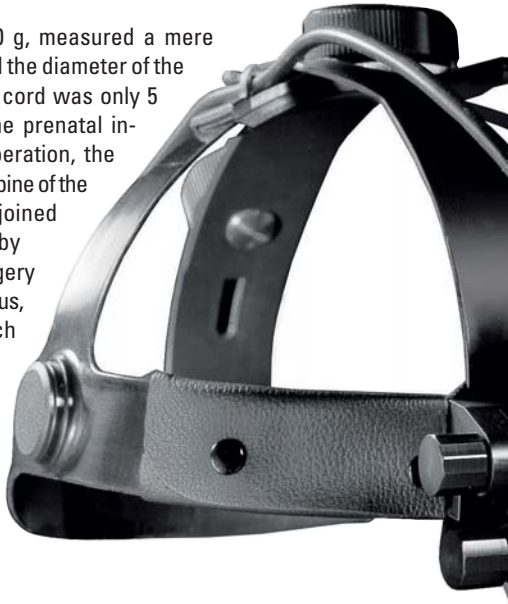
Márquez assists EXIT with a Caesarian section in collaboration with gynaecologists and paediatric surgeons. When the uterus is opened and the foetus is accessible, the umbilical cord is first left intact to ensure that the child is supplied with oxygen while the surgeon performs the intubation. Once he is sure of the oxygen supply independently of the mother, he cuts the connection between mother and child. The next day, the actual surgery can take place: organs are removed from the thorax and the opening in the diaphragm is closed. The child can breathe on its own.

"At the moment of the Caesarian and the intubation, everyone involved has to act very quickly and precisely," reports Dr. Márquez. "In such conditions, it is an enormous advantage for me to be able to move unhampered in my familiar operating environment with the Leica HM500 on my head. It gives me complete flexibility to move my hands and illuminates all the key areas." Another vital factor for him is the integrated autofocus video camera system of the Leica HM500, as the documentation material provides him with an analysis and evaluation of the therapy as the basis for his scientific research.

Spina bifida joined together in 24th week

Not long after the EXIT for CDH, Dr. Márquez also used the Leica HM500 for the first time to operate on a case of spina bifida in the 24th week of pregnancy. This damage of the spinal cord causes problems in walking and may even lead to paralysis from the affected area downwards. Also, spina bifida sufferers are frequently unable to control their bowels and bladder.

While Dr. Márquez found the documentation the best advantage of the Leica HM500 for the CDH surgery, the important thing for him in this application was the microscope's magnification, as the foetus weighed about 500 g, measured a mere 15 cm and the diameter of the umbilical cord was only 5 mm. In the prenatal invasive operation, the tiny split spine of the foetus is joined together by microsurgery in the uterus, after which the uterus is closed. The pregnancy then continues normally.



When the child is born, usually in the 34th week of pregnancy, it can lead a nearly normal life. At the very least, the prenatal operation improves its cognitive and motor functions. In view of such minimal dimensions and the manipulation of vital parts of the body, the optical performance of the microscope is crucial for Márquez. The first-class razor-sharp 3D image of the Leica HM500, the zoom magnification, and the integrated autofocus give him the accuracy he needs to perform such a delicate operation.

Worth getting used to

Foetal surgery is the special field of Dr. Márquez. However, he also works in other disciplines and will use the headmounted microscope for cerebral, vascular and spine surgery as well. "In my opinion, this instrument is an extremely useful and interesting tool. It has become an excellent addition to the Leica M720 OH5 and M2 surgical microscopes that I also use. You have to be prepared to learn how to handle it, though." Despite the relatively low weight of the headmounted

microscope, wearing something on one's head and having it in front of one's eyes during the whole operation takes some getting used to.

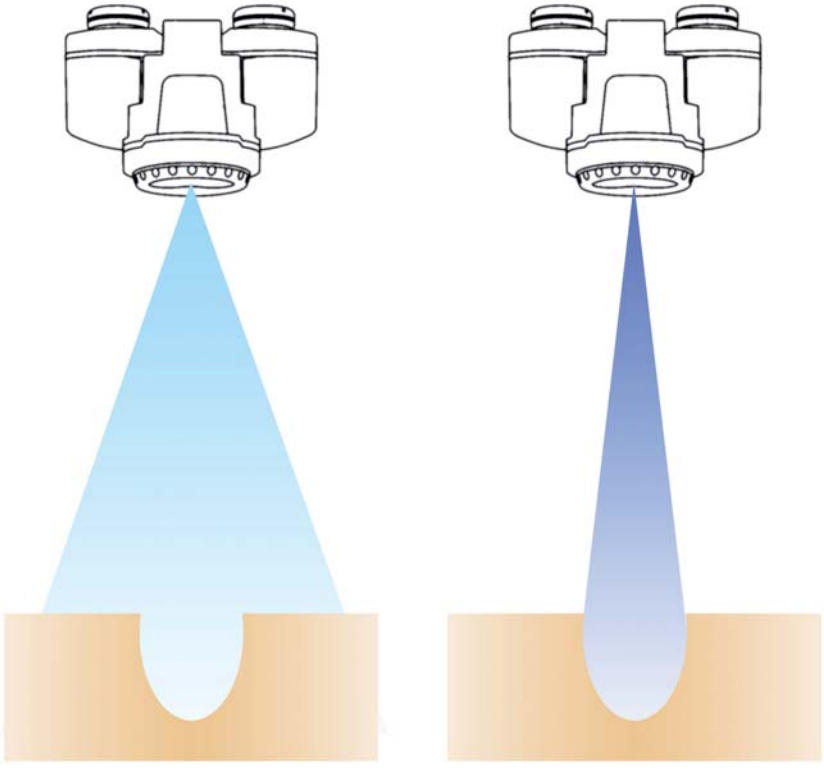
However, Dr. Márquez had already had some practice in this – as someone who enjoys thinking up and making devices of his own, he made a helmet with a video device which he wore to document and analyse his operations. For the early development of this helmet Márquez worked in close collaboration with the engineering team of Prof. Emilio Gomez from the University of Seville. Gomez is also a co-leader and colleague in the interdisciplinary research projects with the Virgen del Rocio hospital.

"I've worked with a weight on my head for many years and hardly noticed after a while. Surgeons who are unaccustomed to it will no doubt need a certain amount of training. But it's definitely worth the effort", states Márquez. The ergonomic design of the Leica HM500 is also conducive to long periods of fatigue-free work. So Dr. Márquez will continue to benefit from the advantages of the Leica HM500 in various types of surgery – in the interest of his research work and, even more importantly, in the interest of his patients.

New: Leica HM500 SL Spot Light for Better Vision

Surgeons who work with deep and narrow cavities as in Urology and Spine Surgery need a strong centered illumination. The new headmounted Microscope Leica HM500 SL (Spot Light) offers eight times more centrally intensified spot illumination.

The illuminated field of the HM500 SL is smaller but has a significantly more central light performance, especially at long working distances. Besides the different illumination concept, the new microscope has the same features as the Leica HM500.



Leica HM500: Illumination concept filling the field of vision for applications requiring a large field of illumination, e.g. plastic and reconstructive surgery, cardio vascular surgery or paediatric surgery.

Leica HM500 SL: Illumination concept with a centrally 8x intensified Spot Light (SL) for applications with deep and narrow cavities, e.g. urology or spine surgery.

Ergonomics Support Performance

Body in Balance

Kerstin Pingel, Leica Microsystems

Operations not only demand maximum concentration of the surgeon but also maximum physical fitness. Physiotherapist John Ludescher explains how the body can be given optimal support to perform at its best. The Austrian qualified as physiotherapist in Switzerland and has had his own practice for nine years. He is the author of the book "Aufrecht – Bewusst – Stark" (Upright – Aware – Strong) and designer of the "PhysioCap".

Mr. Ludescher, which parts of a surgeon's body are subject to particular strain when operating with a microscope?

Mainly the cervical spine, the cervicothoracal junction and the shoulder and neck muscles. The strain manifests itself in symptoms such as tenseness and pain in the shoulder muscles that may radiate into the arms, slipped discs, headaches, tinnitus symptoms and general states of exhaustion.

The frequently observed anteroposition of the head also has a negative effect. This leads to an unfavourable position of the first cervical vertebra C0/1, which not only affects the structures in the jugular foramen, but also creates stress in the craniomandibular system.

Hyperextension of the wrists causes asymmetrical strain on the lower arm muscles, which can result in tendon sheath pain and the so-called "tennis elbow".

What does an ergonomically ideal workplace in the operating room look like?

Ideally, the chairs for the surgeon and his assistant should be small, manoeuvrable and comfortable besides having adequate adjustment options. They should also be compatible with the operating table. The microscope should be easy and quick to control, have a memory function if possible, and be adaptable to all sizes of surgeons. Only then can the operating team adopt a working posture that is ergonomic and resource-saving in the long term.

The body should be in a perpendicular line, i.e. ear, shoulder joint and hip joint have to be in vertical alignment. The first step towards achieving this is to make sure the surgeon's chair is properly adjusted: In a sitting position, the surgeon's hip joint should be at an angle of greater than 90 degrees to the upper part of his body. Also, the hip joints should be higher than

John Ludescher demonstrates the optimal position: "The body should be in a perpendicular line, i.e. ear, shoulder joint and hip joint have to be in vertical alignment."

These postures lead to symptoms such as tenseness and pain in the shoulder muscles that may radiate into the arms, slipped discs and headaches.

An ergonomical and resource-saving working posture like this is achieved when the surgeon adjusts the position of the microscope until he can sit in an upright and comfortable position with the correct working distance.

the knee joints to be able to bend both legs at right angles. This straightens the position of the pelvis, making sitting less tiring. The muscles are in a neutral position and strain is avoided. Finally, when adjusting the inclination of the seat it is important that the pressure of the seat is evenly distributed to the thighs. In a second step, the operating table has to be set at the right height and the right working distance between the chair and the table must be observed.

After these adjustments have been carried out, it's time for the third step: the surgeon adjusts the position of the microscope to enable him to maintain an upright posture: Depending on his girth and size, the viewing height and angle of the objective and binocular tube have to be adjusted until the surgeon can work in a comfortable upright posture and with the correct working distance to the operating area. Of course, this is only possible with a microscope system featuring variable binocular tubes and flexible accessories. They should also be easy to handle, as in many operating rooms several surgeons use the same microscope in succession. In this respect, Leica Microsystems provides a pioneering portfolio of products.

That is the best case scenario. And what is everyday reality for a surgeon?

Most surgeons sit down first and then adjust their posture to the microscope, which inevitably leads to posture errors and the types of pain I described.

I have often also heard the objection that eye operations only take about ten minutes, so ergonomics are not a major issue. But a large number of short operations ultimately add up to a long working day spent at the microscope. Apart from this, many surgeons don't make the most of the facilities the microscope has to offer. They use it to see better without being aware of its ergonomic features.

What else can surgeons do to counteract physical strain at the operating table?

Extremely important, of course, is physical fitness, a healthy lifestyle and awareness of the body. Because to bring his body into the perpendicular line necessary for relaxed sitting and working, the doctor has to know how it feels when he is in equilibrium. After all, he can't have a look at himself in a mirror first!

The PhysioCap I designed is useful for this. It's a baseball cap with a silicone insert weighing 500 grams. It gives you the feeling you're balancing a book on your head. This cap trains and conditions the neck and spine muscles and encourages the body to automatically assume a good upright posture. With time, a correct posture is "programmed", as it were.

Even the best surgeon can only deliver good results if he offers his body, of which he demands a great deal, optimum conditions. An upright, comfortable posture improves concentration and the quality of work – and makes the surgeon feel less exhausted at the end of the day. After all, even a surgeon's day doesn't end when he leaves the operating room.

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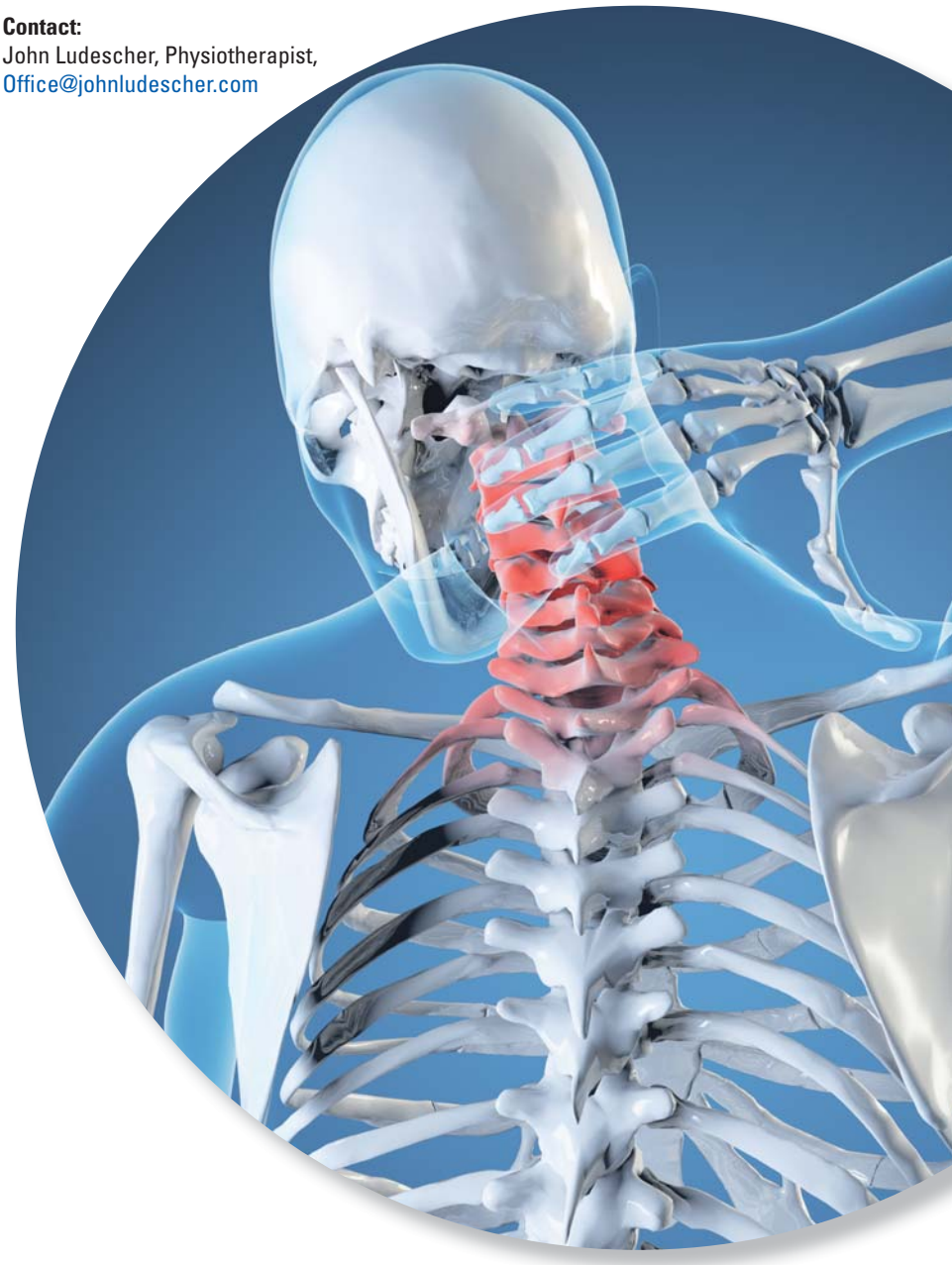

Ergonomics in Ophthalmic Surgery

"It's Easy to Neglect One's Own Health"

Kerstin Pingel, Leica Microsystems

Every operation demands a maximum of concentration from the surgeon and his team. A comfortable, pain-free working posture helped by the ergonomic design of the surgical microscope aids concentration – and contributes significantly to the success of the operation. Andrew Morris, Consultant Ophthalmologist at the Royal Bournemouth Hospital, England since 2002, reports on his experience with ergonomics in everyday working life.

Dr. Morris, please tell us something about the sort of work you do!

My subspecialty interest is vitreoretinal surgery. I am one of 2 "VR" surgeons in the Bournemouth eye unit as part of a team of 10 ophthalmologists. Most of my microscope work involves vitrectomy surgery and the most common condition that we treat with this technique is retinal detachment. The microscope is adapted with the BIOM attachment (Binocular Indirect Operating Microscope) for viewing the retina and vitreous cavity through the dilated pupil of the eye.

"The ergonomics of the equipment I use are a key factor in my working day."

In vitrectomy we need a well-illuminated, wide field of view and good stereopsis. A complex vitreoretinal procedure may take 90 minutes or more, so the ergonomics of the equipment that I use are a key factor in my working day.

Which ergonomic features of your microscope do you consider helpful?

The Leica M844 C40 surgical microscope offers several key features: It is easy to move and adjust to the required position. The eyepieces can be adjusted to suit most heights of surgeons allowing him or her to sit in an upright position. It is straightforward to fit the vitreoretinal equipment and this can be left in place for cataract surgery.

I also greatly appreciate the co-observation unit: Firstly, the assistant enjoys the same degree of stereopsis as the operating surgeon. Secondly, the second binocular tube can be effortlessly swivelled through 180

Andrew Morris appreciates the ergonomic features of his Leica M844 C40 surgical microscope: the eyepieces can be adjusted to allow surgeons of all heights to sit in an upright position.

Leica Microsystems' crisp, sharp APO OptiChrome™ M844 optics and exclusive direct illumination system offer the best clarity, contrast, and colour at safer low-light levels. The ceiling mount provides a convenient alternative solution for the operating room that frees up floor space while allowing flexibility for the surgical team to access either side of the operating table.

more meets the eye

degrees if the assistant has to change sides. The Leica sales team offered us optimal assistance in choosing the right equipment.

How important is ergonomics in your department?

It can be easy in busy practice to neglect one's own health. Back trouble is relatively common! High quality, reliable equipment that is quick to adjust is essential for dealing with a heavy workload.

What fascinates you about ophthalmology?

I gathered my first experience in this field as a student in East Africa. We flew to remote clinics equipped with a bag of simple surgical instruments that were sterilised in boiling water before the operation (SightByWings/Christian Blind Mission). Without a microscope operating was done with the aide of a loupe. The operating lamp was a car headlamp powered by a 12 V battery. Yet in spite of various adverse conditions we were, in many cases, able to restore people's eyesight with relatively simple surgical techniques. New techniques, advances in technology and the awesome visualisation achieved with the operating microscope have had a great impact on our working lives.

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The Leica ErgonOptic™ System

Of all the suppliers of surgical microscopes, Leica Microsystems offers the widest range of binocular tubes and adapters that meet the special requirements of every surgeon and assistant. Choosing from the large selection of binocular tubes and accessories, the customer builds an individual microscope system that provides him or her with optimum vision and perfect ergonomics for long workdays.

Variable binoculars:

For the **10°–50° Ultralow™ II binocular tube**, the viewing height is shifted far downwards, which allows the use of accessories such as a beamsplitter, inverter or laser shutter without impairing vision.

The variable, but still compact **30°–150° binocular tube with low viewing height** reduces the distance to the field of operation. This is also ideal for the assistant, who can adjust the viewing angle and height of the assistant's attachment according to his or her body height.

The long tubes of the **binocular tube with variable viewing angle from 10°– 50°** create a greater distance to the field of operation and enable an upright posture. The higher position of the swivel range provides ergonomic viewing conditions to surgeons of different body heights.

The tubes of the **binocular tube with a viewing angle variable from 5°–25°** create a medium distance to the field of operation and provide ergonomic viewing conditions to surgeons of different body heights. Ideal for a microscope configuration with few accessories.

The **binocular tube with a viewing angle variable from 0°–180°** provides optimum viewing comfort in all microscope positions, from horizontal to vertical.

Fixed binocular tubes and accessories:

With the **ErgoWedge 5°–25°** and the **ErgoWedge +/-15°**, the viewing angle of the binocular tube can be varied for better viewing comfort.

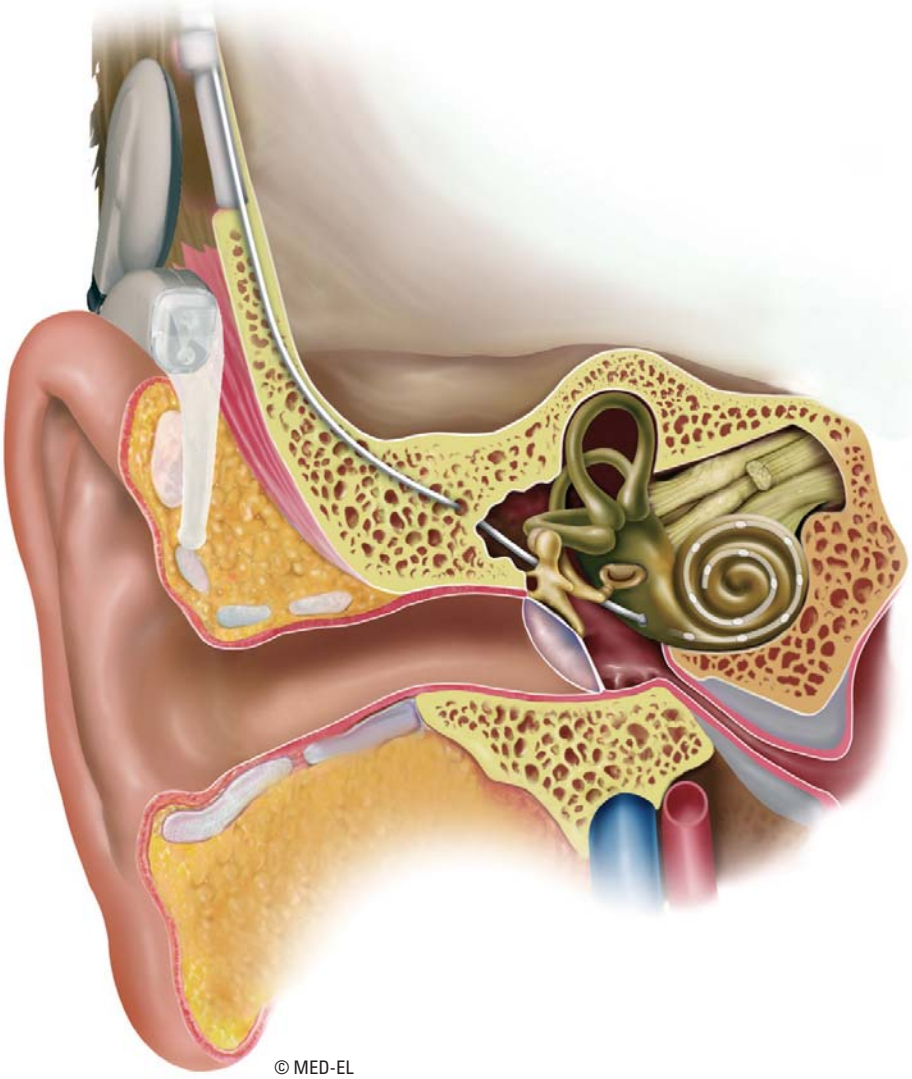
The tubes of the **highly inclined binocular tube** and the **inclined binocular tube** are fixed at an angle of 45°. They are particularly suitable for assistants' accessories such as the stereo attachment for a second observer and enable an upright posture.

Cochlea Implants for the Deaf and Severely Hard of Hearing

Breaking the Sound Barrier in the Head

Anja Schué, Leica Microsystems

People who can't hear are outsiders, cut off from normal conversation. Children born into a silent world never learn to talk. Adults who lose their hearing due to age, accident or illness are no longer able to participate in social life as they did before and are moreover often branded as slow-witted. Prof. Dr. med. Jan Maurer, Senior Consultant of the ENT clinic and Medical Director of the Catholic Hospital of Koblenz, Germany, has specialised, among other things, in special hearing implants such as the cochlea implant, and post-implantation rehabilitative therapy.



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Prof. Maurer, who are the suitable candidates for a cochlea implant?

Most deaf and nearby deaf people needing more than a conventional hearing aid still have an intact auditory nerve. These patients can benefit from an inner ear implant, or cochlea implant (CI) as it is called. The indication is determined by special hearing tests, diagnostic imaging of the petrous bone and testing of the auditory nerve function. In addition, the history and duration of the hearing loss are key factors for successful rehabilitation.

"Cochlea implant patients have to learn to hear all over again."

Children who were born deaf can lead a practically normal life with this implant, provided surgery is performed as soon as possible around the first 12 months. The sooner adults receive an implant after losing their hearing, the higher the chances of success. After more than ten years of deafness, it is unlikely to be successful. Patients with a damaged auditory nerve can be given a so-called auditory brainstem implant. This works in a similar way to a CI, except that here the first hearing centres are electrically stimulated in the brainstem.

Is there an age limit for a CI?

Speech and hearing develop in parallel very early on in childhood. Deaf children should receive a hearing implant before their 4th year of age - before the centres of speech are fully developed. After that, the

chance of learning to speak naturally decreases. We fit implants in children of around one year of age. Our youngest CI patients are eight months old. At the other end of the scale, there is no numeric age limit. My oldest patient was 86, now he's 94. The implant has enabled him to continue looking after his invalid wife at home. Before he had the implant, his deafness made it almost impossible for him to cope with everyday things such as shopping.

"Our youngest CI patients are eight months old, my oldest patient was 86."

Are always both ears provided with a CI?

Even people who were deaf in both ears used to receive only one CI, just as people who were hard of hearing only used to receive one hearing aid. Today we know how important bilateral, stereophonic hearing is for spatial orientation and hearing in noise, for example. It has long been the norm to fit hearing aids in both ears. And more and more countries are gradually adopting bilateral CI implants as standard procedure.

Although this is naturally a positive development in general, I do see a certain risk of cost explosion, as there are a great many people who are deaf in only one ear. It is simply a matter of assessing each case individually. A CI costs around 20,000 Euros and a further 15,000 to 30,000 Euros are spent for diagnostics, surgery, and rehabilitation.

How important is rehabilitation?

The hearing impression with a CI is completely different from normal hearing. You have to bear in mind there are about 20 electrodes to replace approximately 30,000 highly sensitive hair cells with 100 sensory hairs each in the cochlea. The hair cells enable us to finely differentiate sounds by transforming the oscillations of the inner ear fluid, which are generated by sound waves of differing amplitude and frequency, into electric impulses and relaying them to the auditory nerve. Despite the ongoing improvements in hearing implant technology and refinement of stimulation possibilities and speech coding, an implant is not a full substitute for the loss of hearing.

Therefore, rehabilitation is extremely important, especially for deaf children so that they can learn to speak as freely and normally as possible. Adult patients have to learn to hear all over again. The CI is first set about four weeks after surgery has taken place. Although patients can hear sounds and noises, they don't know what they're hearing. They have to acquire completely new hearing skills and need time and patience to regain their communication competence.

This arduous process can take up to two years. It's comparable to learning a new language. However, the brain is flexible when it comes to processing acoustic stimuli and adapts well to the new perceptual situation. I have even had patients who went for a walk a few hours after the CI was first set and already began to understand what the "new" world sounds like.

Fig. 1: Professor Dr. med. Jan Maurer, senior consultant of the ENT clinic and Medical Director of the Catholic Hospital of Koblenz, is a specialist for hearing implants.

How a cochlea implant works

The cochlea implant (CI) replaces the function of the outer ear, the middle ear and the cochlea of the inner ear. Basically, it consists of an external unit comprising a microphone, speech processor, transmitting coil and magnet and the implant proper, consisting of the receiving coil with magnet, the stimulator and the electrodes that are directly connected to the auditory nerve in the cochlea.

The speech processor transforms the sound waves into electric signals. The transmitting coil of the processor has a magnet by which it attaches to the scalp directly above the receiving coil of the implant and sends high frequency signals. The receiving coil is positioned subcutaneously behind the ear. The signals are passed on to the stimulator, situated in a milled recess of the skull, and from there to the electrodes that stimulate the auditory nerve.

To connect the electrodes to the auditory nerve, a channel is milled through the petrous bone as far as the middle ear, giving access to the round window to the inner ear. Through this channel, a hole is drilled in the cochlea through which the electrodes are inserted. The implant is provided with the necessary voltage by electromagnetic induction through the scalp.

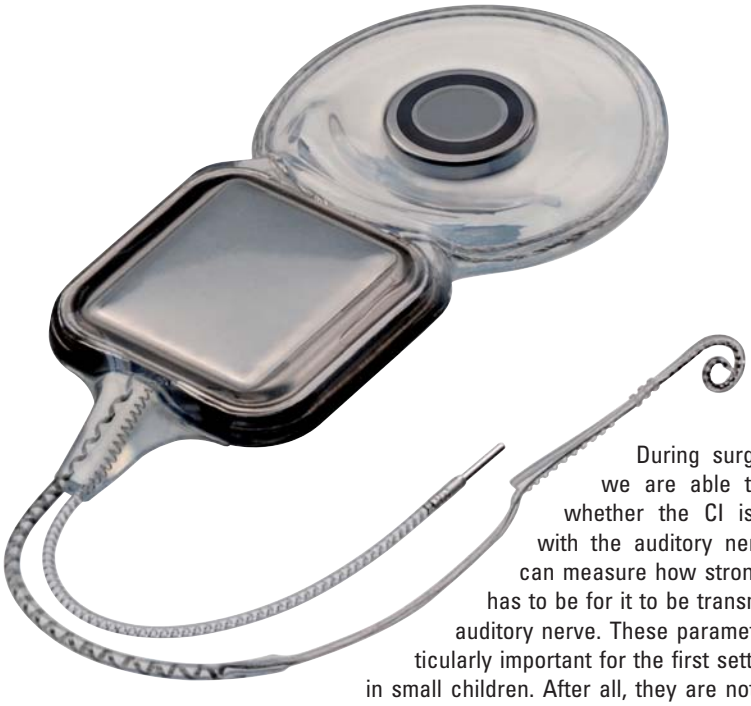

Fig. 2: High-tech in miniature: Cochlea implants (CI) are only a few centimetres in size and can help people who are deaf or severely hard of hearing to re-join the world of sound. ©Cochlear

During surgery already, we are able to determine whether the CI is in contact with the auditory nerve, and we can measure how strong a stimulus has to be for it to be transmitted by the auditory nerve. These parameters are particularly important for the first setting of the CI in small children. After all, they are not able to say whether a sound is too loud or too quiet. So we start with really quiet stimuli and carefully build them up until we reach the optimum setting.

What role does the surgical microscope play in your work?

The trend towards miniaturised accesses in nearly all areas of ENT surgery means extremely small fields of view. For example, we can't drill the 1 mm hole in the cochlea to fix the electrodes for a CI without using a microscope. As well as optical quality, I need good field depth and optimal illumination, particularly for deep and narrow surgical approaches. The instrument must also always be ready to operate, easy to use and adjust for all those involved. I do between 25 and 30 hours of surgery a week, which would be unbearable without an ergonomically adaptable microscope. We are highly satisfied with the systems of Leica Microsystems in all these points.

How would you like to see a surgical microscope of the future?

I would find it extremely useful to have a microscope I could combine with an endoscope, maybe using an attachment. For paranasal sinus surgery for example – I do this with a microscope, but I then use an endoscope to check all the corners to make sure everything is clean. An issue that is gaining general significance is the integration of the various imaging techniques. Considerable progress has been made here in the last few years, but there is still vast potential for future innovations.

Fig. 3: The external unit of a cochlea implant. ©Cochlear

Leica Microsystems sponsors ADANO Innovation Award

Every year, ADANO (Society of German-speaking Audiologists and Neurootologists) distinguishes scientists for outstanding work. To be eligible for selection, scientists must have written a publication that has contributed to a better understanding of the pathogenesis or to the development of new diagnostic or therapeutic procedures for disorders of the sense of hearing and balance.

Prof. Maurer has a long-standing engagement in the ADANO. It is a platform in the German ENT Society devoted to research and clinics in the neurootological field. Maurer himself dedicated a significant part of his time in active research to the inner ear. At the 2009 autumn conference, he presented the Innovation Award for Audiology and Neurootology in his capacity as conference chairman. The 1,750 euro award, which was sponsored by Leica Microsystems in 2009, went to: Dr. Alexander Meyer, ENT clinic at the University of Göttingen, Germany, and PD Dr. Alex Huber, from ORL clinic at the University Hospital of Zurich, Switzerland.

www.hno.org/adano (German only)

The DICOM Solution

Integrating Neurosurgical Images in Patients' Medical Records

Georges Le Goualher, ETIAM S.A.

In view of the problems associated with exchanging images of different formats and the major risk of identification errors in the absence of consistent rules of identification, a committee comprised of expert associations (notably the American College of Radiology – ACR) and a group of major players in the medical imaging industry (notably the National Electrical Manufacturers Association – NEMA) decided in 1983 to work together to create an international standard for medical imaging. The standard which resulted from this work is known by the acronym DICOM, which stands for Digital Imaging and Communications in Medicine. Neurosurgery is one field where this standard is gaining more and more importance. Leica Microsystems has therefore included the DICOM option for its neurosurgical microscopes through ETIAM integration products like DICOM Izer and Print-in.

Images linked to the patient's medical record

"The integration of intraoperative images in the patient's medical record makes it possible to trace the procedures performed during the operation. This, in turn, improves the clinical support which can be offered to patients, the doctor treating them and even to their surgeon", explains Dr. Victor Scordidis, neurosurgeon at the Clinique Notre-Dame de Grâce (CNDG) in Gosselies, Belgium. Like many other hospitals around the world, the CNDG attaches great importance to integrating images from medical examinations into the patient's medical record. As Filippo Palagi, system architect of the hospital, points out, "The compilation of a computerised medical record which integrates medical reference documents, e.g. laboratory reports, reports on operations, and the key images they refer to is a major foundation of safe and reliable hospital practice". The DICOM medical imaging standard meets these needs perfectly.

International radiology standard ready for neurosurgery

"DICOM has been a successful standard in the field of radiology for over 15 years and allows radiologists and clinicians to benefit from the advantages of digitising medical images. The standard makes it possible to access images for the purpose of interpretation, enables collaborative exchange between experts and allows the creation of secure image archives", says Emmanuel Cordonnier, Vendor Co-Chair of the DICOM Standards Committee. "Furthermore, DICOM is a standard which is constantly evolving in order to take into account the actual needs of medical practitioners in all areas of speciality as the use of medical imagery increases," he explains.

Powerful microscope for neurosurgery

Neurosurgery is a form of microsurgery and, as such, requires the use of a surgical microscope for a range of operations such as herniated cervical or lumbar discs, tumour surgery or aneurismal surgery. The Department of Neurosurgery at the CNDG is the first establishment in Europe to have obtained the innovative surgical microscope Leica M720 OH5.

Digitisation of intraoperative video images

The majority of neurosurgical pathologies at the department – particularly tumours of the brain or spinal column – are treated by Dr. Scordidis. As well as being able to record images and videos of surgical operations in digital format using the video digitisation system integrated in the Leica M720 OH5, Dr. Scordidis also wanted a reliable infrastructure for securely archiving relevant images with a link between these images and the patient's medical record – an essential requirement for being able to fully exploit this data in his practice.

Fig. 1, 2: Neurosurgery is a field which makes great use of imaging (MRI, scanners) and also produces many images through surgical microscopes.

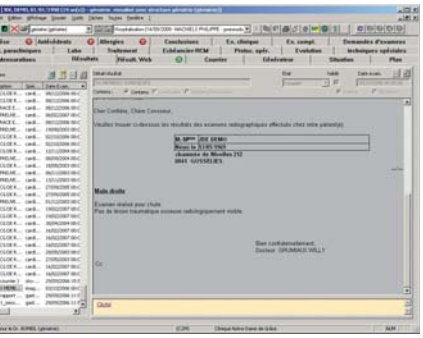

Fig. 3, 4:
Top: View of a computerised medical record.

Bottom: Dr. Victor Scordidis, neurosurgeon at the Clinique Notre-Dame de Grâce (CNDG) in Gosselies, Belgium, consulting the intraoperative images archived on the DICOM network via the patient's medical record.

Meetings were held between specialists in the fields of medicine, information technology and biomedicine at CNDG to find a solution to meet these needs. The solution that was adopted was the integration of significant images and video sequences in the hospital imaging archive – referred to as PACS for Picture Archiving and Communication System – with the DICOM option available through ETIAM's DICOM Izer, on the Leica M720 OH5 surgical microscope.

Secure patient database for many purposes

The data securely archived on the PACS using the ETIAM's DICOM Izer option of the Leica M720 OH5 can be easily used by neurosurgeons who are already familiar with the PACS visualisation tools. The recorded intraoperative images make up a secure patient database which allows the neurosurgeon to review the major phases of the operations performed at a later date, particularly for the purpose of postoperative support. This material can also be made available for training new specialists, for case studies within the department or even within the framework of exterior collaboration (e.g. requests for an opinion or experts' groups).

With respect to legal aspects, the integration of surgical images on the imaging network makes it possible to trace and securely archive imagery from examinations. The images can also be used to supplement the report on the operation intended for the referring doctor, thus strengthening the relationship between the neurosurgeon and the referring doctors, e.g. by distributing reports on CD including a selection of intraoperative images. The patient benefits through this infrastructure in the form of full monitoring of his/her case and his/her neurosurgeon can obtain a complete overview of the examinations and operations carried out including MRI, scanners, intraoperative and postoperative images.

Pioneering hospitals

The approach taken by the CNDG shows the way forward for other hospitals which have also started considering the integration of images from surgical operations. Notable examples include LKH Klagenfurt, Austria; the University Hospital of Basle, Switzerland; HAITS Hospital Authority, Hong Kong, China and the CHU of Charleroi, Belgium.

Integrating images in the DICOM network requires skills that are not within the core expertise of optical imaging modalities providers. "Thanks to the support of André Arcq, ETIAM representative within Belgium, I was able to deploy seamlessly the DICOM integration connectivity to take advantage of this competitive feature", indicates Mr Didier Prairie, Leica sales representative for operating microscopes in Belgium. "The strong expertise of ETIAM in DICOM connectivity makes this company the key partner for such an integration."

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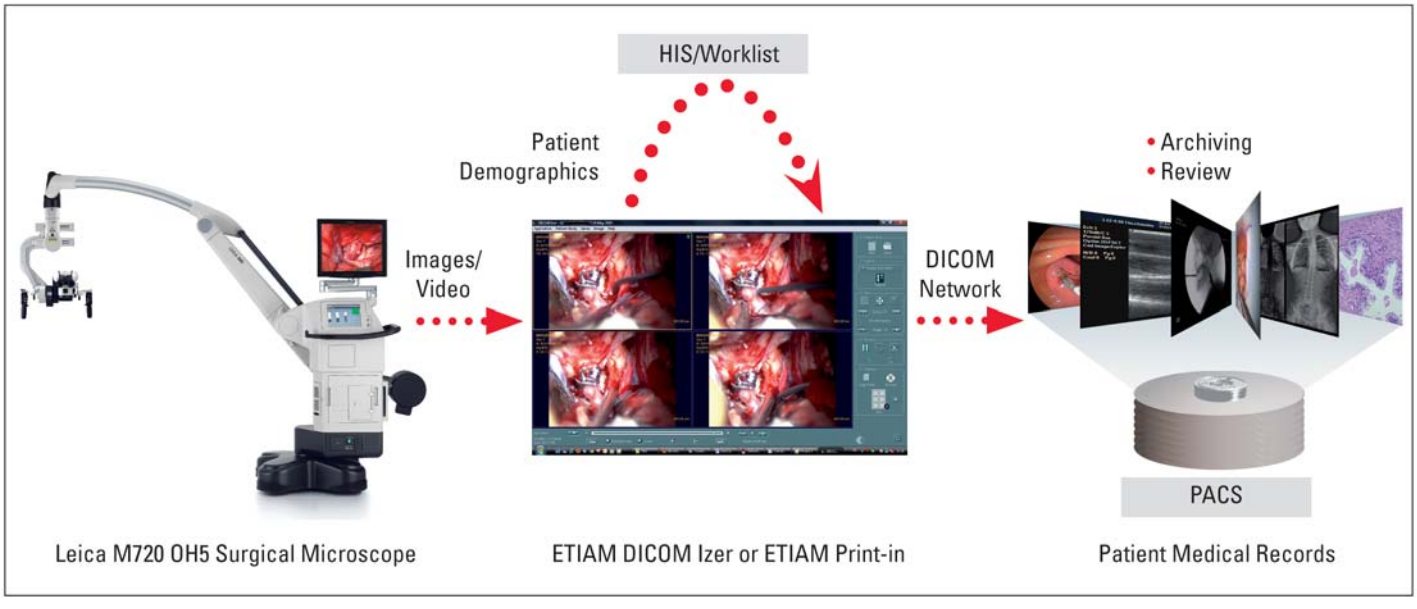
http://www.cndg.be/cndg/cndg.nsf

Fig. 5: Integration of surgical microscope solutions in the entire workflow through DICOM offers many advantages.



High-Definition Platform for Digital Recording and Visualising

One Step Ahead in Medical Imaging

Andreas Tedde, Leica Microsystems

In home entertainment, the high-definition standard is here to stay. Even those who had never heard of HD TV knew about it by the end of the World Cup of 2006. If you want a magnificent picture, there's no alternative to this high-resolution technology. This fascinating picture quality is now available for medicine, too. Leica Microsystems is offering the first High-Definition recording platform for surgical microscopes.

More picture, more definition, more colour

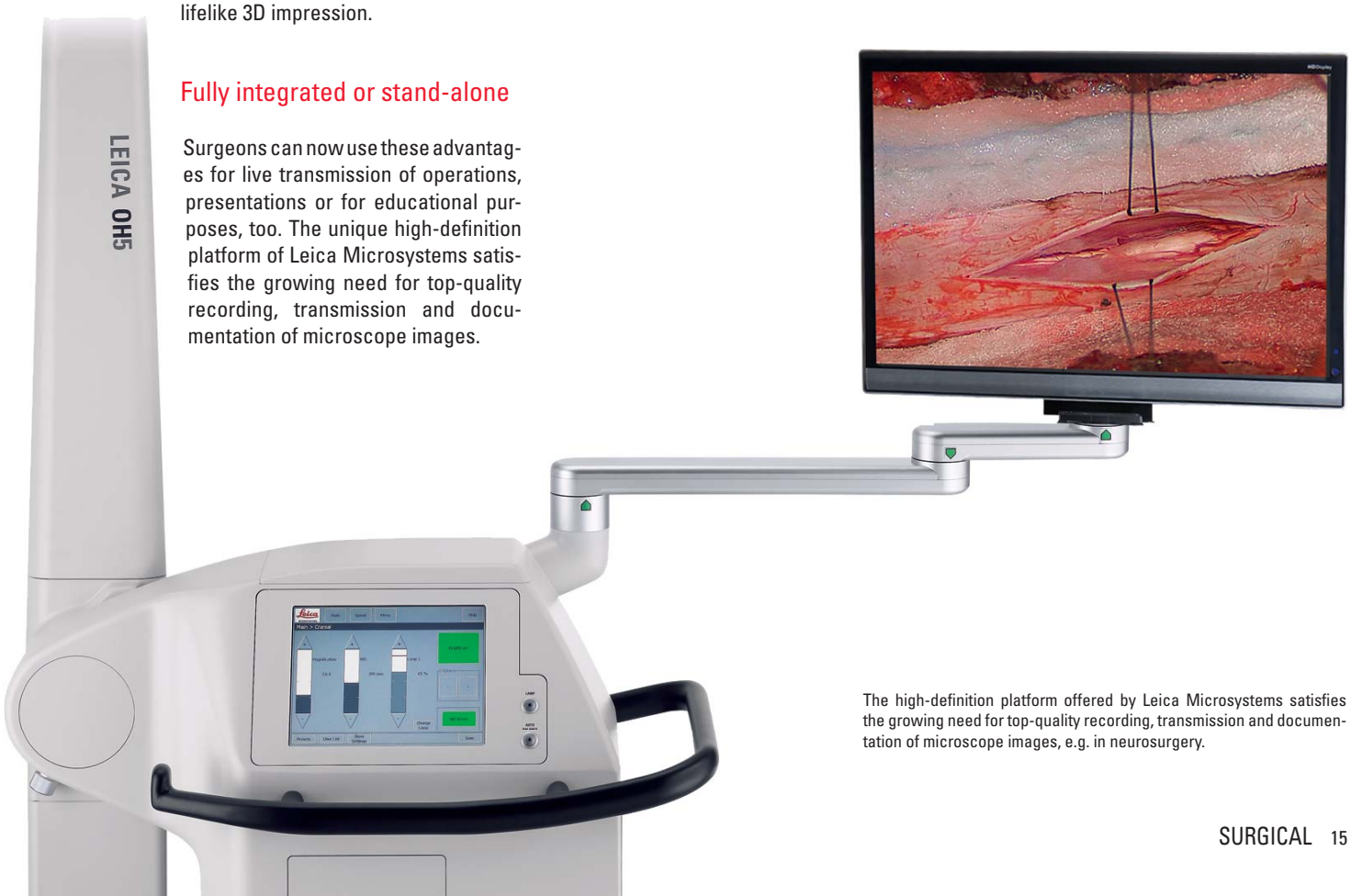
The conventional imaging standard used to be state-of-the-art for years in the operating theatre. But why shouldn't surgeons benefit from new technological developments? The difference between high-definition and conventional standard is tremendous: High-definition produces significantly better image quality, more depth of field, shows up more detail and improves colour brilliance, providing a lifelike 3D impression.

The innovative and so far one-of-a-kind solution consists of a HD recording system that is also DICOM compatible, a 24-inch HD LCD monitor with full HD resolution and a HD camera system.

The HD platform is available as a fully integrated solution for the Leica M720 OH5 and the Leica M525 OH4 surgical microscopes. As a stand-alone system it can be combined with all surgical microscopes from Leica Microsystems.

Fully integrated or stand-alone

Surgeons can now use these advantages for live transmission of operations, presentations or for educational purposes, too. The unique high-definition platform of Leica Microsystems satisfies the growing need for top-quality recording, transmission and documentation of microscope images.



The high-definition platform offered by Leica Microsystems satisfies the growing need for top-quality recording, transmission and documentation of microscope images, e.g. in neurosurgery.

Leica DMD108 in Remote Breast Cancer Diagnosis

Digital Microscopy Proves its Value

Anja Schué, Leica Microsystems

When the surgeon in Varberg Hospital in the South of Sweden takes a tissue sample from a patient's lymph node before a breast operation, a frozen section is immediately produced for clinical diagnosis. But the pathology unit that makes the diagnosis is 70 kilometres away, in Halmstad County Hospital. Nevertheless, the pathologist there has the high resolution microscopic image before his eyes immediately, as soon as the specimen preparation is complete.

That this is possible today can be attributed first and foremost to an innovative technology from Leica Microsystems. The Leica DMD108 digital microscope was integrated into the videoconferencing system of the two hospitals for that purpose in 2007. Dr. Tomas Seidal, Head of the Pathology and Cytology Department at Halmstad County Hospital, talks about his experiences with the Leica DMD108.

Dr. Seidal, how successful has the introduction of digital microscopy been?

In our breast cancer diagnosis, the Leica DMD108 has proved excellent. We are extremely satisfied with the system. The remote diagnosis saves us from losing valuable time transporting samples. Our pathologists are very pleased with the quality of image resolution and colour, and also with the easy, user-friendly handling. And I would like to stress that Leica Microsystems provided excellent support for the installation of the Leica DMD108 equipment and during the start-up phase.

"The Leica DMD108 is at the forefront of digital microscopy techniques by now."

The Leica DMD108 is also a great help to us in our conferences with surgeons, pathologists and oncologists. I well remember how surprised and impressed all those involved were the first time they saw the excellent quality of the microscope image on the monitor. Another advantage is that microscope stage movements are immediately visible on screen and easy to follow for the viewer. In the days when we were still using several microscopes with discussion bridges and someone kept moving the sample extremely quickly by hand, it almost made us seasick to watch.

Is remote microscopic diagnosis here to stay in pathology?

The subject of telepathology has been discussed for many years and is an innovation driver. The reasons for the interest in telepathology are the increasing specialisation of medical centres and also the specialisation of pathology itself – which entails a growing need for a second opinion. Digital microscopy is a significant development in this context. It offers fantastic image quality today and saves time, although it is not used everywhere yet.

Some pathologists are still sceptical and reluctant to trust new technologies. Nevertheless, I think the future belongs to virtual microscopy, even if it takes a few years before it is fully accepted. It can lead to shorter surgery times – not only in cases of breast cancer, but also for other forms of cancer, where biopsies are made during the operation. The digitisation of specimens and the integration of the data in the patients' files offer tremendous potential for innovations and improvement of work routines.

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Surgical Microscopy at Leica Microsystems

On Course for Success for Over 30 Years

Anja Schué, Leica Microsystems

The merger of the two companies Leitz, Wetzlar, and Wild, Heerbrugg, to form the Wild Leitz Group in 1972 laid the foundation for the product division of Surgical Microscopy. Today, Surgical Microscopy at Leica Microsystems is one of four divisions – beside Life Science, Biosystems and Industry – and is still domiciled in the Swiss town of Heerbrugg. The former head of R&D Jürg Müntener and the current R&D Manager Joachim Schaible report on the challenges at the time of the merger and the position of Surgical Microscopy today.

Mr. Müntener, you were with the company for 43 years, most of this time as Head of R&D. You shaped the beginnings of Surgical Microscopy at Leica Microsystems.

What were the challenges you faced at that time?

Müntener: When the two long-established companies merged, we thought about how we could put our business on a broader footing. The Surgical Microscopy diversification project I headed was the kick-off for our new business division in 1974.

The greatest challenge for us was to learn about all the requirements of a surgical microscope and get to know the surgeons themselves and their needs. After all, we were practically starting from scratch. So we worked together with the Selling Units to arrange countless talks with surgeons and sat in on operations to capture every detail of how surgeons work and move. I can still exactly remember the first operation I watched live. It was a sciatic nerve surgery – I was literally overwhelmed and had to leave the operating room for a few minutes.

What was the situation on the market 30 years ago?

Müntener: Microsurgery had already established itself in some fields, but it was beginning to develop at a breathtaking pace and new applications were constantly being created. At that time, however, the market was dominated by one company. This meant there were high expectations of alternatives, which gave us opportunities both for R&D and for marketing.

Can you name two groundbreaking innovations that were realised in your time?

Müntener: There were a great many new developments, but I would like to mention these examples in particular: We launched the first illumination zoom, which automatically adjusts the light intensity at the surgical site to the optical zoom. This prevented fatigue at high magnifications. The binocular tube with its steplessly adjustable 180° viewing angle was another milestone – not only for surgical microscopy but also for stereomicroscopy in general.

Mr. Schaible, you have been R&D Manager of the Surgical Microscopy Division since 2001.

What is the position of Leica Microsystems on this market today?

Schaible: We are now number two on the world market. We have continuously developed this business division right from the start and gradually narrowed the gap between us and the market leader. Our main strengths are the outstanding quality of our optics and our innovation power. Our customers know that they get innovative products from us and they appreciate our application support.

We always involve surgeons in every product development to ensure that customers' needs are considered from the very beginning. It never fails to amaze me how much so many doctors know about technology – that's what makes the cooperation so interesting and productive.

Can you name two groundbreaking innovations of the last few years?

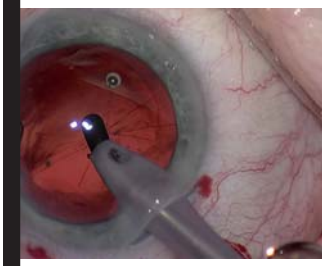
Schaible: One of the most important current innovations are our Leica OH4 and OH5 microscopes for neurosurgery. Their performance – perfect balance, large reach, low vibration, integrated archiving and documentation solution – is the benchmark for the competition. Another of our innovations, the horizontal optics of the Leica M720, is a pathbreaking step in the direction of more ergonomics, more freedom for the surgeon and better access to the surgical site. The M720 is the most compact surgical microscope on the market at the moment.

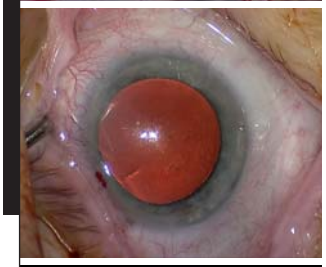
What trends in surgical microscopy do you find promising?

Schaible: The subject of integration is a key innovation driver. One of the current developments is to superimpose or blend additional imaging techniques such as CT and MRI into the live image. For this Image Guided Surgery we work together with partners such as Brainlab and Medtronics.

Secondly, the integration of the surgical microscope in the entire workflow all the way through to the digital medical record offers great potential. This comes under the heading of DICOM, for which ETIAM offers solutions.

Another trend is Digital Imaging. We already offer digital microscope solutions in other fields. The rapid progress in camera and LCD technology is making these solutions increasingly interesting for surgical microscopy, too.





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