



User Report

Product	Leica Headmounted Microscope HM500
Topic	Foetal Surgery with the Leica HM500 Helping Children to be Born Healthy
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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 Rocío 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 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.

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.

EXIT: between birth and independent breathing

Márquez starts 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 head-mounted 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. "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." 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.

Caption:

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