

Orthopaedic Product News

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Extremity Reconstruction

A New Technology Platform for Arthroscopy



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The arthroscope and video system continue to be vital tools in an orthopaedic surgeon's hands. The ability to see and effectively treat an increasing variety of joints problems arthroscopically has continued to develop. There is a need to consistently present an enhanced picture quality, and a recent advancement in technology will allow for numerous benefits for each arthroscopy.

The fragile components that allow the arthroscopist to get his job done have not seen significant improvement since the early 1980s, with the introduction of the first solid state Charge Coupled Device (CCD) cameras. The arthroscope functions in essence the same way it did when it was developed in the mid 20th century. It consists of a series of fragile glass optics that sends the image from the distal tip up to its eyepiece, through a coupler (more glass) to deliver the image to the current CCD sensors. The scope and image are at risk for damage with the tools arthroscopists use every day...burrs, shavers, radio frequency wands and even force, as we try to see as much as possible within the joint space. Lately, the buzz from the video endoscopy companies is high definition (HD). But common sense dictates that the image shown on a HD camera may easily be compromised due to a "nicked" or otherwise bad scope. The video image degrades from day one from repetitive usage and harsh processing that negatively affects the optical clarity and light bundle efficiency.

The actual process of sending the image through fragile, inefficient and easily damaged glass optics seems quite uncertain, given the demands we make of them. The reality is that nothing in 25 years has significantly improved the visual image or surgical scope until now. In the past we have accepted the issues and hoped that our surgical schedule is not too delayed as a result!

The image we see is only as good as the weakest link in the optical and video chain. When was the last time in your OR that there was a flurry of activity to try to determine why the image was bad or non-existent? And how about the down-time as the staff went to locate a replacement scope or camera head to resolve the issue while the patient was under anesthesia? How much extra inventory and cost is necessary to reduce your risk of down-time? How often does your staff stand and gaze at a Steris or an autoclave, waiting for the end of the cycle as you stare at it while gowned up? Wouldn't it be nice to *significantly* reduce your room turnover time? Would it be a comfort going into a surgery, knowing that you would be using a NEW, sterile and remarkably clear scope/video system on every patient? And if that system was inadvertently damaged intra-operatively, wouldn't it be great if you were up and running again

in a matter of seconds? Finally, would it be an advantage if that system was available at a surprisingly reasonable price?

Recent and significant improvements in video technology have offered a solution to the issues we've lived with for years, closer than ever. A Denver-based company has developed and patented high resolution, sturdy and inexpensive CMOS sensors (Complimentary Metal Oxide Semiconductors) that are actually built into the distal tip of arthroscopes, as well as other commonly used endoscopes. The image clarity from the distally mounted CMOS sensors is superior because the image is generated at the distal tip of the scope system and does not have to pass through a series of optics and coupling interfaces. This is efficient for image clarity, as light does not diminish through a series of glass optics. The technology allows for a greater number of individual pixels to be placed on the face of the chip or to reduce the physical footprint, since the majority of the circuitry is moved elsewhere. A significant increase in the number of pixels delivers an enhanced picture. The smallest custom-made CMOS sensor will fit in the distal end of a standard 4mm arthroscope and is designed to function in the surgeons' hands identically as their current system. As can be seen in Exhibit 1, the custom 1.8mm x 1.8mm patented image sensor (green portion of fixture) is smaller than the tip of a pen.

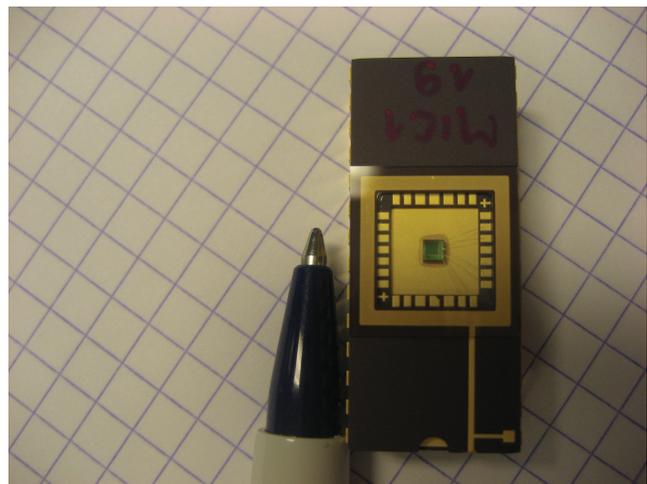


Exhibit 1: Image sensor

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FUTURETECH

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The benefit of the CMOS sensors had been recognized back in the mid-1990s, but only recently did technology allow CMOS to be manufactured to a level that would meet and exceed the high visual clarity demands required in surgery. CMOS sensors can be manufactured in mass quantity and very inexpensively, making them appropriate for disposable products. The CCD chip currently used in surgical video systems can be 100x more expensive than CMOS sensors. CMOS sensors have become a standard imaging platform, delivering picture quality equal to or exceeding existing CCD camera technology.

The first images generated from the first custom CMOS sensors delivered in late 2Q07 have demonstrated exceptional results. Prior attempts at disposable scopes either were a step backwards in image quality or did not address the convenience issue. If the scope was disposable, but the balance of the system had to be reprocessed by standard means, then nothing was really gained. The sterile packaged CMOS-based product delivered to the sterile field will replace four items: the arthroscope, introducer system, coupler and camera (including the cable) (See Exhibit 2.) Also, it can be fully compatible with existing peripheral support. The conversion from existing technology would be seamless.



55-year old
glass-lens
endoscope
technology

27 year old
focusable coupler
technology

27 year old CCD
camera head
technology. CCD
imager cost is \$450 in
high volumes from
Panasonic or Sony

Exhibit 2: Items replaced by new technology

This new technology will allow custom designed scopes to address specific anatomic needs and challenges. Requirements for hip arthroscopy are different than those demands found in other joints, due to access. Real potential exists to produce a disposable scope that would bend or flex at the distal tip to allow full and easy visualization of the hip joint as well as other joints. The high resolution and extremely small CMOS sensor can even be placed within the jaws of other instruments for minimal cost, while providing significant optical options.

A recent study conducted by the Millennium Research Group observed the actual cost of owning older-technology reusable scopes. The group was able to identify many costs that rose far beyond the initial purchase price, and it was concluded that the average cost per procedure for a reusable arthroscope was greater than \$170. Unfortunately any busy facility should recognize this as a reality, since scopes and camera heads can come and go on a regular basis. Even though they may be deemed "warranty" repairs, there is still major down-time, reprocessing costs and inconvenience factors. The study only addressed the costs associated with the use of the scope and did not investigate similar costs pertaining to the remaining components of the existing video system. All of

these costs and inconveniences are remedied by the new technology platform.

It is evident that we have needed an appropriate and thoughtful improvement to the scope and video system as we currently know it. The development of the CMOS sensor has addressed the needs of the surgeon, surgical facility and the patient while addressing the important issues of video image, thoughtful design and cost-effectiveness. This disposable scope system represents a significant advancement for arthroscopists, cost-conscious hospitals and surgery centers and I believe it will be embraced by the endoscopy companies. The justification that my peers and I always recall is that if we can't see...we can't do the procedure.

Marc J. Philippon, M.D. is an orthopaedic hip surgeon and a partner at the Steadman Hawkins Clinic. Dr. Philippon joined Steadman Hawkins in 2005 after a successful time period at the University of Pittsburgh Medical Center where he served as Director of sports related hip disorders and was also Director of the UPMC Golf Medicine Program. Previously, he was chief of orthopaedic surgery at Holy Cross Hospital in Fort Lauderdale, Florida. For more information, please visit www.steadman-hawkins.com.

For more information on Micro-Imaging Solutions or their technology, please contact Eric Dahlinger at Micro-Imaging Solutions, Inc., eric@micro-imaging.us or 866.545.CMOS.

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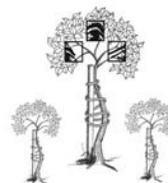
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