

ArthroFree Wireless Camera Application, Functionality and Technical Assessment for the ENT Specialty

Introduction

Over the last forty years, the endoscope has become a vital tool in minimally invasive surgery. The endoscope provides visualization of previously hidden regions and is used in the excision and correction of pathologies, with less damage to the body than with open surgery. Minimally invasive surgery is linked to less pain, shorter hospital stays, faster recovery, and fewer complications. Many surgical fields have since adopted the endoscope, paired with a surgical camera, as an essential device for surgery, visualization, education, and training.

Abstract

ArthroFree® is the first wireless surgical camera with FDA market clearance for all surgeries where a laparoscope, endoscope, or arthroscope is indicated for use; designed for surgeons who want more agile tools to use in their procedures. The camera simplifies the surgical field and frees surgeons from the conventional tethers of the surgical visualization tower. ArthroFree accepts C-mount and eyepiece rigid, semi-rigid, and flexible scopes from nearly all manufacturers. With an integrated light source and interchangeable battery, it weighs in at only 460g – lighter than 40% of the wired camera heads reviewed while still retaining the user experience of standard camera systems. ArthroFree is expected to improve outcomes for patients, surgeons, and medical staff by eliminating risks endemic to standard surgical cameras and improving the user and patient experience. ArthroFree was initially designed for orthopedic surgeons and is expanding its application to additional specialties, including otolaryngology.

Methods

Members of Lazurite, the creator of ArthroFree, investigated the usability of the camera system by ENT surgeons in the OR and clinic. This effort was initiated through interviews with nine ENT surgeons across the Northeast (Bethlehem, PA; Cleveland, OH; Towson, MD), West Coast (San Francisco, CA; Santa Monica, CA), and Southern US (Dallas, TX; Colleyville, TX, Frisco, TX; Birmingham, AL). They have held prestigious roles including Founder, President, and CEO of ENT practices including some of the largest ENT practices within the US, Chief Medical Officer and Chief of Otolaryngology, University Professor, Chairman and Member of the American Academy of Otolaryngology, and President, Vice President, and Member of the Board of Directors of the American Rhinologic Society. Interviews were held on-site at clinic locations and at the American Rhinologic 2024 Summer Sinus Symposium in New Orleans, LA.

Surgeons that were interviewed participated in either a clinical evaluation or hands-on demonstration of the operation and use of ArthroFree, including a review of its components, functions, and visual user interface. All participants performed tasks including adjusting camera focus, zoom, and viewing and capturing still images and videos. Following the demonstration or clinical use, each surgeon was interviewed about their experience with the device and asked to comment on its potential benefits in a clinic and OR environment. Participants reported surgical cameras currently in use in their clinics and operating rooms (ORs) to include manufacturers such as Karl Storz, Stryker, and Prosidio.

Results

Wireless Design: When asked about their experience with the power and light cords associated with the devices that they currently use, multiple participants referred to the cords as “cord spaghetti”, often inconvenient, draped across patients, and likely to get dirty – which increases the potential for infection –

during normal use. A smaller fraction of the participants reported they did not find them inconvenient but indicated that a camera system without cords would increase their efficiency and would provide ergonomic value with not having to regularly reposition the cords. There were also comments about how the wireless design would provide a simpler setup, as well as enhancement to the patient experience.

Image Quality: Regarding ArthroFree’s visualization quality, 100% of participating surgeons provided positive feedback about the image quality, clarity, and brightness. Many were also pleased with the camera’s ability to initiate the recording of videos and still images on a separate patient data console.

Ergonomics: We inquired with surgeons about their impression of ArthroFree’s size and weight. We examined the weight of eighteen competing camera heads from six manufacturers – the average weight was 0.400 kg, ranging from 0.161 kg to 0.680 kg (see Figure 1) – with eight devices weighing more than ArthroFree and ten devices weighing less. It is important to note that these weights do not include the weight of power and light cables that add additional pull. Most participants reported the weight of the ArthroFree camera as being acceptable for the clinic. Participants provided positive feedback on the size, shape, and balance of ArthroFree.

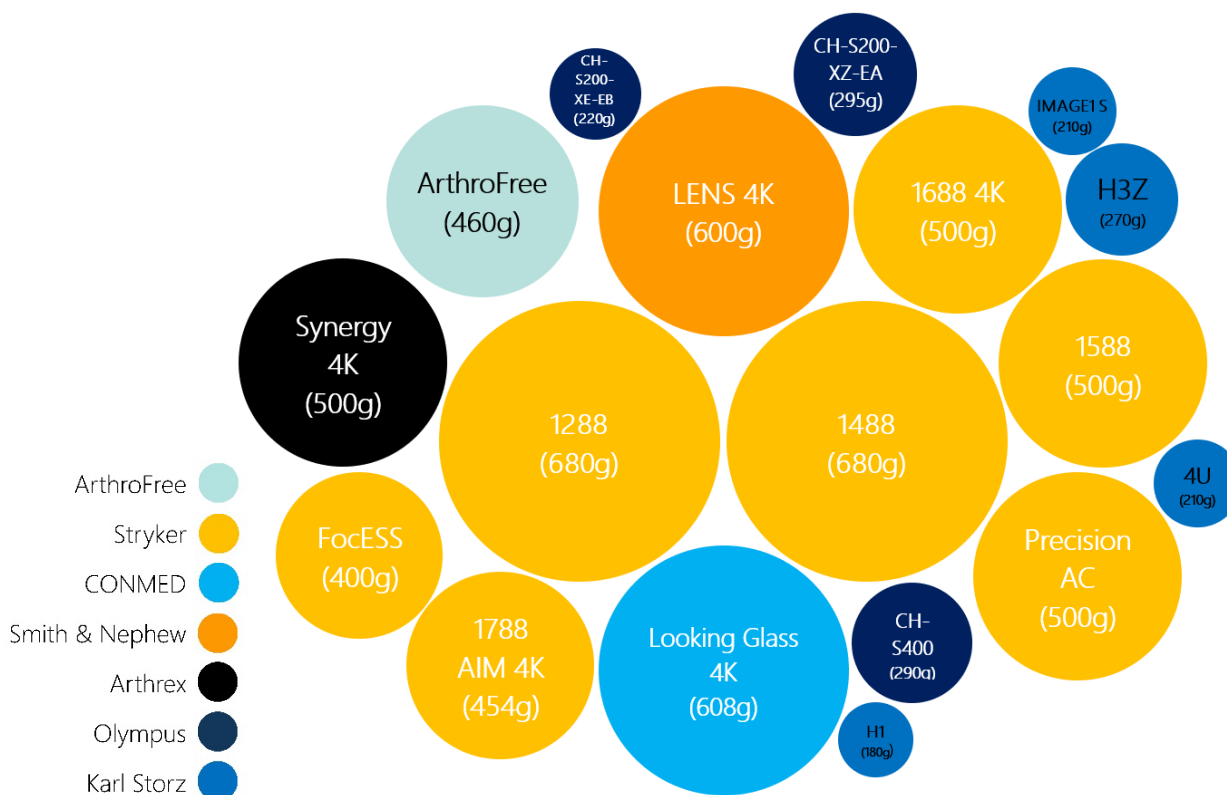


Figure 1. Surgical Camera Head Weights

Battery Life: The participants’ impression of the acceptability of the 60-minute life of each ArthroFree battery was discussed. Many felt the battery life was sufficient or were not concerned. Others reported the battery life was sufficient for use in the clinic but may not be sufficient for the OR. The camera is actively used in orthopedic ORs and negative feedback about the battery swap process for longer cases has not been received from this surgical specialty.

Conclusion

ENT surgeons interviewed had an overall positive response to their experience with ArthroFree. This was represented by their comments - “It’s a really good product.” “I would like to see this camera used both in my clinic and in the OR.” “I want it to replace all the other systems that we have.” “Compared to other cordless systems, this is leaps and bounds improved.”