

INTERNATIONAL PERSPECTIVES ON ARTHROPLASTY TECHNOLOGY

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The annual conference of the International Society for Technology in Arthroplasty (ISTA) was held in September in the idyllic setting of Maui. More than 500 participants from no less than 20 countries attended. Coordination of such an event and worldwide participation was greatly enhanced by the International Organizing Committee. It is generally believed worldwide that Technology is a major way in which advances will be made in the treatment of joint problems. But what particular technologies are likely to be the most effective? To explore the answers to this question, Members of the Committee were invited to a special evening forum to exchange ideas. Peter Walker (USA) organized the event, while an introduction was given by Kevin Garvin (USA), who was the Co-Chair of the entire ISTA conference, Chaired by Hani Haider. Dr Garvin gave an overview of three major areas. First was a shortage of health care workers, brought about largely by Covid, now partly alleviated by automated systems such as AI. Robotics will enable procedures to be carried out with less staff, and more efficiently,

while producing improved results. But joint infection, which has been problematic for decades, is still not adequately solved, yet causes major problems for patients.

One common factor was apparent from all of the participants, an enthusiasm for technology in all facets of arthroplasty. Pain control and joint preservation were advocated as first steps before joint replacement itself. Thanainit Chotanaphuti (Thailand) was interested in how to treat inflammation in early OA knee. He verified the natural pattern of inflammation and bio markers such as urine CTX-II and ultrasound, finding a correlation between them. He explored interventions with Hyaluronic, PRP, steroids injection and transdermal NSAIDS by micro-needle as well as stem cells. Nico Verdonschott (Netherlands) pointed to innovative companies that create joint saving procedures, such as an artificial meniscus, cartilage repair materials, and a mechanical distractor for joint distraction to redistribute load. Catherine van der Straeten (Belgium) proposed that on the horizon was the rapprochement of mechanical, electrical and computer technologies with advancements in biology, in order to regenerate tissues and organs. We are living in exciting times by witnessing these evolutions.

Navigation and robotic surgery were generally recognised for the ability to provide accurate surgery, accomplish a surgical plan, and reduce the damage to tissue during surgery. For example Ko Jih-Yang (Taiwan) had determined that avoidance of intramedullary violation during computer assisted TKA surgery lowered the inflammation responses and preserved the micro-architecture of the medulla, which may be beneficial in lowering the incidence of periprosthetic joint infection. Lafayette Lage (Brazil) thought that thanks to computer technology we are on the right track of how to properly position an acetabular component in relation to the pelvis. It is inevitable that virtual and augmented reality will be further enhancements of surgical technique according to Mort Meftah (USA) as well as Dr van der Straeten. There was relatively little comment on the design of the joint implants themselves, except that Dr Verdonschott pointed out the real possibility of designing and manufacturing customized implants using 3D printing technology, which can produce not only the structural elements of the implants, but micro-textured interfaces for bone ingrowth. Remarkably, ISTA was actually started as a society dedicated to custom implants, made by CAD-CAM techniques, but interest was later expanded to technology on a broader front.

Such technologies however had some headwinds. In Europe, the stringent requirements of medical device regulation, cited by Dr Verdonschott; and the high cost of technology-assisted systems in Japan, according to Nobuhiko Sugano (Japan), where Robotics, Navigation, and PSI all receive the same small reimbursement from the health insurance system. Dr Verdonschott stated that in Europe at least, there is a shortage of skilled medical staff to utilize all of these technologies, echoing Dr Garvin's introductory comments. Dr Sugano, as well as Dr Meftah, also emphasized that we need more clinical data to prove the benefits of these systems.

This latter area was strongly emphasized by Dr Meftah: in the past few years, we have seen a plethora of new devices that give us more information on various aspects of arthroplasty. We are in the area of big data. From Persona-IQ to wearables, to augmented reality and robotics. There is a trend of startup companies that are trying to manage this big data using machine learning and artificial intelligence. The next phase of our innovation will be how to manage, analyze, package, and commercialize such data. Bill Walter (Australia) even went a stage further in relation to diagnostics and predicting outcomes; there is a rising tide of machine intelligence and machine capability overtaking human capabilities. We are currently seeing improved precision in diagnostics, planning and surgery as machines and humans collaborate to give better results for our arthroplasty patients. In the next 15 years we will see machine capabilities overtake human capabilities in many more areas dominating aspects of arthroplasty.

Thinking outside the box, Stefan Kreuzer (USA) gave the following perspective; we have spent very little time assessing the pre-operative health status and physical status of our patients. With only 12% of the US population being metabolically healthy, we do little to optimize our patients prior to surgery. The analogy is that no one would run a marathon without training, but we perform surgery on patients without trying to optimize them metabolically and cardiovascularly.

Shinro Takei (Japan) gave everyone a colorful recollection of ISTA in its early days, and highlighted the value of the meeting being held in different countries and the camaraderie among members which resulted. A theme expressed by several speakers was that ISTA represents an ideal forum for progressing the area of technology in arthroplasty. Lafayette Lage from Brazil started attending ISTA meetings in 2015, and expressed it this way; ISTA is an ideal forum to create knowledge by bringing together several health professionals where they have the opportunity to exchange new learnings and talk about what they think freely with no fear. The inspiring environment ISTA is provided by bringing together surgeons and clinicians, engineers, scientists and industry, to create and develop new technologies or improve older technologies in an ecosystem without hierarchy between those groups. DR van der Straeten put it this way; the inspiring environment ISTA is providing by bringing together surgeons and clinicians, engineers, scientists and industry together, to create and develop new technologies or improve older technologies, in an ecosystem without hierarchy between those groups. As to the format of the conference itself, Dr Sugano's perspective was; it gives us a good opportunity to see and touch the technology at the booth area and some workshops help us understand the systems.

A final message from Dr Mort Meftah, Chairman of next year's ISTA conference; ISTA is at the forefront of innovation and entrepreneurship in arthroplasty and we will continue to lead this international effort next year at the annual conference in September 2023 in New York. We look forward to your participation.