

What Lies In Future Orthopaedics

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Predictions are difficult about future, but change is inevitable. Orthopaedics is also constantly changing and touching new horizons every day. Existing techniques are being systematically upgraded and new techniques are constantly being integrated into existing systems. Although, it cannot be predicted too much, about how orthopaedics will look tomorrow, but there are a few key trends that are becoming apparent. Hence we orthopaedians have to rise up to face the challenge and to keep up the pace.

Today, like other surgical fields, orthopaedics is also on minimal invasive path with precision, favouring day care and overnight procedures. Minimal invasive procedures have been already established in joint surgeries of knee and shoulder. But now arthroscopies of small joints like ankle, wrist, elbow etc are also regularly performed. Scopies are recently performed even for various tendinopathies and also for nerve decompression. Minimal invasive and endoscopic spinal procedures are increasingly done and the spectrum of diseases which can be treated endoscopically is day by day increasing, broadening their scope. Even various training programs and fellowships are being structured and dedicated to these minimal invasive surgeries. Knee replacements are also being performed as day care procedures with the help of micro-plasty and improved instrumentation. Thus minimal invasive surgery is the future prospective of orthopaedic surgery and the trend towards outpatient and minimal invasive procedures in diagnostic studies and imaging, hospital-based treatment and rehab programs will also continue as technologies advance.

Newer advances are made in the field of implant and metallurgy as well. Femoral neck plate system, PFNA-2, Fence plate, variable angle plates, patellar plates, locked nails for rami are some of the examples of newly available implants. But are these implants really useful and beneficial for our patients or it is just an industrial and market driven hype

to use them, will be tested over time. Proximal femur plate, short PFN, surface hip replacement and metal on metal arthroplasty are some of the examples which failed as quickly as they arrived. Hence we as surgeons should be vigilant, aware and judicious, in use of these implant weighing all pro and cons and use the implant what suits our patients the best.

The weak link in implant surgery is the metal with which they are made. There has been continuous research for search of an ideal metal to be used in orthopaedics. Today, other than stainless steel implants, implants made of titanium, and other alloys are available. Recently developed biodegradable implants and carbon implants are particularly useful for intra-articular fractures, which avoids need for second surgery for removal and are also radio transparent. Prosthesis made of zirconium, oxinium or newer alloys like TiNbN or NiCo are advantageous as they are inert, better survival-ship, less corrosive and less wear. Smart implants of further generations will be self-protective by automatically responding to changes in the local environment.

Orthobiologics including stem cell therapies and platelet-rich plasma have revolutionized some the orthopaedics treatment protocols by enhancing regeneration and repair. They are of tremendous use in sports injury, tendinopathy, arthropathies and wound healing. They act by increasing the growth factors at the pathology site and thus delay in aging procedure. They are increasingly used for joint preservation. Other treatments like including recombinant growth factors, cell transplants, gene therapies, stem cell therapy, tissue-engineered products are the new evolving biologics markets.

Introduced about two decades ago, computer-assisted orthopaedic surgery (CAOS) has emerged as a new and independent area in orthopaedics and traumatology. With the advances in technologies and imaging

modalities, surgeries are increasingly performed with computer navigation, computer assisted, patient specific instruments and by robotics. Computer assisted surgery in arthroplasty, scoliosis, pedicle insertion etc have increased accuracy. Further uses of robotics to perform these surgeries have added a new dimension to orthopaedic surgery. The spectrum is increasing day by day. These are more precise, accurate, user friendly, lesser risk, economical and with fewer complication, especially for complex joints, deformed bones and complicated cases. Use of hexapods with computer software's has given precision and flexibility for rapid corrections of deformity with simultaneous correction in all the planes. Use of robotics and computer software based hexapods is being explored and expanding for traumatological applications as well. Artificial intelligence in orthopaedics is in its infancy, yet its use has been helpful. But robotic surgery and artificial intelligence with its transformative potential will revolutionise orthopaedics and become increasingly common and it will assist and enhance decision-making intra-operatively, as well as in the planning and recovery stages too.

Many recent advances have occurred not only inside the operating theatre, but also outside the hospital and clinic room, both before and after surgery, as well. Improved imaging and printing have helped surgeons to better delineate three dimensionally, to assess the pathology early and definitely, thus help in better treatment at early stage. Fluoroscopy-based navigation, intra-operative 3-D fluoroscopy, O-arm, 2-D or 3-D multiple Image Stitching, Image Fusion or Statistical Shape Modelling are some of the recent modalities which can overcome the common problems of viewing of small portion of the target structure in a single C-arm image due to the limited field of view as these newer modalities image the entire structure by creating a panoramic view and also allow for visualization of critical structures such as nerve roots or vascular structures during surgical navigation. These improved diagnostic capabilities with the recent advancement like low-dose X-ray imaging, cartilage imaging, diffusion tensor imaging, MR arthrography,

and high-resolution ultrasound and enabling image-guided interventions with real-time MRI or CT fluoroscopy, molecular imaging with PET/CT, and optical imaging have added a new dimension to orthopaedic practice. It is expected that with the advent of the flat panel technology, the use of fluoro-CT as a virtual object generator will significantly grow.

Smart phones and computers have added a new tool as an armamentarium for both the surgeons as well patient. They are helpful in many ways and can help in literature review, knowledge updates, search on a certain topic, diagnosing, pre-operative planning of patients, deformity assessment, measurement and calculations, treatment progress and to evaluate the outcome. They can also help to communicate, collect data digitally, remote monitoring, peer or expert advice for getting a second opinion. Hence it is very much necessary for a surgeon to learn and operate on these smart phones smartly because new generations of mobile imaging systems, will soon be available.

Issues related to training, technical difficulty, and learning curve are commonly presumed to be major problems to the acceptance of new technology, but these are not supposed to be the barriers for surgeons. The barriers to adoption are more intrinsic to the technology itself, including intra-operative glitches, unreliable accuracy, frustration with intra-operative registration, and line-of-sight issues. Despite these possible challenges, the future for the orthopaedic field looks bright as it evolves.

Large numbers of newer modules covering a wide range of traumatological and orthopedic applications have been developed, validated in the laboratory and in clinical trials. Some of them are abandoned, because the anticipated benefit failed to be achieved or the technology proved to be unreliable or too complex to be used intra-operatively. Hence all these new techniques, procedures, technologies and devices need to be carefully evaluated first in the laboratory setting and then clinically and must be proved better in both short and long-term outcomes for our patients rather than just a market driven gimmick.

A planned multidisciplinary approach holds the key for future treatment amalgating together other disciplines as well. Despite the advantages of newer technologies, to the

patient and the surgical team and increased accuracy, technology is yet to gain general acceptance among orthopaedic surgeons of all age.

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