Evolving Minimally Invasive Spine Surgery (MISS) and Technological Consideration.

J Chiu, H Huang

Citation

Abstract
Degenerated spinal disc and spinal stenosis are common problems requiring decompressive spinal surgery. Open spinal discectomy is associated with significant morbidity, long-term convalescence, prolonged general anesthesia and wide dissection of tissues that can cause bleeding, scarring and eventual destabilization of spinal segments. The evolving less traumatic minimally invasive endoscopic lumbar decompression procedure is free from these potential complications. Therefore the pursuit of minimally invasive spine surgery (MISS) began. Current and future trends of spinal surgery are toward minimally or less invasive and biologic material. This endoscopic spine surgical procedure, its surgical indications (for treatment of herniated lumbar discs, post fusion junctional disc herniation, neural compression, osteophytes, spinal stenosis, vertebral compression fractures, spinal tumor, synovial cysts and etc.), its operative techniques (both transformaminal endoscopic approach and interlaminar endoscopic assisted approach) including tissue modulation technology (i.e. laser and radiofrequency surgical application), requires preoperative planning, intraoperative monitoring, control and image data collection and utilization.

Problems and challenges facing minimally invasive spinal surgery: Additional problems and challenges facing MISS include large number of surgical personal for each case, slow turn over time, preoperative review of numerous medical records, imaging and X-rays studies, no biometric confirmation of the surgical patient, many multiple scattered intraoperative data monitors/displays, lack of adequate bio sensors and warning systems, lack of organized educational and training displays for MISS etc.

Answer: With increased utilization of complex high tech and digital technologies, and instruments in the digital operating room (DOR), it requires seamless connectivity and control to perform the surgical procedures, in a precise and orchestrated manner. The Surgical ePR Control System (SECS), SurgMatix® prototype, a new integrated DOR, image-data based convergence and control system has been developed and utilized to facilitate MISS. This system is designed to promote seamless integration of all aspects related to the surgical procedure and to reduce surgical time and personal requirement significantly. This ease to use SECS, SurgMatix® system creates an organized control instead of organized chaos is needed. In addition, it can provide training of other spinal surgeons to perform the minimally invasive spinal surgery. Providing a picture of the patient’s medical information and status by consolidating data from multiple IT and OR systems - “being patient transparent” and “patient centric”. Seamless integrated digital OR is needed to provide effective, safer and higher quality in spinal surgical patient treatment.

References
Evolving Minimally Invasive Spine Surgery (MISS) and Technological Consideration.

Author Information

John C. Chiu, M.D., FRCS, D.Sc
Director, Neurospine Surgery, California Spine Institute Medical Center

H.K. Huang, Ph.D.
Professor of Informatics, University of Southern California, Medical University