



이름: 권동수 / Dong-Soo Kwon

직위: 명예교수 / Emeritus Professor

소속: 한국과학기술원 / Korea Advanced Institute of
Science and Technology

기타소속: Founder CEO, ROEN Surgical Inc.

국문 강연제목: AI 기술을 활용한 혁신 기능을 갖춘 유연 내시경 수술 로봇

영문 강연제목: Flexible Endoscopic Surgery Robots with innovative functions
using AI technology

Abstract

The successful clinical adaptation of the da Vinci system in laparoscopic surgeries demonstrated the benefits of robotic assistance such as precise and dexterous instrument motion and intuitive and ergonomic manipulation. In endoscopic surgery, surgical robots are gradually transiting to flexible systems to reach the surgical site via narrow and tortuous pathways.

This presentation discusses the technical issues and challenges of flexible endoscopic surgery robots. Two types of flexible endoscopic robotic surgical systems have been developed overcoming several technical issues. The first robot system is “Zamenix” for ureter and renal stone removal which is capable of teleoperation of a flexible ureteroscope, a laser fiber, and a stone basket. The system can equip a commercial flexible ureteroscope. The system provides intuitive and comfortable remote manipulation of the ureteroscope and instruments by a single operator without wearing a lead gown. Moreover, the system provides innovative functions with AI technologies such as an automation capability that can record and replay the ureteroscope motion, and the detection of oversized stone retrieval to prevent ureteral injury. A first-in-human trial for approval by the Korean Ministry of Food and Drug Safety has finished with a favorable stone-free rate and without any major complications in 2022. Finally, Zamenix, the flexible robotic ureteroscopy system, was acknowledged publicly as the Innovative Health Technology in Sept. 2023 from the Ministry of Health and Welfare of Korea, and is ready to use in clinical operations.

The second robot system features a bendable overtube and multiple flexible surgical instruments. The robot can enhance the accessibility to the surgical site located in curved and confined spaces, and then provide complex surgical tasks such as dissection or suturing with intuitive teleoperation. The feasibility of the system in transoral surgery and gastrointestinal endoscopic submucosal dissection has been demonstrated through several animal trials.

Further advancement of such flexible robotic systems will overcome the limitations of a conventional endoscopy or a surgical robot and broaden the application of a minimum invasive surgery in various fields through transluminal and extraluminal approaches as well as an endoluminal approach.