



An Overview of Retractor Systems Used in Transoral Robotic Surgery

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Objectives: To review available literature on current retractor systems used for transoral robotic surgery (TORS) in the oropharynx, hypopharynx and larynx, and obtain in-situ images.

Methods: A query was performed to identify full text articles related to TORS and the use of the Crowe-Davis Mouth Gag, McIvor Mouth Gag, Dingman Mouth Gag, Feyh-Kastenbauer (FK) Retractor, Laryngeal Advanced Retractor System (LARS) and Medrobotics Flex Retractor System. Images were obtained in cadaveric specimens.

Results: The demand for novel TORS retractor systems is being met with the evolution of a variety of devices. The goal of these systems is to improve exposure of the surgical site, while accommodating an endotracheal tube, endoscope, and robotic effector arms. Standard mouth gags such as the Crowe-Davis and McIvor have been shown to be useful in oropharyngeal procedures, and the Dingman retractor improves base of tongue access. The development and modification of retractor systems has allowed for improved visualization and access to more distal sites. The use of the FK, and its modifications by Drs. Weinstein and O'Malley (FK-WO), revolutionized TORS. The recent development of the LARS retractor for laryngeal surgery and the Flex retractor system with its fine tunable blades and retraction have made TORS an increasingly viable option for a variety of head and neck procedures. Pictures of each system both on-table and in-situ were obtained.

Conclusion: We provide a review of the available retractor systems to the TORS surgeon, as well as in-situ images of these systems.

Retractor	Features	Limitations
Crowe-Davis	Open lateral frame, easily accessible, familiar	Limited base of tongue, hypopharynx, and larynx exposure
McIvor	Easily accessible, familiar, useful in edentulous patient	Limited base of tongue, hypopharynx, and larynx exposure, closed frame
Dingman	Wide frame, cheek retractors, tie down points, accessible	Limited base of tongue, hypopharynx, and larynx exposure, closed frame
FK/ FK-WO	Wide frame, various blades designed for exposure of specific areas, integrated suction, modified for TORS (FK-WO)	Closed frame, expense
LARS	Designed for laryngeal procedures, curved frame, various blades, vertically adjustable blades, instrument attachments	Closed frame, expense
Medrobotics Flex (FRS)	Designed for TORS, curved frame various blades, blade adjustment in multiple planes, integrated suction	Closed frame, expense



Figure 1: Crowe-Davis (left) and McIvor retractor (right) systems with different sized tongue blades

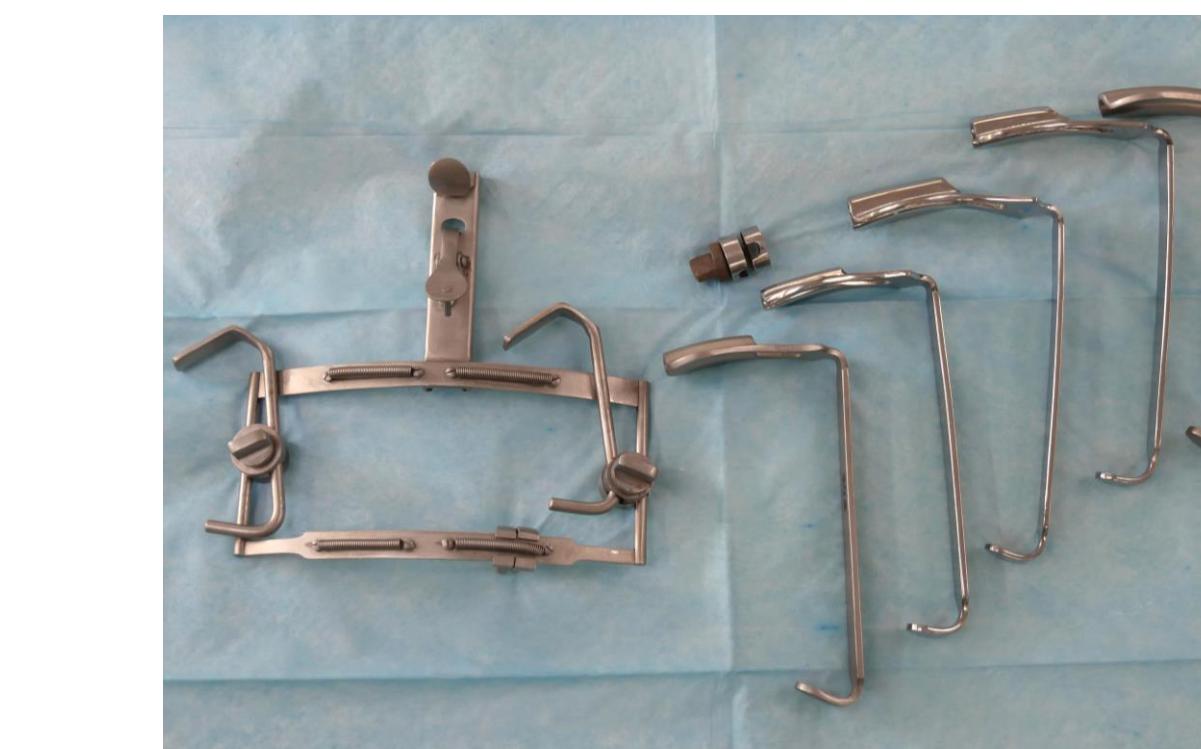


Figure 2A: Dingman retractor system with different sized tongue blades.



Figure 2B: Dingman retractor in situ



Figure 3: FK-WO retractor system with blades available for exposure of different areas.



Figure 4A: LARS retractor system with blades available for exposure of different areas.



Figure 4B: LARS retractor in situ

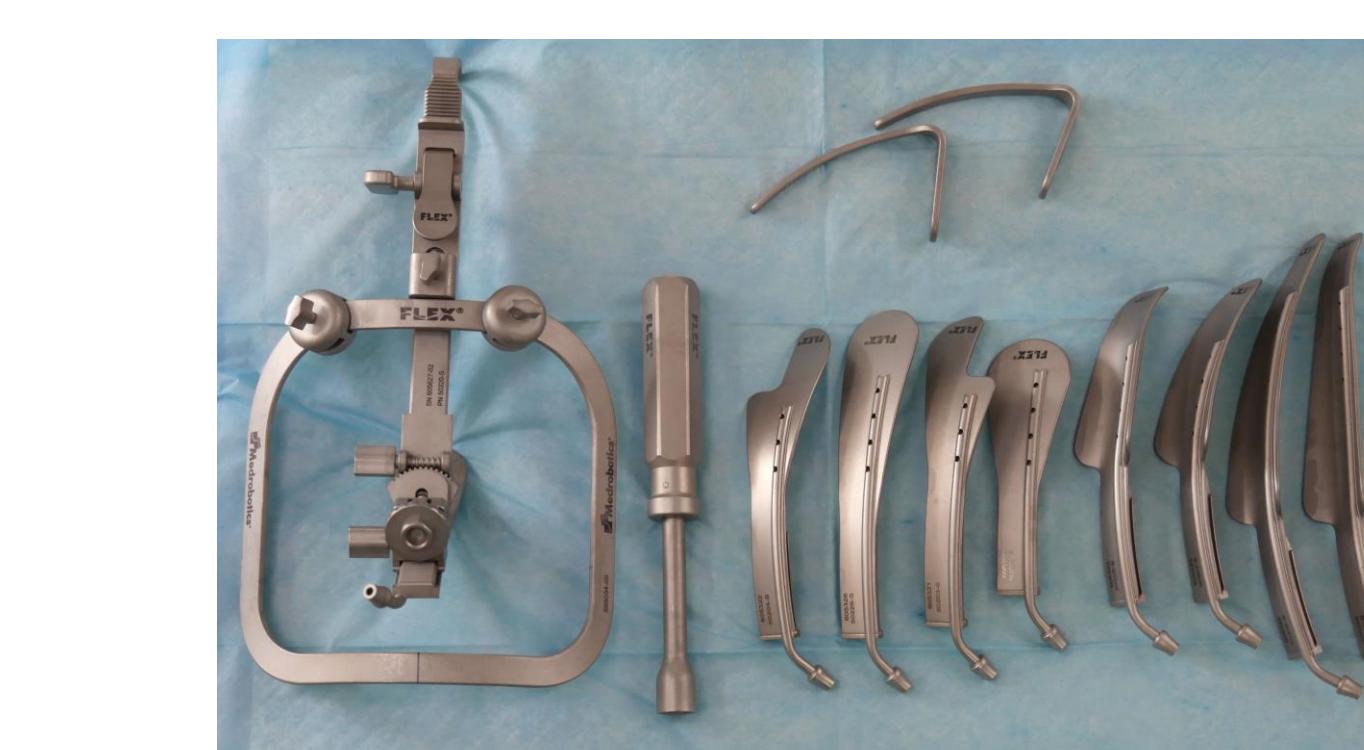


Figure 5A: Flex retractor system with blades available for exposure of different areas.

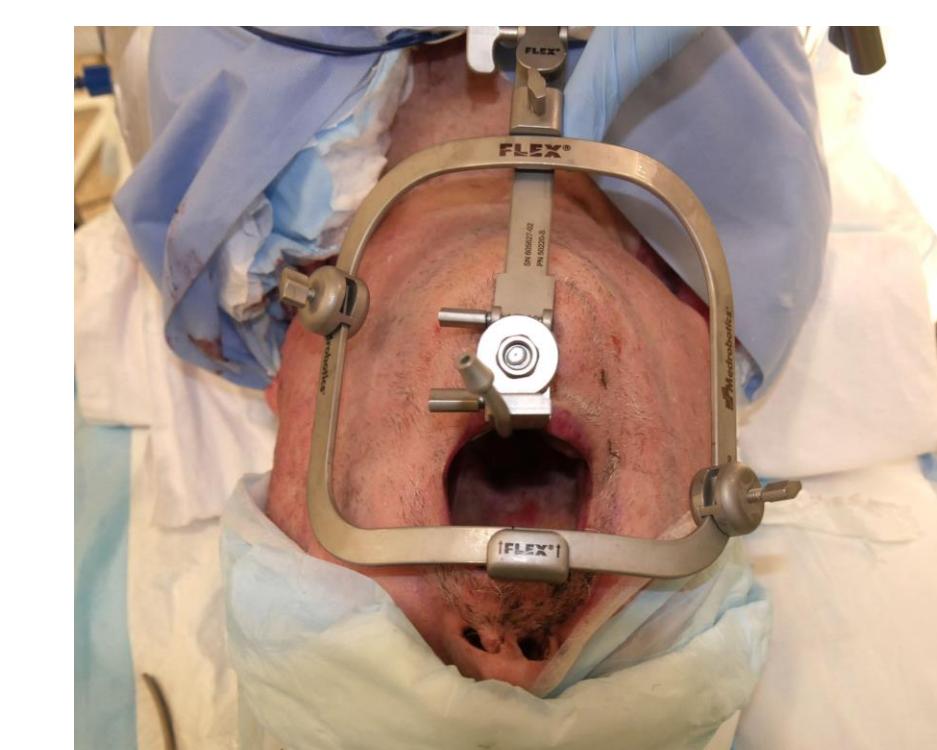


Figure 5B: Flex retractor in situ



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