



Overcoming instrumentation limitations in robotic anatomic segment VIII resection

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Abstract

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BRIEF EXPLANATION

Robotic anatomic segment VIII resection (RH8) remains one of the most technically demanding procedures in minimally invasive liver surgery. Lesions in the anterosuperior dome - deep beneath the ribcage and in proximity to the middle hepatic vein (MHV) - pose challenges in access, visualization, and controlled parenchymal transection.

We report an elderly male with a 6 cm hepatocellular carcinoma in segment VIII. The Tampa robotic difficulty score was 21, classifying this as a high-complexity case requiring advanced robotic expertise (see [Video](#)).

We describe a pragmatic, widely applicable solution: the use of a modified Fr 12 nasogastric tube (NGT) as a flexible suction adjunct. The distal tip is bluntly transected to widen the lumen and introduced via a superior epigastric port, stabilized by a robotic arm. This enables controlled sweeping motions to maintain visualization during parenchymal transection in areas beyond the reach of rigid suction instruments. This device does not replace ultrasonic aspirators or CUSA; it serves purely as a flexible suction adjunct.

Integrated with intraoperative ultrasound (IOUS), indocyanine green (ICG) fluorescence guidance, a deliberate expose-and-clip pedicle strategy, and partial anterior mobilization, this technique restores ergonomic control in the hepatic dome - particularly where rigid suction lacks adequate angulation or advanced devices are unavailable.



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Operative technique

The patient was placed in the French position. A 12-mm assistant port was positioned infra-umbilically, with robotic ports aligned for an anterior approach. A 5-mm epigastric trocar just below the sternal notch provided direct cranial access to the dome.

IOUS defined tumor–MHV relationships and localized segment VIII pedicles. Rather than a Glissonian approach, parenchymal transection was initiated at ultrasound-mapped pedicle sites. Individual pedicles were exposed, clipped, and divided under direct visualization. ICG fluorescence was used for segmental demarcation and bile leak assessment.

Flexible NGT suction technique

The modified NGT was connected to standard suction (200–300 mmHg), regulated by the assistant. The robotic arm provided stability while the surgeon performed controlled sweeping movements to clear blood and debris. Its flexibility allowed atraumatic contact with liver tissue, reducing the risk of focal injury associated with rigid suction tips. In 10 consecutive dome resections, no device-related injuries were observed.

Safety and limitations

The blunt tip minimizes trauma, and continuous visualization is maintained. The technique is intended to enhance exposure - not replace ultrasonic dissection. It is most useful in segment VIII, IVa, and selected VII dome lesions where assistant access is limited. It is less applicable in major hepatectomies requiring extensive hilar work or where advanced energy platforms are fully feasible.

Conclusion

The flexible NGT suction technique offers a simple, reproducible, resource-conscious solution to assistant ergonomic limitations in high-difficulty RH8. When combined with IOUS, fluorescence guidance, and structured pedicle control, it enhances visualization, precision, and operative safety in complex dome resections.

DECLARATIONS

Authors' contributions

Conceptualized the technique and performed the surgery: Teh CSC

Assisted as bedside surgeons and contributed to video collection and editing: Ong KG, Casupang MAJ

All authors reviewed and approved the final manuscript.

Availability of data and materials

Not applicable.

AI and AI-assisted tools statement

Not applicable.

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Conflicts of interest

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Ethical approval and consent to participate

Informed consent was obtained from the patient.

Consent for publication

Written informed consent was obtained from the patient for publication and video presentation.

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Supplementary Materials[Supplementary Materials](#)

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