



# Minimally Invasive Robotic Neck Dissection Using Insufflation and an Infraclavicular Approach:

## A Feasibility Study Using a Human Cadaver

Hillary Newsome<sup>1</sup>, F. Chris Holsinger<sup>2</sup>, Umamaheswar Duvvuri<sup>3</sup>

1. University of Pittsburgh, School of Medicine, Pittsburgh, Pennsylvania

2. Department of Otolaryngology—Head and Neck Surgery, Stanford University Medical Center, Stanford, California

3. VA Pittsburgh Health System, Department of Otolaryngology—Head and Neck Surgery, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania

### Objectives

Strong impetus to reduce known morbidities from open-approach neck dissection for the treatment of head and neck cancer exists. The goal of this study was to determine the feasibility of performing a robotic neck dissection using an infraclavicular incision and insufflation in a human cadaveric model.

### Study Design

We hypothesized that remote incisions outside of the neck could be used to introduce da Vinci Surgical Robot System (Intuitive Surgical, Inc., Sunnyvale, CA) into the neck for nodal packet dissection.

### Background

With the push for minimally invasive surgery there is a need for remote approaches to the neck that maintain small incision size and oncological soundness. The need for robotic lymphadenectomy exists, considering lymph node metastases are an important prognostic factor for head and neck cancer. Different approaches to the neck already described in the literature include cervical, transaxillary, breast and post auricular<sup>1,2</sup>. While a transaxillary incision was more cosmetically pleasing than the traditional cervical neck scar, nodal levels I and IIb were difficult to access due to the long distance from the robotic port site, and required repositioning of the robot. This poster describes our initial attempts to use insufflation and a minimally invasive approach to perform a cervical lymphadenectomy.

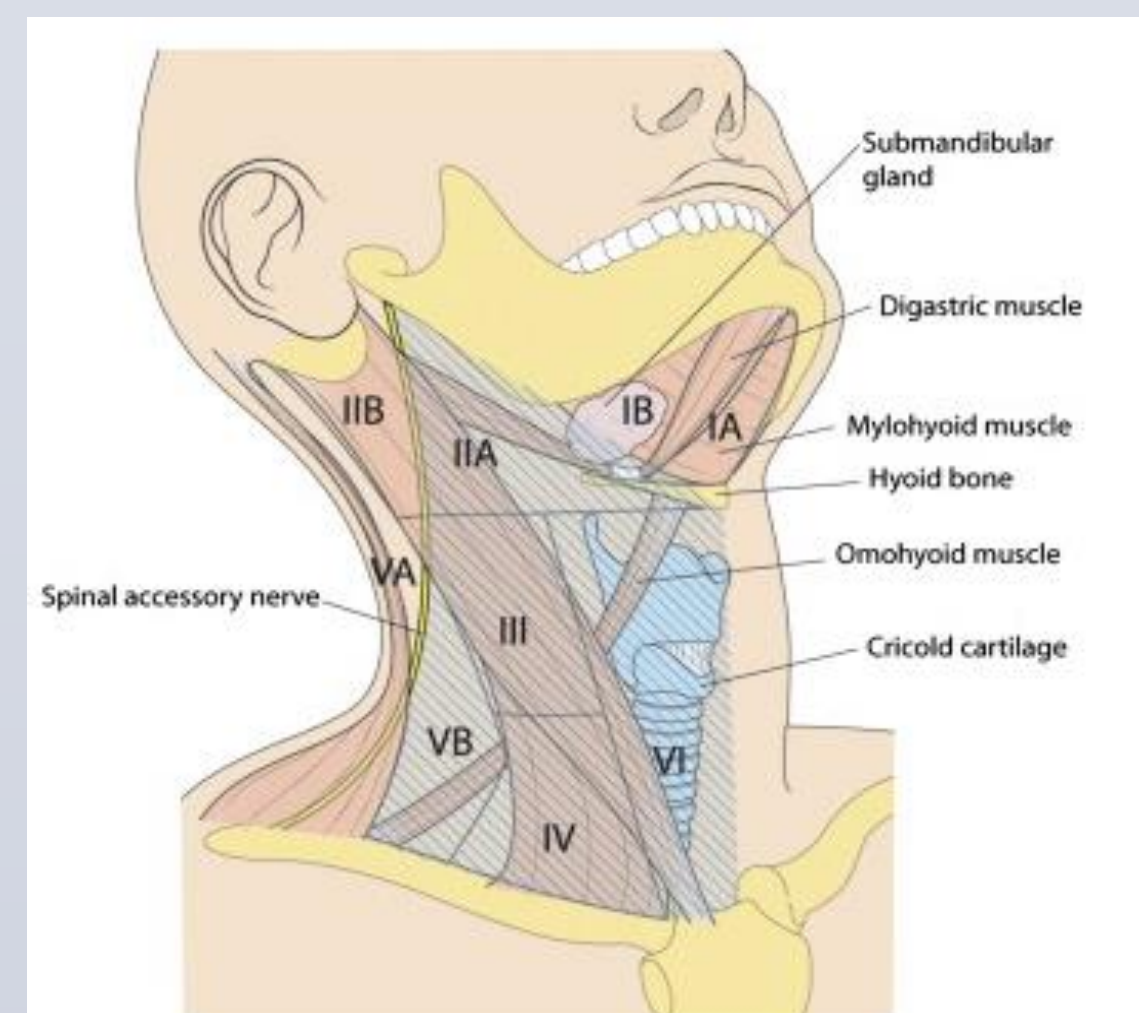
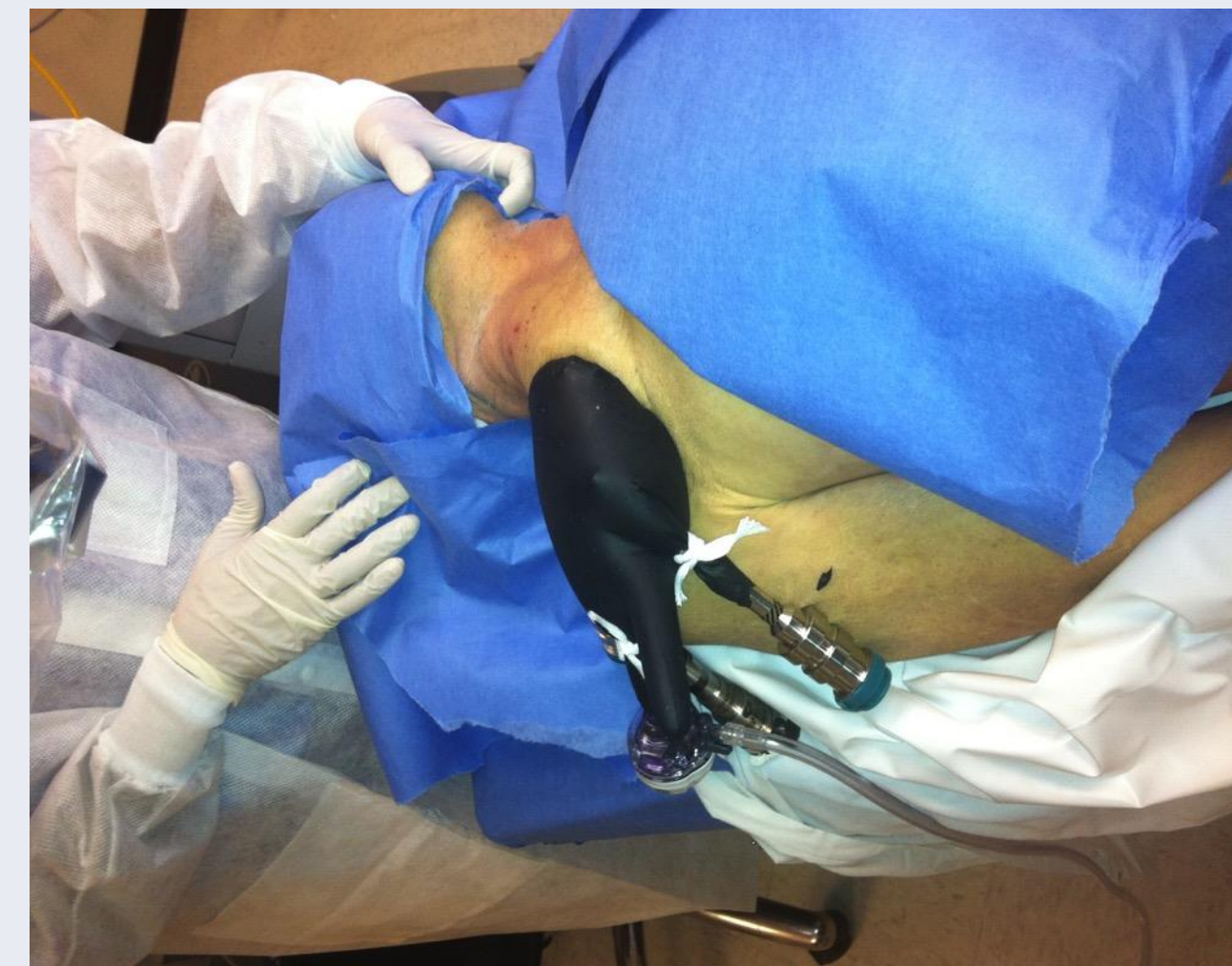


Figure 1. Lymph node levels of the cervical region. (Schematic borrowed from Khan et al. *Surgery*. 2010.)

### Methods



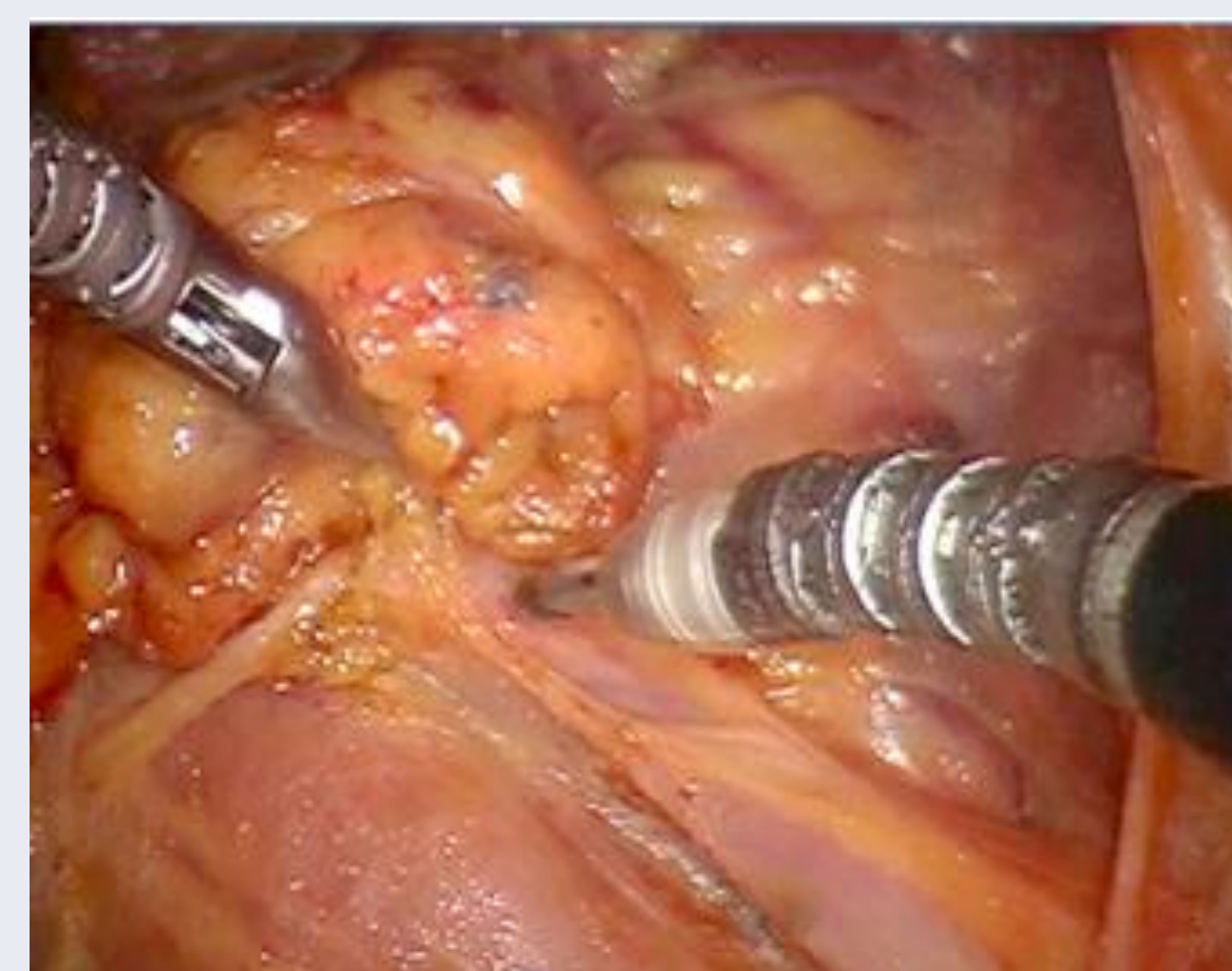
Figure 2. A whole fresh frozen human cadaver was thawed prior to experimentation. A 3 cm infraclavicular incision was made and subplatysmal skin flaps were manually raised.



Figures 3,4. Wound edges were retracted with an Alexis self-retracting retractor and a folded over glove to create an airtight seal. The surgical glove was then insufflated within a safe range of a PCO2 of 4-6mm Hg to limit potential adverse metabolic and physiologic effects. The fingers of the gloves acted as guides for the robot ports.



Figure 5. Surgical set up. Da Vinci robot arms in place and robot is positioned near the head of the bed. Four robotic arms were used in combination with three 8 mm instruments and camera.



Figures 6. Robotic cervical lymphadenectomy was performed in the standard fashion.



Figure 7. Cervical nodal pack specimen bloc removed without injury to surrounding neurovascular structures.

### Results

The insufflation-based neck dissection technique was implemented on both sides of the cadaver's neck without damage to surrounding structures. The cervical nodal pack was removed en bloc.

### Conclusion and Discussion

We show the feasibility of performing neck dissection through an infraclavicular incision using insufflation. This approach might be useful for robotic cervical lymphadenectomy. This technique's small, remote incision potentially reduces morbidities associated with open techniques, such as visible neck scarring.

Robotic surgery, however, does produce its own considerations, for example, the steep learning curve associated with handling of the robot. One must also consider the larger working field required for the robot. Insufflation provided a unique solution to this problem during this study.

Future directions of this study can include more robust cadaveric experiments before use on human patients. Eventually, scarless robotic neck dissection may become a possibility for treatment of head and neck cancer.

### Funding/Disclosures

Dr. Duvvuri serves as proctor for Intuitive Surgical, Inc.

This work was funded in part by the Department of Veterans, and the PNC Foundation (UD).

This work does not represent the views of the US Government or Department of Veterans Affairs.

### Contact

Hillary Newsome, BS: han17@pitt.edu

### References

1. Kang S-W, Jeong JJ, Nam K-H, et al. Robot-assisted endoscopic thyroidectomy for thyroid malignancies using a gasless transaxillary approach. *Journal of the American College of Surgeons*. 2009;209(2):e1-7.
2. Tae K, Ji YB, Song CM, et al. Robotic selective neck dissection using a gasless postauricular facelift approach for early head and neck cancer: technical feasibility and safety. *Journal of laparoendoscopic & advanced surgical techniques. Part A*. 2013;23(3):240-5.