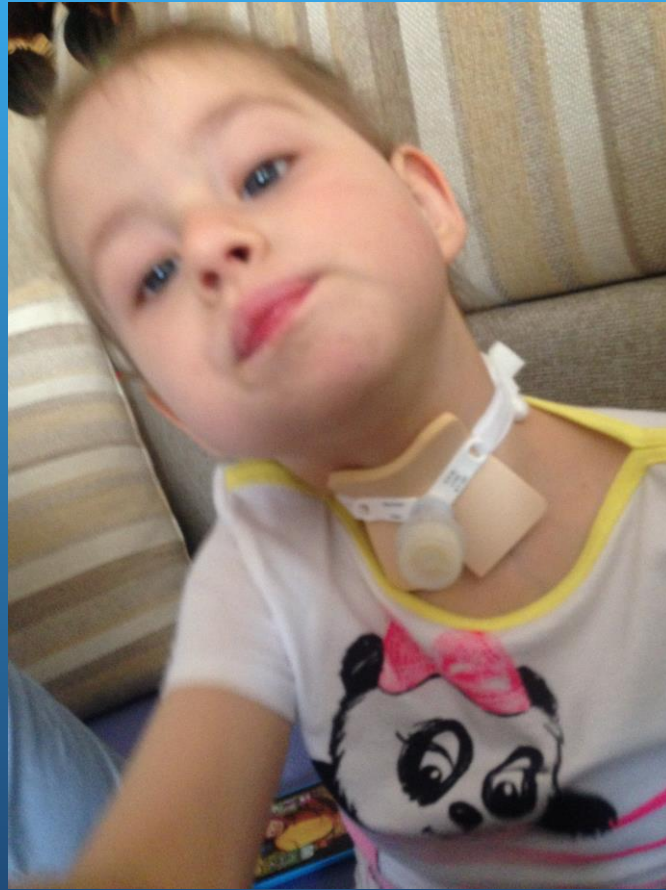
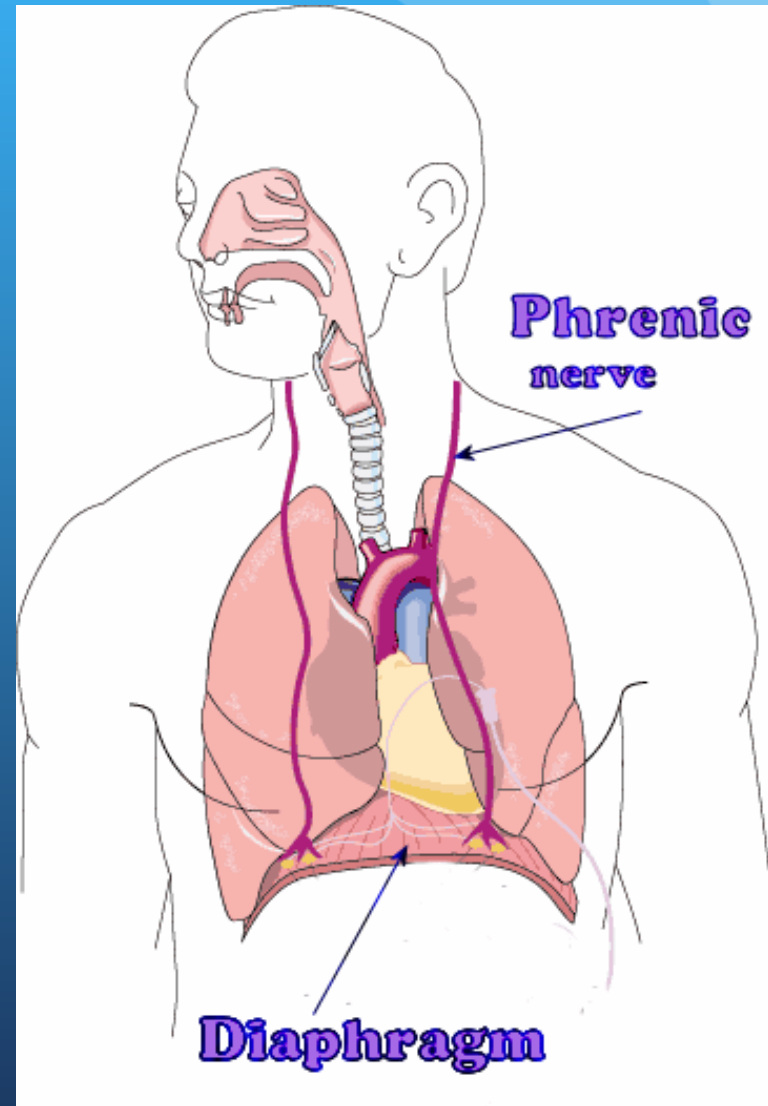


Considerations and Complications of Cervical Implantation

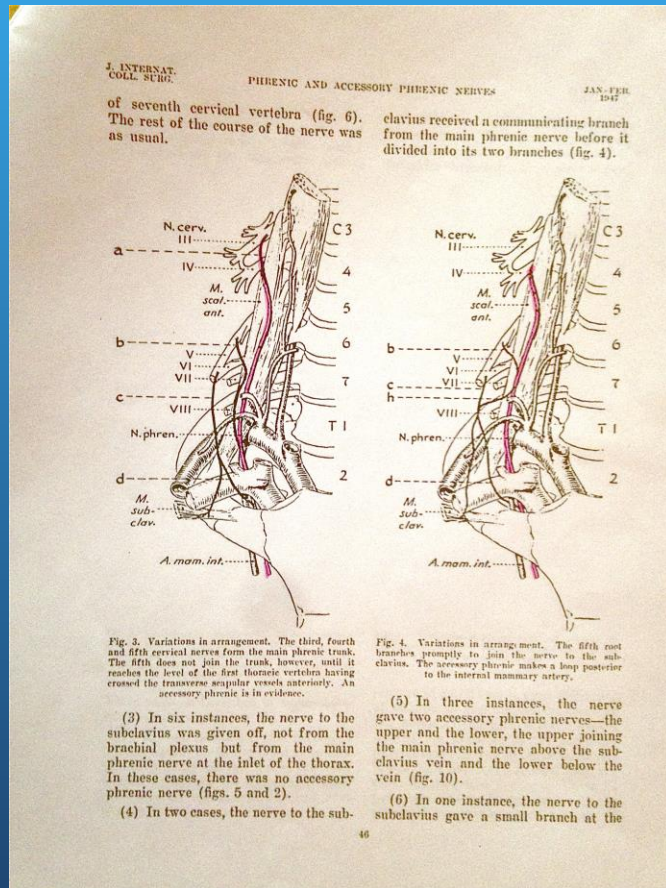
Don Headley, MD
St. Joseph's Hospital and Medical Center



Phrenic Nerve & Diaphragm



Anatomical and Surgical Considerations of the Phrenic and Accessory Phrenic Nerves
J. Internat. Coll. Surg 1947



Surgery

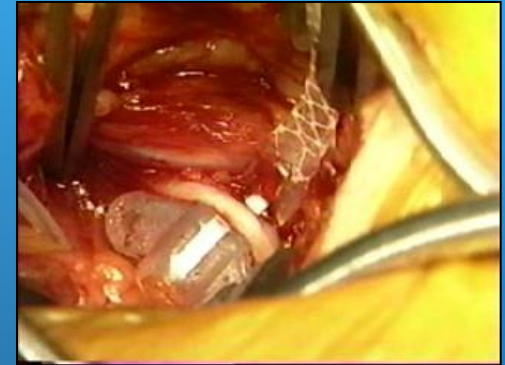
- Electrodes can be placed either cervically or intrathoracically.
- No difference in efficacy has been observed, so choice is left to the surgeon's preference.

Cervical Approach

- Phrenic nerve isolated over anterior scalene muscle.
- Can be performed on an outpatient basis, with local anesthesia and sedation.

Thoracic Approach

- Phrenic nerve isolated alongside pericardium.
- Can be performed through small intercostal incisions, thoracoscopically¹, or with use of robotic assistance.²



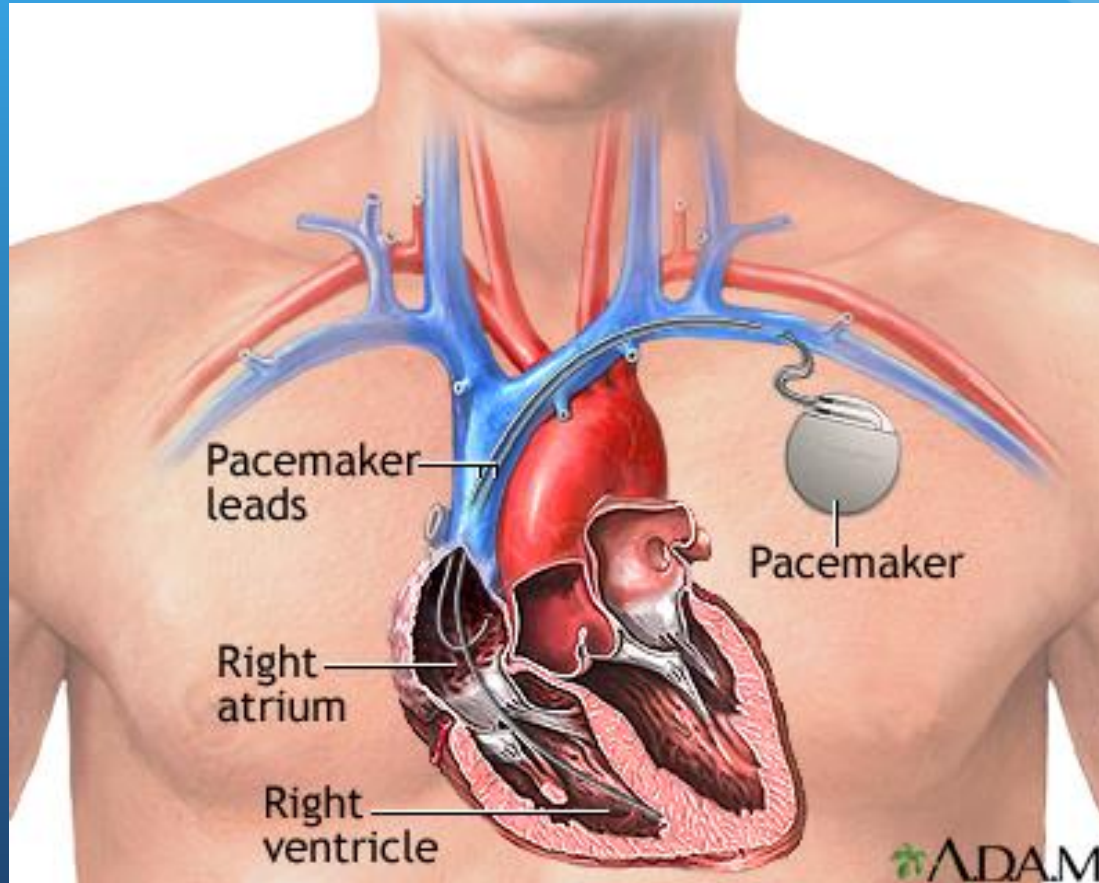
¹ Shaul DB, Danielson PD, McComb JG, Keens TG. "Thoracoscopic Placement of Phrenic Nerve Electrodes for Diaphragm Pacing in Children." *Journal of Pediatric Surgery*. Vol.37, No.7 (July 2002), pp.974-978.

² Argenziano, M. et al "Endoscopic, Robotically Assisted Implantation of Phrenic Pacemakers." *The Journal of Thoracic and Cardiovascular Surgery*. Vol.126, No. 2, August 2003, pp. 582-3.

Neck/Arm Pain Post Implant

- Can happen with both cervicle and trans-abdominal techniques.
- C5 is the dematome for the shoulder. Stimulation of the C5 contribution to the phrenic nerve may also stimulate sensory afferents of the shoulder.
- Not reported in trans-thoracic technique

Cardiac Pacemaker



Acute Cervical Spine Fracture

- Surgical considerations
- Timing of procedure
 - Clinical Survival
 - Post Trauma Elective Survival
 - Prior to discharge from facility ?
 - After acute rehab placement
 - Insurance issues

Monitored Anesthesia?

- If significant risk for general anesthesia
 - Use experienced anesthesiologist as more difficult in OSA patients

Scoliosis

- Surgical considerations
 - Mobility of neck
 - Distorted anatomy
 - Landmarks
 - Mid Clavicular
 - Deep cervical fascia
 - Branchial Plexis
 - Recurrent Laryngeal Nerve

Scoliosis



Thoracic Duct Injury

- Left side
- Rare
- Ligate/dermabond

