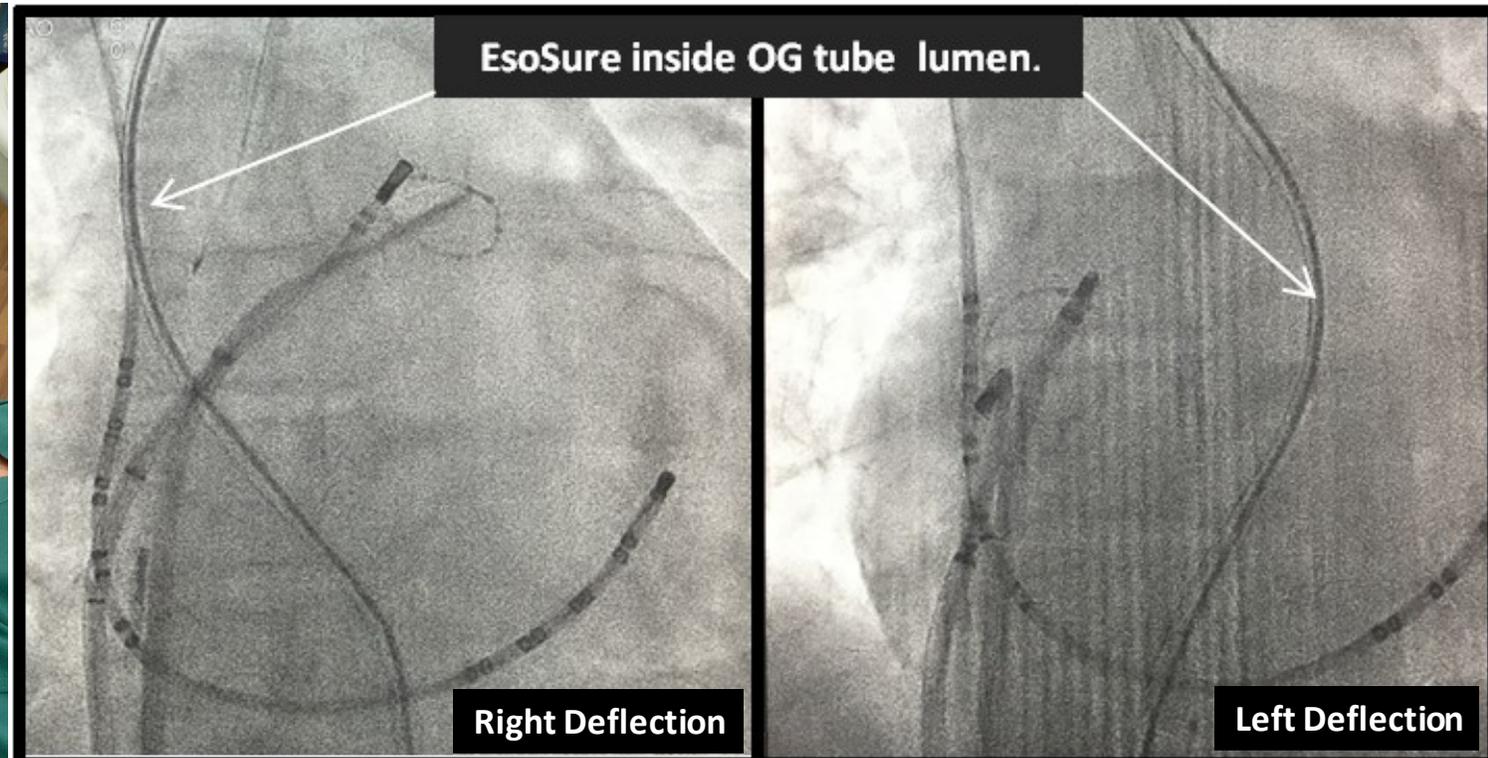


Safely Move the Esophagus with the EsoSure Esophageal Retractor.

The only US-patented and FDA-registered device specifically designed to move the esophagus.



Courtesy of Dr. Andrea Natale.
California Pacific Medical Center. March - April, 2016.

“Patients undergoing AF ablation are at risk of esophageal thermal injury, which ranges from superficial ulceration, to gastroparesis, to the rare but catastrophic atrioesophageal fistula.” (1) From 17 pre-clinical tests on the inventor to use in EP Labs across the country, the EsoSure has proven to be a safe and effective tool for esophageal deflection.

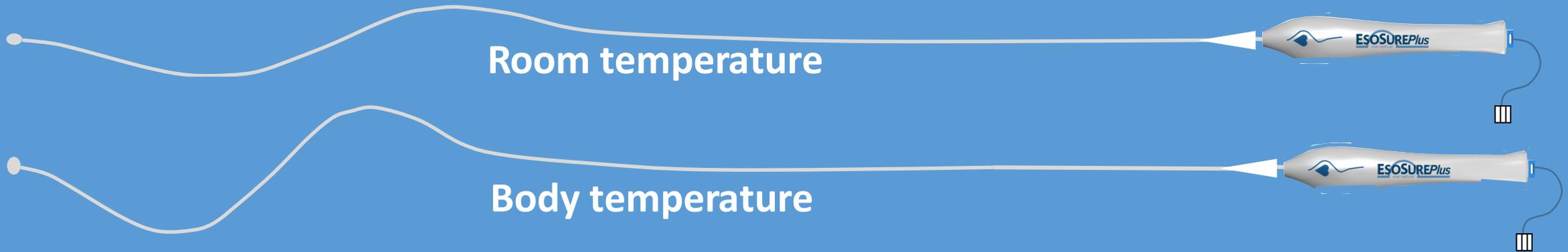
EsoSure Training Index

- Describe the evidence-based benefits of moving the esophagus. Pg 3
- Introduce the EsoSure. Pg 4-5
- Provide fluoroscopic examples of esophageal deflection. Pg 6-8
- Review the anatomical considerations for moving the esophagus. Pg 9-12
- Share rationale for the design of the EsoSure curve. Pg 13
- Discuss other devices which move the esophagus. Pg 14-15
- Outline the roles of the electrophysiologist, anesthesia provider and EP staff. Pg 16-19
- Provide a supply list and instructions for inserting & deflecting the esophagus. Pg 20-29
- Suggest methods for correlating the fluoro image to the 3D Map. Pg 30-33
- Identify contraindications, potential complications & non-successful deflections. Pg 34-36
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The goals and potential benefits of moving the esophagus, as described in the literature, are to:

- 1) Minimize thermal damage to the esophagus. (1)
- 2) Allow for the placement of appropriately deep lesions, rather than compromise with partial thickness lesions or abort them completely. (2)
- 3) Allow for the creation of ablation lesions in optimal targeted locations. (2)
- 4) Reduce procedure time by decreasing the frequency and amount of luminal esophageal temperature increases. (3)
- 5) Increase procedural success rates through a combination of all of the above. (4, 5)

The EsoSure Esophageal Retractor



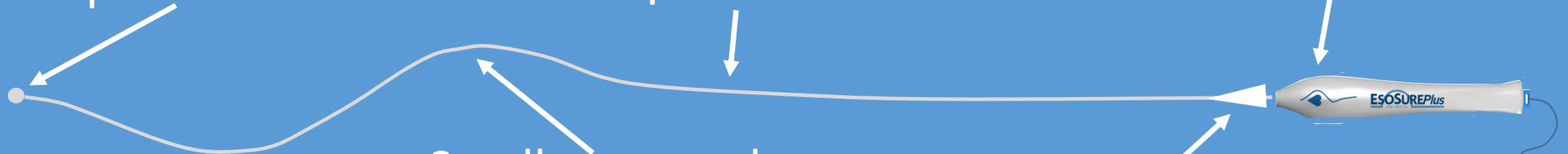
The EsoSure has a temperature-programmed nitinol stylet which is softer at room temperature for placement into the lumen of an 18 Fr Salem Sump OG tube and assumes a firm S-shaped curve at body temperature to create esophageal deflection.

The EsoSure's Anatomy

Ball on tip prevents OG tube puncture.

.052 dia. Nitinol shaft is shorter than the distance to the OG tube's proximal hole.

Markings on handle indicate direction of primary curve during insertion.



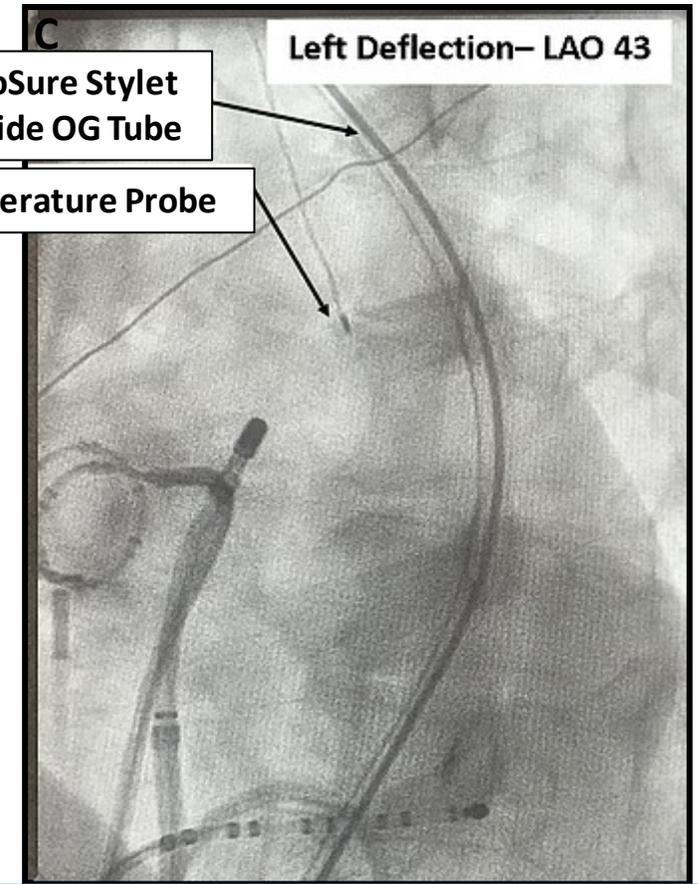
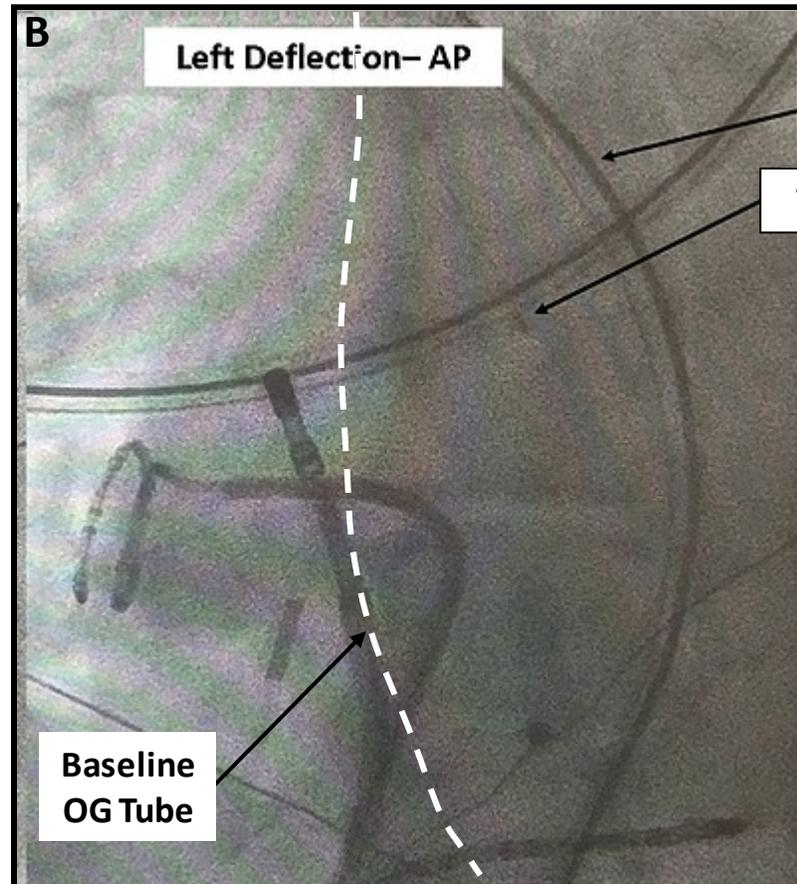
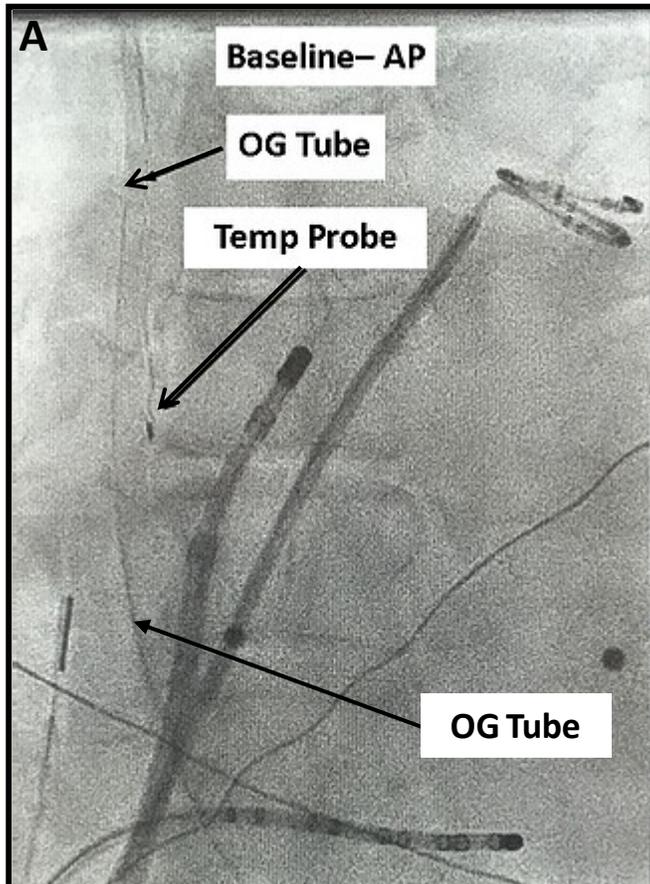
Larger primary curve is on distal end of stylet.

Smaller secondary curve is proximal.

Spongy plug occludes end of OG tube.

Clip secures handle to pillow or sheet.

Unilateral Deflection for a Lateral Esophagus: Primary Curve to One Side

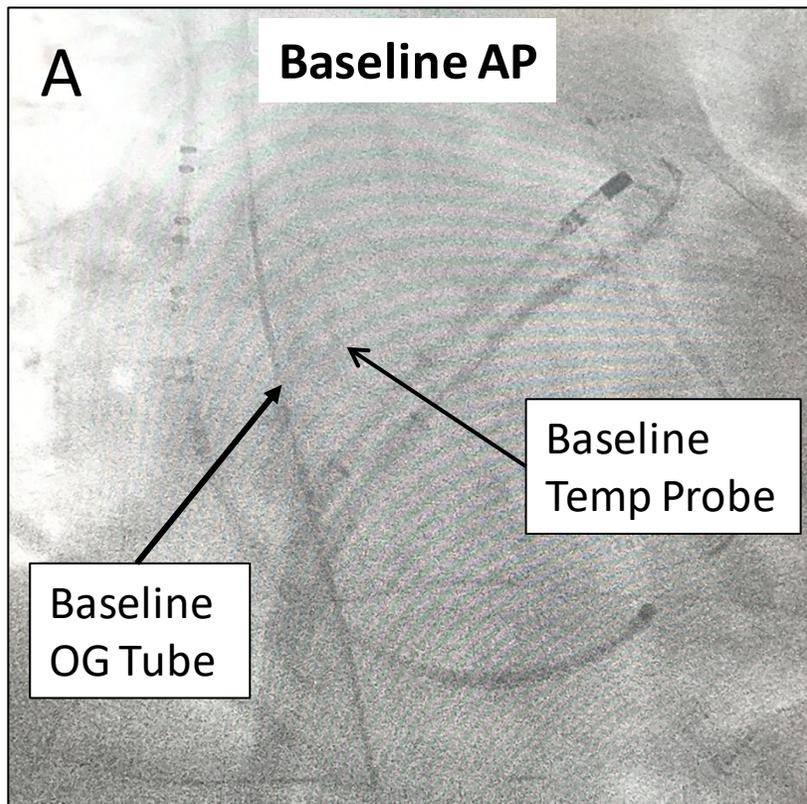


A) Left Pulmonary Vein Isolation (PVI) was completed with the esophagus in its baseline position along the right side of the spine. Note: The OG tube was inserted before anticoagulation to the right of the temp probe to position it closest to the ablation catheter.

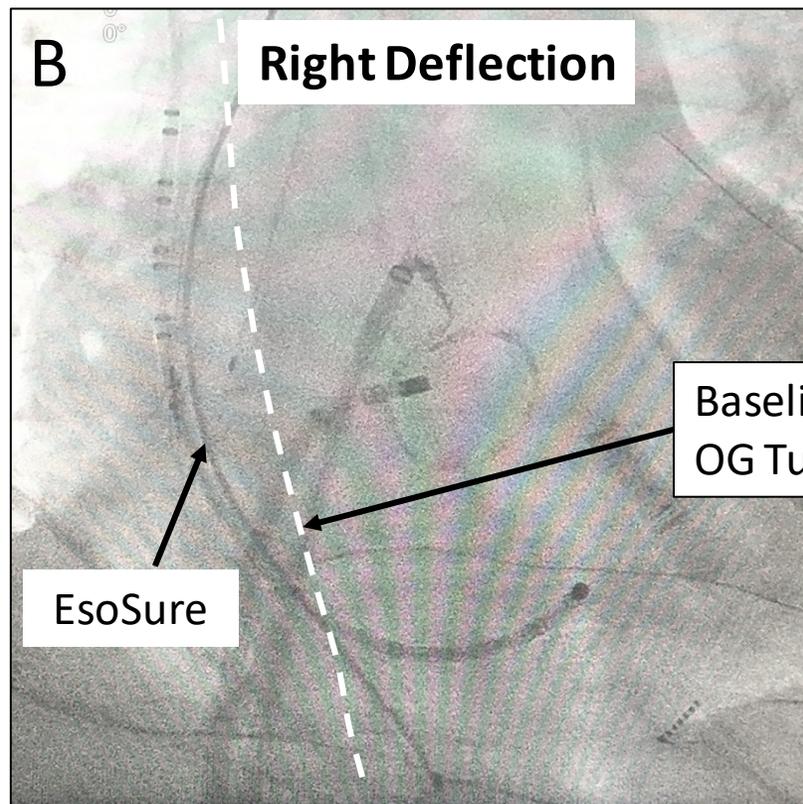
B) When it was time to begin the right PVI, the temperature probe was removed, cooled and reinserted to the right of the OG tube. The EsoSure was then inserted into the OG tube lumen to deflect the esophagus to the left, away from the right pulmonary veins.

C) The LAO 43 view demonstrates posterior as well as lateral displacement of the esophagus. The temperature probe assists with visualizing esophageal luminal diameter during deflection. Courtesy of Dr. Bruce Lindsay, Cleveland Clinic Hospital. Cleveland, OH. June, 2016.

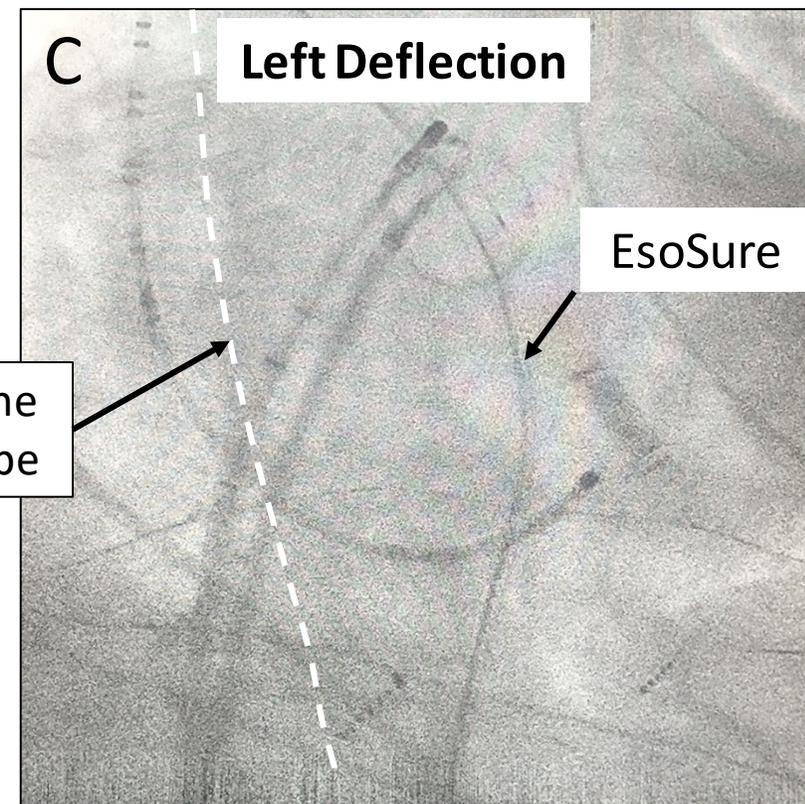
Bilateral Deflection for a Medial Esophagus: Rotating the Primary Curve



A) The baseline OG Tube lies along the right side of the vertebrae but was felt to be too close to the left PV antrum. Courtesy of Dr. Luigi Di Biase. Montefiore Medical Center. Bronx, New York. July, 2016.

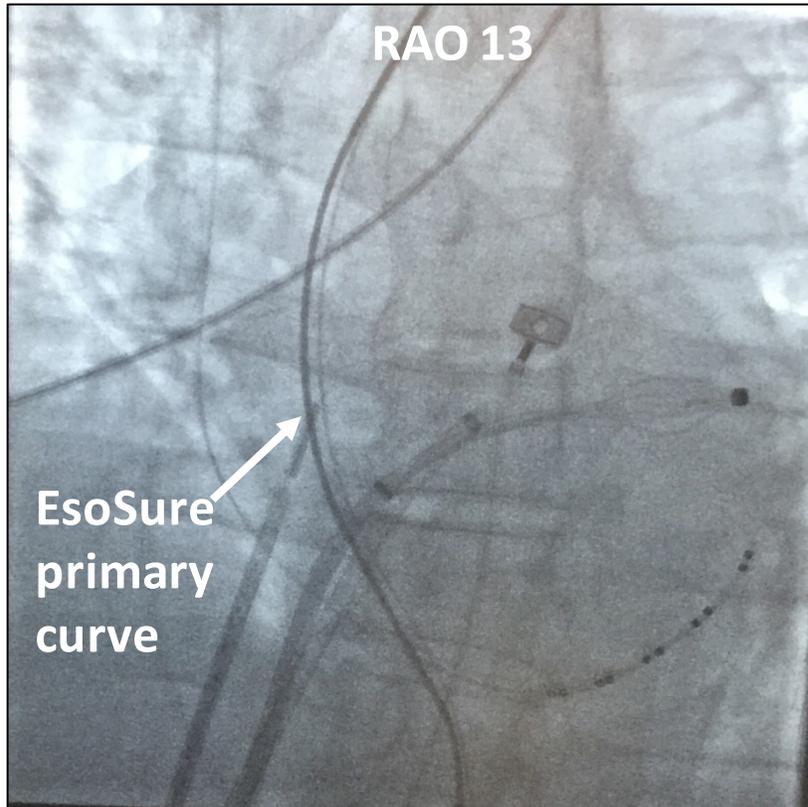


B) The EsoSure was inserted for rightward deflection to increase the distance from the esophagus to the ablation catheter in the left PVs. A left-sided PVI was effected.

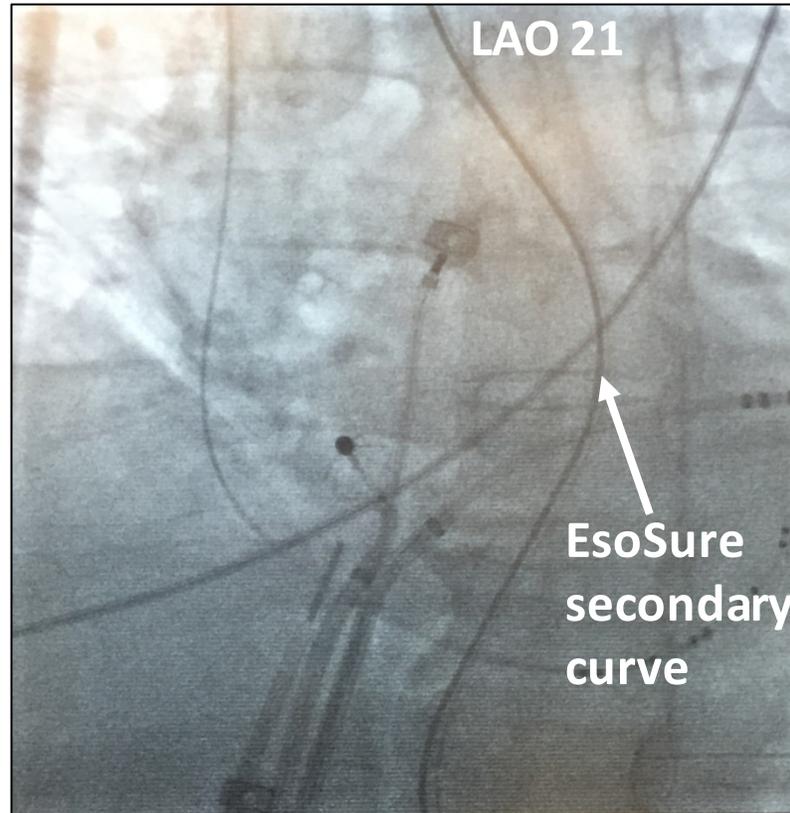


C) After completion of the left sided PVI the EsoSure was rotated to deflect the esophagus to the left away from the right PVs. The temperature probe is yet to be repositioned to the right side of the OG tube.

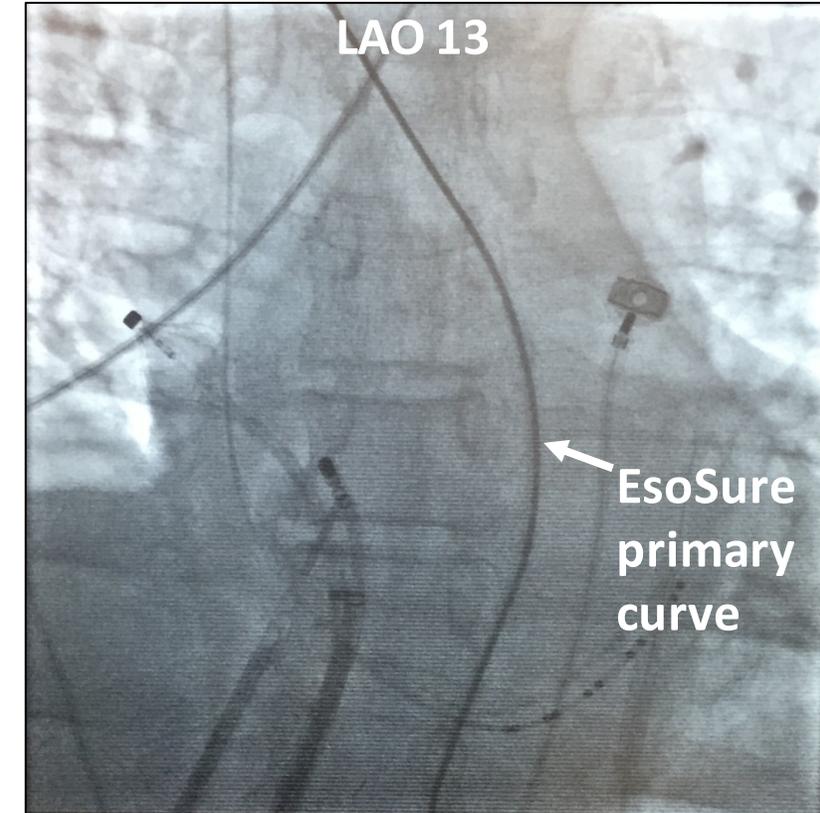
Bilateral Deflection for a Medial Esophagus: Advancing or Rotating the Primary Curve



Redo of failed PVI. Baseline esophagus was inside the left spinal border in the AP view. Deflection to the right allowed for complete isolation of the left PVs avoiding the esophagus laying behind the LA.

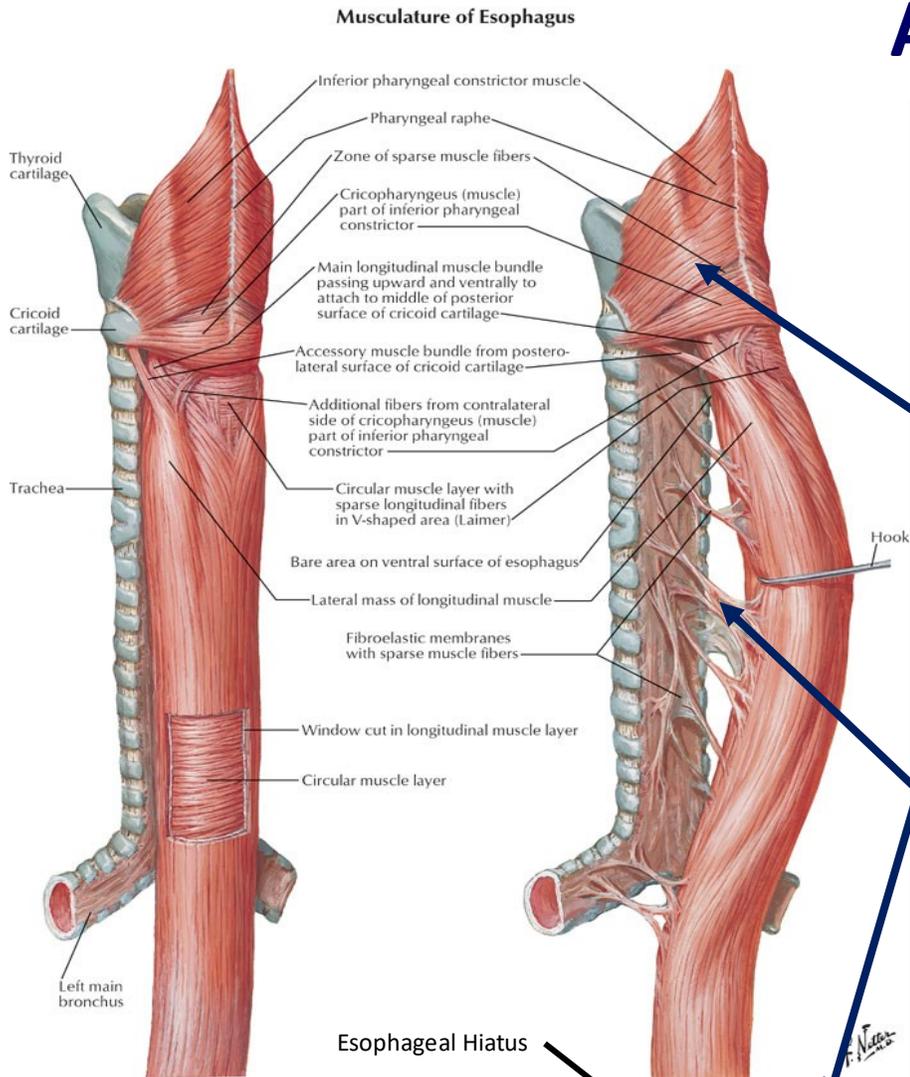


Testing in the right PVs demonstrated incomplete PVI as well. The distal half of the primary curve was advanced past the diaphragm to the stomach, but the smaller secondary curve achieved only moderate deflection.



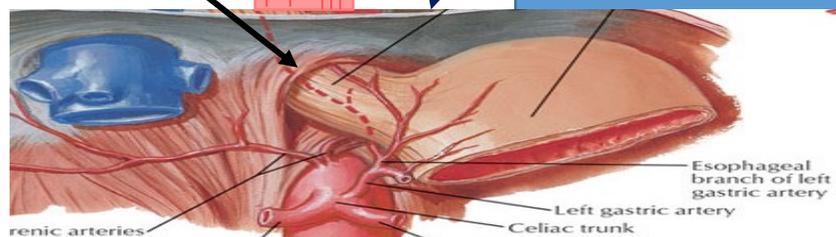
The stylet tip was retracted to the diaphragm and the larger primary curve was rotated to the left for better results. Courtesy of Dr. Marcos Daccarett, MD. St. Luke's Medical Center. Boise, ID. September, 2016.

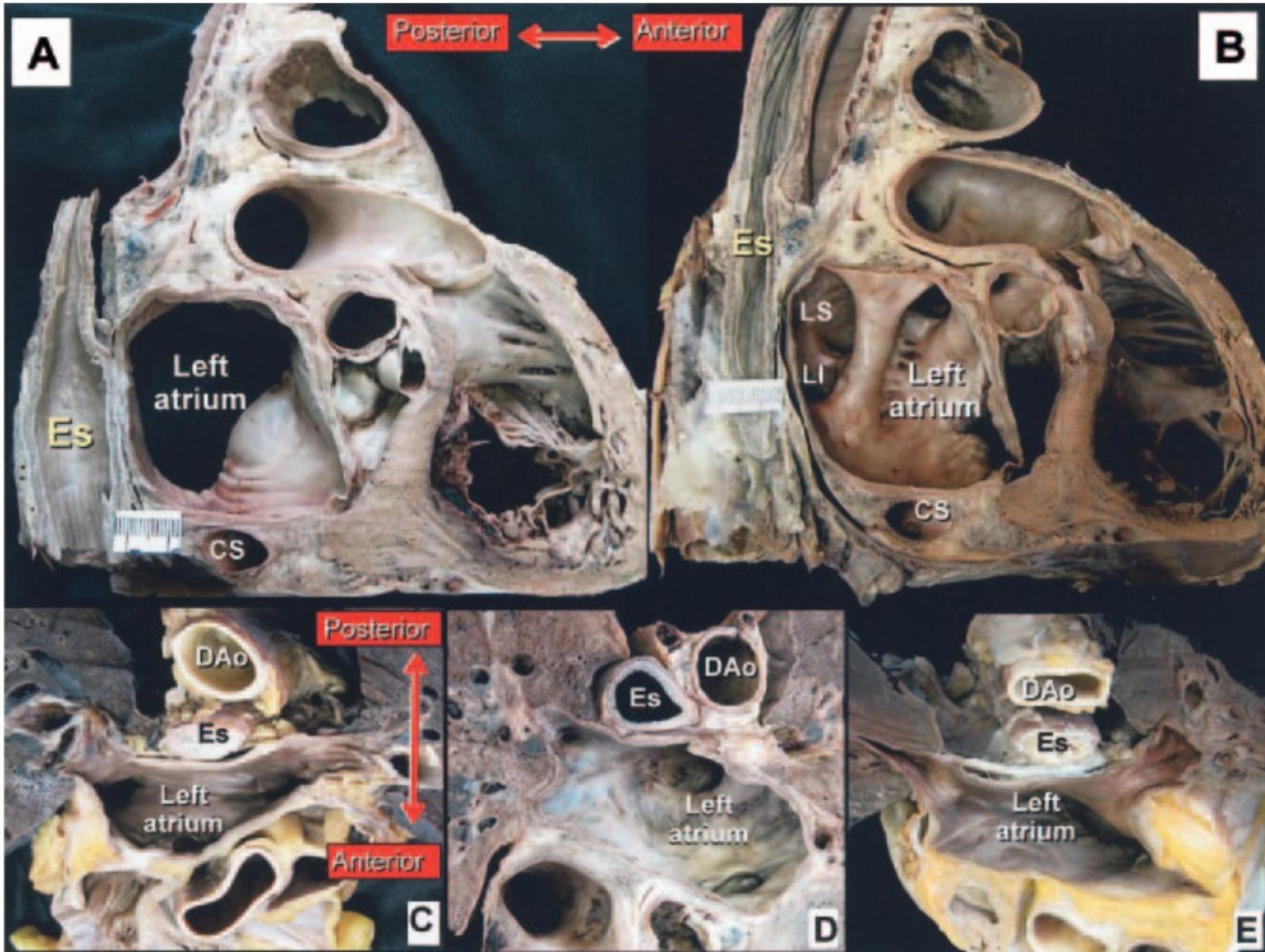
Anatomical Review and Considerations



The EsoSure curve is designed to utilize the support given to the esophagus superiorly from the inferior pharyngeal constrictor muscle and inferiorly from the diaphragm.

Between the pharynx and diaphragm there are only loose fibroelastic membranes and sparse muscle fibers connecting the upper esophagus to the trachea. There is no restrictive tissue attached to the esophagus below the carina.

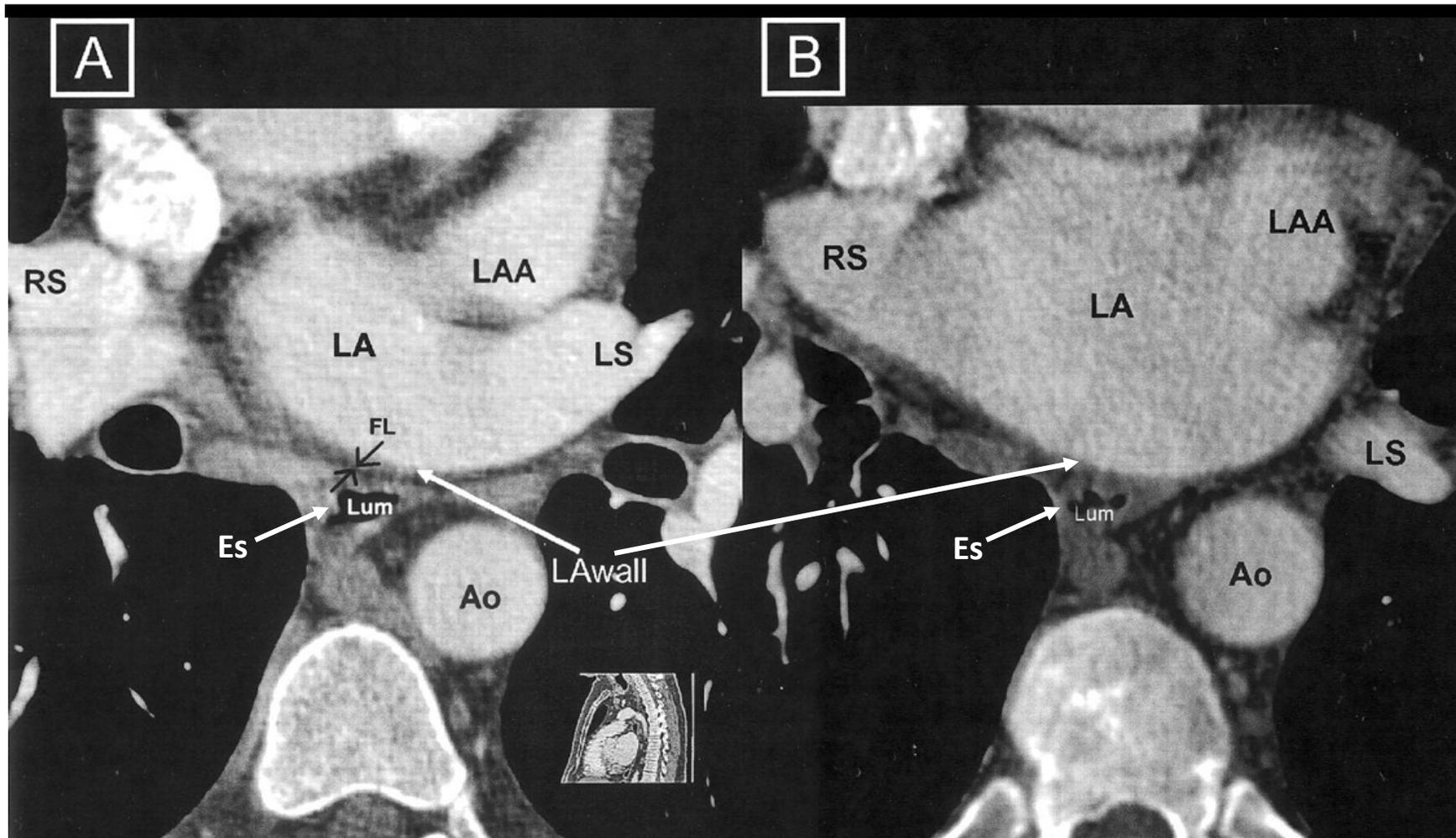




Eso – LA Relationship

(A) & (B): Sagittal sections through the heart and esophagus (Es) showing a middle section between the left and right PVs and a section close to the left PVs (LS and LI), respectively.

(C-E): Transverse sections through the LA and esophagus show the esophagus related to the middle of the posterior atrial wall (C), the esophagus passing close to the right inferior PV (D), and the esophagus close to the left inferior PV (E). (6)



Eso – LA Distances

The total distance from the LA to the Esophagus varies and may be as little as 3.2 mm. which may be traversed by ablation energy.

The mean thickness of the **esophageal wall** is 2.5 +/- 1 mm.

The mean thickness of the posterior **left atrial wall** is 2.5 +/- 1 mm.

The mean thickness of the **parietal pericardium** is 0.3 +/- 0.1 mm.

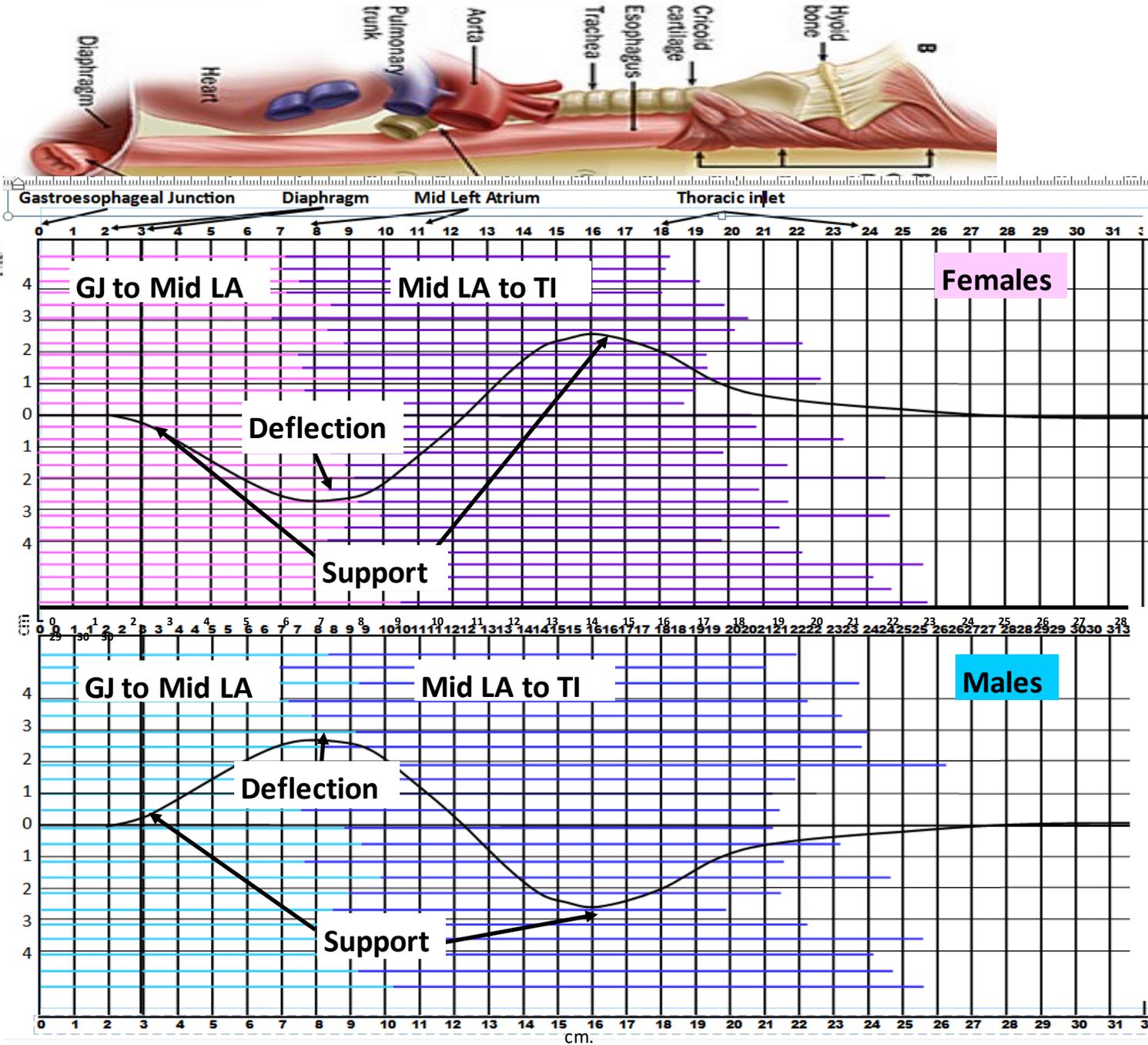
The mean thickness of the **fat pad** between the esophagus and left atrium varies from 1.3 mm to zero mm.

Figure 2. Axial image of esophagus and posterior LA at level of superior PVs. Between LA and esophageal lumen (A), 4 different layers are visible: radiocontrast agent within left atrium (most radiodense), a thin layer of posterior LA wall (less radiodense than LA), a thin layer of adipose tissue (radiolucent), and anterior esophageal wall (radiodense). B, There is no fat layer visible between left atrium and esophagus. Measurements were made using digital calipers. FL indicates fat layer; LA, left atrium; LA wall, posterior LA wall; Lum, lumen of esophagus; Ao, aorta; other abbreviations as in [Figure 1](#). (Es= Esophagus; LAA= Left Atrial Appendage) (7)

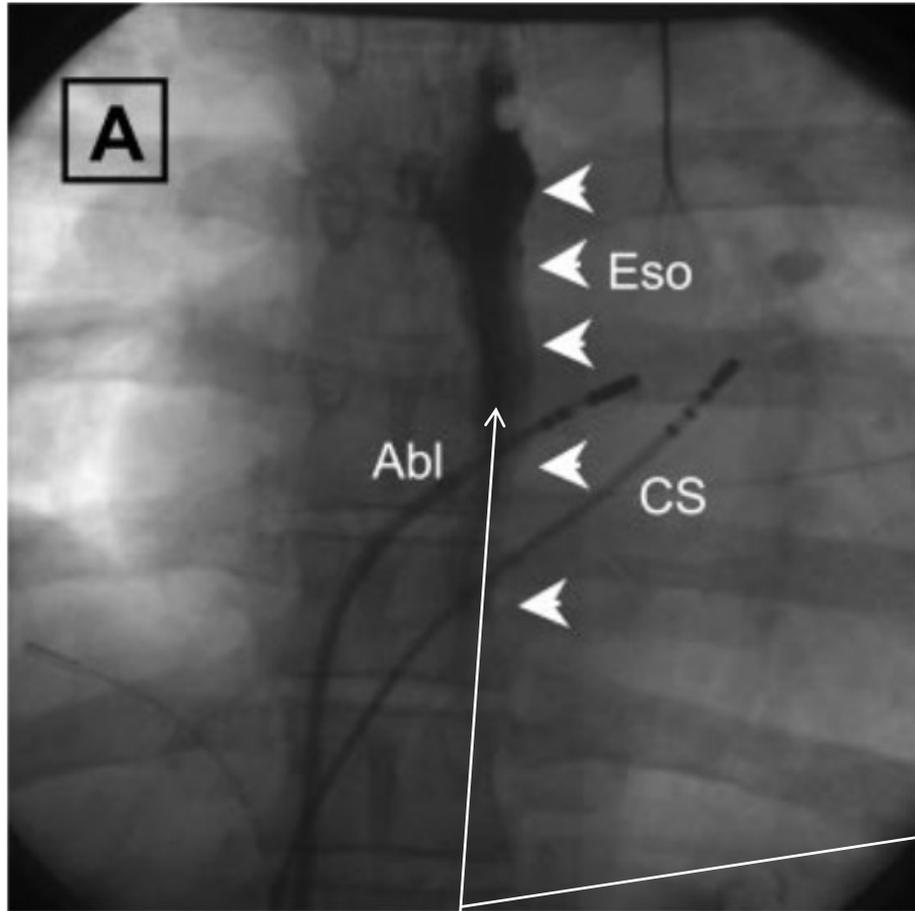
EsoSure Design

The EsoSure stylet deflects the esophagus in the area of the mid left atrium by utilizing support from the muscles of the pharynx and the diaphragm.

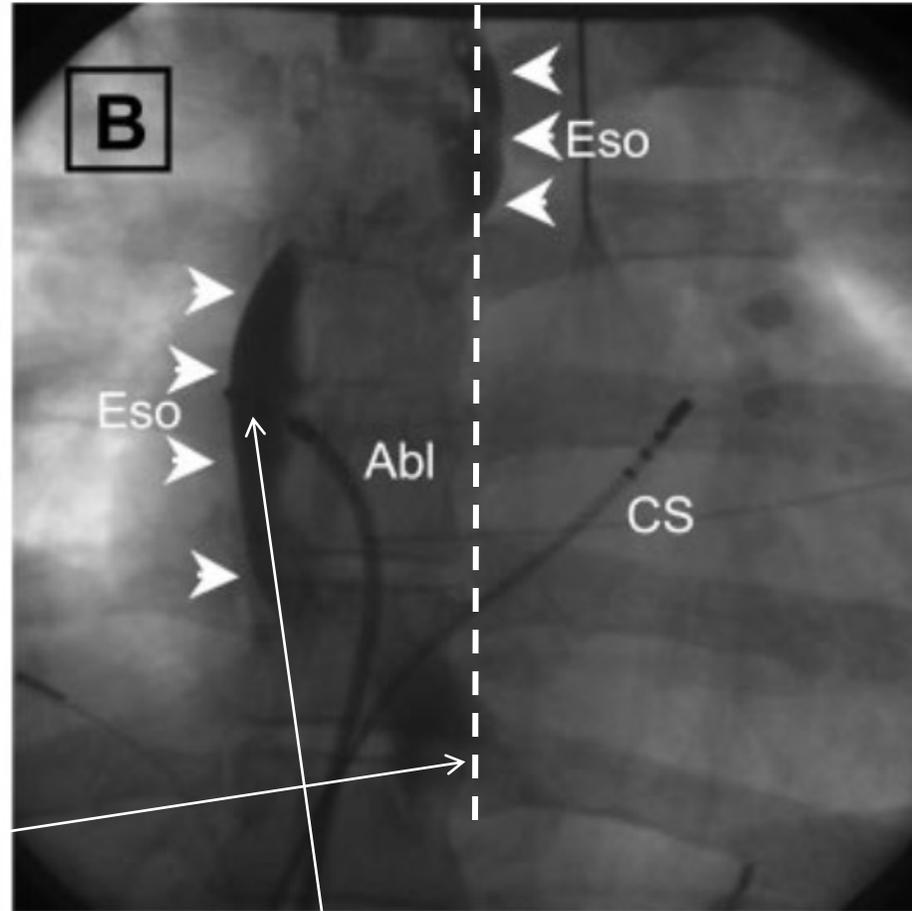
*The data for each patient (colored horizontal line) was obtained from 53 patients scanned in a 40 slice multidetector Siemens CT scanner and reconstructed from the raw data at 5mm intervals. Measurements were obtained in the sagittal reconstructed images utilizing a GE Centricity PACS software. Measurements done by Dr. Nino Alvarez, MD.



Background on moving the Esophagus



Baseline Position



**Migrated Position 40 min. later,
without mechanical influence.**

Most important, the esophagus moves laterally 2 to 3 cm all by itself through physiologic migration. (8) The EsoSure simply and safely facilitates esophageal deflection in a manner that mimics physiologic esophageal migration.

A- Endoscope used successfully in 10 of 12 patients



B- ET Stylet inside a Chest Tube



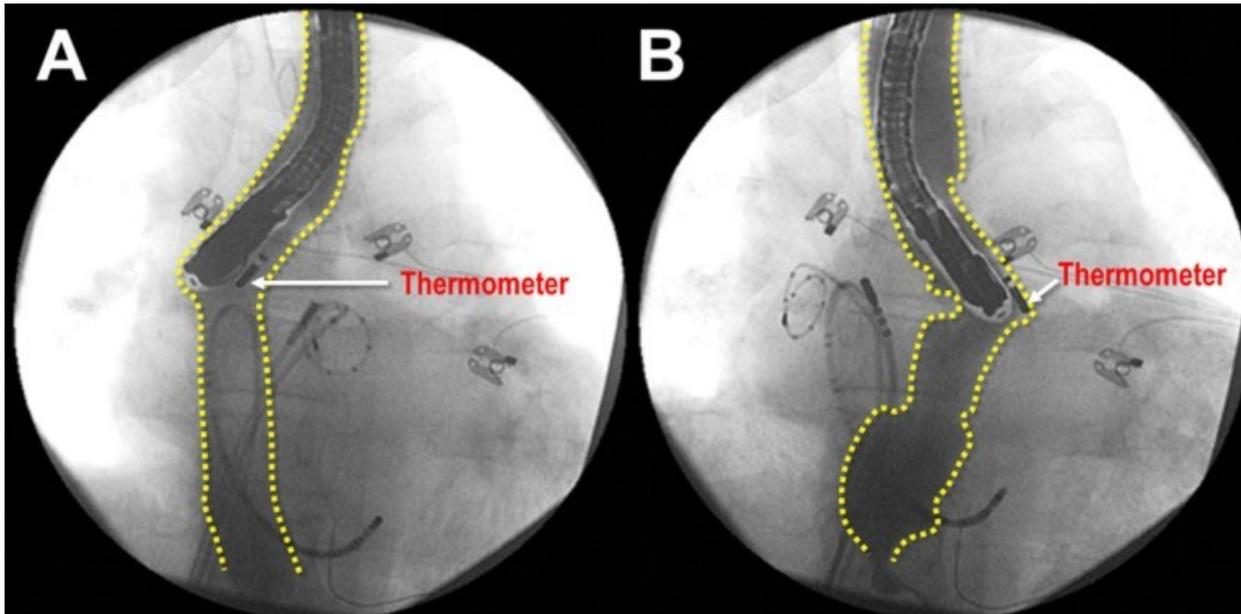
Hx of Deflection Devices

Moving the esophagus is not a new practice as there are several devices which have been used with success.

A) The Uni. Of Michigan conducted a study using an endoscope to move the esophagus. (9)

B) An ET Stylet inside a Chest Tube was used by Mount Sinai Hospital in New York City, as well as other facilities. (3)

C- TEE Probe used in 704 cases. 96% effective & 2 superficial lesions



C) The most notable is a 2015 study in Brazil which reviewed 704 cases where TEE probes deflected the esophagus 96% of the time with a deflection range of 4 to 9 cm. In this study there were only 2 instances of superficial esophageal luminal lesions. The EsoSure, by contrast, mimics the curve of natural migration by creating movement in a gentle arc of 2 to 3 cm rather than the right angles and corners of a TEE probe. (10)

Electrophysiologist Initial Planning - With Temp Probe Use

- 1) At the time of vascular access, fluoro the temp probe to assess esophageal baseline position.
- 2) Before Heparin is given, instruct the anesthesia provider to insert a generously lubricated 18 Fr 48" Salem Sump OG tube on the side of the temp probe that will be towards the side of initial deflection. This will leave the temp probe closest to the ablation catheter. Verify OG tip is in stomach.
- 3) As the EsoSure stylet is advancing down the OG tube, observe the stylet under fluoro and instruct the inserter to stop advancing when the stylet tip is at the diaphragm.
- 4) Regularly fluoro and guide EsoSure curve and temp probe adjustments to maximize deflection distance and minimize temperature probe distance to the ablation catheter tip.

Electrophysiologist Initial Planning- No Temp Probe Use

- 1) At time of vascular access, and before anticoagulation, have the anesthesia provider insert an 18 Fr 48" Salem Sump OG tube, placing lubricant along the length of the OG tube during insertion. Verify tip in stomach with fluoro.
- 2) If contrast is used, have the contrast injected behind the left atrium at the same time fluoro is being used to position the diagnostic EP catheters.
- 3) Reposition OG tip in stomach and evaluate the baseline position of the OG tube and decide to which side you want initial deflection.
- 4) Use fluoro to guide EsoSure insertion and regularly make curve adjustments to maximize deflection distance between esophagus and ablation catheter tip.

Insertion Role- Anesthesia vs. EP Nursing Staff

Anesthesia Provider

Pros:

- Experienced with OG and airway management
- Positioned at head of table

Cons:

- Rotating staff may have infrequent experience
- Takes 2-3 procedures to become comfortable
- Takes regular use to become proficient
- Infrequent use makes for lower competency

EP Nursing Staff

Pros:

- Will have regular use of device
- Experienced inserting OG/NG tubes
- Frequent use will make for easier and quicker insertion and positioning

Cons:

- May not be allowed by Hospital
- May not feel comfortable with procedure

Insertion Role- Anesthesia & EP Nursing Staff

- Insertion is most easily done by two people: one to insert the EsoSure and a second to perform a jaw thrust with a push of the chin towards the chest to assist the stylet in passing through the oropharynx and upper esophagus.
- Rotation of the primary curve from one side to the other is also easier with one person rotating the OG at the mouth and the another simultaneously rotating the handle in the same direction.
- Anesthesia and EP Nursing Staff collaboration with both of these tasks will be helpful.

Equipment for EsoSure Use

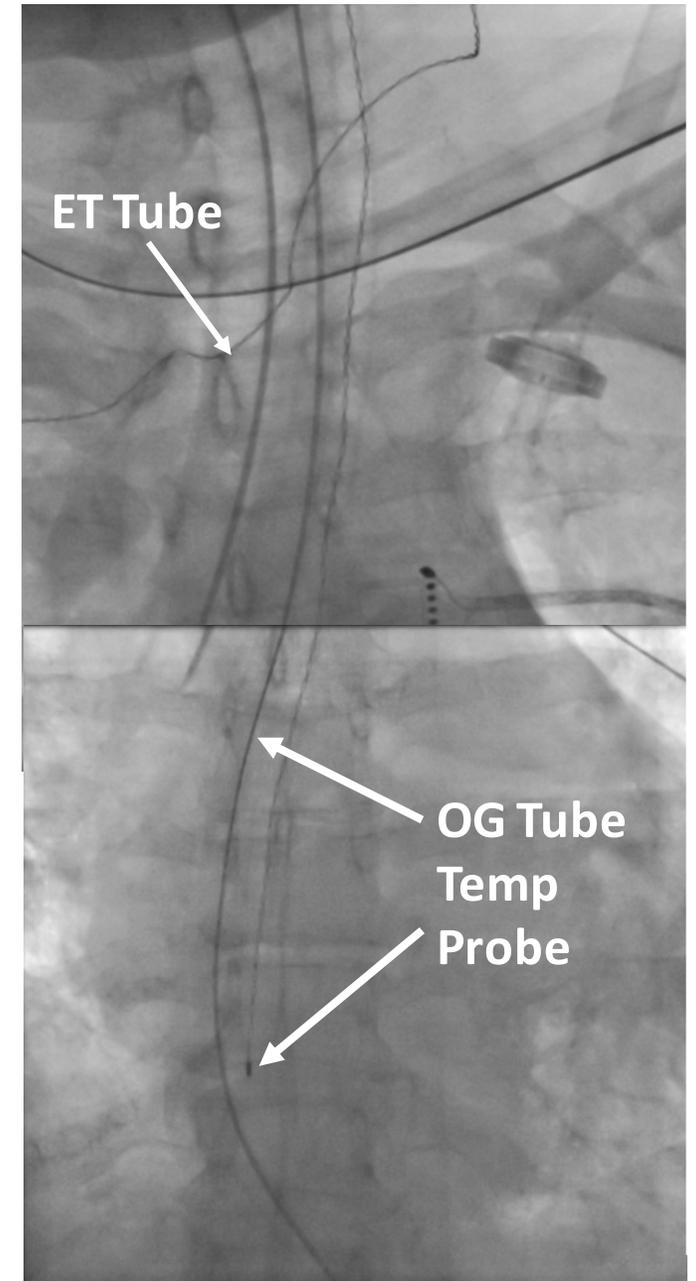
- 1) Salem Sump gastric tube 18 Fr by 48"** - The first time the EsoSure is used it should be inserted into the hospital's Salem Sump to confirm that the stylet does not extend past the proximal hole in the gastric tube.
- 2) Toomey syringe-** For injecting olive oil into the gastric tube. If not available a 20 cc luer lock or straight tipped syringe will fit into the end of the connector that comes with the Salem Sump gastric tube and suction tubing.
- 3) Olive oil-** Used as a lubricant for the stylet inside the OG tube lumen as hospital water based lubricants are not as effective. Packets are included with each EsoSure. If not present, a container of olive oil can be obtained from dietary or the cafeteria.

* It is helpful to get the feel of inserting the stylet by practicing inserting it into the circular holder.

Instructions for EsoSure Insertion & Positioning

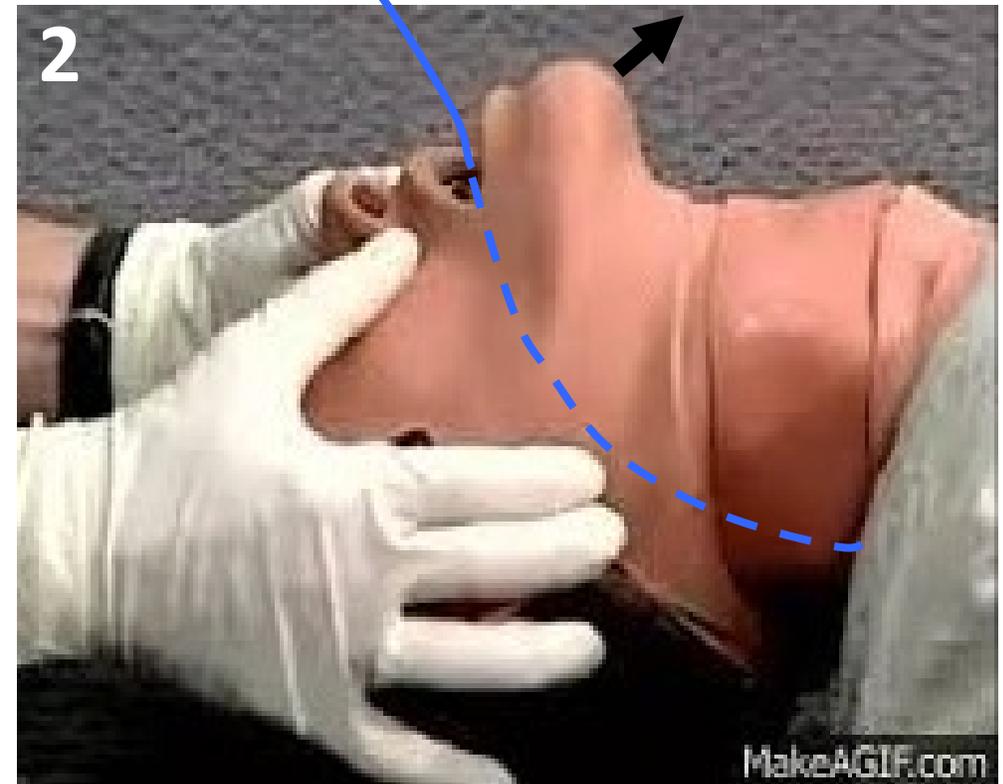
Prior to Insertion Review Quick Instructions in Box:
Intubate > Insert Temp Probe > Insert OG > Inject Contrast > Olive Oil

- 1) Intubate.
- 2) Insert single or multi pole Temp Probe with extra lubrication and advance further than normal, if one is used.
- 3) Insert 18 Fr 48" Salem Sump OG tube lateral to temp probe prior to anticoagulation, with GENEROUS lubrication placed on the distal 1/2 of the OG tube. Confirm placement in stomach.
- 4) Perform esophogram to visualize esophagus behind the Left Atrium, if contrast is part of your protocol.
- 5) Reposition OG tip into stomach and flush with 8-10 cc of Olive Oil. (Packets included or obtain from dietary. Mineral oil is OK. Water soluble lubricants less effective).



Advancing the EsoSure stylet past the oropharynx

#2 A jaw thrust with a chin towards the chest maneuver by another staff person will ease the stylets advancement 1-2" at a time past the oropharynx. Using fluoro, stop advancing when the tip reaches the diaphragm. If the stylet becomes difficult to advance, maintain the stylet position and ...

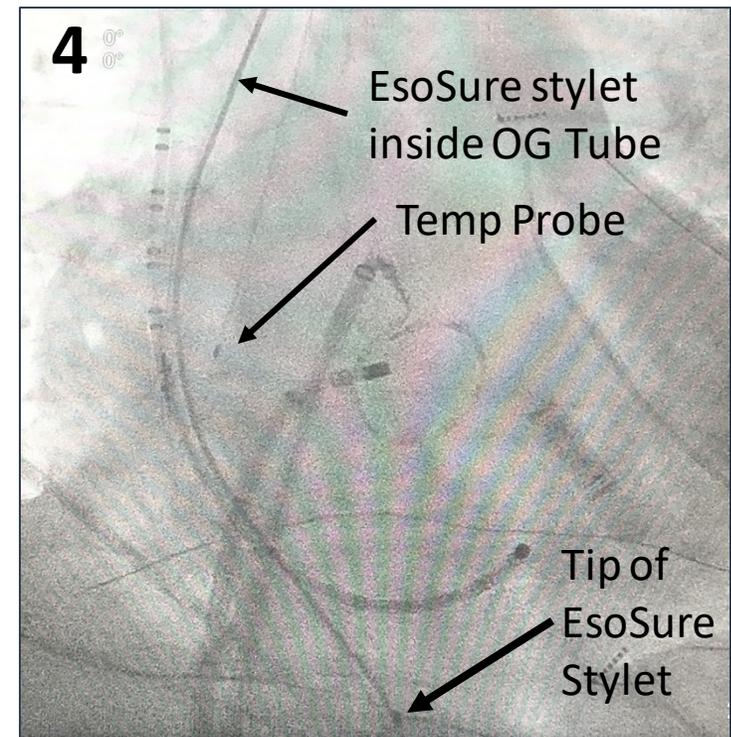
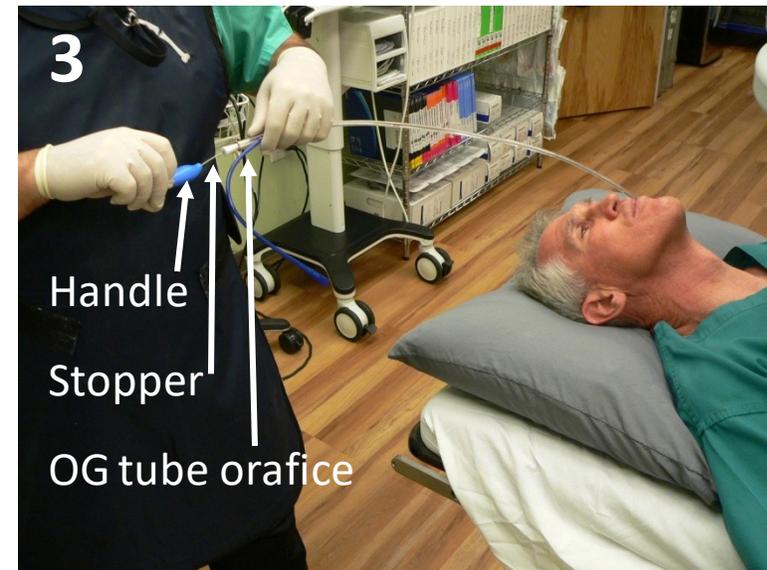


Seat Stylet in OG & Position

#3 Retract the OG tube back over the stylet until the OG tube is sealed by the white stopper at the handle.

#4 Then advance the OG tube/stylet together to the diaphragm under fluoro, assisted by the jaw lift. Move the EsoSure and OG tube as a single unit hereafter.

(The Hantla technique. Jacob Hantla, CRNA, CCDS, FHRS.)



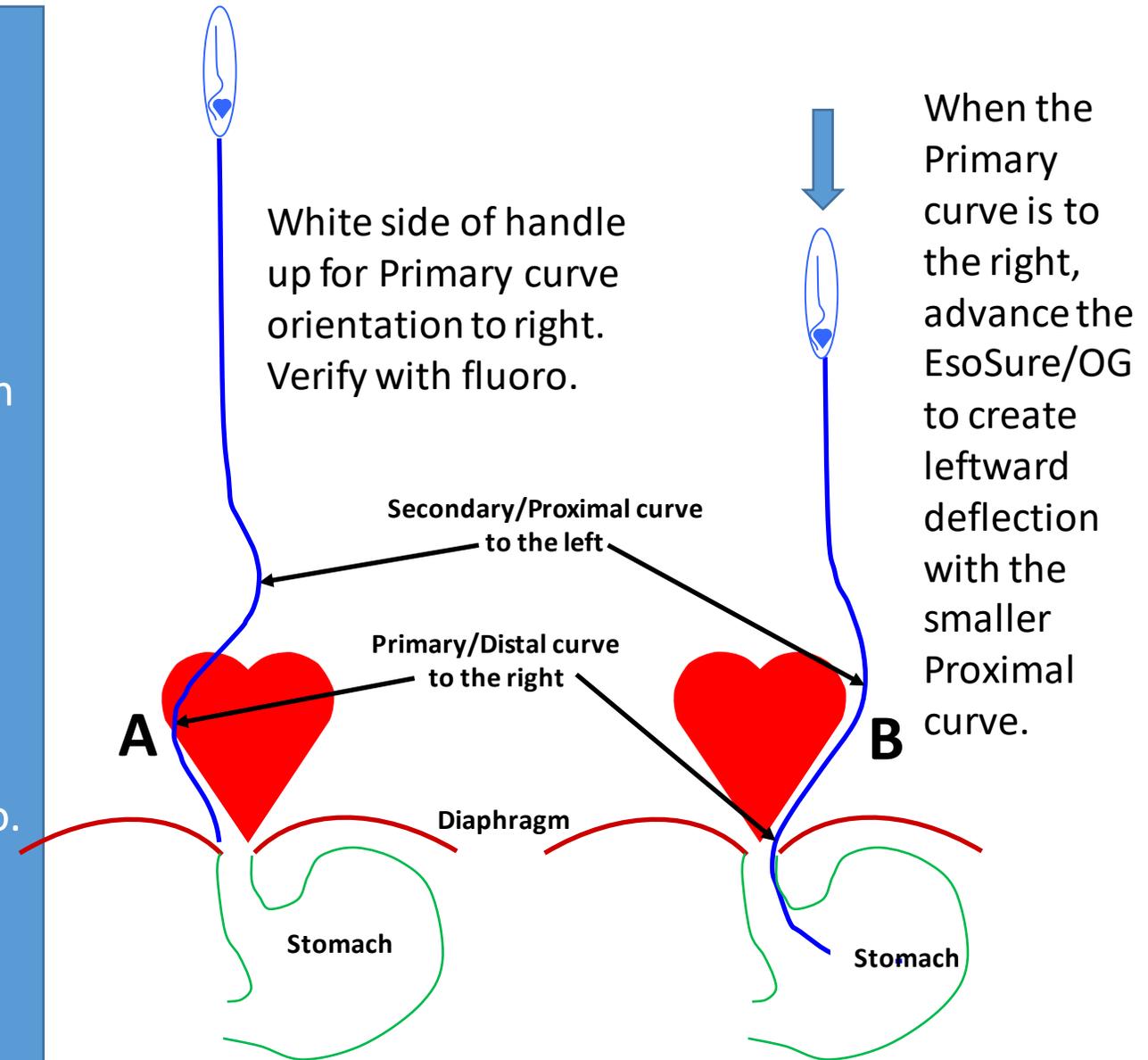
EsoSure Positioning: Primary Curve to Right

The larger Primary/Distal curve is usually oriented to the right after insertion (A).

If deflection to the left is desired, there are two ways to achieve this.

First, advance the OG and stylet together so that the distal 1/2 of the primary curve passes through the diaphragm and angles left towards the stomach. This will orient the Smaller/Proximal curve to the left (B).

Second, if greater leftward deflection is desired, you may retract the OG and stylet to the A position and rotate the OG at the mouth and EsoSure handle together while watching on fluoro. If rotating does not work, the stylet may be withdrawn and reinserted with the blue side of the handle held up and distal curve oriented to the left (C).

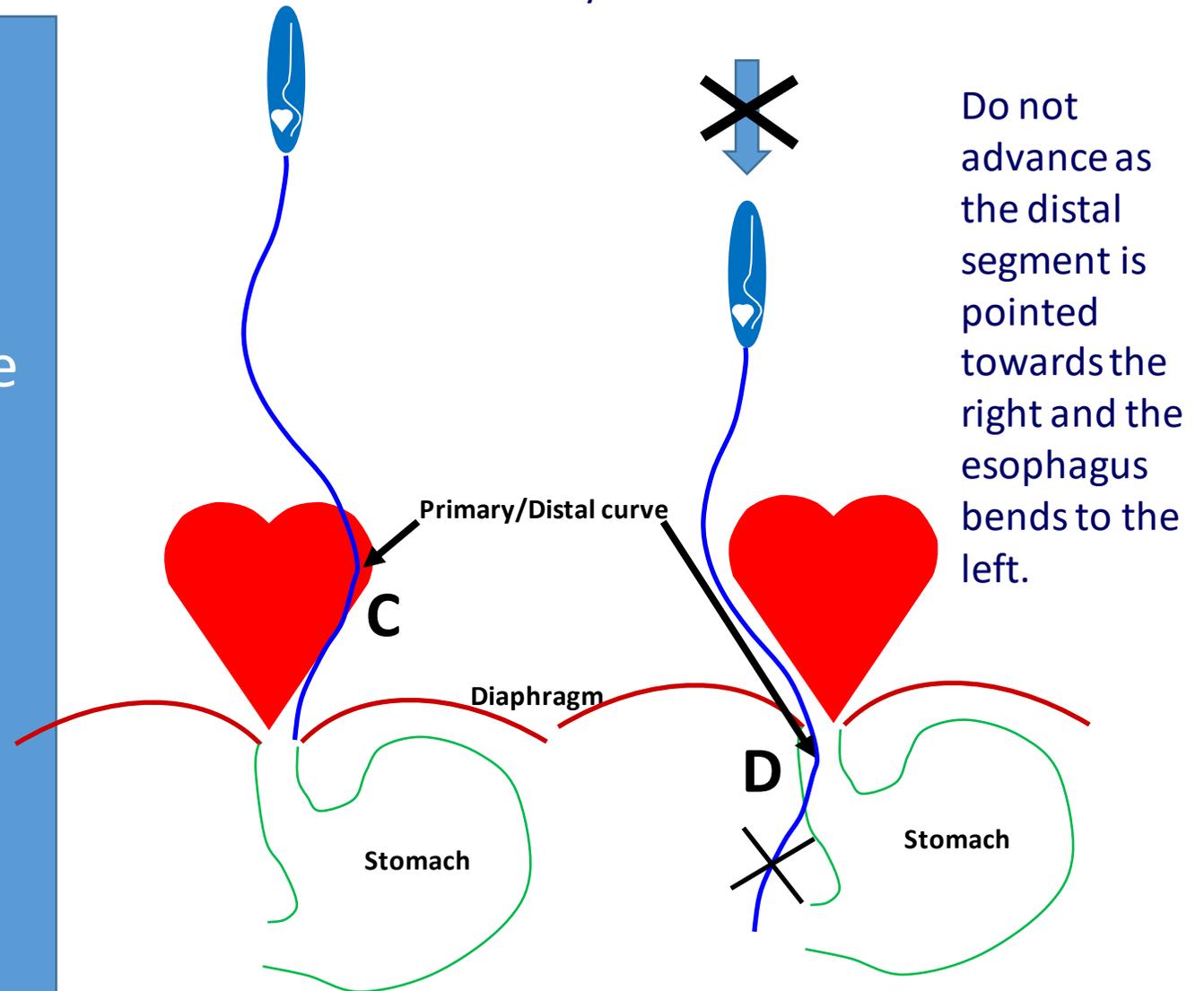


* Sometimes the curve will not go to one side or the other.

EsoSure Positioning: Primary Curve to Left

If the Primary/Distal curve is creating deflection to the left (C), the stylet MUST NOT be advanced past the diaphragm (D). To change the side of deflection to the right, the stylet and OG tube may be rotated together from the C position, or the stylet may be removed and reinserted with the handle reversed.

Blue side of handle up for Primary curve orientation to the left. Verify with fluoro.

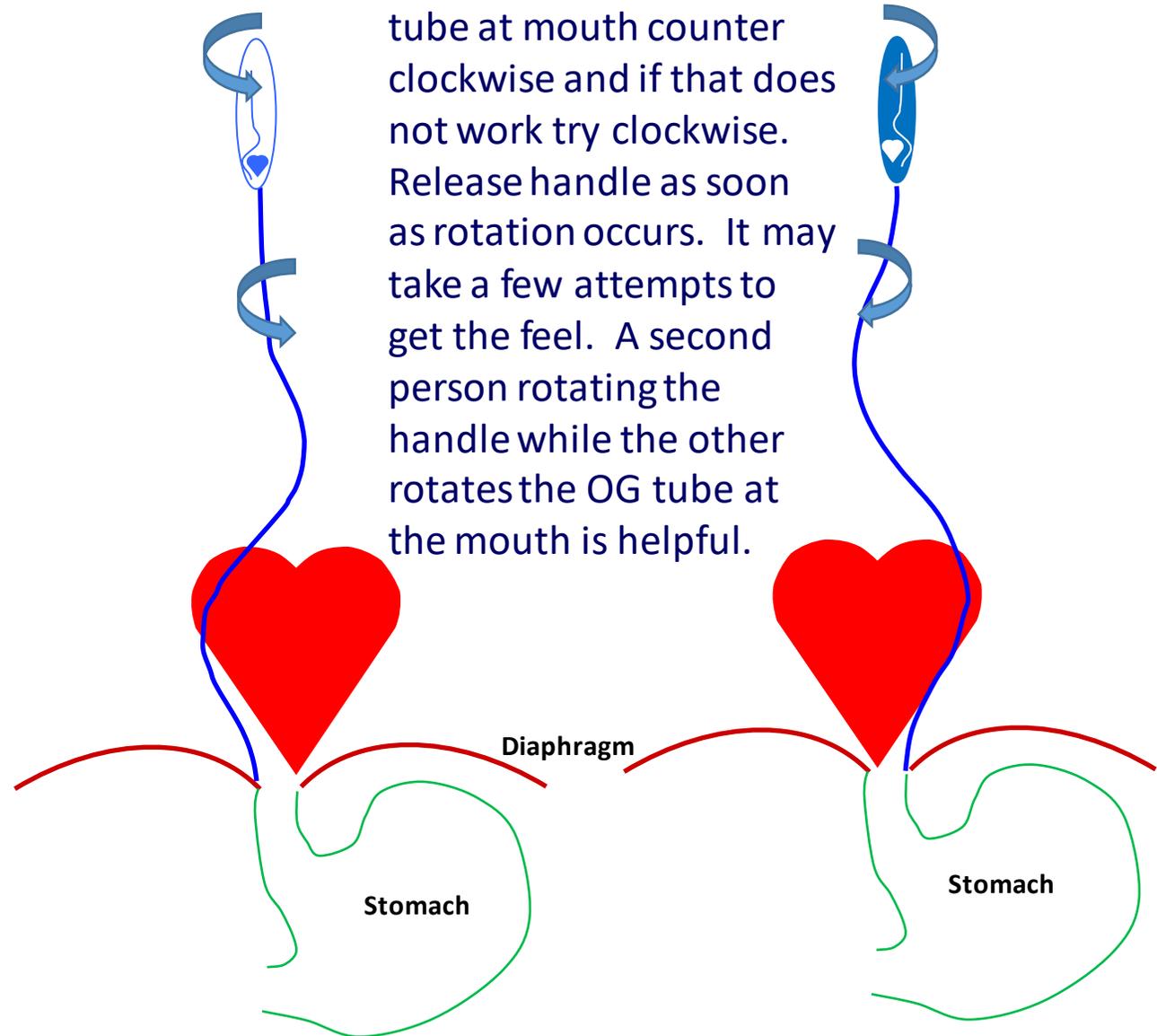


EsoSure Positioning: Rotating the Stylet

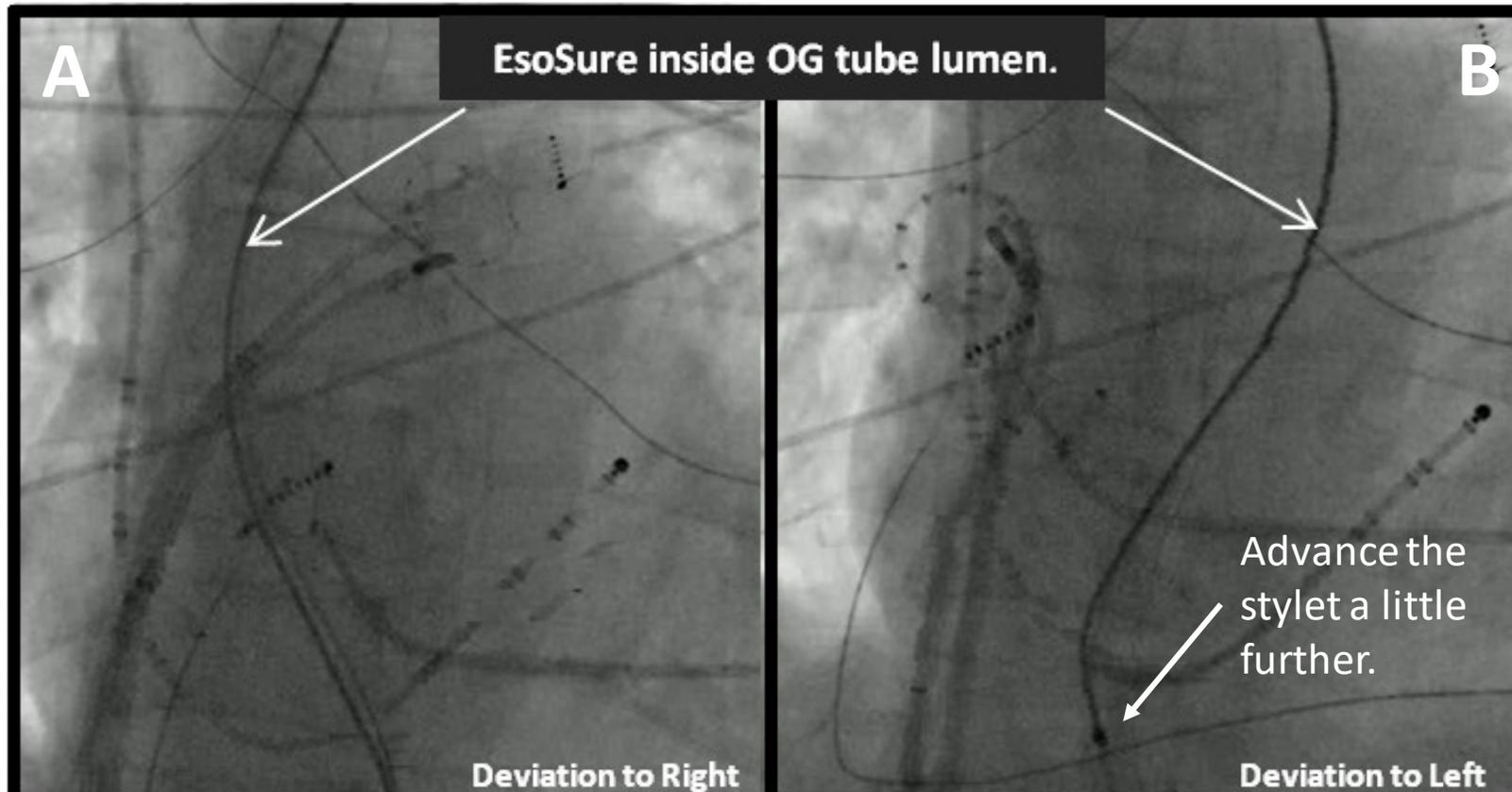
Rotating the stylet to reposition the primary curve to the opposite side must ONLY be done with the tip of the stylet above the diaphragm.

Procedure: Rotate the OG tube at the mouth and the EsoSure handle at the same time more than 360 degrees in the same direction. If the curve does not rotate or if it spins 360 degrees, try rotating in the opposite direction. Release torque on the handle as soon as rotation occurs. A little retraction on the OG/EsoSure may help. If rotating does not work, withdraw and reinsert with primary curve to left (Pg. 26 C)

Rotate handle and OG tube at mouth counter clockwise and if that does not work try clockwise. Release handle as soon as rotation occurs. It may take a few attempts to get the feel. A second person rotating the handle while the other rotates the OG tube at the mouth is helpful.



After Stylet Reaches Diaphragm Position Curve to R or L

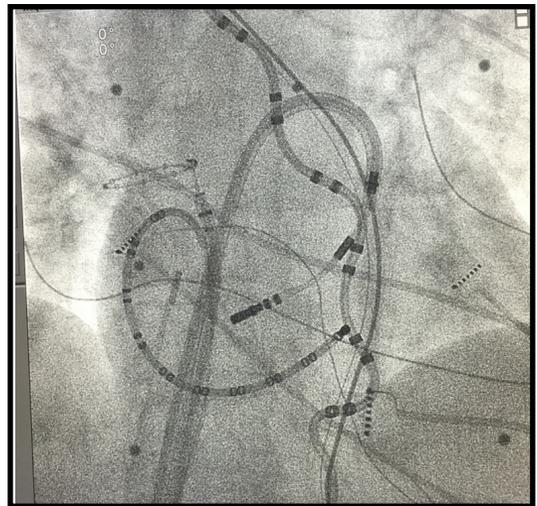
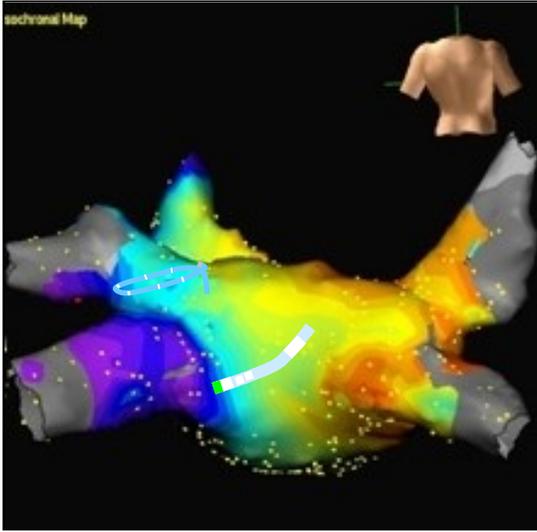


Position the tip of the EsoSure at the diaphragm and adjust the side and location of the Primary curve under fluoro to the desired side of deflection. In image B the stylet should be advanced another 1-2 cm. to better seat the tip in the diaphragm. If ablation lesions are needed more superiorly, the stylet can be retracted to move the apex of the curve superiorly. Remove, cool and reinsert temp probe if not on side of ablation catheter. Image Courtesy of Dr. Andrea Natale. St. David's Medical Center. Austin, TX. April, 2016.

Stylet Removal

- To remove the stylet simply maintain the end of the OG tube and smoothly withdraw the EsoSure by the handle.
- Leave the OG in place to suction out gastric contents and the esophagus during removal of the OG tube. If esophageal contrast was used this is particularly essential as contrast is caustic if aspirated. Ensure airway reflexes return prior to extubation.
- Discard the EsoSure.

Correlating the 3D Map and Fluoro Images

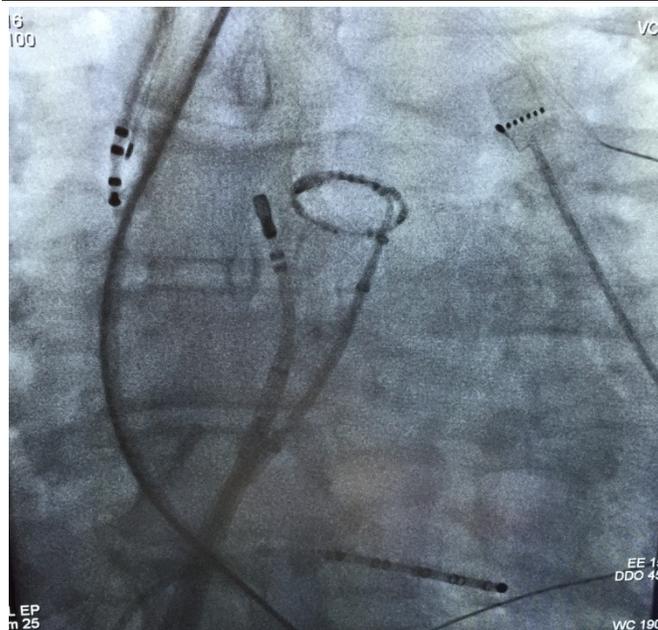
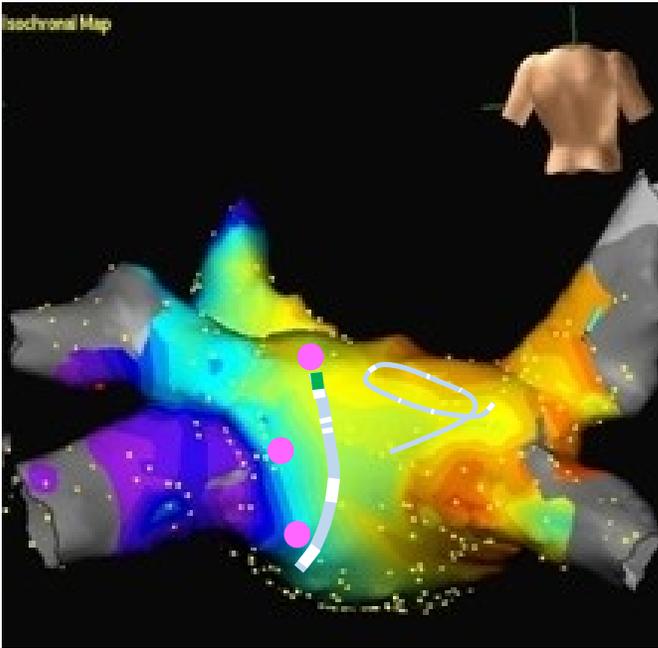


These two steps can provide you with a more precise approximation of the fluoro image of the esophagus and the 3D map image of the left atrium.

Step 1- Transpose the esophageal trailing edge position from Fluoro to the 3D map.

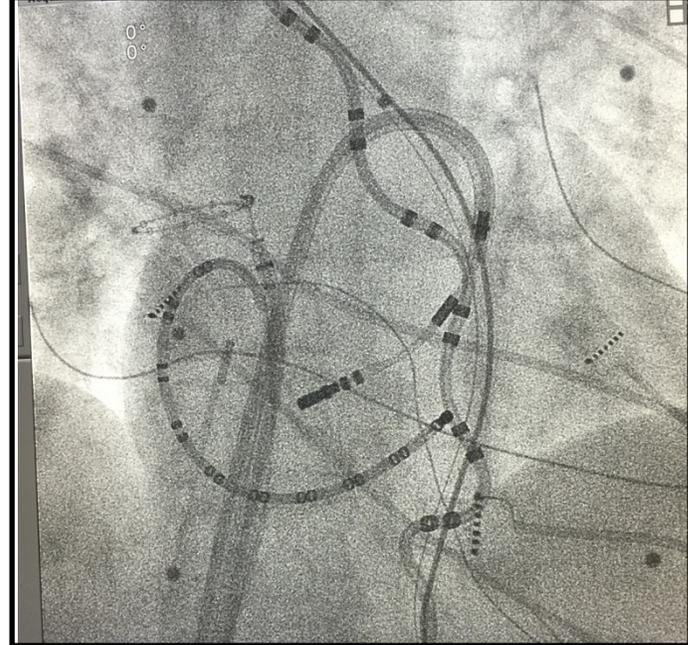
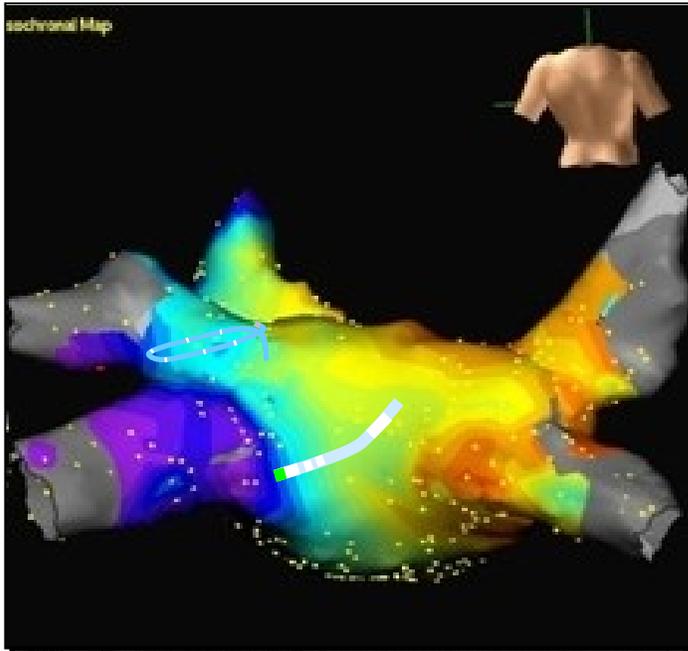
Step 2- Correlate the ablation catheter & target lesion location on the 3D map to fluoro.

#1 Transpose the esophageal trailing edge position from Fluoro to 3D map



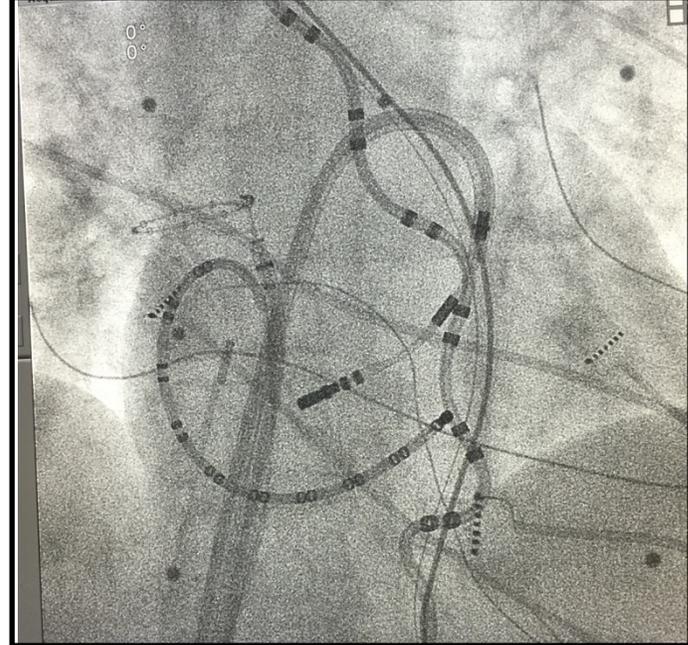
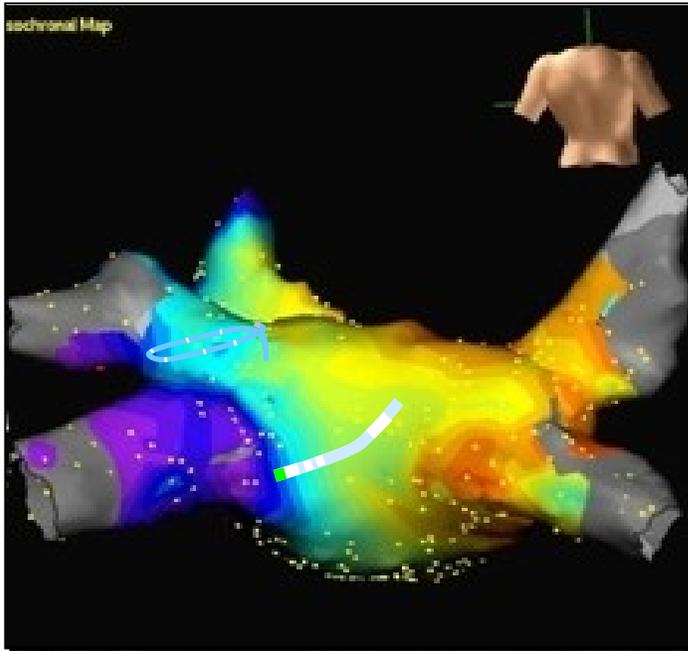
- 1) In a Fluoro AP view place the ablation catheter tip approximately 2 cm medial to the EsoSure stylet near the base of the heart. If you use contrast or a temp probe and the trailing edge is more medial adjust your catheter position accordingly.
- 2) In a PA view on the 3D map have your mapping person collect 3-4 unique colored points in a line that conservatively estimates the location of the trailing edge of the esophagus under the ablation catheter tip. If you don't use contrast or a Circa S Cath, the average luminal diameter is 1.5-2 cm, but it may stretch to be larger with deflection.
- 3) Utilize a catheter for a distance reference to estimate the distance from the ablation catheter tip to the esophagus trailing edge. In this case, 25 mm is the approximate diameter of the lasso catheter, or the CS catheter has 10-2-10 bands. Also, the width of the top or bottom edge of a vertebrae is 3.5 to 4 cm.

Correlating the 3D map ablation site to Fluoro image esophageal trailing edge



- 1) In a PA view on the 3D map place the ablation catheter tip in the location of your desired ablation lesion.
- 2) In an AP view under fluoro, conservatively estimate the location of the trailing edge of the esophagus relative to the position of the ablation catheter tip. If you don't use contrast or a Circa S Cath, the average luminal diameter is 1.5-2 cm, but it may stretch to be larger with deflection.
- 3) Utilize a catheter for a distance reference to estimate the distance from the ablation catheter tip to the esophagus trailing edge. In this case, 25 mm is the approximate diameter of the lasso catheter, or the CS catheter has 10-2-10 bands. Also, the width of the top or bottom edge of a vertebrae is 3.5 to 4 cm.

Correlating the 3D Map ablation catheter tip position relative to the esophagus



4) 15 mm is considered to be a safe distance from the ablation tip to esophagus trailing edge to avoid thermal injury. In this case the distance is ~20 mm.

5) If the ablation catheter overlays or is near the esophagus, attempt deflection in the opposite direction to see if greater distance is created between the ablation catheter tip and the esophageal trailing edge.

6) Under fluoro, view the ablation catheter tip and esophagus from a RAO (for deflection to the right) or LAO (for deflection to the left) angle to better understand the amount of posterior deflection. (In this 3D image the catheters were created and are not part of the original 3D map.)

Contraindications for use of the EsoSure

Absolute contraindications are the same as those for a TEE or gastric tube insertion and include esophageal:

Strictures

Fistula

Varices

Diverticulum

Upper GI bleeding

Surgery of the esophagus

Surgery of the stomach

Other abnormalities

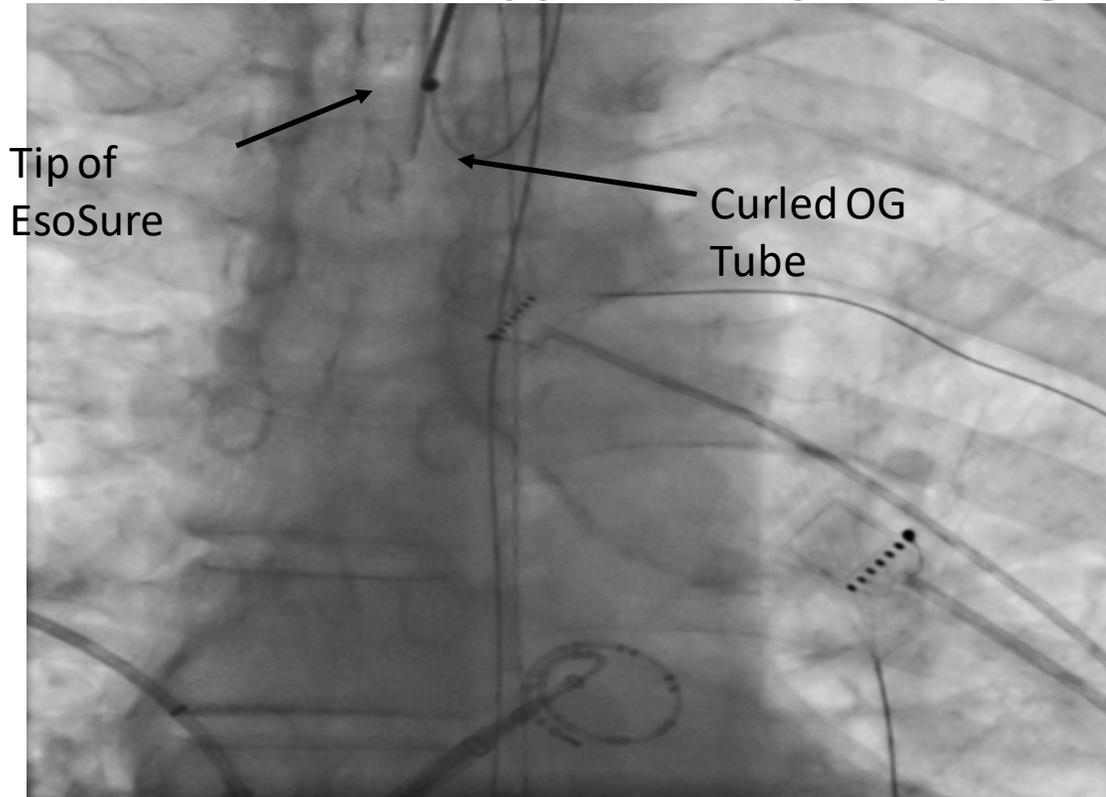
Relative contraindications include:

Hiatal hernia

GERD

Gastric ulcer

Complications: The same potential for complications as with a TEE or gastric tube including trauma to the upper airway, esophagus, stomach or surrounding organs and tissues.

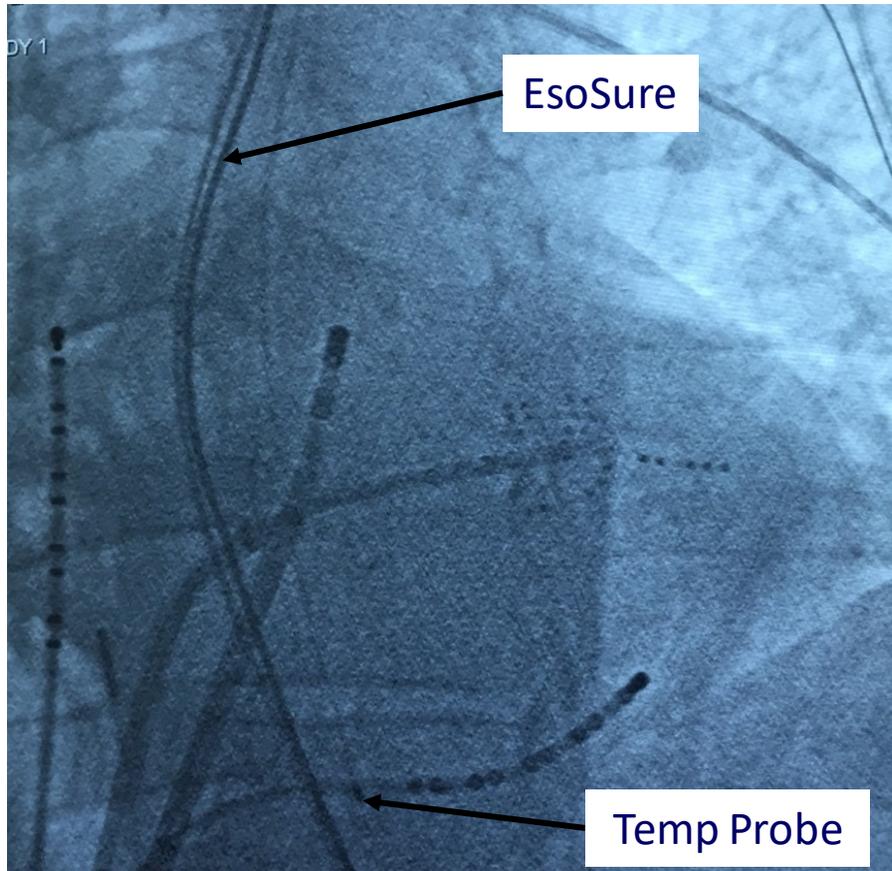


If resistance to EsoSure advancement is felt, fluoro the tip of the stylet to determine the problem. Here, the EsoSure was advanced without the OG tube being retracted to the EsoSure handle, resulting in curling. Pull the OG back to the handle if the stylet does not advance and then advance the OG/stylet together.

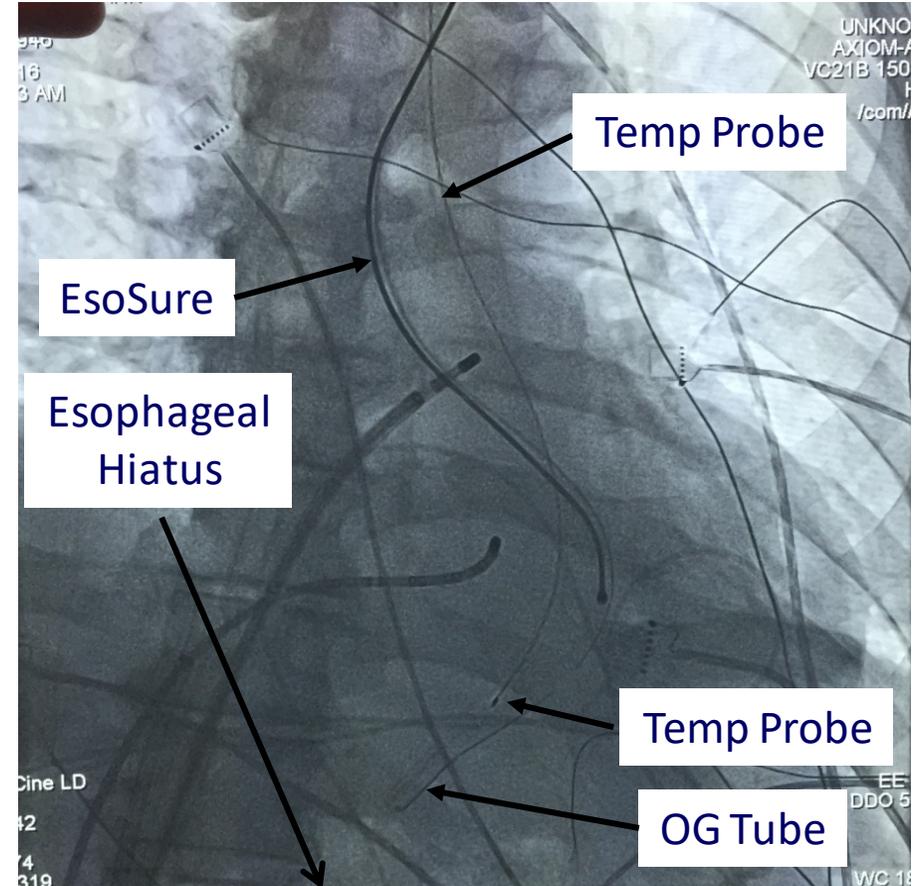


Trauma to the posterior oropharynx is possible during insertion of the stylet or with advancement of the stylet/OG tube. No instances of airway trauma have been reported when appropriate lubrication was used on the OG tube during insertion. The jaw thrust maneuver will help open the airway during advancement of the stylet.

Non-Successful Deflection: Anatomical differences between patients are unpredictable and lead to different outcomes during deflection.



No deflection of the esophagus. Esophageal hypomobility may be apparent by minimal deflection to the right, left or both sides. Reasons may include a Hx of smoking, restrictive lung diseases, RA enlargement, thoracic surgery, esophageal sclerosis or other unknown causes.



In this case the esophagus may be dilated or have a hiatal hernia, which accounts for the tip of the stylets far lateral position and the OG tube and temp probe prolapsing on top of the diaphragm during stylet advancement.

EsoSure Equipment- Temperature Probe Considerations

1- A single pole temperature probe

Pros

- Fastest reported transmission of temperature change
- Lower cost

Cons

- Thin shaft is more difficult to insert and manipulate
- Requires frequent adjustment to align with ablation catheter tip
- May require reinsertion to place between OG and ablation catheter tip

EsoSure Equipment- Temperature Probe Considerations

2- Single pole temp probe with stethoscope over temp sensor

Pros

- Thicker shaft assists with easier placement and manipulation
- Moderate cost

Cons

- Stethoscope balloon over temperature sensor is reported to insulate the temperature sensor and delay temperature rise during ablation
- Size of balloon catches on OG tube
- Requires frequent adjustment to align with ablation catheter tip

EsoSure Equipment- Temperature Probe Considerations

3- Circa S-Cath

Pros

- Wavy shape helps to better identify the esophageal lumen
- Uncovered sensors have rapid temperature transmission
- OG tube slides over the top of it when moving from side to side
- Does not need to be repositioned from one side of the OG tube to the other
- Does not need to be advanced and retraced
- OG tube is inserted before Circa is deployed (or OG may catch on curves)

Cons

- Very expensive

See (11) for other Temp probe considerations.

Temperature Probe Placement & Deflection with EP Catheter

- When a temperature probe is used, it should be positioned on the medial side of the OG tube so that it is closest to the ablation catheter.
- This can be done by withdrawing, cooling and repositioning the temperature probe when it is lateral to the OG tube opposite the side of the ablation catheter.
- Some EP Labs have reported success with placing a used sterilized deflectable EP catheter inside an esophageal temperature probe/stethoscope. Others have used silk suture to tie a used sterilized deflectable EP catheter to the outside of a regular temperature probe.
- Deflection allows the temperature probe to be deflected towards the trailing edge of the esophagus, closest to the ablation catheter. The catheter may also be connected to a 3D mapping system to visualize the position inside the esophagus real time on the 3D map.

EsoSure Equipment- Contrast Considerations

Pros & Cons of Using Contrast

Pros:

- An esophogram quickly evaluates the esophagus for dilatation and hiatal hernias.
- Residual contrast allows for a more accurate estimate of the distance between the ablation catheter tip and the trailing esophageal edge. (Very important.)
- Gastrographin acts as a lubricant eliminating the need for olive oil.

Cons:

- Contrast is pulmonary toxic and extreme care should be taken to avoid aspiration.
- Remind Anesthesia providers to suction the stomach as well as the esophagus prior to extubation.

EsoSure Equipment- Contrast Considerations

Types of Contrast

Barium pudding, cream and paste- Difficult to inject due to thickness and manufactured to pass through the esophagus resulting in a shorter coating time.

Gastrographin- Clear liquid is easiest to inject. Spreads easily but passes through for a shorter coating time.
Lubricates OG in lieu of Olive Oil.

Barium Sulfate- Made to adhere to esophagus. Comes in a powder and mixed in EP Lab to a syrup consistency for easier injection. (Recommended)



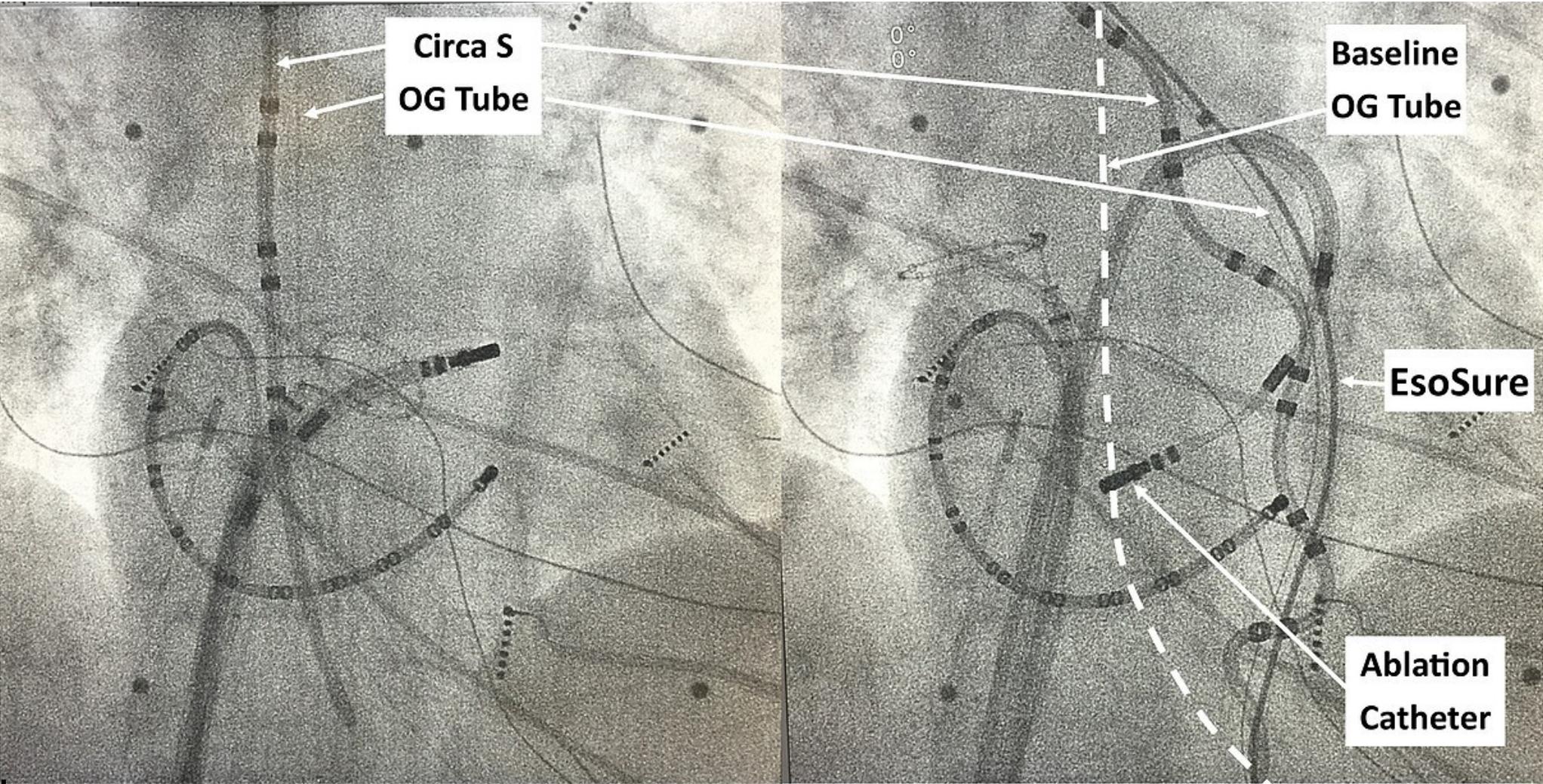
EsoSure Equipment Fluoro Monitor for Inserter

Fluoro Monitor- It is most helpful if the EsoSure inserter is able to see the fluoro image during insertion & manipulation. If they are not able to see the primary EP monitor, then a slave monitor should be considered. Otherwise, they are only able to respond to the voice commands of the Electrophysiologist viewing fluoro when inserting or positioning the EsoSure which is awkward & inefficient.

EsoSure Finer Points & Review

- If the OG tube or the stylet has difficulty passing the oropharynx use a laryngoscope blade or a glidescope to open the airway.
- View right esophageal deflection from RAO and left esophageal deflection from LAO to evaluate the amount of posterior deflection as an AP view by itself may be inconclusive.
- Remove and reinsert the Temp probe to keep it on the side closest to the ablation catheter tip. Sometimes the OG/stylet prevents this when adjusted from side to side.
- In some patients the esophagus does not deflect. Reasons may be a history of smoking, non-compliant lungs, intrathoracic surgery with mediastinal scarring or esophageal sclerosis and unknown causes.
- The upper surface of the thoracic vertebrae is 3.5 to 4 cm in diameter. Use this as a rough measure of distances in the left atrium. You can also use the diameter of a lasso catheter, or the spacing and bands of a CS or other catheter.
- Never ablate on top of the OG tube or temperature probe. This will increase the chance for esophageal thermal damage.
- Generous lubrication must be placed on the length of the temp probe and OG tube to allow them to slide within the esophagus and not stick to each other or the mucosa.

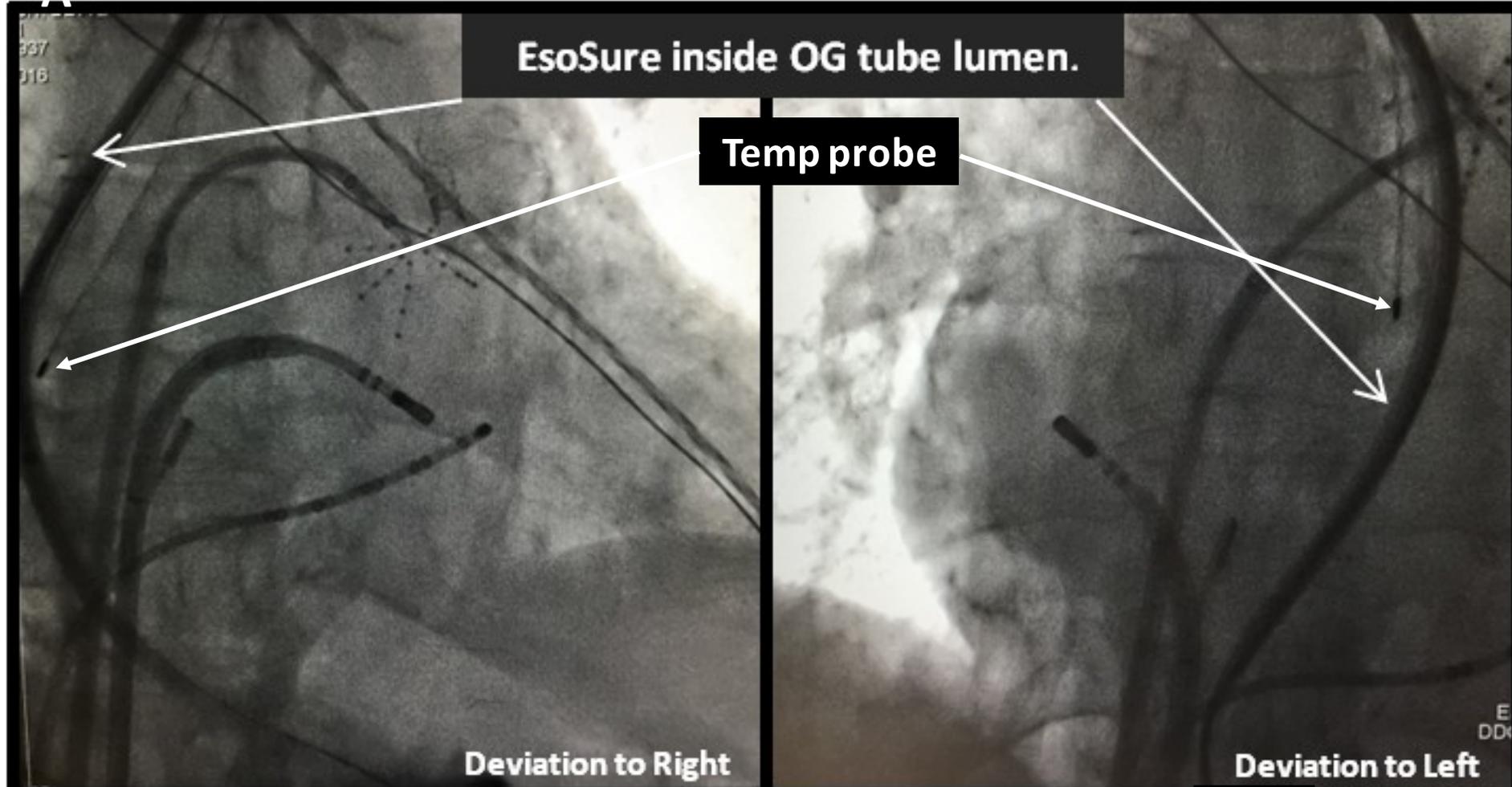
Unilateral Deflection for a Lateral Esophagus: Primary Curve to One Side



- 1- Perform the PVI on the contralateral side;
 - 2- Insert the EsoSure so the primary curve deflects to the isolated side;
 - 3- Perform the PVI on the opposite side.
- * Deflecting only to one side is easiest and quickest.

Images courtesy of Dr. Charlie Young. Kaiser Hospital Santa Clara. July, 2016.

Bilateral Deflection for a Medial Esophagus: Rotating the Primary Curve



**Courtesy of Dr. Vijay Swarup & Jacob Hantla. (65 cases)
Arizona Heart Hospital. February -July , 2016.**

If the baseline esophagus is not far enough to one side to perform a PVI on the opposite side,

1- Insert the EsoSure with the primary curve to the right;

2- Perform PVI on the left side;

3- Advance EsoSure to have secondary curve deflect to the left;

4- If deflection not sufficient, withdraw tip to diaphragm and rotate primary curve to left side;

5- Perform PVI on right side.

EsoSure Feedback

Dear EP Physicians, Anesthesia Providers and EP Staff,

We welcome thoughts and feedback from your observations and experiences as we are constantly looking for ways to improve the device and the instruction materials. You are welcome to email me at steve@epreward.com or call me on my cell phone at 561-779-1040 with any comments or especially if you have difficulties or questions during a procedure.

Thank you.

Steve Miller, RN

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