Mediastinal tracheostomy for total laryngectomy with resection of manubrium

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Mediastinal tracheostomy for total laryngectomy with sternal resection

see: Case Example Mediastinal Tracheostomy with Anatomic Diagrams

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Indications:
An anterior mediastinal tracheostomy for malignancy should be performed in the situation of:
1) Carcinoma invading the subglottic larynx; 2) Stomal recurrence after laryngectomy, or 3) Well differentiated thyroid carcinoma invading the trachea.

Technique of Mediastinal Tracheostomy with Manubrial Resection

I. Procedure

1. Incision:
   a. In addition to standard transverse incision for laryngectomy, make vertical midline extension to below angle of Louis

2. Preparation to resect manubrium:
   a. Skin and subcutaneous fat are dissected to expose the sternoclavicular joints, the manubrium, and the medial ends of the first and second ribs.
   b. Preserve the perforators arising from the internal mammary arteries, which supply the deltopectoral flap
   c. Divide both anterior jugular veins at the suprasternal notch.
   d. Release sternal heads of SCM's
   e. Blunt dissection underneath the manubrial bone is developed to separate the thymus and surrounding great vessels and pleura from the undersurface of the bone in preparation for osteotomy

3. Resection of manubrium:
   a. Sternal saw with a guard us used to cut both medial ends of the clavicle as well as sternoclavicular joints, medial ends, and the costochondral junction of the first and second ribs.
   b. Bone wax used to stop bleeding.

4. Complete the surgical resection of tumor

5. Relocation of tracheal stump below innominate

6. Sustained positive pressure by anesthesia to search for leakage from thoracic duct or other lymphatic channels.

7. Drains:
   a. Insert chest drain if the pleura I is injured during the operation.
   b. In addition to usual neck drains, insert mediastinal drain.

II. Key Points

1. Innominate artery should be free of compression from surrounding structures (ref Chan et al 2011)
   a. Early authors recommended ligation – no longer necessary due to relocation below innominate
   b. May ligate innominate vein if compression of this structure is anticipated

2. During relocation of the tracheal stump, do not skeletonize the trachea excessively from surrounding soft tissue
   a. XS mobilization or separation will compromise blood supply to trachea
   b. Will cause distal necrosis of trachea with stenosis

3. Interpose PM flap skin paddle between tracheostome and neck skin
   a. Helps separate innominate from trachea
   b. Reduces tension of tracheostome- skin closure
   c. Concept= “PM skin paddle reconstruction of posterior tracheal wall”

4. If the tracheal stump is too short, further dissection inferiorly can permit removal of some of the upper sternum
III. Anatomy

1. Innominate artery (brachiocephalic trunk)
   a. Largest of the branches (other two: left common carotid, left subclavian) arising from arch of aorta.
   b. Measures 4-5 cm in length
   c. Divides into right common carotid and right subclavian arteries at the right sternoclavicular articulation
   d. Usually doesn’t give off branches – occasionally the thyroid ima artery (10%); occasionally a thymic artery or bronchial artery as well.
   e. To the right of the innominate artery: right brachiocephalic vein, superior vena cava, right phrenic nerve, and pleura
   f. To the left of innominate artery: remains of the thymus, origins of left common carotid artery, inferior thyroid veins
2. Left brachiocephalic vein
   a. From deep to the sternal end of the left clavicle, it courses obliquely downward and to the right, behind the upper half of the manubrium sterni.
   b. At the sternal end of the first right costal cartilage it unites with the right brachiocephalic vein to form the superior vena cava.
   c. It is separated from the manubrium by the sternohyoideus and sternothyroideus muscles, the thymus and loose areolar tissue. Behind the vein are the trachea and left vagus and phrenic nerves.
   d. At times the brachiocephalic vein courses more superiorly and lies in the root of the neck at the level of the jugular notch.
3. Right brachiocephalic vein
   a. Short (2.5 cm) begins behind the sternal end of the clavicle to pass vertically down to join the left brachiocephalic vein to form the superior vena cava below the cartilage of the first rib, close to the right border of the sternum.
   b. The right brachiocephalic vein lies anterior to and to the right of the brachiocephalic artery (innominate).
   c. On its right side are the phrenic nerve and pleura, interposed between it and the apex of the lung.
4. Angle of Louis = sternal angle
   a. The junction of the manubrium and body of sternum

References

   a. note: hospital mortality of 5.3% from innomate artery bleed on day 12 after surgery and from innominate vein on day 7 after surgery; 47.4% stomal stenosis rate – requiring stenting. Common: hypothyroid and hypocalcemia.