



Using the Body as a Living Bioreactor for Tracheal Transplantation: an Anatomic Feasibility Study

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- No financial disclosures




Causes of Tracheal Stenosis

- Prolonged intubation
- Endotracheal cuff pressures
- Tracheostomy
- Trauma
- Idiopathic



Current Treatment

- Endoscopic laser incision
- Dilation
- T-tubes
- Tracheal resection with end-to-end anastomosis



Limited Efficacy

- Expandable stents
- Cadaveric allografts
- Prosthetic replacement
- Tissue autografts



Potential Pitfalls



- Tracheal specimen
- Stent
- Surgical specimen

Birchall, Macchiarini, et al.



- University College of London (UCL) was the first group to successfully perform stem cell-derived tracheal transplantation in humans (2008)

Challenges to Tracheal Transplantation

- Cost and inaccessibility of external bioreactor
- Vascular supply
- Sufficient stability
- Rejection of transplant



A Possible Solution

- Development of an “*in-vivo*” bioreactor
 - Decellularization of cadaveric trachea
 - Implantation of trachea into recipient muscle
 - Growth factors and chemoattractants
- Rotation of pedicled muscle flap
- Potential flaps remain poorly defined

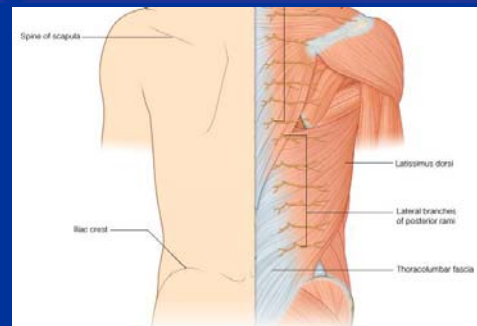
Hypothesis

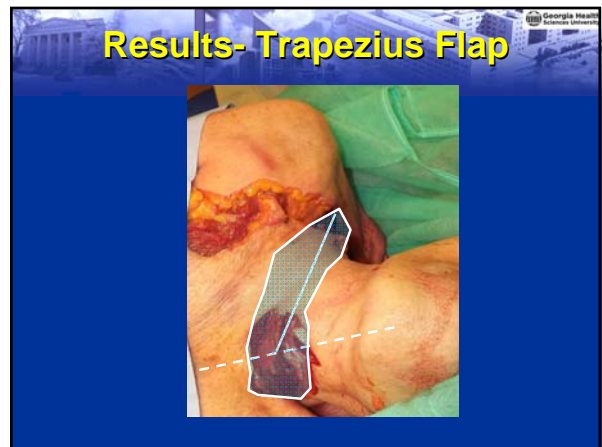
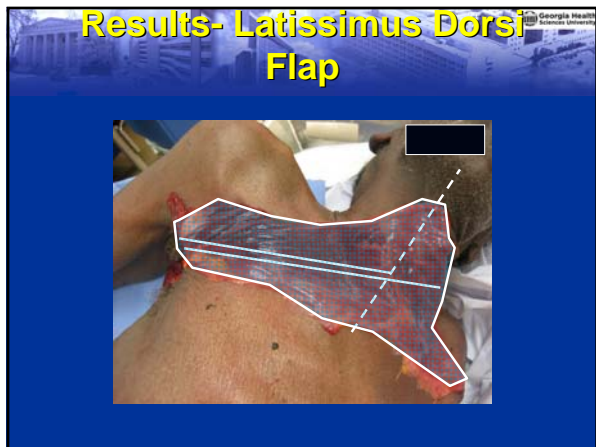
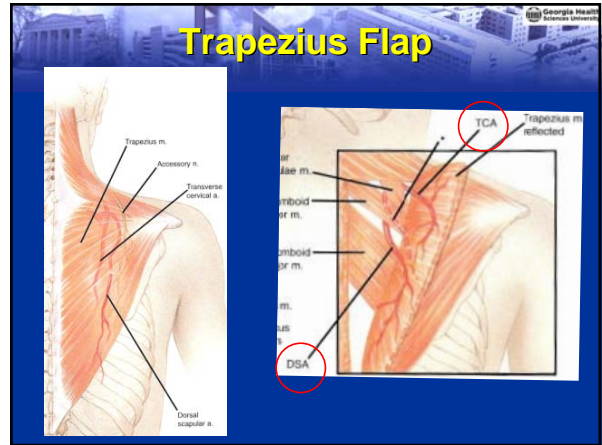
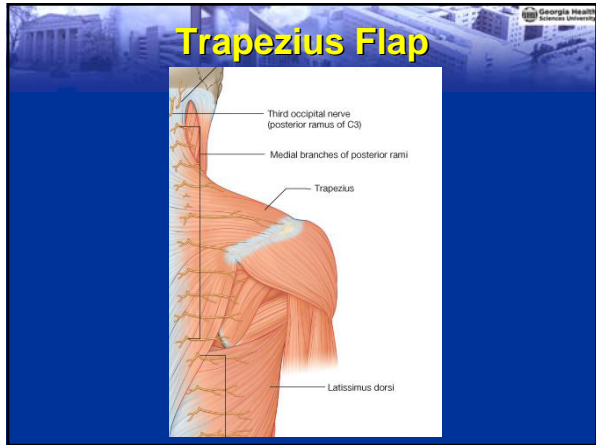
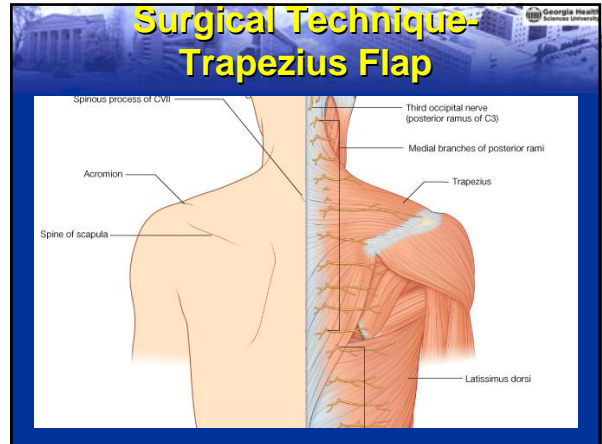
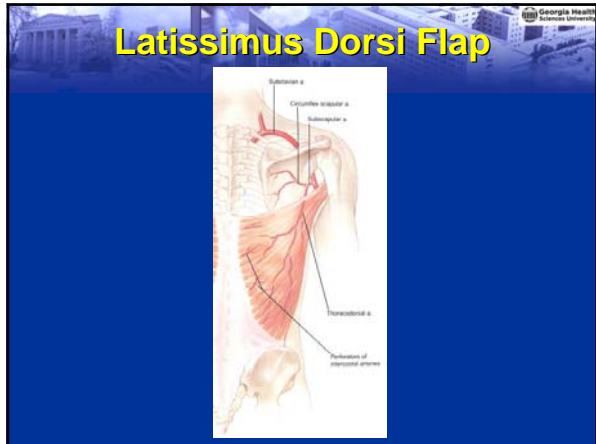
- Pedicled muscle flaps based on the latissimus dorsi or trapezius are anatomically feasible for facilitating tracheal transplantation

Materials and Methods

- 12 total muscle flaps (latissimus dorsi and trapezius)
- 5 fresh human cadavers
 - 4 men, 1 woman
 - Mean age 89 years
 - Mean height 163.7 cm
 - No known history of previous head and neck or back surgeries

Surgical Technique- Latissimus Dorsi Flap





Conclusion

- Both the latissimus dorsi and trapezius muscles are anatomically suitable to be used as pedicled muscle flaps for tracheal transplantation

Discussion



Future Directions

- Animal model
- Investigating cellular repopulation of donor trachea
- Human trials in the next 3-4 years