ABSTRACT

OBJECTIVE: To address the need for a surgical simulation model for facial plastic surgery training that is versatile, widely available, and cost-effective.

METHODS: Ten pre-pubescent sheep heads harvested following humane euthanasia at the completion of unrelated animal research were utilized in this study. Head and neck tissues were harvested and refrigerated for 3-7 days prior to dissection. An experienced oculoplastic surgeon and a resident otolaryngologist led a student through a wide variety of oculoplastic procedures.

RESULTS: The ovine model was useful for teaching basic principles in eyelid surgery. Procedures performed included: upper lid blepharoplasty, aponeurotic advancement ptosis repair, lateral canthotomy and inferior limb cantholysis, lower lid tightening via the tarsal strip procedure, ectropion repair, transconjunctival lower blepharoplasty and approach to the orbital floor, and repair of eyelid defects.

CONCLUSION: The sheep head and neck model provides an inexpensive, safe model for developing skills in a variety of oculoplastic procedures. This model could serve as an effective tool in teaching surgical techniques, particularly in residency training programs.

INTRODUCTION

- Developing operative skills in facial plastic surgery poses a unique challenge in resident training.
- Delicate and precise dissection technique required.
- Patients often aware and aware.
- High patient expectations.
- Simulation allows students to achieve proficiency in technical skills while minimizing risk to patients.
- Residency training programs are shifting toward competence-based proficiency models in which surgical simulation has a role.
- Surgical simulation has been accomplished using:
  - Animal models
  - Bench models
  - Human cadavers
  - Virtual reality simulators.
- We describe the use of a fresh, saline-perfused sheep head and neck model for surgical simulation for oculofacial plastic surgery training.

METHODS

- Sheep obtained from a Temple University and United States Department of Agriculture approved supplier.
  - Tested for Coxiella burnetii.
  - Fully inspected by a licensed veterinarian.
- Tissue collected from pre-pubescent sheep (n=10, mean age: 4 months, mean mass: 28 kg).
- Collected after unrelated in vivo protocol approved by the Lewis Katz School of Medicine at Temple University through its Institutional Animal Care and Use Committee.
- Post-euthanasia, the head and neck of each sheep was disarticulated 4 cm above the sternal notch.
- Tissue was stored at 5°C for 1-5 days.
- Operative procedures were performed in the animal facility using a veterinary operating table and standard oculoplastic surgical sets.

RESULTS

- The ovine head and neck model is a useful simulation model for teaching the following procedures:
  - Upper blepharoplasty
  - Ptosis repair
  - Lateral canthotomy/cantholysis
  - Tarsal strip procedure
  - Transconjunctival blepharoplasty
  - Approach to orbital floor
  - Ectropion/entropion repair
  - Eyelid laceration repair

CONCLUSION

- Despite variations in proportion and structure, the sheep head and neck preparation provides an inexpensive, safe model for developing skills in facial plastic surgery.

REFERENCES


Figure 1 a,b. The ovine model used for simulation of upper lid blepharoplasty

Figure 2 a.b. Ptosis repair via levator aponeurosis advancement and fixation to the ovine tarsus

Figure 3 a,b. Lower lid blepharoplasty and approach to the orbital rim

DISCUSSION

- The sheep head and neck model:
  1. Accurately reflects normal human anatomy.
  2. Is readily available.
  3. Is inexpensive.
  4. Has a low risk of disease transmission.
- The sheep orbit has several important distinctions from the human orbit:
  - Orbits located on sides of head.
  - Orbital floor and lateral walls incomplete.
  - Orbital fat firmer than in humans.
  - Extraocular muscles similar in number and position but less robust.
  - Eyelids are thicker than in humans.
- These anatomical differences limited use of the model for orbital floor reconstruction and lacrimal drainage procedures.
- Sheep are widely available in North America and are inexpensive.
- Using tissue from male or pre-pubescent female sheep reduces risk of exposure to Coxiella burnetii.