

ADVANCES IN
VETERINARY
SURGERY

Advances In **Equine Upper Respiratory Surgery**

JAN HAWKINS



WILEY Blackwell

Advances in

Equine Upper Respiratory Surgery

Edited by

Jan Hawkins, DVM, DACVS

Department of Veterinary Clinical Sciences
Purdue University
Indiana, USA

WILEY Blackwell



This edition first published 2015 © 2015 by ACVS Foundation.

Editorial offices: 1606 Golden Aspen Drive, Suites 103 and 104, Ames, Iowa 50014-8300, USA

The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, UK
9600 Garsington Road, Oxford, OX4 2DQ, UK

For details of our global editorial offices, for customer services and for information about how to apply for permission to reuse the copyright material in this book please see our website at www.wiley.com/wiley-blackwell.

Authorization to photocopy items for internal or personal use, or the internal or personal use of specific clients, is granted by Blackwell Publishing, provided that the base fee is paid directly to the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923. For those organizations that have been granted a photocopy license by CCC, a separate system of payments has been arranged. The fee codes for users of the Transactional Reporting Service are ISBN-13: 978-0-4709-5960-2/2015.

Designations used by companies to distinguish their products are often claimed as trademarks. All brand names and product names used in this book are trade names, service marks, trademarks or registered trademarks of their respective owners. The publisher is not associated with any product or vendor mentioned in this book.

The contents of this work are intended to further general scientific research, understanding, and discussion only and are not intended and should not be relied upon as recommending or promoting a specific method, diagnosis, or treatment by health science practitioners for any particular patient. The publisher and the author make no representations or warranties with respect to the accuracy or completeness of the contents of this work and specifically disclaim all warranties, including without limitation any implied warranties of fitness for a particular purpose. In view of ongoing research, equipment modifications, changes in governmental regulations, and the constant flow of information relating to the use of medicines, equipment, and devices, the reader is urged to review and evaluate the information provided in the package insert or instructions for each medicine, equipment, or device for, among other things, any changes in the instructions or indication of usage and for added warnings and precautions. Readers should consult with a specialist where appropriate. The fact that an organization or Website is referred to in this work as a citation and/or a potential source of further information does not mean that the author or the publisher endorses the information the organization or Website may provide or recommendations it may make. Further, readers should be aware that Internet Websites listed in this work may have changed or disappeared between when this work was written and when it is read. No warranty may be created or extended by any promotional statements for this work. Neither the publisher nor the author shall be liable for any damages arising herefrom.

This work is a co-publication between the American College of Veterinary Surgeons Foundation and Wiley-Blackwell.

Library of Congress Cataloging-in-Publication Data

Advances in equine upper respiratory surgery / editor, Jan Hawkins.
p.; cm.

Includes index.

Summary: Advances in equine upper Respiratory surgery is a comprehensive, up-to-date reference on surgical techniques in the upper respiratory tract in the horse, presenting theory and background as well as detailed procedures information.

ISBN 978-0-470-95960-2 (cloth)

I. Hawkins, Jan, editor.

[DNLM: 1. Horse Diseases-surgery. 2. Respiratory Tract Diseases-veterinary. 3. Respiratory Tract Diseases-surgery. 4. Surgery, Veterinary-methods. 5. Surgical Procedures, Operative-veterinary. SF 959.R47]

SF959.R47

636.1'0897542-dc23

2014022277

A catalogue record for this book is available from the British Library.

Wiley also publishes its books in a variety of electronic formats. Some content that appears in print may not be available in electronic books.

Contents

[Contributors](#)

[Foreword](#)

[Section I Recurrent Laryngeal Neuropathy](#)

[1 Recurrent Laryngeal Neuropathy: Grading of Recurrent Laryngeal Neuropathy](#)

[Introduction](#)

[Resting endoscopic grading](#)

[References](#)

[2 Recurrent Laryngeal Neuropathy: Diagnosis, Dynamic Endoscopy](#)

[Introduction](#)

[Treadmill endoscopy](#)

[Overground endoscopy](#)

[Exercising laryngeal function](#)

[Resting versus exercising laryngeal grading systems](#)

[Bilateral laryngeal collapse](#)

[Dynamic collapse of the apex of corniculate process](#)

[Vocal fold collapse](#)

[Enforced poll flexion](#)

[Progression of RLN](#)

[Implications of RLN in show horses](#)

[References](#)

[3 Ultrasonography of the Larynx for the Diagnosis of Recurrent Laryngeal Neuropathy](#)

[Introduction to laryngeal ultrasound](#)
[Patient preparation and equipment](#)
[How to perform a laryngeal ultrasound examination](#)
[Use in recurrent laryngeal neuropathy](#)
[Use in other laryngeal abnormalities](#)
[Summary](#)
[References](#)

[4 Laser Ventriculocorpectomy](#)

[Introduction](#)
[Instrumentation](#)
[Laser VCE techniques](#)
[Aftercare](#)
[References](#)

[5 Prosthetic Laryngoplasty](#)

[Introduction](#)
[Surgical techniques for prosthetic laryngoplasty](#)
[Alternative laryngoplasty technique](#)
[Postoperative course and aftercare](#)
[References](#)

[6 Biomechanics of Prosthetic Laryngoplasty](#)

[Introduction](#)
[What are the goals of prosthetic laryngoplasty?](#)
[Biomechanics of prosthetic laryngoplasty](#)
[The arytenoid cartilage](#)
[The cricoid cartilage](#)
[The cricoarytenoid articulation](#)
[The prosthetic suture/material](#)

References

7 Ablation of the Cricoarytenoid Joint

Surgical technique laser debridement of CAJ

Mechanical debridement of the CAJ

Surgical technique mechanical destruction of CAJ

References

8 The Use of Partial Arytenoidectomy in the Management of Recurrent Laryngeal Neuropathy

References

9 Evaluation and Management of the Horse Following Failed Laryngoplasty

Introduction

Evaluation of the horse with failed laryngoplasty

Preoperative planning

Decision making repeat laryngoplasty versus PA

Complications

References

10 Evaluation and Management of the Horse with Dysphagia Following Prosthetic Laryngoplasty

Introduction

Evaluation

Management

References

11 Treatment of Recurrent Laryngeal Neuropathy in Racehorses

Prognosis and postoperative evaluation of horses after treatment of recurrent laryngeal neuropathy: evaluation of the racehorse

References

12 Treatment of Recurrent Laryngeal Neuropathy in Draft Horses

Introduction

Diagnosis

References

13 Evaluation and Treatment of the Horse with Fourth Branchial Arch Defects

Description and etiology

Pathologic anatomic features

Diagnosis

Treatment

Conclusion

References

14 Future Developments in the Management and Treatment of Recurrent Laryngeal Neuropathy

Introduction

References

15 Objective Evaluation Following Surgical Correction of Upper Airway Abnormalities

Introduction

References

Section II Dorsal Displacement of the Soft Palate

16 Dorsal Displacement of the Soft Palate: Pathophysiology and New Diagnostic Techniques

Introduction

Etiology

References

17 Dorsal Displacement of the Soft Palate: Standing and Dynamic Endoscopic Examination

Introduction

[Endoscopic examination at rest](#)

[Endoscopic examination during exercise](#)

[Resting versus exercising endoscopic examination](#)

[Persistent DDSP](#)

[DDSP in show horses](#)

[References](#)

[18 Ultrasonography of the Horse with Suspected Dorsal Displacement of the Soft Palate](#)

[Introduction](#)

[Ultrasonographic technique](#)

[Discussion](#)

[References](#)

[19 Sternothyroideus Myotectomy and Staphylectomy](#)

[Introduction](#)

[Surgical technique](#)

[Aftercare](#)

[References](#)

[20 Dorsal Displacement of the Soft Palate: Laryngeal Tie-Forward](#)

[Introduction](#)

[Surgical technique](#)

[Results](#)

[Management of complications](#)

[References](#)

[21 Laser Palatoplasty](#)

[Introduction](#)

[Surgical technique](#)

[Aftercare](#)

[Complications](#)

[Discussion](#)

[References](#)

[22 Surgical Management of Dorsal Displacement of the Soft Palate in the Racehorse](#)

[Introduction](#)

[Surgical correction](#)

[References](#)

[23 Dorsal Displacement of the Soft Palate: Evaluation of the Horse with Poor Performance Following Attempted Surgical Correction](#)

[Introduction](#)

[References](#)

[24 Treatment of Persistent Dorsal Displacement of the Soft Palate](#)

[Introduction](#)

[Pathogenesis](#)

[Historical complaints](#)

[Clinical signs and examination](#)

[Management](#)

[References](#)

[Section III Surgery of the Head](#)

[25 Nasal Septum Removal](#)

[Introduction](#)

[Clinical signs of nasal septum disease](#)

[Surgery](#)

[Complications](#)

[Prognosis](#)

[Author comments](#)

References

26 Surgical Treatment of Horses with Wry Nose

Introduction

References

27 Choanal Atresia

Introduction

Diagnosis of choanal atresia

Surgical management

Complications

References

28 Frontonasal and Maxillary Sinusotomy Performed with the Horse Standing

Introduction

References

29 Frontonasal and Maxillary Sinusotomy Performed Under General Anesthesia

Introduction

Anesthesia and preoperative management

Selection of surgical approach

Discussion

References

30 Surgery of the Paranasal Sinuses: Surgical Removal of the Cheek Teeth and Management of Orosinus Fistulae

Introduction

Dental Sinusitis

Dental-related oromaxillary fistulae

Conclusions

References

Section IV Surgery of the Soft Palate, Epiglottis, Arytenoid, and Trachea

31 Surgical Repair of Cleft Palate

Introduction

Clinical signs

Aftercare

Complications

Prognosis

References

32 Surgical Correction of Epiglottic Entrapment

Introduction

Surgical techniques

Transoral axial division of EE

Laser axial division of the aryepiglottic fold (Jan Hawkins)

Postoperative care

Complications of laser axial division EE

Conclusion

References

33 Subepiglottic Cysts

Introduction

Subepiglottic cyst removal via laryngotomy

Transendoscopic laser resection using a transnasal approach

Transoral snare removal of subepiglottic cysts

References

34 Laser Resection of the Aryepiglottic Folds

Introduction

Surgical technique

References

35 Partial Arytenoidectomy with Mucosal Closure

Introduction

Clinical signs of arytenoid chondropathy

References

36 Partial Arytenoidectomy without Mucosal Closure

Introduction

Aftercare and postoperative monitoring

References

37 Management of Guttural Pouch Tympanites

Introduction

Diagnosis

Treatment

Complications

References

38 Treatment of Hemorrhage Associated with Guttural Pouch Mycosis

Introduction

Thrombectomy catheters

Coil embolization

Amplatzer vascular plug

Summary

References

39 Surgical Management of Temporohyoid Osteoarthropathy

Introduction

Clinical signs

Management

References

[40 Surgery of the Trachea](#)

[Introduction](#)

[Diagnosis of tracheal obstruction](#)

[References](#)

[41 Permanent Tracheostomy in the Horse](#)

[Indications](#)

[Tracheotomy technique](#)

[Aftercare](#)

[Complications](#)

[Prognosis](#)

[References](#)

[Index](#)

[End User License Agreement](#)

List of Tables

[Chapter 1](#)

[**Table 1.1**](#)

[**Table 1.2**](#)

[**Table 1.3**](#)

[Chapter 16](#)

[**Table 16.1**](#)

[Chapter 17](#)

[**Table 17.1**](#)

List of Illustrations

[Chapter 1](#)

Figure 1.1 Collapse of the left arytenoid during exercise (Grade C).

Figure 1.2 Grading of laryngoplasty abduction using five-grade system of Dixon et al. (2003).

Chapter 2

Figure 2.1 Diagram illustrating grades of exercising laryngeal function: grade A, full abduction; grade B, incomplete abduction; grade C, severe collapse of arytenoid and vocal fold.

Figure 2.2 Exercising videoendoscopic appearance of the larynx of a horse with exercising laryngeal grade B. Note the concurrent collapse of the left vocal fold.

Figure 2.3 Exercising videoendoscopic appearance of the larynx of a horse with exercising laryngeal grade C. Note the severe collapse of the arytenoid and vocal fold.

Figure 2.4 Exercising videoendoscopic appearance of the larynx of a horse with bilateral laryngeal collapse induced by rein tension.

Chapter 3

Figure 3.1 Composite ultrasound images of the left (a) and right (b) lateral acoustic windows from a 3-year-old Standardbred filly presenting for poor performance. The CAL muscles are depicted with white arrows. In (a), the left CAL muscle is observed to have increased echogenicity relative to the extrinsic laryngeal muscles in the near field and relative to the contralateral CAL (b). In (b), the normal right CAL is observed to have hypoechoic appearance, and is isoechoic to the extrinsic laryngeal muscles. These findings strongly suggest

the presence of neurogenic atrophy in the left CAL muscle and support a diagnosis of recurrent laryngeal neuropathy. In both images, the thyroid and arytenoid cartilages are seen on either side of the CAL muscle as hypoechoic linear structures with slightly echoic margins.

Chapter 4

Figure 4.1 A 120-watt diode laser used for contact and noncontact ventriculocordectomy.

Figure 4.2 Instruments used for eversion of the laryngeal ventricle. These include bronchoesophageal grasping forceps and a transnasal/oral roaring burr.

Figure 4.3 Incision of the vocal cord 2–3-mm ventral to the vocal process of the arytenoid cartilage.

Figure 4.4 (a) An endoscopic photograph of a Quarter Horse, gelding with ventral cicatrix formation post bilateral laser ventriculocordectomy. (b) An intraoperative photograph of the ventral cicatrix as seen via laryngotomy. Rostral is to the left and caudal is to the right.

Figure 4.5 Endoscopic photograph of excessive hemorrhage obscuring visualization of the remaining portions of the vocal cord and laryngeal ventricle.

Figure 4.6 Excessive smoke accumulation associated with intraoral laser ventriculocordectomy.

Figure 4.7 Contact photoablation of the vocal cord and laryngeal ventricle with a 600- μ m sculpted laser fiber.

Figure 4.8 Eversion of the right laryngeal ventricle with bronchoesophageal grasping forceps.

Figure 4.9 Intraoperative endoscopic photograph of eversion of the laryngeal ventricle using an intraoral roaring burr.

Figure 4.10 Endoscopic photograph of a healed left-sided laser ventriculocordectomy.

Chapter 5

Figure 5.1 Horse in right lateral recumbency with dotted line demonstrating the slight tipped down position of the nose to provide better access to the lateral side of the larynx.

Figure 5.2 A cadaver specimen demonstrating the muscular process exposed caudal to the cricopharyngeus muscle. The yellow line demonstrates the eventual position of the sutures.

Figure 5.3 Intraoperative endoscopic view of the larynx while creating abduction. The nasotracheal tube is 20-mm inner diameter.

Figure 5.4 Gross dissection of an equine larynx depicting tensioning of the Fiberwire suture with the Securos tension device. The tension device is tightened against Carmalt hemostats clamped to the Securos suture.

Figure 5.5 Gross postmortem photograph depicting tightening of the Securos suture with the tension device. Note the presence of a single crimp and the Carmalts securing the suture against the tension device. Finally note that once the Securos suture has been tightened the Fiberwire suture loosens.

Figure 5.6 Gross postmortem photograph depicting the crimping of the clamp with the Securos crimping device.

Figure 5.7 Endoscopic view of the larynx the morning after laryngoplasty.

Chapter 6

Figure 6.1 Arytenoid cartilage dissected of all soft tissue demonstrating the arcuate crest (line) extending from the muscular process (star) towards corniculate process.

Figure 6.2 Cricoid cartilages of Thoroughbred horse larynges dissected of all soft tissues. Up is cranial and down is caudal in each image, when viewing the cricoid from a dorsal aspect. The bottom edge of each image demonstrates the marked variability of the caudal aspect of the cricoid.

Figure 6.3 Graph of distraction (mm) during cyclical mechanical testing of cricoid cartilages tested using a single strand of Ethibond or a novel alternate laryngoplasty system. Note the variability in the amount of distraction of the Ethibond constructs.

Chapter 7

Figure 7.1 Gross postmortem photograph depicting isolation of the tendon of insertion of the cricoarytenoideus dorsalis muscle on the muscular process of the arytenoid cartilage.

Figure 7.2 Gross postmortem photograph depicting the arytenoid facet and cricoid facet of the cricoarytenoid joint. All soft tissue has been removed for illustrative purposes only.

Figure 7.3 Intraoperative preparation of the articulating arm of the CO₂ laser for cricoarytenoid joint ablation. Note that specialized eyewear and endoscope have been used for intraoperative evaluation of arytenoid position.

Figure 7.4 Intraoperative photograph depicting the surgical approach to the cricoarytenoid joint. A Richardson retractor is being used to pull the larynx toward the surgeon by traction on the thyroid cartilage. A Poole suction tip is used to remove blood and smoke associated with the procedure and Senn retractors are used for retraction of the muscular process rostrally and the cricopharyngeus muscle caudally.

Figure 7.5 Intraoperative photograph of the cricoid facet following CO₂ laser debridement of the articular cartilage.

Figure 7.6 Endoscopic photograph of a horse 1 day following CO₂ laser ablation of the cricoarytenoid joint and prosthetic laryngoplasty.

Figure 7.7 The same horse pictured in Figure 7.7 but with 45 days postoperative cricoarytenoid joint debridement and prosthetic laryngoplasty.

Chapter 9

Figure 9.1 A gross postmortem specimen of cartilage failure following an incisional infection secondary to inadvertent penetration of the laryngeal lumen during prosthetic laryngoplasty.

Figure 9.2 Prosthetic laryngoplasty incisional scar identified following the removal of the hair from the left aspect of the larynx.

Figure 9.3 Endoscopic photograph of a horse with a failed right-sided prosthetic laryngoplasty. Note the fibrosis associated with right laser ventriculocordectomy site.

Figure 9.4 Intraoperative photograph of prosthetic suture material removal following a failed prosthetic

laryngoplasty. The hemostat in the photograph is grasping the knots of the suture material.

Figure 9.5 (a) Intraoperative photograph of right arytenoid abduction following repeat laryngoplasty. (b) Endoscopic photograph 1 day following right repeat laryngoplasty. (c) Endoscopic photograph 3 days following right repeat laryngoplasty. Note complete loss of abduction. This horse was subsequently treated with partial arytenoidectomy.

Chapter 10

Figure 10.1 A horse with dysphagia following prosthetic laryngoplasty. Note moderate abduction of the left arytenoid cartilage.

Figure 10.2 Feed material at the nares in a horse with clinical signs of dysphagia post prosthetic laryngoplasty.

Figure 10.3 Endoscopic photograph of horse with aspiration of feed material following prosthetic laryngoplasty.

Figure 10.4 Intraoperative photograph depicting removal of prosthetic suture material in a horse with postoperative dysphagia. No effort is made to transect adhesions associated with the prosthetic suture material.

Figure 10.5 (a) Preoperative endoscopic photograph and (b) Postoperative endoscopic photograph following prosthetic suture removal in a horse experiencing postoperative dysphagia. Also note the minimal loss of abduction. This also had laser ablation of the cricoarytenoid joint performed at the time of initial prosthetic laryngoplasty.

Chapter 13

Figure 13.1 Dorsal plane short tau inversion recovery turbo spin echo magnetic resonance image at the level of the cricothyroid articulation. The left side of the horse is to the right side of the image. The asterisk (*) indicates the normal left cricoid articular process and the white arrowhead indicates the normal caudal cornu of the left thyroid cartilage which forms the normal left cricothyroid articulation. The right side of the thyroid and cricoid cartilages do not articulate. The caudal cornu of the right thyroid cartilage lamina and the right cricoid articular process are absent. There is an abnormal gap between the cricoid and thyroid cartilages on the right. TC, thyroid cartilage; AC, arytenoid cartilage; CC, cricoid cartilage. Reprinted from Garrett et al. (2009) with permission from Wiley-Blackwell.

Figure 13.2 (a) Longitudinal ultrasound image of a normal larynx at the mid portion of the arytenoid cartilage. Cranial is to the left of the image. The cricoarytenoideus lateralis muscle is positioned in its normal location deep to the thyroid cartilage. The caudal cornu of the thyroid cartilage (*) is imaged close to its articulation with the cricoid cartilage. (b). Longitudinal image of the right side of the larynx of a horse with fourth branchial arch disorder at the midportion of the arytenoid cartilage. Cranial is to the left of the image. The cricoarytenoideus lateralis muscle is positioned between the thyroid cartilage and the cricoid cartilage in an abnormal space (between arrows). The caudal aspect of the thyroid cartilage (*) is abnormally shaped and does not articulate with the cricoid cartilage. TC, thyroid cartilage; CAL, cricoarytenoideus lateralis muscle; AC, arytenoid cartilage; CC, cricoid cartilage.

Reprinted from Garrett et al. (2009) with permission from Wiley-Blackwell.

Figure 13.3 Transverse proton density turbo spin echo magnetic resonance image at the level of the arytenoid cartilages. The left side of the horse is to the right side of the image. The lamina of the right side of the thyroid cartilage extends dorsal to the muscular process of the arytenoid cartilage (white arrow). The left side of the larynx is normal with the muscular process of the arytenoid extending dorsal to the thyroid lamina (black arrow). TC, thyroid cartilage; AC, arytenoid cartilage. Reprinted from Garrett et al. (2009) with permission from Wiley Blackwell.

Figure 13.4 (a) Transverse proton density turbo spin echo magnetic resonance image of a normal larynx at the level of the cricoid cartilage. The left side of the horse is to the right side of the image. (b) Transverse proton density turbo spin echo magnetic resonance image of a horse with fourth branchial arch disorder at the level of the cricoid cartilage. The left side of the horse is to the right side of the image. Note the widening and rotation to the right of the spine of the cricoid cartilage and subsequent abnormal positioning of the left and right cricoarytenoideus dorsalis muscles. The left cricopharyngeus muscle is present while the right cricopharyngeus muscle and cricoid articular process are absent. CAD, cricoarytenoideus dorsalis muscle; CP, cricopharyngeus muscle; CC, cricoid cartilage. Reprinted from Garrett et al. (2009) with permission from Wiley Blackwell.

Figure 13.5 Resting upper airway examination of a horse with fourth branchial arch abnormality. Note

the rostrally displaced position of the palatopharyngeal arch (black arrowheads).

Figure 13.6 Lateral-lateral radiograph of the pharyngeal and laryngeal region of a horse with fourth branchial arch abnormality. Rostral is to the left of the image. The rostrally displaced palatopharyngeal arch can be seen as a teardrop-shaped soft tissue opacity (black arrow). Air is present within the esophagus (white arrows).

Chapter 17

Figure 17.1 Resting videoendoscopic image of the pharynx of a horse with dorsal displacement of the soft palate.

Figure 17.2 Resting videoendoscopic image of the pharynx during nasal occlusion. Note the “flaccid” appearance of the epiglottis and soft palate instability.

Figure 17.3 Dorsal displacement of the soft palate. Note the ulcer (arrow) along the dorsal aspect of the caudal free edge.

Figure 17.4 Exercising images of spontaneous dorsal displacement of the soft palate. (a) Inspiration, (b–d) progressive upper airway obstruction of the soft palate during expiration.

Figure 17.5 (a, b) Progressive billowing of the soft palate dorsally.

Figure 17.6 (a–d) Axial deviation of the aryepiglottic immediately prior to dorsal displacement of the soft palate.

Figure 17.7 Exercising videoendoscopic images of the pharynx. (a) flaccid epiglottis, (b–d) progressive

loss of the normal subepiglottic position of the soft palate.

Figure 17.8 Concurrent epiglottic entrapment and persistent dorsal displacement of the soft palate. Entrapping aryepiglottic tissue (white arrow) is ventral to the soft palate (black arrow).

Chapter 18

Figure 18.1 Composite ultrasound images of the rostroventral (a, b) and midventral (c) acoustic windows of the throat region of a 4-year-old Standardbred gelding presenting with and upper respiratory noise during exercise. Images (a) and (b) depict the bony landmarks used to locate the basihyoid bone, beginning cranially in the transverse plane the lingual process (LP) and the base of the basihyoid bone (BH). Both can be identified by the hyperechoic surface and the strong acoustic shadow. Image (c) is obtained in a cranial (Cr) to caudal (Cd) direction, and demonstrates the characteristic slope of the base of the basihyoid bone, such that the depth of the basihyoid bone is different cranially (Cr) than caudally (Cd). For this reason, to ensure standardization of findings, it is recommended to assess basihyoid depth at the cranial aspect of the basihyoid bone, as the lingual process is merged with the base of the bone, as depicted in (b).

Chapter 19

Figure 19.1 Ventral midline incision centered over the caudal aspect of the cricoid cartilage. The hemostat marks the cricoid cartilage. Rostral is toward the left and caudal is toward the right of the photograph.

Figure 19.2 Gross postmortem photograph depicting isolation of the left sternothyroideus muscle. Note insertion of the sternothyroideus on the thyroid cartilage. Rostral is toward the left and caudal is toward the right of the photograph.

Figure 19.3 Gross postmortem photograph depicting clamping of the tendon of insertion of the sternothyroideus muscle and the muscle belly.

Figure 19.4 Gross postmortem photograph depicting transection of the tendon of insertion of the sternothyroideus muscle with Metzenbaum scissors.

Figure 19.5 Gross postmortem photograph depicting a laryngotomy incision through the cricothyroid ligament. Gelpi retractors are being used to open the cricothyroid space. Rostral is toward the left and caudal is toward the right.

Figure 19.6 Gross postmortem photograph depicting exposure of the caudal aspect of the soft palate. The thyroid cartilage and rostral aspect of the larynx have been removed. Note the characteristic V shape of the soft palate.

Figure 19.7 Gross postmortem photograph depicting grasping of the soft palate on the midline with straight sponge forceps and the incision of the soft palate on the left side with curved scissors.

Figure 19.8 Gross postmortem photograph depicting the two “tags” left behind following excision of the soft palate in the clamp of the sponge forceps.

Figure 19.9 Gross postmortem photograph depicting the excision of one of the soft palate “tags.” The tag is grasped with an Allis tissue forceps and is excised with scissors.

Figure 19.10 Gross postmortem photograph depicting completion of the staphylectomy procedure. Rostral is at the bottom of the photograph and caudal is toward the top of the photograph.

Chapter 20

Figure 20.1 Intraoperative image showing the ventral aspect of the throatlatch area after skin incision and separation of the sternohyoideus muscle. C, cricoid cartilage; T, ventral aspect of the rostral aspect of the thyroid cartilage; B, basihyoid bone.

Figure 20.2 Intraoperative image showing the placement of the sutures into the thyroid cartilage ventral to the ST tendon. Four bites are placed to divide the forces between suture and cartilage and thus minimizing the likelihood of suture pull through.

Figure 20.3 Schematic representation of suture placement for laryngeal tie-forward sutures. (a) Ventral view: note that the dorsal suture is placed ipsilateral while the ventral suture crosses to the contralateral side. (b) Lateral view: note that both sutures are placed dorsal to the basihyoid bone to enhance the dorsal mobilization of the larynx.

Figure 20.4 Two-year-old Standardbred racehorse 1 day postoperatively. Note deviation of the epiglottis to the left associated with suture pull through from the right thyroid cartilage.

Figure 20.5 Radiograph of a 6-year-old Thoroughbred mare after laryngeal tie-forward using metal implants to reinforce the thyroid cartilage based on Rossignol's technique.

Chapter 21

Figure 21.1 Endoscopic photograph depicting retraction of the esophagus with bronchoesophageal grasping forceps.

Figure 21.2 Intraoperative endoscopic photograph of diode laser palatoplasty under general anesthesia prior to laryngeal tie-forward.

Figure 21.3 Standing endoscopic photograph 7 days post diode laser palatoplasty and laryngeal tie-forward.

Figure 21.4 Standing endoscopic photograph of complete healing of the soft palate post diode laser palatoplasty. Note areas of fibrosis and contracture of the caudal free edge of the soft palate.

Figure 21.5 Standing endoscopic photograph 45 days post diode laser palatoplasty. Note granulation tissue mass on right aspect of the caudal soft palate.

Chapter 22

Figure 22.1 Standing endoscopic photograph of a Standardbred racehorse with ulceration of the caudal free edge of the soft palate in a horse with DDSP.

Figure 22.2 Endoscopic photograph of a Standardbred racehorse with DDSP during high-speed treadmill exercise.

Figure 22.3 Endoscopic photograph of diode laser palatoplasty of an ulcer on the caudal free margin of the soft palate in a racehorse with DDSP.

Chapter 23

Figure 23.1 Intraoperative images of a failed tie-forward. A Crile hemostat is placed under the left ST muscle that has healed to the cricoid cartilage, re-establishing a caudal force on the larynx.

Figure 23.2 Radiograph of a horse with failed tie-forward. Note the ossification at the base of the thyroid cartilage (*) is caudal to the thyrohyoid bone.

Figure 23.3 Ultrasound image obtained with an 8.5-MHz semiconvex probe showing a loose tie forward suture upon head extension in a 3-year-old Thoroughbred filly.

Figure 23.4 Ultrasonographic image obtained with an 8.5-mHz semiconvex probe showing a suture in the cricoid cartilage after laryngeal tie-forward in a 3-year-old Thoroughbred filly.

Chapter 24

Figure 24.1 Horse with enlarged lymph node in the floor of the medial compartment of the guttural pouch near the pharyngeal branch of the vagus (white arrows).

Figure 24.2 Fungal lesions over internal carotid artery in close proximity to cranial nerves IX, X, XI, XII.

Figure 24.3 Horse with persistent DDSP; notice that the soft palate is flat with no evidence of an epiglottic bulge or mass on its oral surface. This is typically seen in horses with intermittent displacement as well.

Figure 24.4 Horse with persistent displacement and an epiglottic bulge (white arrows) on its oral surface suggesting that the epiglottic cartilage is enlarged or deformed.

Figure 24.5 Horse with persistent displacement of the soft palate during a swallow after a laryngeal tie-forward. Note the epiglottic bulge underneath the soft palate.

Figure 24.6 Horse with persistent DDSP after laryngeal tie-forward. The horse is being prepared for a laser staphylectomy. Note the three “dots” placed on the soft palate prior to resection with the diode laser. These “dots” serve as a guide for the soft palate resection. The bronchoesophageal grasping forceps are in the upper left of the photograph and the diode laser fiber is contacting the soft palate.

Chapter 25

Figure 25.1 A vertical cut through the caudal part of the septum directly below the trephine places the septal stump where swelling from edema, granulation tissue, and fibrosis (broken line) could occlude the nasal passage by impinging on the adjacent conchae (a). If the caudal cut is directed as far caudally as possible on the septum (b), then the swelling in the septal stump (broken line) will be in a wide part of the nasal passage and will not impinge on adjacent structures.

Figure 25.2 Resin cast of the left nasal passage of a horse between the septum and the bony components of the nasal passages showing the septal surface. Note that the caudal part of the floor of the nasal passage declines ventrally at the caudal end (below white line).

Figure 25.3 Introduction of wire x through one nasal passage and exiting through the mouth (a,b) after manual retrieval around the soft palate. Wire y is introduced the same way through the contralateral nostril and the two ends outside the mouth are spliced together with adhesive tape (c). The nasal portion of each wire is black and the oral portion is gray in (b). Wire y is pulled in the direction of the arrow (c) to bring the splice and the other end of wire