

Esophageal Obstruction in the Horse

Dr. Amelia Munsterman reviews the diagnosis and management of esophageal obstruction in horses.

Speaker Bio:

Dr. Amelia Munsterman graduated from the University of Missouri-Columbia, College of Veterinary Medicine. She completed both a residency in Large Animal Surgery and an MS in Biomedical Sciences at The Ohio State University, and a PhD and Fellowship in Large Animal Emergency and Critical Care at Auburn University. Dr. Munsterman is also certified in acupuncture and spinal manipulation with an MS in Traditional Chinese Veterinary Medicine. She is currently an Associate Professor of Large Animal Surgery and Emergency Medicine at Michigan State University. Dr. Munsterman has authored or co-authored 44 peer-reviewed journal articles, 30 book chapters, and 54 scientific abstracts. Dr. Munsterman is a board-certified diplomate in the American College of Veterinary Surgeons (Large Animal Surgery) and also a board-certified diplomate of the American College of Veterinary Emergency and Critical Care (Large Animal).

Learning Objectives:

1. To develop an understanding of the causes and clinical features of esophageal obstruction.
2. To be able to formulate an appropriate therapeutic plan for treatment of esophageal obstruction, as well as options for persistent obstruction.
3. To understand additional diagnostic tools that may be useful to assess the severity and complications due to the obstruction.
4. To identify additional medical and surgical approaches to resolve and prevent recurrence of esophageal obstruction.



Esophageal Obstruction in the Horse

Amelia Munsterman, DVM, MS, PhD, DACVS-LA, DACVECC

Good evening, everyone. Thank you so much for joining us tonight. This afternoon we'll be talking about esophageal obstruction in the horse.

Our speaker tonight is Dr. Amy Munsterman. She is an Associate Professor of large animal surgery and emergency medicine at the Michigan State University College of Veterinary Medicine. She also happened to be one of my teachers when I was at Auburn as a student. She's double board certified in large animal surgery and emergency critical care, and I will turn it over to her for the lecture.

Thank you so much.

Thank you, Katie. And I'm very happy to be here tonight to let a little bit more about esophageal obstructions or choke.

Outline

- Anatomy Review of the Equine Esophagus

- Clinical Presentation

- Pathophysiology
- Clinical Signs
- Diagnosis
- Treatment
- Prevention



So we'll go through a little bit of this tonight about-- go through the anatomy first in terms of what the esophagus of the horse looks like, where it transverse through the neck, through the chest, through the abdomen, what it's composed of. And that's going to help us sort of think about what drugs might be appropriate in order to resolve choke, things we can do to hopefully improve our outcomes. We'll go through some of the clinical presentation we would see with a horse that has an esophageal obstruction, what it would look like, things we can do to diagnose choke, how we can treat it-- That's the most probably most important-- and then things we can advise the owners to do to try to prevent it from reoccurring.

Complications of Esophageal Obstruction

- Mucosal ulceration
- Inability to resolve obstruction
 - Esophagotomy
- Ruptured esophagus
 - Esophagostomy
- Esophageal strictures
 - Esophagomyotomy
- Esophageal diverticulum
 - Mucosal inversion

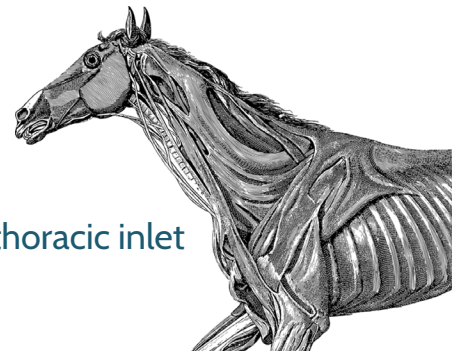


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Other things we'll talk about include ruptured esophagus. So sometimes we might see this with a very long standing choke. If you're trying to pass a tube and you have a very compromised esophagus, that could be a complication, and so things we could do to fix that or resolve that, including an esophagostomy tube. Esophageal strictures may occur down the road after a horse has a choke, and so we'll talk about esophageal myotomies briefly. And then esophageal diverticulums may be a cause of recurrent choke in these horses, and we'll talk about mucosal inversions to solve that.

Equine Esophageal Anatomy

- Length of the esophagus: 125 to 200 cm
- Spans the cervical region, thoracic and abdominal cavities
- Positioning
 - Originates and lies dorsal to trachea for first third
 - Courses lateral to trachea on left side of neck to the thoracic inlet
 - Lies ventral to the trachea within the thorax



And so let's dive into what the anatomy of the horse's esophagus is. So a horse's esophagus is really, really long, so we're looking at almost 200 centimeters in our larger breeds. And so if we're thinking about where it's traversing through the neck and through the thorax and the abdomen, it's going a long way. We have a lot of structure to cross if we're trying to pass a tube and relieve an obstruction.

So it usually starts right above the trachea. So if you're looking at, say, a scope image of a pharynx, it's going to be right above this [INAUDIBLE]. It's just going to be a tiny little fold, and that's where the esophagus entrance is.

So it's right above the trachea at the start. It lies there about for the first third down the cervical part of the horse, and then it starts to move lateral. So it's going to move to the left side. So usually when you're passing a tube, you'll look for that little bump to be moving down the left side of the neck, right above the jugular vein. So that's usually where we're going to see it and where we think about the esophagus running.

But then it sort of deviates ventral to the trachea right at the thoracic inlet. So it sort of moves around the trachea as it goes down through the cervical part of the esophagus. Once it gets into the chest and the abdomen, we typically can't see that. It's not something we're often going to diagnose a problem in, but it does lie ventral to the trachea once it goes into the chest there.

Microscopic Anatomy of the Esophagus

- Elastic inner layer composed of mucosa and submucosa
 - Composed of stratified squamous epithelium
 - The “holding layer” of the esophagus
 - Freely movable
- Muscular outer layer
 - Striated muscle up to the base of the heart
 - At this point, turns to smooth muscle
- Surrounded by inelastic tunica adventitia

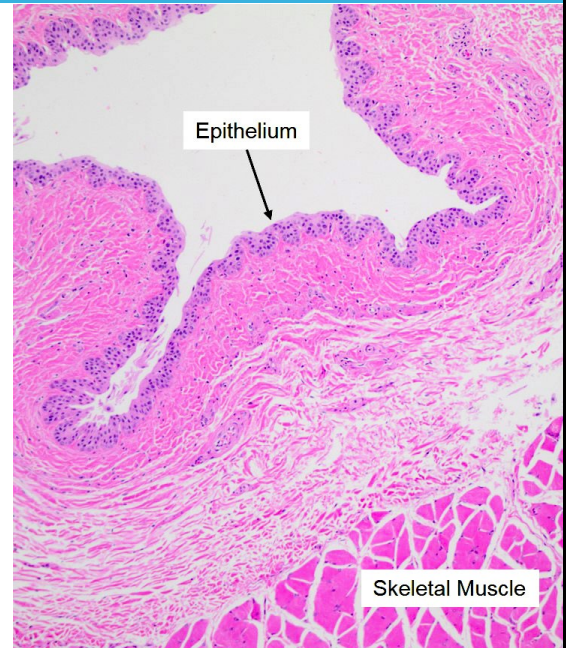


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So what is the microscopic anatomy of the esophagus? So the inner layer is going to be that stratified squamous epithelium. It's going to be this loose layer that lies right on the submucosa, and this is actually the holding layer of the esophagus. So if we're trying to suture or put the esophagus back together, this is the part that we actually want to engage with our sutures in order to provide a very strong closure. So that's sort of unusual compared to the rest of the gastrointestinal tract.

It's also pretty movable. So it's sort of loosely connected to that skeletal muscle underneath, and so that allows it to form folds that stretch and allow things to move through it.

Around that is going to be those muscular outer layers. So up to the base of the heart, we're looking at skeletal muscle being the main component of that muscular layer. And so that's going to make a difference in terms of what drugs we might use in order to relax the esophagus to allow things to pass through. After that heart base, it's going to turn into smooth muscle, and so that's going to be a little bit different there in that last third of the esophagus of the horse.

And then surrounding all of that is going to be this inelastic tunic, its tunica adventitia. And compared to the rest of the GI tract, which has a serosal lining because it's actually in the peritoneal cavity, the esophagus doesn't have that outer layer. And so that makes it a little bit different than other parts of the GI tract.

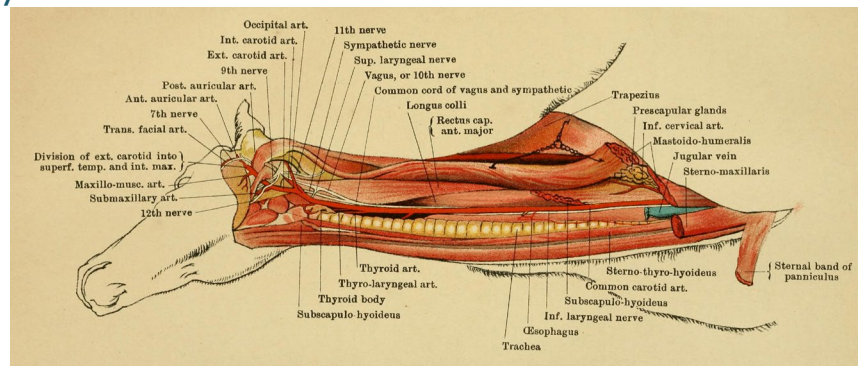
Esophageal Blood Supply and Innervation

● Arterial supply

- Carotid artery supplies esophagus in the cervical portion
- Bronchoesophageal and gastric arteries supply farther aboral
- Note: Arcuate blood supply with little collateral circulation

● Innervation

- 9th and 10th Cr. N.
- Sympathetic trunk
- Mesenteric ganglion



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So in terms of what supplies this, the arterial and the nervous system supplying the esophagus, we have the carotid getting most of the branches to the esophagus and the cervical portion of the esophagus of the horse. As you move farther back, the bronchial esophageal and gastric arteries do supply some blood supply to that organ. But what's most important to note about the arterial supply the esophagus is that it's arcuate, and so it has these little arcs that come off of the carotid and then innervate supply that esophagus itself.

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Equine Esophageal Obstruction



- ...Also called “choke”
- Most common abnormality of the equine esophagus
- Causes of obstruction
 - Inappropriate feed materials
 - Poor quality roughage
 - Large sized treats
 - Beet pulp
 - Poor dental care or tooth senescence



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Esophageal obstruction is also called choke by our owners, and so you'll hear it called both things. And it's not actually going to be obstructing the trachea itself and causing them to asphyxiate, but they will be aspirating, and that's going to be something that's going to cause some respiratory disease down the road. This is the most common abnormality that you will see in the equine esophagus and so something we often will see if we're going out to the farm. We have owners that call us about this disease process. So it's going to be the thing we're going to see most commonly affecting the esophagus in the horse.

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Other things we think about our young horses that eat things that are not food products. So they may chew on ropes, they may grab things outside their stall, they may be something that they can't chew up very well, and that also get a good lodge in the esophagus. Other things we think about, poor quality roughage. If it's really stemmy hay, they're not able to chew that appropriately.

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So one thing we always think about with horses with choke is that we think about it happening in our older horses, simply because a lot of times their teeth continue to grow, they may have sharp points, it makes it difficult for them to chew. They may have lost teeth that allows the other one to grow into that space and cause problems with mastication. And so we do want to make sure that our older horses are being provided regular dental care in order to prevent choke from happening.

One thing we do see a lot of owners do is feed beet pulp to their older horses simply to-- because they want to provide them with a highly digestible fiber, something with small fiber character. And if they don't water it appropriately, it's really dry sometimes, it will actually obstruct the esophagus. So sometimes even when we're trying to prevent choke, we may have owners that accidentally cause it to happen.

Clinical Signs of Esophageal Obstruction

- Tachypnea and tachycardia
- Nasal or oral discharge
- Coughing

- Retching, gulping, repeated swallowing
 - Odynophagia-painful swallowing
 - Signs of difficulty swallowing may be delayed
 - *It takes 16 seconds to traverse length of esophagus*



So what do we see when we have a horse with choke, the clinical signs of esophageal obstruction? So these horses are often pretty agitated. Their heart rates may be high. They may have a high respiratory rate.

The key thing you often see is that they have a nasal oral discharge, and often it's feeding, especially if they continue to try to eat. Horses often eat to make themselves feel more comfortable, to soothe themselves. And so they may continue to make this problem worse by taking an additional hay or grass or even feeds that their owners offer them.

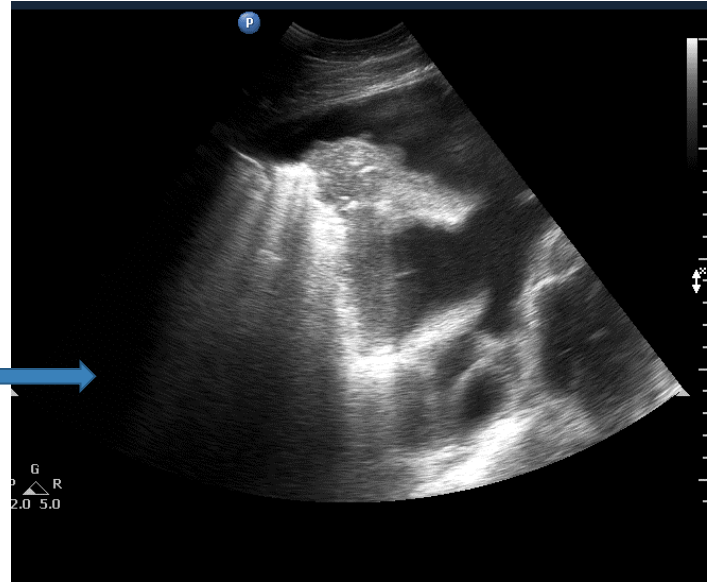
They may be coughing. A lot of times their aspirating feed or saliva, and that may cause them to cough. And you may see this continued retching or gulping action. So they'll stretch their necks out, they try to swallow repeatedly.

And the word of the day that you can think about is odynophagia. So this is going to be painful swallowing. So if they're having difficulty swallowing, this could be a sign of choke.

It's important to recognize that often the difficulty in swallowing can be often delayed from when it actually takes something in. So it takes about 16 seconds for food to go from the mouth all the way to the end of the esophagus. So if they swallow something and the obstruction's very, very caudal, it may take some time for them to actually gulp, retch, or even the saliva back up. And so just if you don't see it immediately happening after they eat, it may be that just the obstruction is quite distal.

If Esophageal Obstruction is Not Treated...

- Dehydration
- Electrolyte imbalances
- Aspiration pneumonia
- Tetanus



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Other things to think about in terms of clinical signs you would see if a horse has a choke, especially if it's long standing, so these are horses that may have been choked in the morning. The owners didn't go out and feed them till sometimes even the next day. If you think about it, they aren't able to take any food or water in, these horses can get dehydrated, especially if the weather is really hot outside, if they have other issues going on. They're going to develop some electrolyte imbalances because saliva is full of sodium and chloride, and so if it's spilling out onto the ground, you can see how they can quickly get an acid-base disturbance.

If it's long standing and to continue to breathe in that saliva or feed, these horses often develop aspiration pneumonia. So this is something we want to talk about later in terms of want to go ahead and stick your probe on, and look at their chest and get an ultrasound of their thorax. You can see in this image we have some quite consolidated lung flapping in this big fluid pocket here. And so this is something that would be easily recognizable as a pleural pneumonia that you could see with a long standing choke.

The other thing to think about with esophageal obstruction is that the esophagus is actually connected to or encountering the external world. And so it's just like having a laceration outside, we worry about these forces developing tetanus because they're exposed to that tetanus toxin, that they're actually ingesting and getting through a wound in their esophagus. So we want to make sure that we booster these horses if they have an esophageal laceration.

Diagnostic Procedures

- Sedation is **imperative** to perform an examination
- Thorough oral exam should be performed
 - Foreign body
 - Dental disease
 - Cleft palate
 - Neoplasia
- External exam may note cervical swelling at site of obstruction
 - Crepitus may indicate rupture

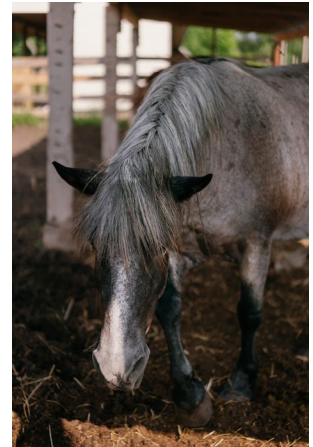


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So what do we do if we have a horse that we suspect has choke or esophageal obstruction? The most important thing we can do for these horses is sedate them. And not only does this provide a more safe exam for both you and the horse. These horses are often very upset, agitated. They may not be following directions very well. So it's very important to make sure everyone around is safe when you're trying to relieve the choke.

It also causes them to drop their heads, like in this picture. And the most important thing about that is now anything that-- their saliva that they're trying to swallow, anything they've taken in is going to drain back out and hopefully not or be less likely to be inhaled or taken into the trachea. If their head's up, it's more likely to drain down into their trachea that way, from the pharynx. So getting them to drop their heads is very important. It also allows you to, when you're passing the tube and trying to lavage that obstruction, most of that fluid is hopefully going to come out and rather than be breathed in.

It's good to perform a really good, thorough oral exam, probably not the first thing you're going to do with a choke, but we definitely want to look at them at least after we relieve the obstruction or relieve their agitation, to make sure there isn't something else that may be going on. Some horses rarely could have some sort of neoplasia or a cyst or something in their pharynx that's causing an obstruction. They may have dental disease. That may be the cause of the choke to begin with. In our babies or our younger horses, a cleft palate might be something we want to look for. But those things may not be the first thing you want to do, but you definitely want to make sure your oral exam is on the list.

Other things you want to look for externally is some cervical swelling. So if you run your hand down the side, the left side, of the neck and look for or if you see a lump or bump, sometimes you actually can palpate the obstruction if it's large, if there's a lot of food backed up behind it. You may be able to identify where the choke is in the esophagus.

And you can also notice if there's any crepitus underneath the skin. If you do note crepitus, it could be possible that the esophagus has already ruptured. And that bodes poorly for the horse, but also gives you some indication of additional steps you may need to take.

Diagnostics: Nasogastric Intubation

- **Can be diagnostic and therapeutic**
 - 30-100 ml Lidocaine per NG can reduce spasm
 - Double lumen tubes are available
- **Common sites of obstruction**
 - Proximal esophagus
 - Thoracic inlet
- **If lavage relieves obstruction immediately, and the choke is acute, further diagnostics are often unnecessary**
 - *However, unusual clinical exam findings or recurrence warrant a more extensive exam*



So one of the most important diagnostic tools you have for a horse with esophageal obstruction is your nasogastric tube. Not only can you use it to relieve the choke-- or identify choke, you can relieve the choke by passing it through. So it's important to figure out exactly how far in the choke is. If you can pass the tube and mark it on your tube, you can get an idea of how deep it is. You can sometimes see your tube going down the side of the neck and identify where the obstruction is.

And once you have the tube in place, then you can gently try to lavage that feed and try to get it to come back out. So usually what I'll do is run a couple of buckets through this horse. I'll have their head down, maybe a twitch on to make sure that they are compliant. I'll flush some in, let the fluid come out to make sure they can breathe in between and allow that hopefully the obstruction to be lavaged out.

As you're lavaging, you can generally try to continue to pass to farther down. Most cases of feed obstruction will allow you to eventually get that tube to pass all the way into the stomach. And so usually within 30, 45 minutes, you should be able to lavage out an uncomplicated choke and get the tube to pass all the way through. At that point, you can give them some fluids orally, try to get them ahead in terms of their fluid balance, and make sure they don't have any additional problems.

If it's difficult to pass the tube, sometimes what I'll do is actually infuse 30 to 100 mls of lidocaine down the tube to reduce some spasms that may occur in the esophagus. And then if you're worried about aspiration, there are some double lumen NG tubes out there, so it allows you to flush fluid in through the center tube and then the feed and the water comes out through the external tube, preventing that

from being inhaled by the horse. The bad news is it's a very small diameter in between those. And so if we have large pieces of hay and things like that, sometimes they obstruct those tubes. I haven't been very successful with those, but they are on the market.

Some of the places you will see the obstruction most commonly will be at the proximal esophagus, so the very proximal third of the neck, and then at the thoracic inlet, where it sort of turns and dives into the chest. And so those are places you'll commonly see choke. So it's going to be a part of the esophagus that has the striated muscle.

If you're able to get that tube to go into the stomach and you can resolve this fairly quickly, the owners in this said that the choke is fairly acute so they went out to feed and immediately after the horse became distressed, often those horses, we don't say that further diagnostics are needed. So you probably don't have to scope the horse and do radiographs and all these additional tests to see what else is going on.

Those are things you can offer the owner, especially if they are concerned about any mucosal erosions and what caused the choke and did they have a problem that combat in their esophagus that may have led to the choke happening. But most of the time, if it's an uncomplicated choke, you can easily resolve it, those are probably not things you have to do at this time.

If, however, this horse has choked repeatedly, you have other findings. Say you have swellings on the neck or something that just is not typical, those horses definitely are ones you might want to refer for additional extensive tests, doing an esophagostomy-- I'm sorry, endoscopy procedure or radiographs or something along those lines to identify if there's something else that may have led to the choke to begin with.

Medications to Relax Esophagus

- **Acepromazine**
 - Phenothiazine tranquilizer
 - Alpha-1 antagonist
 - Most effective on smooth muscle
 - Therefore, acts on distal esophagus
 - Caution in hypovolemic animals



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So in some chokes, it's often difficult to push the tube or relieve that choke and get that obstruction to either lavage out or pass back to the stomach. And so there are some medications that are suggested to possibly relax the esophagus as well as sedate the horse and make it easier for you to remove that obstruction. One of those is acepromazine, which is a phenothiazine tranquilizer. It is an alpha-1 antagonist, so although it's most effective in relaxing smooth muscle, it does have some skeletal muscle action.

So therefore, if you think about when we talked about the histology of the esophagus, smooth muscle is mostly going to be confined to the distal esophagus, so way past the heart. So if the obstructions are typically in the cervical portion of the esophagus, this drug is probably not going to be very helpful in terms of relaxing the muscle that you're interested in.

You also want to be very careful with acepromazine because of these horses are dehydrated, the choke has gone on for some period of time, it's very easy to vasodilate them and cause further problems in our hypovolemic animals. So we want to be very cautious if this horse is dehydrated and then give them ACE on top of that.

Medications to Relax Esophagus

- Alpha-2 agonists

- Relax skeletal muscle of proximal esophagus
- Detomidine most effective to improve dilation at thoracic inlet
- Xylazine and butorphanol reduce swallowing reflex
- Combination of alpha-2 agonist and an opioid agonist-antagonist show the best effects *in vivo*



One medication that is very helpful is an alpha-2 agonist. So these are going to relax skeletal muscle in the proximal esophagus or the part of the esophagus we typically see chokes in. Of the drugs that are out there, detomidine has been shown to be most effective to improve dilation at that thoracic inlet, so one of the places we commonly see chokes occur.

They've also shown that a combination of xylazine as well as butorphanol can help to reduce that swelling and reflux that we see. And so if they have spasms in the esophagus, the horse is repeatedly retching on your tube, this combination can be very helpful in terms of reducing that reflux and allowing you to more easily pass that tube. So of the drugs that are out there, most commonly we're going to combine an alpha-2 agonist and then our butorphanol, our opioid agonist antagonist, which at least is in both clinical practice as well as research have been shown to be most effective for relaxing that esophagus.

Medications to Relax Esophagus

- **Oxytocin**
 - Effective *in vitro*, but no effect *in vivo*
 - Meyer 2000, Wooldridge 2002

- **N-butylscopolammonium bromide (Buscopan)**
 - Eliminates swallowing reflex in the distal esophagus
 - Does not affect baseline esophageal pressures
 - Bertone 2011



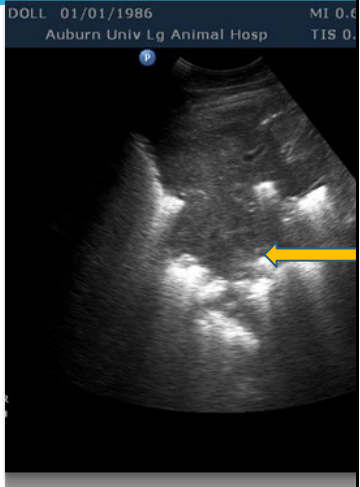
Other drugs out there that you'll hear people talk about to relax the esophagus for choke include oxytocin and BUSCOPAN. Oxytocin had a lot of research in the early 2000s with whether or not it would be very helpful with relaxing skeletal muscle, and did have some effects, *in vitro* at least, on little specimens of muscle in a Petri dish. But when you put balloons into the horse and expanded those, it really didn't show a lot of effects in the live horse. And so that drug has been relatively abandoned in terms of using it for esophageal obstructions.

BUSCOPAN pan does eliminate the swallowing reflex in the distal esophagus. If you're having trouble, just pushing stuff past the cardia and getting it into the stomach, this drug may be helpful for that. But it doesn't have a lot of effect on the skeletal muscle in the esophagus. It's more for smooth muscle. Again, it's going to affect that distal part of the esophagus, so probably not something that will affect where chokes are most commonly seen.

Diagnostics: Ultrasonography

- **Esophageal ultrasound can identify obstruction**
 - Identify rupture or cellulitis

- **Thoracic ultrasonography most helpful**
 - Determine severity of aspiration
 - Monitor progression or resolution
 - Most aspirated fluid will be reabsorbed my 24 hours



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So other diagnostics that are recommended for horses with esophageal obstructions, probably the number one thing that I do with my chokes, in addition to passing the tube, would be to do an ultrasound of these horses. And so not only can you ultrasound the esophagus, you can run it along the neck, on the outside of the neck, to identify it at any cellulitis, any signs of gas or fluid buildup, and that can identify if you have some sort of esophageal rupture. And probably the most common place I'm going to look is the chest, and it's going to be very helpful for identifying how much aspiration these horses have incurred.

So most horses that have choke will aspirate some fluid, whether it's saliva, whether it's water. If they were eating, they're probably going to aspirate some of that, if it's regurgitated up. So definitely they're going to have some fluid in their chest, and you'll see that as typically some comet tails or disruptions of the pleural surface, if you put your probe on the outside of the chest.

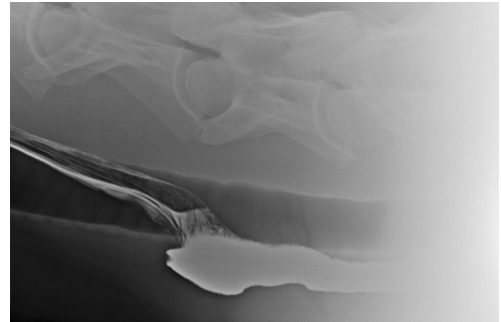
This will indicate that they have absorbed or have taken in some fluid into their thorax. And most of the time this fluid will be reabsorbed by about 24 hours. So if you rescan them in a day or so, you should see that these comet tails or pleural disruptions should have reduced in severity. And that's a good sign that this is all just acute homologous fluid that they breathed in and they've reabsorbed that, and everything is probably progressing in the right direction.

If, however, you see a picture like this, where you have some hepatized lungs, so the lung looks very consolidated, this would be a horse I'd be very concerned about aspiration pneumonia in. They've

probably breathed in a lot of fluid if this choke has been fairly long standing, and it's going to give you an idea this horse is a high risk for developing pleural pneumonia. So this gives you an idea based on the thoracic ultrasound of, if I'm more worried about complications down the road, should I extend our antibiotic protocol, should I keep them on antibiotics for a longer period of time. So it gives me idea up front how severe it is. It gives me idea over time if things are changing and if they're improving with my treatment.

Diagnostics: Esophagography

- Useful for complicated obstructions, recurrent choke, and surgical planning
 - 120 ml 85% wt/vol barium paste PO
- Outlines obstruction
 - Flow halted by complete obstruction
 - Barium will escape with rupture
- Advanced studies using liquid barium and air contrast useful for mucosal lesions
 - Air can also be used for a negative contrast study



Other things we can do in terms of diagnostics, this is going to be if we are looking for reasons for recurrent choke or if they have had a more complicated obstruction, this has been going on for a while, it took you a long time to resolve the choke, esophagography, or basically taking radiographs of the esophagus, is another way we can identify if there's issues going on with that. And a lot of times we're going to combine this with some sort of contrast series, so give them some barium paste or barium fluid. Basically what this is going to do is outline the obstruction or if there's a disruption or if there is some sort of diverticulum going on.

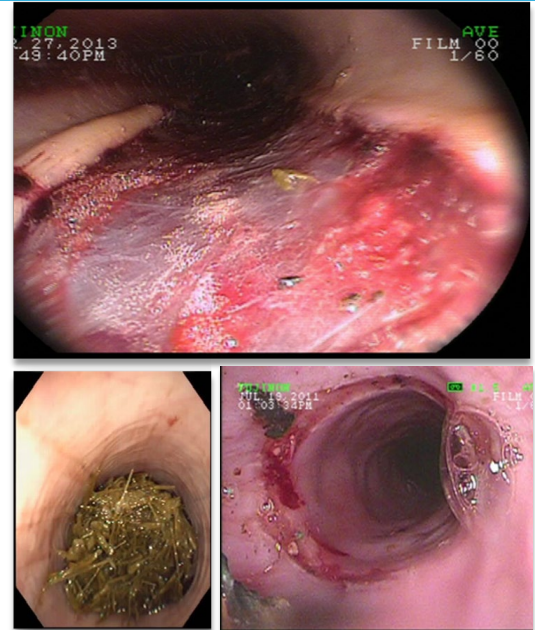
And so we'll feed them or give them the barium slurry and then take the radiographs quickly after that. If they have a complete obstruction, you'll see that flow is completely halted. Things aren't moving past it, and that may give you an indication of where things are going wrong. If they've ruptured, you may see it escape into the tissues surrounding the esophagus. So that helpful to give you an idea of what's going on there.

Or if they have a diverticulum, such as in this image, you're going to get an idea of what kind of diverticulum it is, how large it is, what the shape is, and I can give you some ideas in terms of surgical planning. So those are some things we can do with more complicated esophageal obstructions. And we can also do some more advanced studies with air contrast, negative contrast to identify mucosal lesions as well. But those are some more advanced diagnostics we can think about, especially depending on what we're finding clinically.

Diagnostics: Endoscopy

- Allows examination of lumen and mucosa
 - 200 cm or longer necessary to examine entire length of esophagus
 - *Most cranial aspect logistically difficult*

- Common findings
 - Impacted feed
 - Erosions
 - Lacerations



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One of the more common diagnostics we use, a lot easier, at least in terms of getting a more accurate identification of mucosal lesions, will be endoscopy. And so this allows you to take an image of the lumen, gives you an idea of what's going on if you have an obstruction and if you have any disruptions of their mucosa. Unfortunately, it's going to take a fairly long scope to identify or examine the entire esophagus. So remember, the esophagus of a horse can be up to 200 centimeters long, so you're looking at a 3-meter scope to get a good look at everything that's going on in that esophagus. However, because most of our chokes are going to be in the cranial third, in the cervical esophagus, a 1-meter scope and get you an idea of most of the lesions that are happening, at least in the more proximal esophagus.

So what you'll commonly see when you scope these horses, if it's acute and you just want to say, OK, what exactly is obstructing this esophagus, you can see often your feed bolus that you'll have. So in this very bottom left image, you can see this little wad of hay that is obstructing this horse's esophagus. So it's a fairly acute lesion.


We don't see a lot of esophageal erosions, esophagus still nice and very pale pink. We don't see any disruptions. So those are all good things. This tells me this horse probably will resolve if I do some gentle lavage, maybe sedate him, give him some fluids and some time, he should be good.

The bottom right image, you see an esophageal erosion that's in a circumferential manner. So this is of course that had the obstruction relieved, and now we've have what's left over in terms of the damage

that this obstruction caused. And the thing about circumferential lesions, which we'll talk about later on, is that we worry about those causing strictures because of the scar tissue that formed is going to be circular in nature and slowly can track down over time. And the question is, will it expand and remodel to allow feed and things to move past, and that's going to be the biggest worry with a circumferential lesion.


And this is in comparison to the image on the top, which is a linear laceration. Although this looks pretty bad, it is not circumferential, which is great. And so this horse is actually going to have less risk of stricture than the one in the lower right. So endoscopy images can give you a better idea of, number one, what is obstructing the esophagus, 2, the nature of the mucosal lesions, and do we have any diverticulum or changes in the esophageal shape. So there's some things that your endoscopy can show.

Endoscopic Dissection

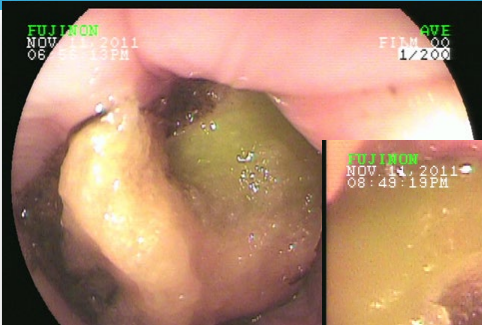



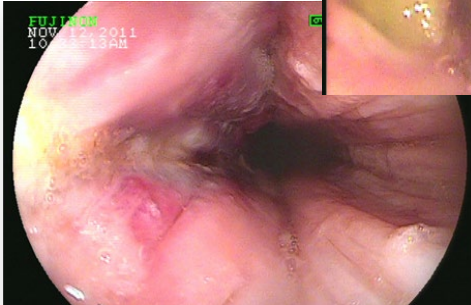
PRESENTED BY VetPrep

- Useful for solid obstructions



- Reduces trauma
- Time consuming



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One thing that can be helpful with endoscopy that's sort of an additional therapeutic that you can use is these little esophageal biopsy probes that you can place down in the scope itself. And so all those are used for taking small biopsy samples from whatever you're trying to get a sample of, they're also useful for breaking up these solid obstructions that you may have. So this is an image of a horse that ate a large chunk of apple and did not chew it, swallowed it whole and it became obstructive in his esophagus.

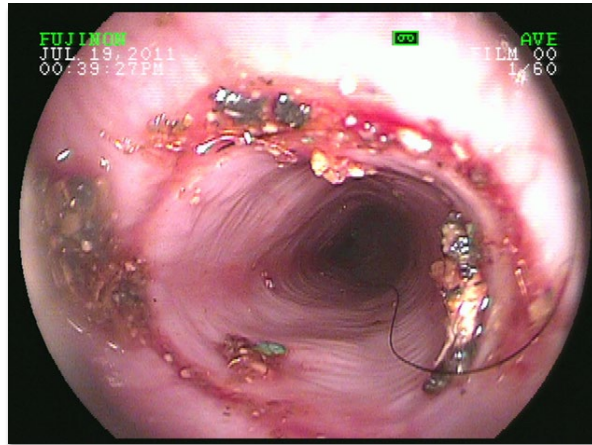
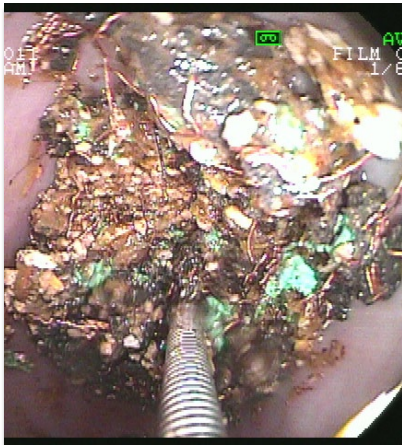
And so in this case, there's no amount of flushing that's going to remove this apple from. You can't break it up into bits with fluid. It wasn't going to be able to be pushed any further with a tube. You're probably going to rupture the esophagus if you tried.

And so in this case, we actually just chewed away at the side of the apple with these small the small biopsy instruments in order to create a big enough sort of erosion in the apple itself to allow the apple to then turn and be passed down the esophagus with a tube. So although it's good for resolving these solid obstructions, it does take a lot of time. So this is probably six to eight hours of picking away at this apple in order to remove it from the horse's esophagus, so it's very time consuming. We have to probably do this in stages so the horse can rest in between. They will need fluids in between.

And so although there are some benefits in that we aren't having to excise the esophagus, which has a lot of complications, it does have the negatives that, number one, we can't tell how large this apple piece is and we can't see how deep it goes, and it takes a lot of time to break up. But this is another mechanism, at least, we have or method we have to resolve esophageal obstructions.

Endoscopic Dissection: Case Example

- Copper Wire Obstruction

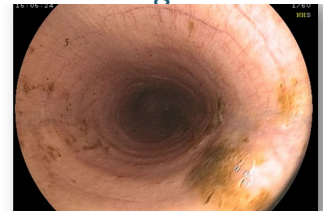
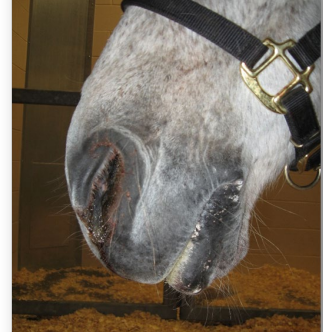


This is another example when we used endoscopic dissection to remove an esophageal obstruction. This was a horse that ate the wire that was-- this was the wire coming off of a fan outside his stall. And so he pulled it into a stall, he chewed it up into tiny little pieces, and then swallowed it, along with food as well as a plastic covering on the wire itself.

And so you can see these tiny little copper fragments that are in there along with the plastic, food, all became this giant bolus that then is Velcroed to the inside of the horse's mucosa. And so there wasn't any way we could flush it out. It was just sort of stuck in, like barbed wire into the esophagus itself. And so in this case, we again picked away at it with the biopsy instrument and were able to relieve the obstruction there. And you can see the after picture on the right-hand side. Small-- a little bit of esophageal erosion, but very minimal, and we didn't have to open this horse's esophagus to get it out.

Sequelae: After resolution...

- Most cases respond to gentle lavage
- Dilation of esophagus may persist
 - Predisposes to re-obstruction for 48 hours
- Withhold feed for 1-2 days
 - Introduce small quantities of soft feed mashes
 - Feed restrictions may need to continue depending on duration and damage
- Antimicrobials indicated for 5-7 days
 - Broad spectrum
 - Tetanus toxoid



So say you pass the tube, you're able to flush this obstruction into the stomach, remove the rest of it, and you were able to resolve the obstruction fairly quickly. What do you do after that? So you have to remember that because that obstruction may have been in there for a period of time, we worry about it basically stretching the esophagus and causing a temporary dilation.

And most of the time, this will persist for about 48 hours, somewhere around there, after the obstruction is relieved. So we want to make sure that we are very careful about feeding them slowly after a choke has occurred. So most of the time, we'll withhold feed for one to two days, and we want to make sure that esophagus is working appropriately before we start giving them food and possibly allowing it to reobstruct.

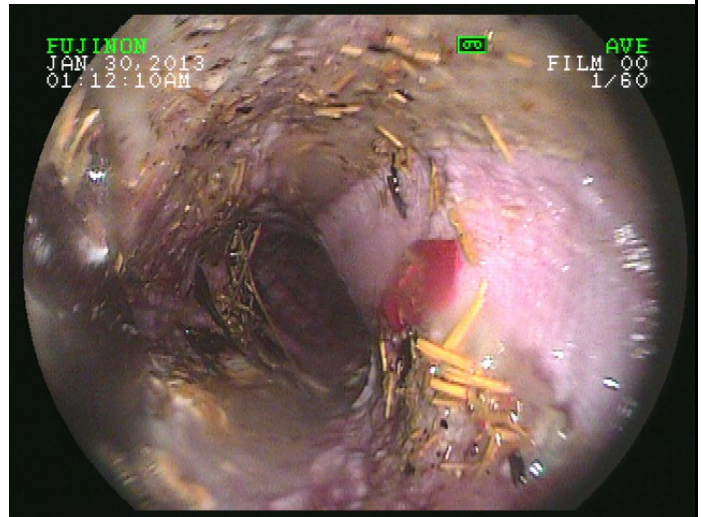
At that time, you can start giving them very small quantities of soft feed. So usually we'll do, say, a senior mash. We could do maybe a beet pulp. I probably would avoid-- I'm sorry, Brian, I would probably avoid beet pulp just because it have a tendency to obstruct in some of these guys. So usually our pelleted feed is usually what we reach for.

So feed them very small amounts, see if they can handle that. And then slowly reintroduce them to feed, depending on how much damage do has occurred. If you've scoped them, you know if they have some pretty significant erosions, you might want to extend that soft feeding out to either 10 to 14 days, just to make sure that you don't cause complications down the road.

In addition to that, you want to go ahead and give them a broad spectrum antibiotic for about five to seven days for uncomplicated chokes, just to cover the fact that they probably have aspirated a fair amount of stuff and we don't want to see them develop pleural pneumonia down the road. So an oral TMS is perfectly acceptable. If it's more severe, you may have to choose a penicillin gentamicin combination, but most of the time team us is perfectly acceptable. Remember, again, to boost them with their tetanus toxoid, just to make sure if there's any lacerations in that esophagus that you have them covered for tetanus on top of that.

Mucosal Ulceration and Esophagitis

- May be longitudinal or circumferential
- Secondary to...
 - Impactions
 - NSAIDS in foals
 - Reflux esophagitis
- Low bulk diet and reassess in 10-14 days
 - Strictures occur in 30 days
 - Most common with ulcers more than 2.5 cm long
- Remodeling will continue for 60 days
 - 71% resolve without treatment
 - *Todhunter et al 1984*



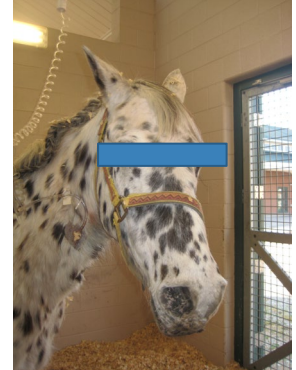
So what do we see in terms of complications after esophageal obstruction? Probably the most common one we see are going to be our mucosal ulcerations. And so again, you worry about the circumferential ones more than you would the longitudinal ones. So if you do see these on your endoscopy-- it's probably the only way you're going to diagnose these-- you want to make sure, again, you provide them with low-bulk diet and then reassess them in 10, 14 days.

It's important to remember that, just like any wound in the body, a structure will continue to remodel for about 60 days. So if you think about the contraction of a wound is going to be the tightest or the smallest at about 30 days after the injury, and so this is when they're most likely to reobstruct or choke. And so what we want to do is continue that soft feeding out to about 60 days. This is about the time period for that scar or that wound to remodel and that structure to open up.

And they've shown in most horses that have esophageal structures, if they're not severe, most resolve within about 60 days, about 70% of those, without any additional treatments whatsoever. So we can continue the soft feed, low-bulk diet, these horses typically resolve without any additional therapies.

Unresponsive Esophageal Obstruction

- Place in stall on IV fluids
 - Sedation may assist in relaxing the esophagus
 - Wait 8-12 hours and reattempt lavage
- If still unsuccessful, can anesthetize and lavage under pressure
 - Place esophageal tube prior to anesthesia



What about the horses that have an esophageal obstruction and aren't able to pass the tube? You've worked on it for a while, the horse has woken up from sedation once or twice. It isn't moving, you aren't getting any feed from the nostrils while you're lavaging, and you're just worried you're not getting anywhere.

So one thing you could do is scope to see exactly what's obstructing the esophagus. And if you don't see other complicating factors, a foreign body or some sort of other complication, a diverticulum, what you can do is just place the horse in a stall on some IV fluids and then provide them with pretty heavy sedation. And I-- just removing that sympathetic stimulus, allowing them to relax, keeping their head down, rehydrating them and hopefully rehydrate that impaction. A lot of times, this obstruction will resolve on its own.

So usually what I'll do is place them in the stall overnight and then reassess them in the morning, either scope them or gently try to lavage them again and see if the tube will pass. And a lot of these horses, as long as there's not another physical reason for them to have that choke, so stricture or diverticulum, these horses will resolve with just fluids and time.

If you're still unsuccessful and you just have a feed impaction, no other complicating factors, and providing them with fluids and waiting them out overnight has not resolved your obstruction, you can anesthetize these horse and horses and try to lavage it under pressure. So what we'll usually do is place the tube first. It's really hard to tube a horse under anesthesia, and then anesthetize them, keep their

head down, and then try to, again, flush and gently pass that tube into the stomach. And sometimes that will relieve our more severe chokes that these other ways of tubing them or fluids and time have not allowed you to resolve the obstruction.

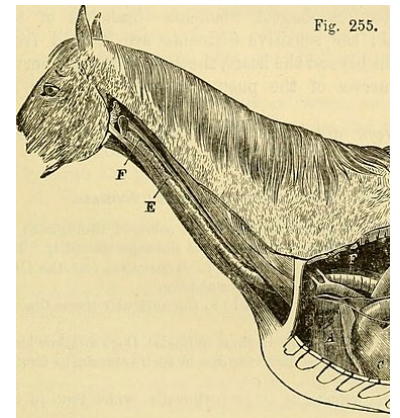
Surgical Approaches: Esophagotomy

- Useful for foreign bodies or persistent obstructions

- GA or standing sedation

- Ventral approach (allows for drainage)

- 10 cm midline incision
- Separate sternothyroideus, sternohyoideus, and omohyoideus m.
- Blunt dissection on left side
 - Avoid vessels
 - Caution when retract left carotid sheath



- Lateral approach is also valid directly over mass/tube

So if all else fails, you've tried lavaging, you've tried fluids, you tried time and sedation, and nothing else is getting rid of it, or say you have a foreign body, a big chunk of carrot or apple or something that you're just not going to be able to move with lavage and pressure, what you can do is perform an esophagotomy. And this can be a way to remove that obstruction and still salvage this horse in a reasonable manner.

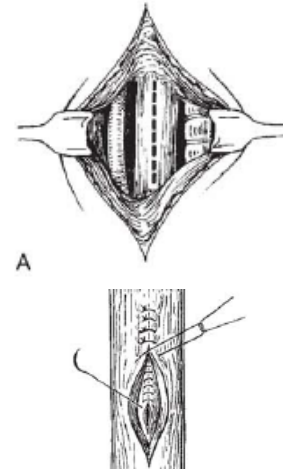
So it can be performed under general anesthesia or standing under local anesthesia with some sedation. But you do need to know your anatomy. And like we talked about before, it's very easy to disrupt the circulation innervation to the esophagus and cause problems down the road. So we want to make sure we know where we're going, and we know what we're doing once we get in there.

There's two ways we can approach the esophagus. One would be-- the probably preferred way would be through a ventral approach, so on midline. We're going to separate the strap muscles and then dissect bluntly onto the left side, avoiding the arteries, gently retracting the carotid sheath, and then locating the esophagus. Often placing the tube first to the level of that obstruction will allow you to identify the esophagus and all the rest of the tissues. But then once you get there, you can identify where it is.

The other way, especially if they're standing, to approach the esophagus is from a lateral approach, directly over that mass, or if you can see your tube, over the tube itself, and that's another way you can dissect through the muscle layers to get to the esophagus.

Surgical Approaches: Esophagotomy

- Pediatric Balfour retractors aid in exposure
- Longitudinal incision into lumen
- Closure performed if esophagus healthy
 - Closure of mucosa with 3-0 polypropylene
 - Knots in lumen-sloughs in 60 days
 - Muscle apposed with 3-0 absorbable suture
 - Remaining muscle closed with 0 suture
- Closed suction drain placed by esophagus and maintained for 48 hours



Once you've found the esophagus, usually some retractors will help aid in exposure. You'll make a longitudinal incision into the esophageal wound and then remove your obstruction. So once you get there, the actual approach is not very difficult, it's just getting to the esophagus carefully that takes the most time.

Once you remove the obstruction, you want to close the esophagus very carefully. So remember, the mucosa is the holding layer, so the mucosa and submucosa. We usually closed that with some sort of nonabsorbable suture and place our knots in the lumen. And what that's going to do is allow for a very secure closure. We won't have any dissolution or dissolving of those sutures early if we used an absorbable suture. And the sutures was simply just slough into the lumen and pass off through the horse.

We'll get the mucosa and submucosa closed nice and tight, and then close the muscle layers over that, close our approach, and make sure we have a suction drain in there. The most important reason for the suction drain is to identify if you have any leakage from that esophagus. And so we'll keep that in for about 48 hours to make sure there isn't any disruption of our sutures because if there is, then basically we have an esophageal rupture that we need to drain to the outside.

Surgical Approaches: Esophagotomy

● Post-operative Care

- Withhold feed for 48 hours
- Maintain hydration with parenteral fluids
- Slurries for the following week
 - Senior pellets
 - Purina WellSolve W/G
 - 100% NRC requirements
 - Low bulk powder
 - Can be given through a tube



- *Endoscopy may provide guidance for when normal feeds can be introduced*

So post-operative care for esophagotomy, you want to withhold food for about 48 hours. We want to make sure that mucosa is sealed nice and tight. We'll keep them on IV fluids, and then we'll slowly reintroduce some sort of slurry, so either senior pellets.

Purina has this WellSolve that's on the market that's already crushed up for you. That's nice. It fits down the tube really easy. I have no financial investment in WellSolve, but it does something else out on the market that you can provide for your owners. Scoping them at about two weeks can give you some idea of whether or not that mucosa is well healed and give you an idea when you can start reintroducing some more normal feeds for this horse.

Ruptured Esophagus

- **Causes**

- Long-standing choke
- Aggressive nasogastric intubation
- Foreign body penetration
- External trauma

- **Clinical signs**

- Swelling
- Subcutaneous emphysema

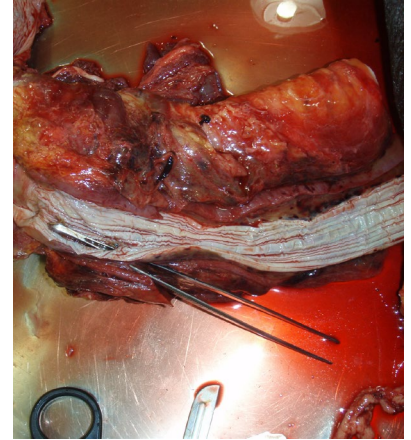


Another complication we see with esophageal obstructions is a ruptured esophagus, and we'll see this sometimes with horses that have had a long standing choke, it's gone for a long period of time, that obstruction is actually eroded through the esophagus. It could be due to aggressive nasogastric intubation or trying to push that obstruction through and the esophagus is already weak, or it could be due to either a foreign body or some sort of trauma to the neck.

But we can usually identify it based on, number one, the swelling. Most horses with esophageal obstructions would not have swung over the entire neck. You can see this horse has a pretty swollen neck. And you can actually feel the crepitus or subcutaneous cutaneous emphysema underneath the skin of these horses.

Treatment of Esophageal Rupture

- **Drainage must be established**
 - Preferably ventral midline
 - Prevents mediastinitis, pleuritis and septicemia
 - Daily lavage is required
- Closure of the perforation is only possible in acute cases



So treatment on esophageal rupture is an emergency. We need to establish drainage as soon as possible. We want to preferably do this on ventral midline because we want it to dissect down and not over to the side, where it could develop pockets ventrally. So the idea there is that we want to get everything to move to the outside. We don't want to dissect down the planes of the fascia in the neck into the chest where it could either cause a mediastinitis or pleuritis or even kill the horse. So it's very important to get things to drain out.

You will have to lavage these guys daily, and we usually can't close the hole in the esophagus because there's usually such severe damage that there's just not any healthy tissue to connect. So we're going to let this granulate in on its own, and it eventually will close once the infection is resolved. So antibiotics and drainage are the key for these guys.

Surgical Approaches: Cervical Esophagostomy



- Allows for alimentation that bypasses pharynx and proximal disease

- Typically placed distal to injury
- Can be placed through wound as well



- Performed under general anesthesia or standing under sedation and local anesthesia

- Place esophageal tube prior to surgery

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One thing we have to think about with an esophageal rupture is that we are probably not going to be able to feed this horse for some period of time. It takes a long time for these guys to granulate in, for this infection to resolve. And so we have to think about how we're going to get this horse some sort of food into its system. So one way we can do that as a cervical esophagostomy tube. And so it's typically either placed distal to the injury, or we can actually place it through the esophageal wound itself and allow it to granulate in around that tube.

So it can be performed under GA or understanding sedation and local anesthesia. Again, it's often helpful to go ahead and place an esophageal tube before you anesthetize them because it's very difficult to identify the esophagus with all the other muscle layers, especially if they have some trauma to the neck.

Surgical Approaches: Cervical Esophagostomy

- Approach is ventrolateral in the jugular furrow
 - Avoids trachea
 - Improves access distally in neck
- Perform 5 cm incision ventral to jugular vein
- Separate sternocephalicus and brachiocephalicus m. to expose esophagus



So if you're performing a esophagostomy tube by itself, usually we are going to approach them ventrolateral, so just for the jugular vein, to try to avoid placing that tube directly over the trachea. However, if there's already a wound, sometimes we are going directly through that.

We'll separate the sternocephalicus, brachiocephalicus, expose that esophagus.

Surgical Approaches: Cervical Esophagostomy

- Esophagus is incised longitudinally 3cm over the nasogastric tube
 - Remove tube and replace with 24 mm tube through the wound into the stomach
 - Enlarge incision if difficult to place
 - Ensure though all layers into lumen
 - Secure to skin with tape butterflies and suture



You see in this picture. And then we'll incise the esophagus longitudinally. So pull our tube back so we can get the new tube in through the mouth, and then place that tube all the way into the stomach.

If we need to make the incision a little bit bigger, we can. Just you want to make sure you're going through all layers and get it directly into the lumen of the esophagus. It's easy to really easy to invert some of those tissues into that incision line, so we want to make sure it's definitely placed appropriately.

Once the tubes in the stomach, we'll just sort of roll it up and attach it to the skin with some tape butterflies, suture it there. And it's going to remain in place until that esophagostomy is granulated in.

So when do you take this tube out?

Surgical Approaches: Cervical Esophagostomy



- Keep tube in place for 7-10 days to allow granulation tissue to form a true stoma
 - Longer may be needed for ruptures or perforations
- Remove tube when wound has granulated fully if no longer needed
 - Stoma will typically heal in 3-4 weeks
 - Normal feeding by mouth can be resumed after stoma is complete
 - Feed with bucket at withers or higher to reduce losses

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You want to keep it in place for about 7 to 10 days. We want enough granulation tissue around that surgical incision or that wound so that things are not going to be dissecting down.

They're going to continue to swallow saliva. They may try to eat some things, and it's going to pass down the esophagus. We want to make sure that the granulation tissue is fully formed so that it's not getting any of that food or slide it into the tissue planes around it. So again, if they've had a rupture or they've have some sort of wound, it may take a lot longer for you get a nice granulation bed before you can decide to pull that tube.

So once you have a good granulation bed, you can then pull the tube. That stoma will heal in about three to four weeks. So they can start taking some food in once you pull the tube and you think they can take-- they have a good granulation bed. But they are going to lose a fair amount out of that stoma, and so one thing you can do to sort of help keep things going down the esophagus and not out into the floor is to put their bucket or their food out about withers height. And that's going to help keep things going the right direction, rather than it just by gravity falling back out that hole.

Surgical Approaches: Cervical Esophagostomy

- **Complications**

- *May be severe*
- Mediastinitis
- Pleuritis
- Septicemia
- Hemorrhage
- Tracheal obstruction
- Laminitis



- **Antimicrobials must continue for 7-10 days**

So while esophagostomy tubes can be lifesaving, they have a lot of complications that we have to be concerned about. So we always worry about, because we made an incision into the esophagus, things dissecting back out, just like a rupture and heading towards the chest. So we worry about mediastinitis, we worry about pleuritis, we worry about hemorrhage if we hit any of those vessels for the carotid that are supplying the esophagus. So those are some things we worry about.

Tracheal obstruction, it had a lot of swelling. And then, as you can see in this horse, we have her on ice. It's just to prevent laminitis. So this isn't something we'd automatically send home with the owner unless there's no other complications, we're just trying to feed this for some other reason, either some sort of oral lesion or something, the pharynx, that we're feeding them. But if it's a wound or if we have an esophageal rupture, these guys usually are pretty sick and have to stay in the hospital. Definitely want to continue our antimicrobials at least 7 to 10 days so we have a good granulation bed, but it may have to be longer if they've had other complicating factors.

Esophageal Strictures

- A narrowing of the esophageal lumen
- Causes
 - Trauma
 - Surgical dehiscence
 - Compression by adjacent structures
- Types
 - Mural lesions in adventitia and muscularis layers
 - Esophageal rings involving the mucosa and submucosa
 - Annular stenosis of all layers



One complication that we often see with choke would be esophageal strictures. Again, if they have that circumferential ring of mucosal disruption, we do worry about that causing a scar that would narrow that lumen. So again, trauma can cause it. If we have a surgical wound that dehisces. That could cause it, or even compression by adjacent structures, you have scar tissue forming around the esophagus, we may see a stricture.

So there's a number of different types. It could be just a stricture of the muscular layers or the muscle wall. It could be just the mucosa inside, or it could be all of the layers. So there's different ways you can have a stricture. But probably the muscle layers are going to be the most common ones we see.

Conservative Management of Strictures

- “Bougienage”
 - May need repeated events
 - Risks rupture
 - Rarely successful
 - Prutton 2015
- Remember...most resolve in 60 days
- Chronic strictures require surgical attention
 - Mural strictures have the best prognosis
 - Esophagomyotomy



Prutton JS, Marks SL, Aleman M. Endoscopic Balloon Dilatation of Esophageal Strictures in 9 Horses. J Vet Intern Med. 2015 Jul-Aug;29(4):1105-11.

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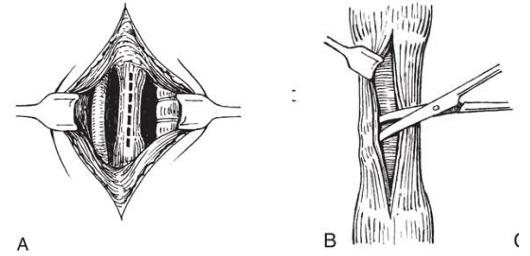
So conservative management with strictures, like we said before, most will resolve within about 60 days. So as long as we feed them a low-bulk feed and wait them out, a lot of these will go ahead and remodel and expand, and we won't have to do additional therapies.

But one conservative method you may hear see in the literature would be bougienage, and this is basically involves passing a tube with a large balloon on it into the stricture and inflating the balloon to stretch that stricture out. They use this commonly in people. In horses, it hasn't been very successful. There have been a couple of cases that have resolved, but a lot of them take a number of repeated bougienage attempts, and it also risks possibly rupturing the esophagus in these horses. So it's not without risk to perform this procedure, but it is a way that we can possibly address them without making a surgical incision into the esophagus.

If you've had this horse with a stricture, you've taken them out 60 days, and they aren't improving and we don't see resolution of this stricture in the esophagus, these horses may require surgical attention. And so while those mural strictures have the best prognosis, sometimes you may be able to also resolve mucosal strictures as well. So the procedure we usually talk about in terms of addressing strictures is esophagomyotomies.

Surgical Approaches: Esophagomyotomy

- Esophagus approached and muscle incised
 - Incision extended 1 cm proximal and distal
 - Important: the mucosa is not entered
- Nasogastric tube is passed distally
- Separate muscularis circumferentially
- Muscle is not closed
 - Approach through neck musculature and skin is sutured as previous
- Progress is followed with repeat radiographs/barium studies



So we'll make our standard approach to the esophagus. We'll have our tube already placed in the esophagus so we can identify it. And then we'll incise basically through the muscle layers themselves. So we want to try to avoid incising the mucosa and making this an open wound because that would then make it a dirty incision. We worry about infections, et cetera.

So we'll incise the muscle layers. We'll then dissect them off the mucosa and basically try to expand that around and then leave it open. So the idea here is that we're trying to open the muscle layers away from the mucosa, allow it to expand, and hopefully the muscle will then heal at a larger position than it was before. And so we'll close the neck muscles and the skin as usual. We'll leave the muscle layers that comprise the esophagus unsutured so they can remain as expanded and hopefully not restricture.

So we'll follow these horses out with repeat radiographs or barium studies to see if that surgical procedure has worked, and then see if we need to address additional strictures down the road.

Surgical Approaches: Esophagomyotomy

- Post-operative care

- Soft feeding for 4-6 weeks

- Complications

- Leakage of saliva and luminal contents
- Fistula formation
- Re-stricture
 - Conservative management often resolves new strictures
 - More complicated strictures may require resection and anastomosis, or patch grafting

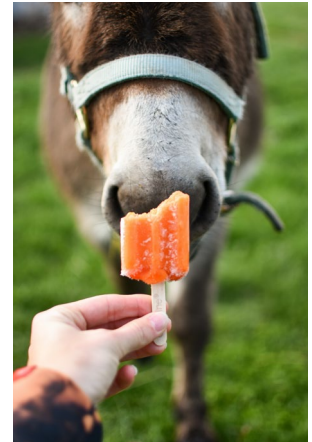


Photo by Julissa Helmuth from Pexels

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So afterwards, we're going to, again, feed these horses with mashes for four to six weeks. We have worry about all the things we worry about with any esophageal surgery-- leakage, fistulas, restricture. If they do get a new stricture, sometimes we can go ahead and treat them conservatively, so that 60-day protocol, and see if they'll expand.

But if another stricture forms and it doesn't resolve it the 60 days, that's when more extensive surgeries may be involved, so resection, anastomosis, patch grafting a muscle into that area. Those are the ones that become the big problems. But most of these structures will resolve just with, again, conservative therapy.

Esophageal Diverticulum

- **TWO TYPES**

- **Traction (true) diverticulum**

- Caused by contraction of periesophageal scar tissues
- Outward tenting of all layers of the esophageal wall



True



False

- **Pulsion (false) diverticulum**

- Protrusion of muscularis and submucosa layers through a defect in muscularis

So the final problem. We see with esophageal obstructions is esophageal diverticulums, and these may either be a cause or a result of esophageal obstruction. There are two types they love to ask you about in the literature. There's traction or true diverticulum, so it's going to be some sort of scar tissue that attaches to the esophagus and then pulls it outwards into the sac. It's going to have a bit of a large opening, and basically all the layers of the esophageal are tempting out.

The other would be the pulsion, or false, diverticulum. And this is where you have some sort of trauma or rent in the muscle areas of the esophagus that allows the mucosal to actually protrude out and then form a sac that forms outside the esophagus. So it has a very narrow flask-like neck.

Esophageal Diverticulum

- Causes of traction diverticulum
 - Healed esophagotomy surgery
 - Surgical or traumatic wounds
 - Neck abscess



- Pulsion diverticulum may be due to external trauma

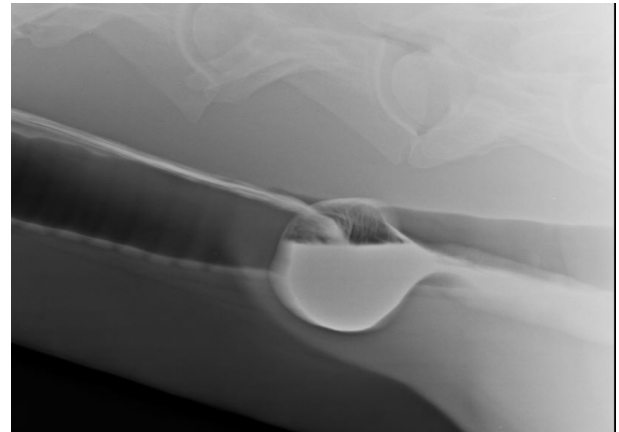
So traction diverticulums are caused by a number of things that may form scar tissue around the esophagus, so esophagostomy surgery, surgery to the neck, wounds, or abscesses in the neck area. So this was a horse that ran to a fence, and you can see her jugular veins actually sticking out right here and was pulsing outside of the neck. So this horse is at risk for forming a traction diverticulum because the esophagus is right there, exposed. A pulsion diverticulum can be caused by external trauma, most commonly.

Esophageal Diverticulum

- **Diagnosis:**

- **RADIOGRAPHS**

- Traction diverticulum are spherical with a wide neck
 - Pulsion diverticulum are flask-like with a narrow neck



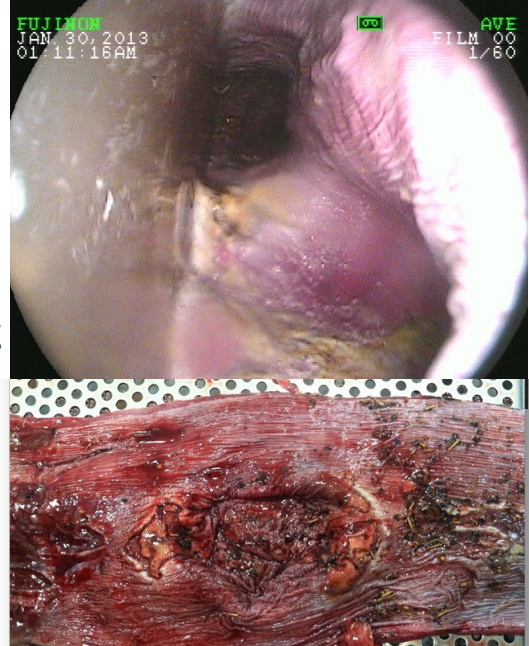
So differentiating the two. Radiographs are sometimes helpful, so we can give them a barium contrast study. Traction diverticulum, again, are going to be pretty wide base necks, they're going to be round. It's going to be this big blob that comes off of there, versus a pulsion diverticulum, where you have a very narrow neck. It'll maybe round as well, but you'll see just a narrow tube separates from the lumen of the esophagus. So that's one way you can diagnose them.

Esophageal Diverticulum

- Diagnosis:

- **ESOPHAGOSCOPY**

- Defines the size
 - Demonstrates the configuration of the opening
 - Helps to identify the type



The other way would be esophagoscopy, so basically scoping the horse's esophagus. You can identify the size. In this horse, again, we had traction diverticula. A big, large sac was formed off the esophagus that was being pulled out by a scar in the muscles surrounding the neck. So this is going to give you an idea, again, of the configuration, the opening, and identify the type.

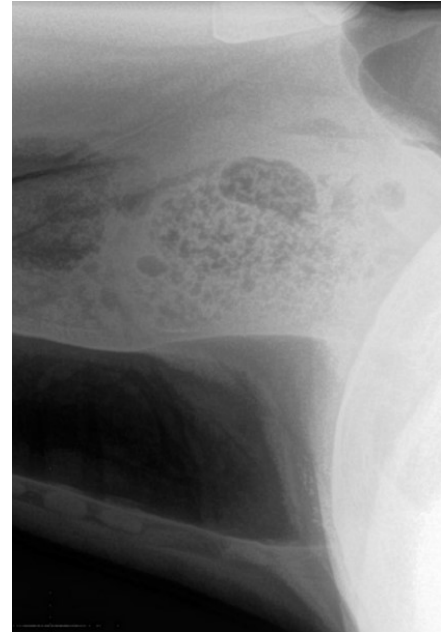
Esophageal Diverticulum

- **Clinical Differences**

- Traction diverticulum
 - rarely cause clinical signs
- Pulsion diverticulum
 - enlarge progressively and risk rupture

- **Treatment**

- Diverticulectomy? Not ideal
- Mucosal inversion
 - Preferred
 - Fewer complications



So clinically, the traction diverticulums often don't cause a lot of clinical problems. They may have a large sac there, but food is able to get in and out of that sac. They typically can move things through, and they often don't cause a problem. The ones we do worry about are those pulsion diverticulums because if the food is packing through that tiny little neck into that pouch, it can continue to pack repeatedly and enlarge progressively until the horse possibly ruptures their esophagus.

So how do we treat these guys? Some people say, just chop them off. Not ideal because then you're opening the esophagus. Again, you have to have all those complications that go along with opening the esophagus to the neck muscle itself. So most of the time what we like to do is just invert the mucus in and close the defect because it has fewer complications.

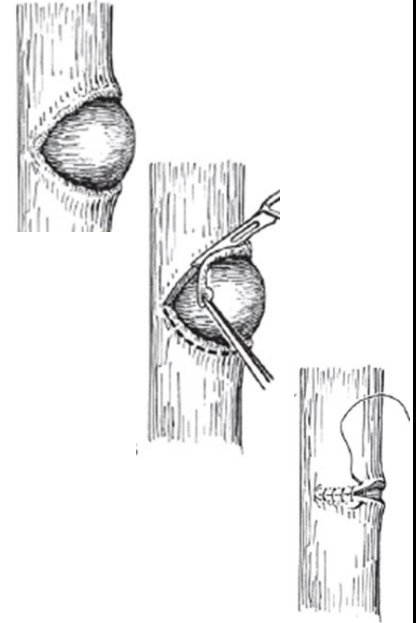
Surgical Approaches: Mucosal Inversion of Diverticulum

- **Expose esophagus and identify diverticulum**

- *As previously described*
- Debride muscularis m. layer to healthy tissue
- Invert mucosal sac
- Appose muscularis layer with interrupted sutures of 3-0 polypropylene

- **Post-operative care**

- Soft feeding for 4-6 weeks



So exposed esophagus, as we talked about before, debride the muscles surrounding that diverticulum, and then invert the mucosal sac into the esophagus itself. Those muscles then closed over the top, and then there again, the soft feed for four to six weeks as that heals. And then basically, like I said before, monitor them with endoscopy, possibly radiographs with the barium study to make sure this hasn't reformed and they haven't formed a stricture.

General Complications of Esophageal Surgery

- **Dehiscence**
 - Closed suction drain detects salivary leakage
 - Large amounts require intervention
 - Open wound management
- **Dissecting infection (to the chest)**
- **Strictures**
- **Laryngeal hemiplegia**
- **Carotid artery rupture**



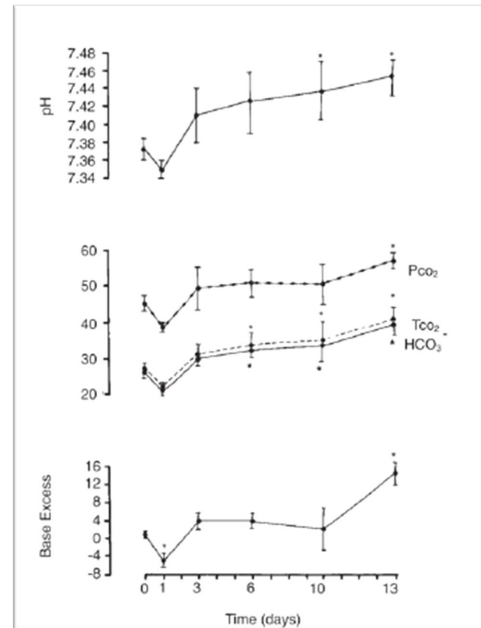
So we talked about a lot of complications that we can have with esophageal surgeries, dehiscence, infections, dissecting to the chest, strictures. We also could see surgical complications, such as laryngeal hemiplegia, pulling on the sympathetic trunk, or carotid artery rupture, if it gets too close to that structure. So hopefully we can avoid most of these by getting to these forces early, resolving these chokes medically, and making sure our owners are aware of these situations so they can address these as quickly as possible.

General Complications of Esophageal Surgery

- Additional Issues:

- Acid base disturbances

- Hyponatremia
 - Hypochloremia
 - Metabolic acidosis
 - (transient)
 - Metabolic alkalosis
 - (progressive)
 - May require sodium chloride supplementation
 - Potassium is adequate in feed



Other things we worry about with horses with choke, again, are going to be those acid-base disturbances. So getting a blood gas in these guys is often very helpful. You can identify these hyponatremias and hyperkalemias, especially if it's long standing and allow you to address those as well.

A lot of these guys have a metabolic acidosis initially just because they're dehydrated, their lactates may be high. But if they're continuing to lose a lot of saliva over time, you may see that metabolic alkalosis form. So sodium chloride, you can give them a salt slurry when you give them their dose of fluids after you resolve the choke, give them some electrolytes with the fluids. Most of the time, putting them back on feed, any alterations in their potassium will be resolved, but we do worry about having a low sodium chloride in these guys if it's long standing.

Prevention of Esophageal Obstruction

- Feed appropriate, good quality feedstuffs
 - Pelleted feed for seniors
 - Wet feed
 - Bite size treats specifically for horses
 - Avoid hard foods (apples, carrots)
 - Slow intake in horses that bolt feed
 - Special feeders
- Prevent access to objects/foreign bodies
- Provide adequate dental care
- Owner education



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So prevention, got to instruct our owners to feed them appropriate foodstuffs. So if they're older horses, they may not be able to eat hay. So they may have to be just on pelleted feed. If they've had recurrent chokes, we have to talk about using either low-bulk feed or senior feeds for at least a period of time till we know they're not going to form a stricture, or they may have to stay on that for life.

Make sure they provide bite-sized treats for these horses. Chop up the carrots or shave the carrots into just carrot shavings, instead of giving them big chunks, so that we could reduce the risk, especially if these horses like to bolt their feed.

There are special feeders out there, slow feeders for these horses, that have little pockets in the tub that they can-- the feed will sort of get trapped in, so they have to slowly get the feed out. Especially if you have a horse that just grabs a whole bunch of pellets at one time and swallows it all at once, that might be a way to at least slow them down. So we have to think a little bit smarter than the horse. Sometimes they want to eat as fast as they possibly can.

Make sure your younger horses don't have access to foreign bodies that could possibly cause a problem in our older horses. Make sure they're getting dental care at least twice a year, and then making sure owners are aware of what choke looks like. Maybe have a little seminar with your horse owners at your clinic and sort of talk about what choke looks like. If you see green feed coming from their nose, call somebody as soon as possible, and then make sure they're getting checked on often enough to catch this in time.

Summary

- Choke is the most common esophageal disorder
- Early and gentle intervention avoids complications
- Recurrent choke should be pursued with advanced diagnostics
- Most esophageal surgery is simple in technique, but complications are common

So summary, choke, most common esophageal disorder you're going to see. There are some things that may predispose them to having it, but a lot of it is just feed related and things that we can avoid. So getting there early and making sure that you can get them quickly resolved is going to avoid a lot of these complications that I talked about.

But if you have a horse that has recurrent choke, those are the ones you want to pursue those advanced diagnostics, so get them scoped, get a radiograph, do a barium study. Those are some things that we can do to identify possible reasons why they continue to choke.

And then we talked about a lot of different esophageal surgeries, and they're all pretty simple in terms of the incisions you're going to make. But there's lots of complications, mainly because of the problems that cause the choke in the first place. And so owner education is key to try to prevent this from happening.



Thank you for choosing Vetcetera!

I think that's it. I thank you guys for joining me tonight, and I'll be glad to take any questions.

Thank you so much Dr. Munsterman. So far, I'm not seeing any questions. We'll give it just a minute. You guys, you can type those questions in the Q&A and we'll ask them real quick if we have some time left.

So that was really interesting I greatly appreciate it. I didn't actually know they have actual special feed buckets now, but I guess that makes sense because they do them for dogs and the other species, too. I just remember using bricks in a rubber tub for my horse.

I tried that, and actually I just bought one for my own horse because she will flip everything over, and basically, the rocks were not going to stay in there. And so they make one that's a giant plastic feed tub and it has just as little pockets in it. And it works fairly well. She's learned how to flip it over, but most of the time, she's finished most of it before she gets to the flipping stage. So it's still at least an effective device for her.

She also has a slow feeder hay bowl because she eats too fast. She's a problem child. But she used to choke on a regular basis when she was a foal just because she ate too fast. And I got tired of tubing her, so I went to the I'm going to sedate you and leave in the stall overnight method, and that worked pretty well, too.

It's not like that's ever happened to problem children, right?

Always.

All right. Well, it looks like we don't have any questions. Thank you very much. You're free to hop off.

So I really appreciate your time.

Thank you.

Thanks.



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References:

Fubini SL. Esophagus. In: Auer and Stick, eds. *Equine Surgery*, 2019: 474-496.

Wooldridge AA, Eades SC, Hosgood GL, Moore RM. In vitro effects of oxytocin, acepromazine, detomidine, xylazine, butorphanol, terbutaline, isoproterenol, and dantrolene on smooth and skeletal muscles of the equine esophagus. *Am J Vet Res*. 2002 Dec;63(12):1732-7. doi: 10.2460/ajvr.2002.63.1732. PMID: 12492290.

Meyer GA, Rashmir-Raven A, Helms RJ, Brashier M. The effect of oxytocin on contractility of the equine oesophagus: a potential treatment for oesophageal obstruction. *Equine Vet J*. 2000 Mar;32(2):151-5. doi: 10.2746/04251640077591660. PMID: 10743971.

Wooldridge AA, Eades SC, Hosgood GL, Moore RM. Effects of treatment with oxytocin, xylazine butorphanol, guaifenesin, acepromazine, and detomidine on esophageal manometric pressure in conscious horses. *Am J Vet Res*. 2002 Dec;63(12):1738-44. doi: 10.2460/ajvr.2002.63.1738. PMID: 12492291.

Bertone JJ, et al. N-Butylscopolammonium Bromide Relaxes the Distal Equine Esophagus: A Mechanism for its Purported Usefulness in Esophageal Obstruction. *Proceedings of the AAEP Annual Convention, San Antonio, 2011*. RJ

Todhunter, JA Stick, GW Trotter, et al. Medical management of esophageal stricture in seven horses. *J Am Vet Med Assoc* 1984;185:784-787.

Prutton JS, Marks SL, Aleman M. Endoscopic Balloon Dilation of Esophageal Strictures in 9 Horses. *J Vet Intern Med*. 2015 Jul-Aug;29(4):1105-11. doi: 10.1111/jvim.13572. Epub 2015 Jun 25. PMID: 26118925; PMCID: PMC4895364.