Disease Du Jour Podcast Episode 59 Transcription—Dr Gardner on Bandaging

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Kim Brown: Welcome to this Episode of Disease Du Jour, Episode 59. This episode is on the topic of bandaging tips with Dr. Alison Gardner. And we have a bonus for you today. Dr. Gardner is recording a webinar to go along with the podcast so you can actually see some of the banding tips she is discussing if you want to.

Dr. Gardner is a DVM and a Diplomat in the American College of Veterinary Surgeons—Large Animal, and a Diplomat of the American College of Veterinary Emergency and Critical Care—Large Animal. She is an associate professor in clinical equine surgery in the Department of Veterinary Clinical Science at The Ohio State University.

I'm your host, Kim Brown, publisher of EquiManagement.

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Welcome back, Dr. Gardner!

Dr. Alison Gardner: Hey Kim. Thanks so much. I really appreciate you having me on today.

Kim Brown: Well, we are very excited about this.

We had a great Disease Du Jour podcast with Dr. Gardner on suturing just prior to this, and in late May, we talked to Dr. Jared Williams from the University of Georgia on Emergency Medicine.

So, this episode on Bandaging Tips is a great finish to our emergency medicine "triple crown."

And as we mentioned, as an added bonus, Dr. Gardener will have a webinar to give visuals to her tips some bandaging so you can watch the webinar on EquiManagement on the article for this Disease Du Jour episode.

So, Dr. Gardner, I'm going to just ask, you know, what your strategies and justifications are on bandaging and wound healing timeline, and let you share your screen, and we'll start the webinar.

Dr. Alison Gardner: Again, thanks for that, Kim. And I appreciate you having me on.

I've included a lot of images in this webinar, just because I have an easier time speaking to pictures.

I do want to say all of the images in this PowerPoint either do not identify the animal just the wound or any pictures where the animal may be identified were used with owner permission. So, I always appreciate those owners giving me follow up and, again, hopefully this podcast can be listened to independent of the webinar. But if you want to see what I'm referring to, feel free to glance through the pictures.

I do want to say a lot of this will be review for the veterinarians out in the field. So, like Kim said, this is just more to justify the decision-making I make in bandaging and to reference some of those decisions back to that suturing podcast that Kim talked about.

So, without further ado, let me start with this podcast.

So, the purposes of bandages in equine medicine are for several different purposes based on where that animal is in the wound healing timeline.

So initially a bandage may be placed to decrease swelling if it's an acute edematous wound, and certainly to control hemorrhage.

And, I believe we touched on this in the suturing podcast, but there are significant vessels, especially in the distal limb, that can cause significant hemorrhage in a horse. And so tourniquets may be applied to the distal limb to assuage some blood loss while the veterinarian is coming out to the farm.

It's been shown in several other animals—small animals, humans—that a tourniquet placed for an hour or less will not compromise the blood flow to that limb long-term. So that's what I'll generally recommend to my owners if they notice that one of the digital vessels has been lanced while that veterinarian is going out to try to control that hemorrhage and the bandaging. However, I do say that if that tourniquet is placed for over an hour, there is some concern to extensive ischemia to that distal limb.

So, bandages also support closure. We'll talk about which closures can be supported with a bandage alone and which may need a little bit more in far as coaptation. Bandages can also wick away exudate from the wound. Granulation tissue in horses is not a bad thing, but it can certainly produce a lot of the exudate that needs to be taken away from the wound.

Bandages keep wounds clean. One of the major causes of exuberant granulation tissue or proud flesh is an infected wound. Bandages encourage granulation tissue, which is usually a good thing. But, as any equine practitioner knows, especially in an area of the body with low blood supply such as a distal limb, sometimes there can be too much granulation tissue. So that's something to be considered as to when an animal should have that bandage removed.

And then, bandages also prevent self-mutilation as that wound contracts —re-epithelializes—there will be neuronal growth, which can cause some, I think that

anthropomorphically, some itching. And sometimes horses will reopen those wounds because of that increased sensation.

So, most of the time when we're talking about bandages, we're talking about what's called a modified Robert Jones bandage. And you can see in the image on the slide, this is usually something over the wound—a non-stick Telfa. And then some cotton padding and Vetrap brown gauze around that.

And the reason we call it a modified Robert Jones is because a true Robert Jones usually causes that bandage to be three times the width of the lamb, which would be a massive amount of bandage material for a horse. So, a modified Robert Jones, usually we just encircle that limb with one to two layers of that cotton to protect the wound.

One of the big questions we get is what do you put on the wound under the bandage?

And a lot of things depends on what stage of healing we're in and how contaminated that wound is.

So, I'll show some examples of times that I'll use a wet to dry bandage, particularly with a hypertonic saline. And usually that's to decrease edema and to provide compression just within the first 24 hours to try to get a delayed primary closure on a wound.

A wound that is producing a lot of exudate may benefit from a calcium alginate pad.

If it's not producing too much exudate, we'll just stick a non-stick Telfa on that so that we don't tear away any of those really fragile epithelial cells that are growing into the wound every time we change the bandage.

Wound dressings include triple antibiotic, steroid cream, hydrogels, Manuka honey and silver sulfadiazine or SSD. I'll touch a little bit on these, but the purpose of this webinar is more bandaging.

I will refer anyone who's interested in further wound dressings … I just listened to the ACVS symposium, they did it digitally this year because 2020 was a year we couldn't have our conference. And a small animal surgeon, Dr. Campbell, did a really good discussion on that. So hopefully Kim will let me put in a plug for the ACVS symposium, but I thought it was a wonderful, wonderful webinar that's digitally available to veterinarians should they want to reference it. https://www.eventscribe.net/2021/ACVS/

So, moving on … the image on this slide, if you're looking at this webinar, shows all the parts and parcels to what we use for our wrap routine modified Robert Jones.

So firstly, usually we'll just lightly clean a wound if it's scabbed over at all with some saline and sterile four by fours. Although if the wound is very clean, I usually don't scrub it.

The next thing that you'll see on here is a nonstick pad or a Telfa pad. This again is for those wounds that do not produce too much exudate.

We usually either keep that pad on because they've got adhesives on either side—like a band-aid—or put a sterile roll gauze over the top of them. And then after that comes our sterile cotton combine, and I usually reach for a sterile cotton combine while that wound is still relatively fresh if I've done primary closure. Once the wound has gone from inflammatory phase to proliferative phase—so five to seven days if it's granulating well—you can probably reduce the sterility of the bandage material. You still want to keep things clean, but not quite so necessary to be absolutely sterile after that wound is closed and the fibrin has closed those wound edges together.

We usually use brown gauze followed by Vetrap, to really stratify the strength of our Robert Jones bandages, and that that just allows these bandages to be fairly tight. What I'll tell students when I'm teaching them how to bandage is when you thump your finger against the side it should sound like a watermelon.

And for the mixed animal practitioners out there, I think that's a major difference between small animal bandaging and large animal bandaging because large animals just don't have the soft tissue that small animals do on their distal limbs. There's much less of a worry of cutting off blood supply to the distal limb. And so we generally make our bandages far tighter than what small animal wounds require.

And then usually we'll finish up with some Elastikon, some stretchy, water-repellent—not quite waterproof—but water repellent tape around the top and the bottom, because that sterile cotton combine can really wick moisture up into the bandage if it's left unprotected.

So that's again probably a review for most of you out there, but I just wanted to give a basis of where I'm starting from.

Some of the points of contention are to scrub or not to scrub. I already said I'm not much of a scrubber, a lot of the wound scrubs that we use—chlorhexadine and betadine—will be deleterious against epithelial cells.

So, if that wound is clean, I will generally avoid scrubbing. And then again, many of these sterile items can be replaced with non-sterile items, even a quilt at the owners if it's available to the owner, once the wound is mostly granulated. And I'll show some examples of this in the webinar.

So, just going through the procedure, this is a horse with a pastern laceration, and you can see a non-stick Telfa is placed over the wound. This non-stick Telfa has just a line of adhesive like a Bandaid on either side. That's really nice for some of those horses that stomp their feet. This is generally a part of the bandaging, it seems, the horses resent the most.

So we've moved towards these nonstick Telfas that are nonstick in the middle and then have the adhesives on the side. If you find that the adhesive is really sticky—sometimes it can be—I'll just put some four by fours with saline on the Telfa right before I remove it at the next bandage change. And that releases some of that adhesive.

The roll gauze to the right showing the wrapping of that nonstick if it doesn't have that adhesive on it. And I usually don't go up or down the leg with this roll gauze cause it can constrict a little bit and get tight. I just do it right over the wound.

Next comes the sterile combine. And this goes around the limb at about the same tightness as a standing wrap is what I tell owners. The difference is we usually sneak it down to cover the top couple millimeters of the coronary band, because if you don't, the bandage is going to slide down on its own.

And then, brown gauze over the top of that. And fairly robustly on that. I tell my students that they should really only be able to get two fingers in the top and bottom of that bandage in rather snugly after that brown gauze is placed.

Just to point out that red Vetwrap around the carpus on this horse is just a temporary Band-Aid over a regional imperfection.

And then the Vetrap … major difference in small animal relative to equine bandages, you can see that we've really removed any of the of the stretch out of that Vetwrap. You can't see any of the lines in that Vetwrap as we place it on the bandage and then Elastikon at the top and the bottom. Elastikon, if it gets wet, it can constrict a little bit, so I usually place this rather loosely. I pull it off the roll before I placed it on a bandage. And I'm usually pretty careful with its use in foals, because with that stretchy, delicate, foal skin, it can really pull away some of the hair on foals and create some abrasions due to the Elastikon pulling on that skin.

Just to point out in a nice distal limb bandage, you can still do a regional limb perfusion above that bandage. So that's the example, given here, you can see that esmark tourniquet at the level of chestnut. We're delivering antibiotics into that vessel.

One thing that I will add on this is if you're doing this on the farm, just cover that bandage with a towel or something, because if you get any blood dripping down from your regional limb profusion … sometimes I've gotten calls from owners and I have to let them know that that was just from the regional limb perfusion. That there was not blood soaking through the bandage that they're seeing on that medial aspect of the limb

So that's just, again, the basis of Robert Jones modified bandage, the most common distal bandage that we use.

And here is an example of a laceration where it was bandaged with a modified Robert Jones from the initial injury through healing. And part of the reason I'm putting up these pictures is because this is just an example of a distal limb wound that healed really well with primary closure. So it's one of those unicorns. A lot of them don't do that. This is probably because there were really fastidious owners. It's a relatively clean wound.

And the way this horse sustained this laceration—and for those of you who can't see the images, it's a very classic dorsal cannon bone laceration—the horse actually was being ridden and it's left front fell into a lead pipe. And the horse was incredibly intelligent. He still is. He's out there. He allowed the rider to get off and extricate him from the pipe without

struggling, which I think really saved this horse's life. But it ended up that he degloved that dorsal skin from the dorsal cannon. The extensor was unaffected, which is unusual in some of these dorsal cannon bone lacerations, but this is a degloving injury from the dorsal cannon bone.

So, we were able to get a primary closure on this wound. The image to the right is immediate primary closure using some of those tension-relieving suture techniques we talked about in the suturing podcast. So, there's some near far, far near sutures in there. There's some releasing incisions. And then there's also a drain placed in this closure.

So, the times we used a modified Robert Jones in this stage of healing was for the primary injury when he was being transported to our hospital for hemostasis. And then also to decrease some of the edema that was forming in that wound. And then after primary closure to get some compression over that suture line and to protect that suture line.

From primary closure to about the first two to three days, it's pretty important in my opinion, for this bandage to be very sterile and sterilely handled because that's before the fibrin clot fills in this laceration.

So that wound is still not water resistant. You can still get significant contamination crawling between those edges of wounds if your bandage isn't sterile.

So, moving on to that scary period in any veterinarian's life after closure—that five- to seven-days post closure. I always tell owners the wound is going to look the best right after we suture it up. I'm more worried about dehiscence in that five- to seven-days post closure. And as you can see in this image, there's some granulation tissue filling in those wound edges. Some of those sutures are starting to spread. And there was a big question if the apex of this wound was going to live or not.

So, we continued with a modified Robert Jones bandage. At this point, this is a stage in bandaging where we'll still put a non-stick Telfa over those sutures, but, the owners can transition to a quilt at this time with either a polo wrap that you might not get enough compression with a polo wrap, but Vetrap certainly over the top.

And when you're talking about bandage expenses, that sterile combine is the most expensive part, aside from the Elastikon. So, using a quilt over that will really decrease expense on this bandage change for the owner. As long as the animal's wearing the bandage well, and it's not too abusive, I usually change these bandages after repair every two to three days.

So, after about two weeks after that laceration, the sutures were removed and luckily, other than that apex, the wound survived. And the owners transitioned to a standing wrap after suture removal, and it granulated really, really well after then. And at this point in the healing, the owners kind of have to know their horse because another horse, other than this one, may reach down and self-mutilate this wound. But granulation tissue is increased in hypoxic environments. And at least in horses, rather than ponies, a bandage will increase the hypoxia decrease oxygen tension to a wound. So, you may get proliferative granulation

tissue or proud flesh forming, if you keep a bandage on after this point. Although certainly if it gets infected, then it'll get proliferative as well.

So usually what I tell owners is if you can keep the horse on stall rest and if it's a horse that won't self-mutilate and you can keep the area clean, this is the time that we can try to leave it unbandaged with careful attention to make sure that the horse doesn't self-mutilate. And this guy did a good job. Again, really, really smart horse, and did not bother this granulation tissue.

And the next slide I'll show you is really what I'm happy with, which is that wound has contracted the granulation tissue did not get exuberant and the epithelial tissue moved in.

And, this is seven weeks after the original injury. And there's just a little bit of hair loss at that apex that we lost just a little bit of epithelium on. And this horse is back in work at this point. So, one of those distal limbs that did well. A lot of them don't. They get exuberant proud flesh, and that's probably a topic for a different day.

So, that's just a distal limb wound that responded well to bandaging techniques.

So, one of the, the things that I'll really try to do is leave that wound unbandaged at least for some parts of the day if the granulation tissue bed has moved in. But again, some of these horses may itch at these wounds. So, some of the strategies we'll use to prevent horses from irritating an unbandaged wound are cradles, which are wooden slats that you can wrap around the neck to keep them from being able to bend their neck to reach at a wound. Of course you want to keep this on animal on stall rest with one of these on and keep careful attention to them that they don't get caught up on anything. Grazing muzzles can work as well. Sometimes just even giving that horse enrichment so that they're not quite as focused on the wound. So hay nets, jolly balls, any kind of games like that.

And then this horse was one that really, she'd irritate the granulation tissue, but it was moving in really nicely. So, we tried an upside down Elizabethian collar on this horse's carpus. It worked because she was in our hospital and we monitored her and try to enrich her when she did reach down. But this was one of those things that didn't work too well. And I wouldn't recommend for a horse that was at a farm and unobserved for any amount of time.

So going into now a little bit of the strategy of what to do in that really acute wound period and how bandages help out here.

Here's an example of that. So, this is a wound for which a bandage really helped. This is an edematous wound. It involves the medial aspect of the dorsal cannon bone of the left hind.

And this horse did not have an extensor tendon laceration in entirety, but had lacerated enough of the extensor tendon that there was a large bulk of tissue on the flap of the laceration that was pretty edematous. There was some exposed bone in this horse, as well. As we began to debride this laceration, the hemorrhage from the tissue and just some of the irritation from our debridement caused it to become even more edematous. So, we tried to

close this the night of presentation, about three hours after the horse have lacerated itself, and just couldn't get a primary closure on this wound because of the edema.

So, what we did is we put a wet-to-dry bandage with hypertonic saline on the wound and then a modified Robert Jones over the top for compression. And this was left on for 24 hours. Any longer than 24 hours with a hypertonic saline solution will cause some maceration of the tissues. So, we generally recommend leaving it on for only 12 to 24 hours.

There's also some suggestion that 7.2% hypertonic saline isn't enough to really draw fluid out of that wound. I think it helps. But you could argue that some of the benefit is conferred by that compressive bandage as much as anything. But this is what the wound looked like 24 hours later. And while you still see exposed bone, there's much less edema within that flap. And there's the primary closure after that bandaging.

So just one of those strategies, if you feel like you can't get a wound closed in the immediate acute period, place a compression bandage, come back the next day, do a delayed primary closure. Cause that's really helped on some of these wounds that really have a lot of tension across that flap to parent tissue.

This is a wound that was much older than the previous one. This is a horse that had an axillary wound that was just a really over a high motion area. Did not heal really well for several months before presentation. The granulation tissue wound bed is beautiful here. Definitely needed some debridement as the top layer was infected, but really not too much infection over that.

But you can see in the right-hand picture, granulation tissue just produces a lot of exudate, and that exudate can scald the skin below the leg that made this horse really, really reticent to have any work done on this wound because she was just really sensitive from this granulation tissue discharge.

So, what we did initially was dry packing of the inguinal or axillary region. Because this wound is so effusive, that dry packing—I usually use cryptorchid packing or an abdominal sponge. Really make sure you count and record how many pieces of material you're packing that wound with just to make sure you can recover all of it upon removal. But if you pack it with dry material and this, in this effusive wound, it acts as a wet-to-dry bandage, which will dry out some of that contamination. In a hospital environment this is a wound that would be a candidate for negative pressure wound therapy. Wound vacs are as annoying to our night staff as fluid pumps. They just go out all the time. They require a lot of husbandry, the wound vaccuums do. So, it's not generally something that you can leave a horse overnight with it. They've got to have careful attention to them, but they really do a nice job of causing a granulation tissue, decreasing infection and really promote contractions. So this wound would be a candidate for that.

However, out in the field, after dry packing of the single axillary region, once that granulation tissue is migrated in a bit more, that's a time to use a calcium alginate dressing.

And these are absorbent dressings that encourage granulation and wound contraction. The calcium alginate once it's placed kind of turns into a bit of a gel and seems to do a good job of encouraging wound contraction.

And finally, on the flip side of those effusive wounds, we see a lot of these wounds with exposed bones.

So over and over again, one of the most common lacerations we see it are horses caught up in high tensile wire, and they completely exposed their dorsal cannon bone. And these horses have a good prognosis for even return to athleticism. For whatever reason, the extensor tendon lacerations don't have the “fair” prognosis of a flexor tendon laceration. They've got a “good” prognosis even without primary closure of that lacerated tendon.

But unfortunately, this exposed bone can really turn into a sequestrum. To try and prevent that we'll try to promote rehydration of that surface as much as possible. You can do that with hydrogels, which support an autolytic debridement, granulation, and epithelialization over the top of this.

And that hydrogel comes in sprays, gels or wound topicals.

Another thing that we've started to use is amnion harvested from healthy placentas of mares, and that amnion also has growth factors in it. So, that's considered a great way to promote some of that autolytic debridement, granulation, epithelialization, as well as encouraging growth factors in the wound.

And there's a couple of protocols on how to harvest this amnion and then how to clean it in these Petri dishes. I’ve got a freezer downstairs. They've got that blue coloration because of our chlorhex solution cleaning protocol. And those can be found again at the ACVS symposium this year. And then there's also an AAEP conference proceedings that talks about that as well.

And those are placed over the exposed bone and then underneath a bandage.

Granulating/granulated wounds, a lot of times I'll just put dry pad on these, unless they're incredibly effusive.

SSD has been used for a long time. It's an anti-microbial, but it's a fairly occlusive ointment. So it doesn't quite allow oxygenation of that wound. I think you probably understand that I really like oxygen to that wound once it's in the granulation stage.

A triple antibiotic ointment, again, unless there's a really infected wound that needs debridement, I stay away from that.

Panolog, which is a corticosteroid ointment with antibiotics in it—or something like Panolog—is pretty darn good for limiting granulation tissue. If there's just a little bit of exuberance of granulation tissue, we'll sometimes apply that just to the edge of a wound that we say is getting a little bit too proud.

But as long as the wound is healing appropriately and that granulation tissue is appropriate, that wound is meeting its markers for sutures removed 12 to 14 days later, and there's not a whole lot dying off—a lot of times we'll just use a little bit of Manuka honey.

So, the horse in this photo, that the entire horse, other than just the skin of his ventral abdomen, made it over a gate. The skin of his ventral abdomen got caught on the bolt on one of those gates, and he just really ripped off a large flap of skin on the ventral abdomen. So, we were able to close this primarily and place a drain.

And then, because there was a large pocket there, the sutures held but they had a little bit of granulation tissue there and the apex of the wound died, just about three centimeters or so, at suture removal. So, we placed Manuka honey along this. And Manukma honey has been shown to be hyperosmotic. It's an antioxidant and a broad-spectrum antimicrobial. And it's turning into a great wound dressing in humans, small animal and equine cases.

So, something to consider for those properties.

This is the example of that horse at suture removal, where just the little apex of that ventral abdomen flap died off.

You can see a little bit of granulation tissue around the outside. In no way do I think this granulation tissue is proud. It's not exuberant. It's doing what it's supposed to do. And that's proliferating before the epithelium can move in. So just put a little bit of Manuka honey on this one.

And, so that was a little bit on what I put under bandages. We'll transition back to bandaging and talk about when a bandage—meaning a modified Robert Jones—isn't enough.

And here are three cases where we chose to do something more than just a modified Robert Jones bandage.

The case on the left is, again, a classic dorsal cannon bone laceration, but this horse completely lacerated his extensor tendon. And that extensor tendon, the purpose of this in ambulation is to allow that horse to put its foot flat on the ground rather than flex a fetlock and walk on the dorsum of the fetlock. So, in that case, a Robert Jones bandage, modified Robert Jones, was placed on that with a splint. And I'll show you a photo of that splint on the next slide.

The horse in the middle, this horse had a very small laceration that unfortunately involved all of the superficial flexor, all of the deep flexor and part of the suspensory ligament, which luckily this owner was really invested in this horse's care for a long time afterwards, but that can be a poor prognosis even with surgical intervention. And this horse we placed in a cast after primary repair of those tendon lacerations cause sutures aren't strong enough to hold those tendons together.

And then lastly, on the far right, this is probably the other very common distal limb laceration we see, this is a heel bulb laceration. So, heel bulbs often require a little bit more coaptation because that purpose of the foot is to spread as that horse bears weight. And

that can really interfere with wound healing. If there's increased strain on those wound edges. I do want to include the caveat that the two horses on the right required surgical intervention at our hospital. The horse on the left had surgical intervention at our hospital because it was quite a young guy. That could be managed in the field, although it was certainly easier with the team we've got at the hospital.

But the ones on the right had to have surgery, in my opinion, to survive these injuries, which they both did.

So going to that really common dorsal cannon bone laceration, that horse gets caught up in a high-tensile fence and really tries to amputate that leg rather than call for help and just have somebody extricate themselves. And we've all seen plenty of these.

So, if they involve the extensor tendon, then that animal needs a little bit more than a modified Robert Jones to be able to ambulate normally during wound healing. So, these animals can either have a modified Robert Jones with a palmar or plantar splint or a bandage cast, which I'll show on the next slide.

These palmar/plantar splints, I usually use a PVC pipe. And I put them down to the ground and then along the back surface—flexor surface—of the leg and just over the modified Robert Jones and then Elastikon/duct tape the whole construct. These are also really good for lacerations over high-motion joints, particularly the dorsal fetlock. And then the splints should be changed or reset once daily, even if the bandage isn't changed, and you can see why in this photo to the right—that splint has rotated to the lateral aspect of this horse's leg.

And so every 24 hours, we would just reset it and make sure that it was right along that plantar surface of this leg rather than rotated around.

So, the next horse, that horse with the flexor tendon laceration, you can see that that fetlock has severely dropped in these examples of unbandaged. Then just with a modified Robert Jones. This horse was sent in, in the referring veterinarian's Kimzey splint. And that probably saved the horses life because it did not have much suspensory ligament hanging on and that changes a "fair "prognosis for pastern soundness to a "pretty poor to grave" prognosis if that suspensory ligament is completely transected in this case without a fetlock arthrodesis.

So, Kimzey splints are great for not only those breakdowns injuries on the racetrack, but also some of these severe flexor tendon lacerations.

Another thing that can really help that horse with an extensor tendon laceration—so one where they're walking the dorsum of the fetlock. Or really decrease movement on a limb if you're trying to keep wound edges together, are bandage casts.

So, this is an example of a modified Robert Jones. Don't make it too thick because a thick bandage will actually increase the risk of a bandage sores. But this is just a couple of rolls of cast tape placed over a bandage cast. And these can be left on for three to four days. If you're leaving an animal on the farm with one of these, the owner has got to keep this animal in a stall and has got to check to make sure that this sleeve hasn't migrated up or down multiple times a day.

But they can be great for in conferring stability to these limbs.

So, they're easy to place in a field situation on front or hind limb. And they provide much more stability to the wound for soft tissue injuries, such as extensor tendon lacerations, or for wounds over the fetlock. They're not enough for fractures or anything like that, but they may be good enough for coaptation prior for referral for those unstable injuries to a surgical facility.

And then the other nice thing about them is once you're ready to change that bandage at three to four days, these can be bivalves and cut in two pieces, and then they can be taped back on … either both pieces or just that palmar/plantar piece for some of those benefits of the splint that we discussed in the previous slide.

Oh, and the one other thing I should mention for this is if it's a distal limb, or you're worried about that sleeve migrating up, you can incorporate that foot with Elastikon to just attempt to keep this sleeve in place over your modified Robert Jones. But again, the owner has got to be cognizant of this fiberglass cast sleeve migrating whatsoever.

And lastly talking about when a bandage isn't enough. An example is heel bulb lacerations. We anesthetized that horse in the previous slide with the heel bulb laceration, because she had synovial sites involved. So, she had an open tendon sheath and an open coffin joint. So, she required lavage for that. Regardless heel bulb lacerations usually heal much better in foot casts. So let me put in my little slide about always ensure that a synovial structure isn't involved with a heel bulb laceration because the coffin joint, the navicular bursa, the pastern and the tendon sheath are pretty darn close to those heel bulbs, those collateral cartilages, and otherwise these heal pretty well with primary closure and a foot cast.

So, on this slide, I've got an order of operations when assessing a wound for synovial involvement: clip, prepare the wound, performing arthrocentesis, collect joint fluid for cytology and culture; infuse saline and see if it comes out the wound, if it does then absolutely gold standard care is lavage of that affected synovial structure.

However, if there is no synovial structure involved, then hoof casts can be placed on the farm as long as the owner is able to keep that horse stalled and monitor that hoof cast really well.

So, for hoof casts, the foot is supposed to flex as the horse bears weight. That's what those heel bulbs are supposed to do. They're supposed to spread in a normal horse without an injury. In an injury that spreads those heel bulbs will detract our wound edges away from each other, which makes primary closure very difficult and healing delayed.

So, a foot cast will keep that foot from spreading.

Forelimb casts can easily be placed in standing horses as long as you've got a strong person to hold up that leg while that cast cures.

Hind limb casts, I usually anesthetize. And that's because if you pick up that hind leg, that foot is going to flex in a different direction from the hock. So those are far more likely to get cast sores if they're placed standing.

And once you place that cast either forelimb,standing, or a hind limb anesthetized, when that horse stands up, that foot will sink a bit in the cast.

So, I always check the backside of the cast to make sure that it is not encroaching up in the sesamoids. If it is, I'll cut that down just a bit so that the back of that cast doesn't bite into the sesamoids.

And then I leave the casts on as long as that horse is walking comfortably and there's no heat, swelling, discharge, and again, there's no synovial structures involved.

I'll leave it on for, for a week to 10 days and then remove it. And this is that horse, here's an image of that horse with that laceration. The laceration is mostly healed. There's granulation tissue in the wound. So, it didn't heal perfectly with sutures, but enough that we could remove those sutures at 12 to 14 days. And that horse will be walking carefully in that cast.

Now, for those of you that are following along with the webinar photos, you can see, even though we place that hind limb cast with the horse anesthetized, that cast still caused enough irritation that it rubbed away some of the hair, the white hair around her pastern. And, you can see some of that pink, inflamed skin.

So just, foot casts can be difficult to place, even with an animal anesthetized. And should be monitored carefully to make sure that horse stays comfortable in them. Otherwise, they should be removed and checked for cast stores.

So that's what I had on wound bandaging, particularly in distal limbs.

Here's a few examples of horses where I didn't know if they needed a bandage or horses that didn't have distal limb wounds.

Firstly, this is a, a horse that in trying to fit through a doorway she didn't fit through. And this laceration went through the muscles.

So, she's got that flap of skin is closed. And then some drains, some releasing incisions in this wound. And this horse was really good, did not mess with her wound at all. So, we never bandaged her. And the corner of this died, but she healed and granulated pretty well. So, I don't usually put bandages on these pictorial wounds unless the horse really irritates them.

Another time I won't use a bandage, but I'll use liquid bandage such as use Aluspray, is for some of these really clean lacerations or an incision from an ovariectomy. And these I'll use spray bandages. They won't obviously keep any of that tension away from the wound edges and they won't provide any compression, but they will allow the wound edges to be closed and fairly waterproof in that 12- to really that 24- to 48-hour period before that fibrin clot seals the wound edges.

And then lastly, that horse that scraped off his ventral abdominal skin, shown here, I was really worried about a seroma forming underneath because of the, just the location of that wound being on the ventrum. So, we placed him in this belly band that we'll often use for ventral midline incisions, and he's doing well; can be turned out at home in this bandage while that heals. Right now, he's still in the granulating stage. So, I think that that wound is still about 60 to 80% of the original strength, probably more than the 60% side. So, I'd hate for him to reopen that by scraping his ventrum. So, we're keeping him in a bandage until there's epithelialization of those wound edges, but we also kept him in that bandage immediately after injury to provide compression, to prevent seromas formation in that flap.

The last wound I want to show you is these photos are courtesy of Dr. Joanne Hardy, and this is a wound that an RDVM will absolutely save this horse's life with their bandaging techniques before referral to a hospital.

So, to orient you in this photo, this horse, we're looking at the left thorax. The elbow is to the left. The caudal aspect of the horses to the right, and the surgeon is opening up a large thoracic wound with rib fractures that shows that this animal has a pneumothorax.

The other way you know he's got a pneumothorax is that there's a catheter and suction inserted to the dorsal ribs spaces to resolve some of this pneumothorax.

And the way a referring vet can save this animal's life is horses have an incomplete mediastinum, meaning with an acute thoracic wound if they've got a pneumothorax on one side, they're very likely to have a pneumothorax on the other hemithorax so they may have collapsed lungs on both sides.

And so in the acute period, The RDVM can relieve the pneumothorax as shown by this catheter and suction, and then place an air-proof bandage over the horse’s thorax.

And that's done in this case with packing material and then a whole lot of Saran wrap and Elastikon over this horse’s thorax.

So yes, this horse required debridement, primary closure to surgical referral center, but the RDVM absolutely can claim saving this animal's life just by how this wound was bandaged up.

So just an interesting case in that one.

That's all I've got for you, and I appreciate your attention today.

Kim Brown: Well, that was wonderful. And certainly very educational if you want to watch the webinar, but just listening to that was great, Dr. Gardner. So, thank you so much for joining me today.

Dr. Alison Gardner: Oh, of course. I appreciate all your attention and thank you.

Kim Brown: And we want to thank our audience for listening and remind you that you can watch the webinar that goes along with this podcast on the EquiManagement.com article about this podcast episode.

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