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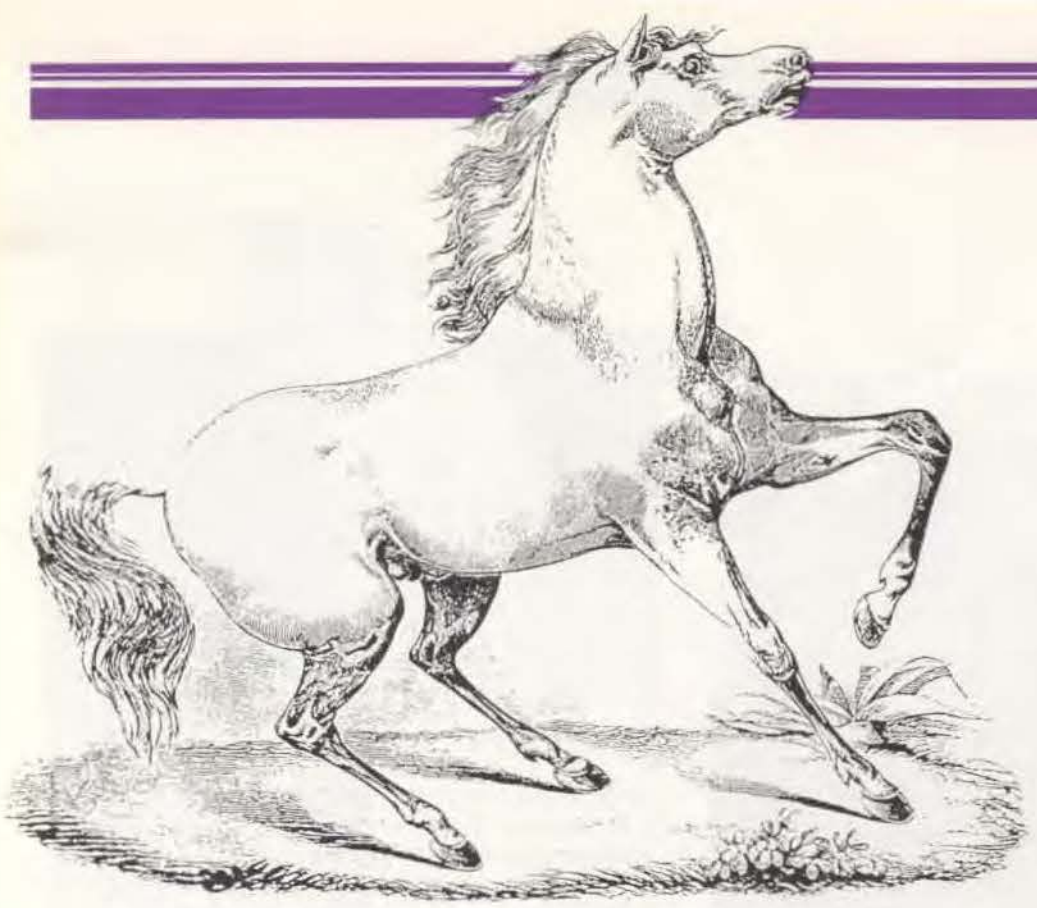
Equine Symposium



Equine Symposium

In the summer issue we carried summaries of three presentations at the Equine Symposium held in April at New Bolton Center. Following are summaries of the remaining three presentations.

Life-Threatening Complications in the Mare

Dr. James A. Orsini, assistant professor of surgery, discussed equine colic and torsion of the uterus, two life-threatening complications which can occur in the mare.

Colic is a general term referring to abdominal pain with particular reference to the gastrointestinal tract. Signs in the horse may vary from slight discomfort. stretching and restlessness to violent rolling and kicking. Causes generally include environmental factors (such as a change in climate). An example may be a change in weather where it becomes very cold; the animal may not drink and is more likely to develop an impaction.

Change in feed, types of hay or grain, coarse or icy feeds, excessive grain, and excessive exercise have also been implicated. Ingestion of rubber fences has also been a cause. A sandy environment predisposes the animal to sand impactions. Straw or wooden shavings may be ingested and cause impaction. A bad worming program or teeth which need care are also contributing factors.

Parasites are well known as a cause for colic. Infarcted (lack of blood) gut can result due to emboli (traveling fragments of parasite or a blood clot) forming a blockage of the cranial mesenteric artery (main vessel to the intestinal tract) or other major vessels supplying the intestine. Specific disorders that may cause colic include a twisting of the intestine, volvulus (torsion), infolding of one segment of the intestine within another (intussusception), pyloric obstruction, strangulated hernia, etc.

In the pregnant mare, one of the more life-threatening forms of colic that occurs is a large colon volvulus (twist). Volvulus or torsion of the entire large colon can occur; this may include the caecum or just a portion of the large colon. The etiology of volvulus of the large colon is unknown. Strongyle larvae (blood worms) have been implicated. Others believe it may be because of more space in the abdomen when a portion of the liver atrophies with age or following parturition.

Signs are continuous pain and range from mild to violent. The animals may move violently, tread and sweat. In the advanced stages the animals become severely depressed with an elevated respiratory rate and have a markedly distended abdomen. When the large colon is twisted, it is often tight, with palpable bands on rectal examination and distended large intestine. Volvulus of the large colon causes the most severe and fatal form of colic.

Affected animals show a very severe, unrelenting colic as a general rule. They rapidly deteriorate physiologically. showing rapid, weak pulse. toxic mucous membranes, elevated packed cell volume and serosanguinous peritoneal fluid. There is little motility and bloating occurs rapidly. Any mare with a large colon volvulus, or any horse for that matter. should be treated as a surgical emergency.

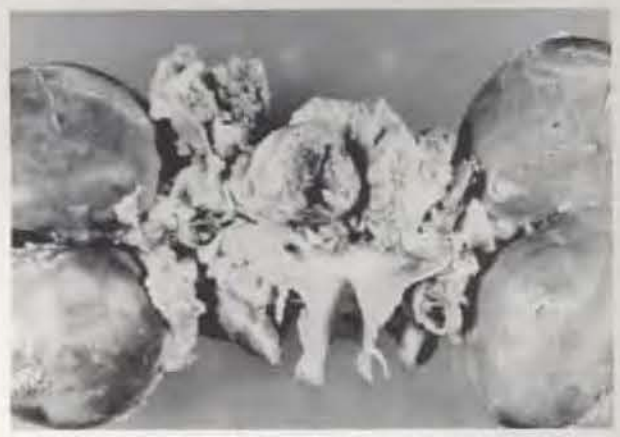
Survival depends on the severity and duration of the vascular embarrassment. Because of the loss of vascular integrity to the twisted portion of the bowel, there is a large loss of protein and fluids into the extravascular space (outside the vessel wall) and into the lumen of the bowel. Therefore, the total protein has to be monitored closely during fluid administration, and if it falls below the level of 4 gm/dl (normal being 6 to 8 gm/dl), a plasma transfusion may be needed. This large loss of protein and endotoxic shock (bacterial producing) are the main reasons for the poor survival rate. Therefore, early recognition and prompt treatment are essential with intensive supportive therapy after correction of the volvulus.

Torsion of the uterus occurs in the latter stages of gestation, possibly associated with the mare's rolling or falling or with excessive activity of the fetus. Equine uterine torsion is seldom associated with parturition. This condition is rare in the mare because of the dorsally attached broad ligaments, limiting the twist to 180 degrees.

Signs of uterine torsion are restlessness, anorexia, abdominal pain or colic and frequent attempts at urination. These prolonged signs resemble those seen in the early stages of parturition, and in late pregnancy, usually with a tightly closed cervix. The anterior vagina should be examined for the twisting or folding of the wall, indicative of torsion. A rectal examination will need to be performed by a veterinarian to determine the direction of the twist and the degree of tension on the broad ligaments. In many uterine torsions, a twisted portion of the genital tract only involves the body of the uterus cranial to the cervix and the anterior vagina.

If the condition is diagnosed early and fetal death and rupture of a large blood vessel (uterine artery) has not occurred, the prognosis is usually guarded to favorable. Torsion may be relieved by sedating or anesthetizing the mare and rolling her in the direction of the torsion. If this conservative method fails, a laparotomy (incision into the loin) through the right or left flank in a standing or recumbent mare may be performed, with the torsion corrected manually.

Strongyle vulgaris



Cranial mesenteric arteritis secondary to larval migration.

Laminitis

Dr. William Moyer, associate professor of sports medicine, spoke about laminitis (founder) which remains one of the most common devastating problems in the horse world. Insurance companies claim that laminitis is second only to colic for the number of mortality claims.

The problem has been researched extensively, but it still remains somewhat of an enigma. Its causes are multiple and the end result of the disease is structural damage in the feet. In acute laminitis the blood supply to the foot is shut down, resulting in extreme pain for the animal. Several popular misconceptions about disease exist:

1. The most common cause is eating too much grain — this is just one of the many causes and it is not very common today.

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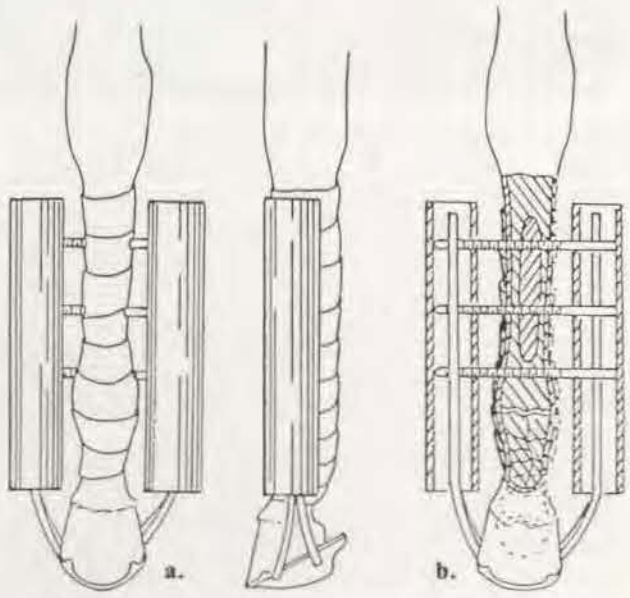
Serious Injuries to the Athlete

Dr. David M. Nunamaker, Jacques Jenny Associate Professor of Orthopaedic Surgery, briefly discussed immediate unrestricted weight bearing following fracture fixation through the use of two new techniques developed by researchers at New Bolton Center. The ability to allow immediate full weight bearing is important in the horse following fracture treatment because this species cannot tolerate recumbency for long periods of time. If the animal cannot bear full weight on one leg, laminitis may result in the foot of the limb that is bearing all of the horse's weight.

For the past several years, the Comparative Orthopaedic Biomechanics Laboratory at New Bolton Center has been developing techniques designed to allow immediate, full, unrestricted weight bearing following fracture fixation in the horse.

As a result of the research an external skeletal fixation device (ESFD) for equine patients was developed. This new external skeletal fixation device with foot support was designed to allow immediate full weight bearing following fracture fixation in the horse. Since many fractures in the horse are comminuted and occur in the short bones of the lower limb, the device was designed to transfer weight bearing forces from the intact bone above the injury to the ground.



a. Dorsal and lateral views of the ESFD are depicted with transfixation pins penetrating the third metacarpal bone.

b. A frontal cross-section shows the relationship of the transfixation pins above a simulated fracture of the first phalanx.

Fixation of the limb distal to the injury is accomplished by attaching the hoof to a plate on the distal end of the frame. In this way, an injured animal can bear weight across the fractured area. To accomplish this, the ESFD has to be very stiff and strong. The strength of the device is related to the diameter of the transfixation pins and the distance from the bone to the longitudinal sidebars.

The pin diameters chosen for this design were sized specifically for use in the equine third metacarpal bone. To ensure strength and low cost of pin sidebar connections, a fast-curing, extremely strong polymeric substance is used to form the sidebars. This material is poured into flexible tubing pushed over the ends of the pins and contains the longitudinal metal tubing of the frame and foot support. The frame is attached to the horse's hoof by a shoe nailed into place and bolted to the frame foot support. Fracture reduction is accomplished before the sidebars are poured. Following application of this device, the horse is recovered from anesthesia and allowed immediate weight bearing. The ESFD is used in horses for closed or open comminuted fractures that would not be amenable to conventional open reduction and internal fixation methods as practiced in horses. It has also been used successfully to fuse the fetlock joints in some horses with "breakdown" injuries in which the soft tissue around the joint is severely traumatized.

Dr. Nunamaker also discussed an improvement in internal fixation of fractures with plates and screws. Internal fixation using plates and screws requires good immobilization of the fracture fragments if healing is to be achieved. The forces of weight bearing add greatly to the stress on the plates and screws, resulting in loosening of the device, shifting of fracture fragments and shearing of the screws. In horses, the unavoidable stresses of weight bearing have often led to loosening of the implants, failure of the fixation and eventual loss of the horse's life.

The term "plate luting" has been coined to describe the application of a space-filling substance between the bone and plate to increase the contact area between them, which in turn should improve the interfacial shear strength between the bone and the plate. Bone has a curved surface and the heavy stainless steel plates cannot be bent to achieve complete, continuous contact with bone. Luting the plate to a bone with polymethyl methacrylate (PMMA) or some other suitable agent allows for complete contact between the bone and the plate and thereby increases the frictional forces between the plate and the bone that allow comfortable weight bearing.

The luting material is polymethyl methacrylate, the same 'bone cement' that is used in humans in some joint replacement surgeries. Besides making for a more perfect fit between the plate and the bone, the luting material fills the plate holes around the screw holes as they are tightened and helps prevent screw loosening, another of the major causes of fixation failure.

Laboratory studies with bones in a testing machine have shown that the technique of luting actually increases the duration of effective fixation by ten times or more. In live animals, the results have been just as encouraging and no deleterious effects have been found. In particular, the results in foals with severe long bone fractures (radius, tibia, femur, etc.) have been markedly improved. Many fractures in foals that previously were rarely treated successfully now have success rates near 90 percent.

A patent has been granted for the external skeletal fixation device which was invented by Dr. Nunamaker and Dr. Dean Richardson, assistant professor of surgery. A patent has been applied for for the plate luting.

Laminitis *continued from page 4*

2. It is a disease of the feet only — not true. The problem in the feet is a manifestation of a problem which begau elsewhere (digestive system, reproductive tract, generalized infection, etc.).
3. It affects the front feet only — not true. The hind feet are affected, but usually to a lesser degree because the horse bears 60-65 percent of its weight with its frontquarters.
4. Laminitis is not necessarily an emergency — not true. It should be treated as quickly as possible.
5. The problem is resolved once lameness, heat, etc. are no longer present (assuming that these features do disappear) — not true. Often the structural damage is permanent and one cannot assume that relief of pain means that the problem is resolved.
6. Radiographs will predict the outcome or the severity of the disease at the time — not always true. Radiographs are very useful but they are not the 'do all-end all.'
7. A single method of treatment is uniformly successful — not true. A successful outcome requires early treatment, control of the cause, constant care, and therapy designed for the individual horse.
8. Fever causes laminitis — not true. The cause is the disorder which resulted in the fever, not the fever per se.
9. The following features must be present to have laminitis: foreleg lameness, heat in the feet, increased pulse, a camped-out stance, etc. The variation in clinical findings is tremendous. For example, laminitis may involve one foot only, it may involve both hind feet and not the front feet, it may exist on a horse which appears to be sound, it has been known to look like stringhalt, etc.

Laminitis is an emergency and the sooner therapy begins the greater the likelihood of arresting the progression of the disease. It has to be kept in mind that by the time lameness and clinical signs are present, damage already exists. If the underlying cause is not eliminated the damage to the foot will continue. As soon as laminitis is suspected, the veterinarian should be contacted. He or she may not be able to see the animal immediately but can suggest steps that can be taken to lessen the horse's discomfort. The owner should provide the practitioner with the following information: the animal's heart and respiratory rate; rectal temperature; severity of lameness; a guesstimate of the cause or recent changes the horse may have encountered.

On his initial visit the veterinarian performs a general physical examination to determine the overall health status, the cause of the laminitis, and the degree of pain. A close examination of all four feet is performed (coronet, hoof wall, sole, etc.). This may involve the use of hoof testers, hoof knife, and other diagnostic tools. Radiographs are very helpful to determine the position of the coffin bone within the hoof capsule and to get some idea as to the damage to the feet at the time of the radiographs. Treatment is then initiated for the underlying disease and for the laminitis. Subsequent visits and nursing care are absolutely essential. Generally it is a good idea to keep afflicted horses from actively exercising until all clinical signs have been absent for a time. When a horse can resume exercise has to be determined in each individual case.

Laminitis is a potentially fatal problem. Its causes are not fully understood at this time. Treatment must be designed to cure both the underlying disease and the feet. No one therapy or treatment regimen is always successful. Laminitis should always be suspected when dealing with a sudden onset of lameness involving both front feet, but one must be aware that a variety of signs exists. There are a number of high risk conditions which make the horse more susceptible to laminitis: acute or chronic colic; any severe illness, brood mare and foaling problems; prolonged lameness forcing the animal to spend most of its time on the "good leg"; ingestion of large quantities of grain or new spring grass. Studies have shown that one of the highest risk patients is the overweight show horse which spends a good bit of time on the road.