FLOTATION THERAPY FOR DOWNER COWS

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Summary

Cattle that become recumbent (unable to get up) as the result of calving difficulty, low blood calcium, traumatic injuries, or other disorders are prone to develop subsequent pressure damage of muscles, nerves, and areas of skin. The resulting medical problems that are secondary to prolonged recumbency may be more life-threatening than the initial medical disorder that caused recumbency. Flotation therapy is an effective means of physical therapy for rehabilitation of "downer" cattle. A description of flotation therapy and data from the first year of use of the flotation tank at the Veterinary Medical Teaching Hospital, Kansas State University, are presented.

(Key Words: Downer Cow, Recumbency, Flotation, Physical Therapy.)

Introduction

In cattle, prolonged recumbency resulting from metabolic, traumatic, or infectious diseases is a common challenge in veterinary practice. In many cases, the inciting cause or underlying disease process can be remedied or repaired, and the animal recovers function in all body systems except for one — it cannot stand without support. The classic "alert downer cow" is a frustrating result, and conventional modes of therapy for these cows are frequently unsuccessful. A 1982 study of alert downers in Minnesota found that only one third of affected dairy cows returned to production. The incidence was calculated at 21 cases per 1,000 cows at risk. The mortality rate of cows that become alert downers following postcalving milk fever ranges from 20 to 67%.

During belly or side recumbency, the cow's weight is focused on the downside limb muscles. Prolonged circulatory compromise to these muscles and their nerve supply occurs, creating nerve muscle damage. Muscle groups such as the triceps, tibialis, and biceps femoris frequently are involved. The radial, peroneal, and sciatic nerves that supply these muscle groups may be compressed against nearby bones, creating direct compressive nerve injury. Permanent loss of muscle and nerve function may occur if the patient is very heavy and/or the duration of recumbency exceeds several days. Severe pressure sores, weight loss, and environmental mastitis are frequent additional complications of prolonged recumbency.

On farms, treatment of downer cows is often limited to deep bedding, frequent turning to limit the duration of pressure on any one area, and good general nursing care. Therapy aimed at supporting the downer cow in a standing position has offered the most promise for rehabilitation. A variety of hiplifts, slings, and inflatable beds have been used by veterinarians and dairymen for years, with variable success. These methods have several limitations. Hip lifts are adjustable metal clamps that can be tightened onto the hook bones of the downer cow. The clamps then are attached to a hoist, and the cow is assisted to rise by direct lifting of the pelvic bones. This technique frequently causes pain and pressure sores over the hook bones, and many cows fail to support weight in the forelimbs when lifted this way. A sling is

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a more effective means of supporting the cow, but the manpower required to fit the sling and hoist the cow into a standing position is often a limiting factor. Frequently, the cow can stand with sling support only for a brief period before the straps become displaced and it loses the necessary balanced support.

An inflatable mattress, constructed of thick rubber, is another method of assisting cows to rise. The cow is centered on the deflated mattress, and air is pumped into the mattress to lift the cow off the ground. These devices are difficult to use as a long-term means of support, because the cow frequently will shift its weight off the center of the supporting mattress and fall off to the side.

Recently, portable flotation tanks for downer cows have been used with great success in California and Florida. The flotation tank takes advantage of the tremendous natural buoyancy of cattle to provide balanced support to the cowþs body. While supported by water, the cow can freely move all four limbs, thereby improving muscular strength and circulation. Similar methods of physical therapy are used widely in the human medical field in rehabilitation of patients with severe neural or musculoskeletal injuries. In September 1995, the Veterinary Medical Teaching Hospital at Kansas State University obtained a flotation tank for use in clinical cases.

Experiences with the flotation device at the University of California at Davis (UCD) are encouraging. Preliminary results of over 80 cases treated during 3 yr were presented at the summer veterinary conference at UCD in 1995. A treatment success was defined as restoration of the ability to stand and walk unassisted for a cow that was unable to stand. The success rate for all cases treated by flotation therapy was nearly 55%. The treatment success rate was nearly 80% for downer cattle that did not have a catastrophic injury (e.g., a vertebral fracture) or untreatable medical disorders (e.g., severe fatty liver). An average of 4 to 5 days of flotation was used in successful cases. Cows have been "floated" for up to 18 hr at a time and fed while standing in the tank. The most frequent flotation use was for recently calving heifers suffering from calving paralysis, followed by cows with prolonged or recurrent milk fever. Cattle, sheep, goats, and pigs suffering from a variety of muscular and skeletal disorders have been supported successfully in the float tank (with appropriate water depth adjustments). Successful flotation treatment was reported for toxic mastitis, metritis, and peritonitis cases that were alert after appropriate medical care but suffered from prolonged recumbency.

Procedures

The flotation tank is rectangular, approximately 7 ft long, 4 ft wide, and 5½ ft tall. Its capacity when empty is nearly 800 gallons. The long steel side walls are connected to a steel floor to form a solid single structure. The removable end doors are also steel but are lined by a rubber gasket. The doors fit into brackets on the main structure to form a waterproof rectangular tank. To place a cow into the tank, the doors of each end are removed. The cow is rolled or pulled onto a durable rubber sliding mat. The mat and cow are pulled onto the tank floor by a chain attached to a tractor. Thus, the transport mat becomes the floor of the tank once it and the cow are moved inside. This mat has a treaded surface to provide traction for the cow as she tries to stand.

Once the cow is centered on the tank floor, the tractor chain is detached from the mat and the doors are placed on each end. These are locked in place with large turn screws. The tank is filled with lukewarm water from a hose (or several hoses, to speed the process). Typically, an average-sized Holstein cow will not be able to stand until the water depth approaches approximately 4-5 ft. The tank is filled until the cow can stand comfortably. Apparently, very little effort is required for a cow to stand in neck-deep water, because cows that are unable to stand at all in a sling can stand in the flotation tank for several hours. The air content of the abdominal viscera imparts remarkable buoyancy to cattle; during flotation, an adult Holstein cow can be lifted off of her hind feet by a person lifting the base of the cow's tail.

Depending on the nature of the underlying disease, a cow may spend up to 10 hr in the flotation tank per day. Flotation therapy is

apparently a relatively pleasant experience for cattle, because fractious range heifers are relatively calm when being treated. On cold days, it is important to periodically refill the tank with warm water to prevent chilling. A steady water level can be maintained by releasing water from a drain spigot located near the tank floor.

To remove a cow from the tank, the water is released via the drain spigot. Typically, the tank is positioned such that once the front door is removed, the cow can walk onto a surface with good footing and deep bedding. We have used a sand-filled hospital stall for this purpose, although any soft dirt or grass surface should suffice. Once the water is drained, the door is removed, and the cow is allowed to walk out of the tank at her own pace. Hobbles are placed on cows at risk for falling in a splay-legged position. If the cow becomes recumbent during drainage of the tank, the mat can be used again to slide the cow to its bedding area.

The flotation tank can be mounted easily on a 2-wheel trailer. This allows the tank to be transported to field locations close to any cow that becomes recumbent outdoors. When mounted on the trailer, the tank and trailer wheels are roughly 7½ ft wide, which makes it possible for the tank to be maneuvered into most barns or free-stall alleys. Once the cow is loaded into the tank, the tank can be hauled on the trailer to a level area for filling with water. However, the tank cannot be moved once it has been filled with water.

The main advantage of flotation therapy over sling support is that it provides uniform support for standing. No sites on the cow's body are subject to focal pressure from support straps. In addition, cows in the float tank can freely move the limbs to allow for strengthening of muscles and restoration of circulation to muscle beds and skin.

Results and Discussion

The cows treated by flotation therapy at the Veterinary Medical Teaching Hospital, Kansas State University, are listed in Table 1. The treatment success rate for all cows treated by flotation therapy was 47%, which is similar to the success rate experienced by veterinarians at UCD. If cows with catastrophic musculoskeletal and neurologic injuries (Cases 3, 7, 8, and 10) were excluded from the analysis, the success rate for this treatment increased to 63%. Obviously, the efficacy of this form of therapy is influenced by the status and primary disease of the patient selected for its application.

The size limitations of the current float tank are estimated to handle a 1800-lb Holstein cow. One might think that complications such as coliform mastitis would be frequent, but only one cow in the UCD series developed that disease during flotation therapy. When possible, the morning milking should be performed 2 to 3 hr prior to flotation, and a barrier teat dip should be applied. To the authors' knowledge, no drownings or cases of aspiration pneumonia have been caused by flotation therapy. This is due in no small part to careful case selection; only alert animals should be candidates for flotation therapy.

Flotation therapy appears to be most effective when initiated early in the course of recumbency. Cattle that are allowed to remain recumbent for prolonged periods of time are at greater risk of more extensive compression damage to muscles and nerves. In the cases treated by flotation at the UCD clinic, patients that were recumbent for >2 days prior to therapy required more days of treatment for complete cure than patients that had been recumbent for <2 days (unpublished data).

Flotation therapy appears to be a promising form of treatment for cattle suffering from prolonged recumbency. The duration and success rate of flotation therapy are determined by the nature of the underlying disease process and the duration of recumbency prior to initiation of therapy. When compared to conventional forms of therapy for downer cattle, flotation therapy can be maintained for longer periods of time with relatively less effort and time commitment by farm or hospital personnel.

Table 1. KSU Flotation Tank Patients, 10/1/95-9/1/96

Case	Duration of flotation therapy (diagnosis)
Wagyu cow	Floated 4 wk (unilateral pelvic fracture)*
Holstein heifer	Floated 1 day (difficult calving)*
Hereford heifer	Floated 4 wk (forelimb nerve injury obtained during birth)
Holstein cow	Floated 1 day (postcalving low-blood calcium)*
Holstein cow	Floated 5 days (postcalving low-blood calcium, secondary radial nerve paralysis)
Holstein cow	Floated 2 days (postcalving low-blood calcium, mastitis, pneumonia)
Holstein cow	Floated 3 days (spinal tumor)
Holstein cow	Floated 5 days (severe stifle injury)
Holstein cow	Floated 2 days (postcalving low-blood calving)*
Limousin cow	Floated 3.5 mo (multiple pelvic fractures)
Holstein cow	Floated 7 days (difficult calving, postcalving low-blood calcium)*
Holstein cow	Floated 5 days (postparturient hypocalcemia, peroneal nerve paresis secondary to difficult calving)*
Angus heifer	Floated 6 days (dystocia, down for 3 wk prior to admission - secondary muscle necrosis)
Angus cow	Floated 4 days (hepatic lipidosis/pregnancy toxemia)
Adult female llama	Floated 8 days (heat stress)*

*Denotes successful treatments (defined as ability to stand and walk at the time of discharge).