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A Review on Lameness in Equine

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Abstract

Lameness is important health problem that seen predominantly in equines, because of their adaptation for the draft power, it is caused by various causes. Once an equine are lame they are not as such vital for the owners. Most of the lameness type are seen when the equines are in motion, mostly in those bearing weight. They feel severe pain as they land their limb to the ground. Factors that predispose equines to the lameness include nutrition, conformation, management, environment, bearing surface, degree of moisture, absence of hygiene, infectious agents and trauma. Even though there is an advanced technology and better awareness regarding lameness in equine in developed country, there is a lack of awareness in the management of equines, treating while they are sick, or lame. In addition to these problems getting an advanced diagnostic tool such as MRI, CT scans, ultrasonography and radiology is very difficult in developing country like Ethiopia. Lameness is not only originate from the limb, it also may result from the back pain, paralysis of the nerve that innervate those limbs and from problems in other sites. Therefore objective of this review, lameness in equine, is to provide information regarding to the factors that predispose equine to lameness, cause of lameness in detail as well as its diagnosis, treatment and further more to provide some recommendations.

Keywords: Equine, Foot, Horse, Lameness, Limb

1. Introduction

Animal power is an economical form of energy for traction, cultivation and transportation. It helps to minimize the flow of foreign currency involved in the import of tractor, spare parts and fuels. More than half of the human population is dependent on the power provided by draft animals, 90 million of which are equines (Fekadu *et al.*,2015)."No feet and legs, no horse" is a common expression of horsemen (Albert, 2012). Lameness is defined as an abnormal stance or gait caused by either a structural or a functional disorder of the locomotor system (Adams, 2016). Lameness is not a disease per se but a clinical sign. It is a manifestation of pain, mechanical restrictions, causing alteration of stance or gait, or locomotory problem (Adams, 2016). This alteration may be mild and only noted at high intensity levels of exercise or may be severe and noted when the horse is walking or standing(Black *et al.*, 2013).

Lameness can be caused by trauma (single event or repetitive work), congenital or acquired anomalies, developmental defects, infections, metabolic disturbances, circulatory, and nervous disorder or any combination of these(Fekadu *et al.*, 2015).All types of horses are susceptible to lameness, and sooner or later, most horses are affected by it (Garber and Stanton, 2000).Clinically, lameness is recognized as an abnormality in the way a horse moves or stands. It is usually associated with a painful musculoskeletal condition or a mechanical abnormality affecting locomotion (Garber and Stanton, 2000).

Objective of this seminar paper is to review on different causes of lameness as well as diagnosis and treatment of lameness in equines.

2. LITRETURE REVIEW ON THE LAMENESS IN THE EXTREMITES

2.1. Health problem of foot

2.1.1 Navicular disease/syndrome

The navicular bone is a small canoe-shaped bone that lies within the hoof behind the coffin and short pastern bones. Navicular syndrome is a term used to describe the heel pain and pathology of navicular disease. Affected horses often have an abnormal hoof-pastern angle. While many other injuries affect only one leg, navicular horses tend to be lame in both front limbs. When walking and trotting, they will land toe first. This may temporarily relieve the pain as the horse moves, but it actually increases the strain on the navicular bone and can worsen the disease (Black *et al*., 2013)

2.1.2 Thrush

Thrush are bacterial diseases of the foot. These diseases are often associated with dirty, wet stalls and paddocks. Thrush affects the frog and is characterized by a foul discharge. For treatment, first cleanse the frog with warm soap and water. Have an experienced person trim away the loose diseased tissue and then apply a good drying medication or disinfectant such as sulfa powder,

Copper sulfate (blue stone), or tincture of iodine (Albert, 2012).

2.1.3 Corn

Corns are bruises or sores on the sole of the foot. Sometimes corns result from stepping on rocks or hard sharp objects; other times they may be due to poor shoeing. Mattery, ulcerated corns may require medication and draining. Sometimes it is best to rest the horse and place protective leather pads on the feet(Albert, 2012).

2.1.4 Canker

Equine canker is described as an infectious process that results in the development of chronic hypertrophic of the horn producing tissue. It has also been described as a chronic hypertrophic, moist pododermatitis of the epidermal tissue of the foot. Canker typically originates in the frog but can invade the adjacent sole, bars and hoof wall. The exact cause of canker is unknown but historically affected horse have a history of being housed on moist pasture year round or in wet, unhygienic conditions. Horse standing in urine, feaces, or mud soaked bedding appear to be at risk. Lameness often present in advanced cases abnormal proliferation of “rubber-like” horn in the frog region (Baxter, 2011)

2.1.5 Sub solar abscess

Sub solar abscesses, localized infections just beneath the sole of the hoof, are one of the most widespread causes of foot pain. As an abscess develops, it exerts pressure on the sensitive structures of the foot. Because the hard hoof wall does not expand, this pressure can become extremely painful. Horses with abscesses may show varying signs of lameness, but it is often an acute onset of a significant degree of pain, sometimes as severe as Grade 5 lameness. These horses may have heat in the foot and an increased digital pulse felt at the fetlock or pastern (Norton, 2014).

2.1.6 Laminitis

Laminitis is a severe condition observed commonly in equine, generating intense painful (Laskoski *et al.*, 2016). Laminitis occurs by loss of integrity of the laminar tissue. The rotation and/or sinking of the distal phalanx may occur, secondarily, as a result of the weight down force of the animal and the pull exerted by the deep digital flexor tendon (Pollitt, 1996).

2.1.7 Hoof crack

Hoof-wall imbalances from conformational abnormalities and/or improper trimming and shoeing can be associated with the occurrence of hoof-wall cracks. However, there are a number of horses with apparently structurally sound feet and good shoeing practices that develop hoof cracks. If imbalance or shoeing abnormalities exist, correcting the observed abnormalities should help in the resolution and prevent recurrence of the crack. However, there are a number of horses with apparently structurally sound feet and good shoeing practices that develop hoof cracks. If imbalance or shoeing abnormalities exist, correcting the observed abnormalities should help in the resolution and prevent recurrence of the crack(Rendel, 2017).

2.1.8 Keratoma

A keratoma is usually described as an aberrant, focal, proliferation of cornified tissue produced by abnormal corium on the inner surface of the hoof wall (Honnas *et al*., 2003). Keratoma have been regarded benign horn tumours (Wagner *et al*., 1986), although no true neoplastic tissue has ever been identified (Honnas *et al*., 2003). It is proposed that keratoma may be produced in response to chronic irritation (Lloyd *et al*., 1988). Surgical removal is the recommended treatment, and this usually carries a good prognosis (Bosch *et al*., 2004).

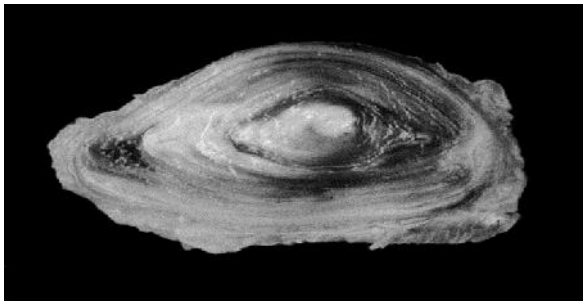

Figure 2:-Keratoma of the hoof wall after surgical removal. The mass is an encapsulated nodular lesion with a central zone of lamellated keratin that is partially mineralized (Bertone, 2006).

2.1.9 Side bones

Ossified lateral cartilage seen to protrude immediately above and toward the rear quarter of the hoof head. They are most commonly in the forefeet, and the condition may occur on one or both feet and on one or both sides of the foot. Lameness may or may not be present (Newman, 1914).

2.1.10 Quitter

An active, seeping sore at the coronet of the hoof, usually over the area of the lateral cartilage. Normally confined to the forefeet, this condition can cause a long lasting lameness (Newman, 1914).

2.2 EQUINE HIND LIMB LAMENESS

2.2.1 Bone spavin

It is a bony enlargement on the inside and front of the hock where the base of the hock tapers into the cannon bone of the lower leg. Also called jack spavin, it is aheritable weakness and one of the most destructive conditions affecting the usefulness of a horse. The lameness is most evident when the animal is used following rest(Draft Horse And Mule Associaton of America, 1981).

2.2.2 Bog spavin (idiopathic synovitis)

Bog spavin, tarsal hydrathrosis or talocrural effusions, is a distention of the joint capsule of the talocrural articulation as a result of chronic synovitis (Pothiappon, 2012). It is more commonly seen in younger horses, although it can occur in horses of any age and can affect one or both hocks (Stashak, 1987). The bog spavin is recognized by three characteristic fluctuating swellings (Gill. 1973). The largest of the three swellings is situated dorsomedially at the level of medial side of the talus and two smaller distensions located one on either side at the posterior surface of the hock. These swellings vary in size depending on the severity of the underlying cause (Venugopalan, 2009). Bog spavin may be associated with lameness which can range in degree from mild to severe depending on the cause (Sullins, 2011). In horses younger than three years of age, most cases of bog spavin are caused by an osteochondrosis of joint talocrural, while in older and fully mature horses; it is most likely because of chronic strain of the joint capsule (Pothiappon, 2012).

2.2.3 Iliac thrombosis

Aortic-iliac thrombosis has been recognized as a cause of lameness in performance horses for many years. A literature review suggests that the most likely cause of aortic iliac thrombosis is vascular damage by internal parasitism (Swanson, 2008). Classic clinical sign of aortic iliac thrombosis involve lameness of hind limb after 5 to 15 minutes of exercise or work. This lameness results from inadequate blood flow to support increased thigh muscle activity. After 10-15 minutes of rest, the horse recovers and can exercise without lameness (Swanson, 2011).

2.3. PROXIMAL LIMB LAMENESS

The head and the neck elevate or rise when the lame forelimb is bearing weight or hits the ground and nods down when he sound forelimb hits the ground (klayman, 2017).

2.3.1. Bicipital bursitis

The biceps brachii tendon runs over the cranioproximal humerus, protected by a synovial bursa. Inflammation of this structure can cause lameness and is usually secondary to a more serious inciting cause. Trauma to the proximal humerus, cystic lesions in the underlying bone, and injury to the tendon itself will cause secondary bursitis; it is important to recognize the primary lesion and treat appropriately. Occasionally, idiopathic primary bursitis arises and responds very well to medication of the bursa with corticosteroids. Bacterial contamination and, rarely, fungal infections can cause bicipital bursitis. In most cases, a wound in the vicinity of the bursa alerts the clinician to this possibility but, very rarely, closed sepsis can occur. Treatment for septic bursitis follows the same pattern as for other synovial structures. Radiography and ultrasonography complement each other in the diagnosis and management of primary and secondary bursitis. Repeat examinations may be necessary if a primary lesion cannot be detected, because it may become obvious with time. Scintigraphy is useful in cases in which the primary lesion remains elusive, because small areas of bone damage or cavitation can go undetected radiographically (Head, 2016).

2.3.2. Osselets

Traumatic arthritis of metacarpo phalangeal joint (fetlock) is occasionally seen in young horses which are used for hard work. This is technically known as Osselets. Many of the horses that are reared in rural areas do suffer from traumatic arthritis of mild to moderate degree and are not reported early, resulting in the development of osteoarthritis. The present report describes the successful management of osselets through medical management(Prasad, 2014).

2.3.3. Ringbone

Ringbone is a horseman's term for osteoarthritis, or bony arthritis, of the pastern and/or coffin joints. Ringbone in the pastern joint is called high ringbone, and in the coffin joint low ringbone. Osteoarthritis forms when the inflammation within the joint creates enough damage that the body lays down bone in an effort to heal the damaged tissue. Another term to describe this type of damage to a joint is degenerative joint disease (DJD) (Janice, 2005*)*. Horses afflicted with high ringbone are difficult to keep sound. The area is similar to the lower hock joints in that it is a "high-load/low motion" joint, meaning the joint is subjected to a lot of pressure but undergoes very little movement. Unlike the lower hock joints, the pastern joint does not respond consistently to intra-articular injections(Eastman, 2008).

3. PREDISPOSSING FACTORS OF LAMENESS

Factors that predispose horses to lameness include physical immaturity, which may occur in premature or dysmature foals, and training older foals before maturity. Other factors include preexisting developmental orthopedic disease (e.g., osteochondrosis, flexural limb and angular limb deformities); poor conformation; improper hoof balance or shoeing; failure to adequately condition performance horses; monotonous repetitive stresses on bones, tendons, ligaments, and joints in performance horses; hard, slippery, or rocky surfaces upon which horses work; and extremely athletic activities. Inciting factors in lameness include direct or indirect trauma, fatigue resulting in incoordination of muscles (which often occurs in racehorses at the end of races), inflammation, infection, and failure to recognize early disease before it creates significant pain.(Stacey, 2011)

4. GENERAL METHOD OF DIAGNOSIS OF LAMENESS IN EQUINE

A typical lameness examination should first involve a thorough visual exam of the horse, taking notice of body symmetry and muscle structure. Observing the horse in its stall may give the examiner some clues regarding the horse's level of comfort. Watching the horse step out of its stall may give big clues about chronic lameness issues. After the visual inspection, a palpation examination should be performed. (Richard, 2013). The horse is then watched while walking and trotting in a straight line, typically on a flat, hard surface. A variety of flexion tests can be performed to help identify a painful region in a particular limb. The horse may then be lunged in a circle traveling both directions. Some lameness's are only apparent when the horse is being ridden so the lameness exam is performed while the horse is ridden(Black *et al*., 2013).

4.1. Lameness Scale

The American Association of Equine Practitioners (AAEP) developed a lameness scale to aid veterinarians and horse owners in communicating about cases and recordkeeping (Grantz 2015)

Table 1: Diagnosing Lameness in the Horse, (Schitz, 2005)

Grade 0	No lameness under any circumstances
Grade 1	Lameness is difficult to observe and is not consistently apparent
Grade 2	Lameness is difficult to observe when trotting in a straight line but is consistently apparent under certain circumstances
Grade 3	Lameness is observable at the trot in a straight line
Grade 4	Lameness is obvious at the walk
Grade 5	Lameness produces minimal weight-bearing or an inability to move

In addition to watching the horse move at the walk and palpating the legs, a veterinarian will ask to see the horse jog in a straight line and long in both directions. The practitioner might ask you to jog the horse over multiple surfaces because hard ground can exacerbate bone problems and soft ground can often highlight soft tissue injuries. Hoof testers will cause a horse to flinch if he feels pain, and this is often an indication of an abscess or hoof bruise. "I usually start at the bottom and work up," says Vrono of a lameness examination. "I do a more thorough palpation of the legs, the joints, the tendons, and the ligaments." Veterinarians will conduct flexion tests. These range from passive flexion, where the veterinarian flexes a joint to see if it has normal range of motion, to holding a joint in flexion for about a minute and watching the horse jog off. "We look to see if the flexion test exacerbates the lameness," says Ouellette. "Our job is to try to pinpoint where the pain is coming from that's causing the lameness." Veterinarians will often use the lameness scale adopted by the American Association of Equine Practitioners to, in effect, grade a horse's lameness. If a horse registers 0, no lameness is perceptible. A 5 is the most extreme (Grantz, 2015).

4.2. History Taking

Histories are obtained from the owner, trainer, or rider. Emphasis is put on the onset of lameness, the severity of joint effusion, and changes in the horse's attitude towards work. (Marc and Mark, 1991)

4.3. Clinical examination

The clinical examination is the most important aspect of any lameness evaluation. A thorough clinical examination will determine the most appropriate course of action for the rest of the lameness workup. Imaging should not be performed until the completion of the clinical examination. The clinical examination should begin with a visual assessment of the horse while the horse stands quietly in its stall and while it stands evenly on firm, level ground. Observations should include the horse's stance; muscle symmetry; enlargements of joints, tendons, or ligaments; and any conformational defects that might predispose to lameness (Elden, 2016).

4.3.1 Clinical examination of horse at rest

Watch how he's standing. "Pointing," resting a foreleg out in front of the normal stance, indicates lameness in that limb. The sound foreleg will be vertical, taking most of the weight. Viewed from the side, sore front limbs (particularly if they are both sore) are placed out front while the horse stands more under himself (almost in a leaning posture) with both hind legs. Resting a hind leg is normal, as long as it's not always the same leg and done in situations where the horse should not be resting. An acutely lame horse will hold his hoof in the air; these cases are clearer than others and don't involve the diagnostic work in this article. A horse may show you he's sore by lying down more than usual, by lying down at times or in places where he'd not normally lie down, or he may have trouble rising (Sue, 2002).

4.3.2. Clinical examination of horse at motion

"The first thing we do is see how the horse is moving at a walk," says Vrono. "Then we go over their legs looking for heat or swellings." (Grantz, 2015).

4.4. Nerve block

Because horses cannot verbalize where the pain is coming from, the next step in most lameness exams is to use local anesthetic to define the region of pain. Diagnostic regional anesthesia, also known as a "nerve block" is used to desensitize an area of the limb. For example, a horse has a Grade 3 left front lameness. Local anesthetic is first used to desensitize the foot. After the "block" has taken affect, the horse is then trotted and observed for left front lameness. If the left front lameness has resolved, then the pain that is causing the lameness is originating from the foot. If the lameness does not improve after the block, the next block is performed slightly higher on the leg. This process is continued until the lameness improves significantly or resolves. This type of nerve block desensitizes an area but does not identify the structure in the area that is causing pain(Black *et al.*, 2013).

4.5. Radiographic examination

Once the area causing the lameness has been identified, diagnostic imaging may be performed. In most cases, radiographs, also called x-rays, will be the first images obtained. Radiographs are most useful for getting information about the bones in the area imaged, but not the soft tissue structures such as tendons and ligaments (Schitz, 2005).

4.6. Ultrasonography

If the radiographs are negative, or the examination revealed soft tissue heat, pain, or swelling, then ultrasound will be used to image the tissue. Ultrasound is very useful for soft tissue and the surface of some bones, but gives little information about the deeper boney structures. Ultrasound examination often requires clipping the hair over the area to be imaged, but not always. Ultrasound can also be used to look at joints, and structures within the foot (Schitz, 2005). If the location and cause of the lameness remain elusive, veterinarians might refer your horse to a facility for nuclear Scintigraphy, an MRI, or perhaps even a computed tomography (CT) scan (Grantz 2015).

5. GENERAL METHOD OF TREATMENT OF LAMENESS

5.1. Physical therapy

5.1.1. Cold

Cold therapy should be initiated immediately following injury and continued for 7–14 days. The major physiologic benefits of cold therapy are decreased local circulation, decreased pain, and reduced tissue swelling. The primary effect of local cold application is to constrict blood vessels and reduce tissue temperature. Reduced blood flow will reduce edema, hemorrhage, and extravasation of inflammatory cells. Cold reduces tissue metabolism and may inhibit the effect of inflammatory mediators and slow enzyme systems (Kaneps, 2016).

5.1.2. Massage

There are some signs you can look for to determine whether your horse might benefit from massage therapy: Shortened strides, Sore back, Stiffness, unwillingness to bend to the left or right, Problems picking up the canter, bucking during transitions, Tripping and stumbling and Change in demeanor. A horse doesn't have to be an athlete to benefit from massage therapy. Just fooling around in the pasture, a horse can pull a muscle and come up sore. Ever seen horses galloping in a muddy field, slip and catch themselves? Imagine how you would feel if the same thing happened to you -- you might pull a groin muscle or some other muscle and feel the effects for days. Horses that are sore like this can't possibly perform at their fullest potential and very likely will be uncomfortable, even just standing in the stable (Pedigo, 2003).

5.1.4. Exercise

Controlled exercise remains the most important methodology for rehabilitation of soft-tissue injuries. Exercise is necessary to align the newly synthesized collagen fibrils along the lines of stress in the limb (Alves 2001). All exercise must be adjusted for the level of soundness. If there is increased lameness, swelling is noted at the injury site, or ultrasound parameters deteriorate, the exercise level must be decreased. Work at the trot should only begin after a solid 10 –15 minutes of hand walking for warm-up. Initially, time at the trot should be broken into short 1–1.5-minute segments (Andris, 2016).

5.2 Medication

Specific treatment of lameness often involves medication, rest, and supportive care including changes in shoeing. The medications used for lameness include drugs to control pain and inflammation, improve blood flow to the affected area, and help repair damaged tissue and joint fluid. These medications may be systemic, given by mouth or injection, or they may be injected directly into the affected joint or tissue (Paul, 2005).

5.3. Other method of therapy

5.3.1. Deep penetrating laser therapy

Laser therapy provides pain relief, a reduction in inflammation and accelerated healing. It is a scientifically proven healing modality. It accelerate the rehabilitation and healing of many common lameness disorders (Rigeal, 2012).

Fig 3:- deep penetrating lesser therapy (Rigeal, 2012).

6. CONCULUSION AND RECOMMENDATION

So, in order to use a specific diagnostic tool and treatment understanding the detail of each causes of lameness is essential. Most of the lameness in equine is as a result of tremendous predisposing risk factors such as poor hygienic. Depending on this conclusion here is some of the recommendations

- By understanding the cause of the lameness and preventing the cause which means preventing lameness
- The place equine live and rest have to maintained by the owner its good hygienic condition
- Diagnosing must start by visual and extend ultrasonography, MRI and radiology as necessary
- Treatment of the lameness if possible by using all those advanced therapy, but in a country like us, Ethiopia, I recommend that early intervention and treatment such as immobilization, exercise, cold and heat therapy to be used.
- Preventive measure for lameness should be focused on hoof, foot, leg, and joint problems.

References

Adams, S.B. (2016): Overview of Lameness in Horses [online]. Available at, http://www.merckvetmanual.com/musculoskeletal-system/lameness-in-horses/overview-of-lameness-in-horses Accessed on date [April 19, 2017].

Albert, W.W. (2012): *Foot and Health Care of Horses*. University of Illinois at urban- Champaign, college of agriculture cooperative extension service circular 1103, Digitized by the Internet Archive in 2012 with funding from University of Illinois Urbana-Champaign, Pp. 1-3

Alves, ALG, Rodrigues MAM, Aguiar AJA, (2001): Effects of beta-aminoprionitrile fumarate and exercise on equine tendon healing: Gross and histologic aspects. *J Equine VetSci*; 21:335–340.

Baxter, G. M. (2011): *Adams and stashak's lameness in horse*, 6 thed, black well publishing, Colorado state university, Colorado .Pp. not available. [online] available at https://books.google.com.et/books?id=wnfv_8dbGcEC&printsec=frontcover&dq=at+what+page+canker+in+Adams+and+Stashak%27s+Lameness+in+Horses+6th+edition&hl=en&sa=X&ved=0ahUKEwi9gYn3t7LTAhWQKVAKHVjCD6EQ6wEIJzAA#v=onepage&q&f=false. Accessed on [April 20, 2017]

Bertone, J. (2006*): Equine geriatric medicine and surgery*. 1st ed. Philadelphia, United States of America: W.B. Saunders Company. Pp. 152

Black, M.J., Conover, K.N. and Thomassen, M.P. (2013): equine lameness examination. [Online] available at http://nebraskaequine.com/Equine_Lameness_Examination2.pdf accessed on [April 21, 2017]

Bosch, G., van Schie, M.J.J., and Back, W. (2004): Retrospective evaluation of surgical versus conservative treatment of keratomas in 41 lame horses (1995-2001). *Tijdschr Diegeneeskd*. 129: 700-705.

Dar KH, Dar SH, Qureshi B (2016): Bog Spavin and Its Management in a Local Horse of Kashmir-*a Case Report. SOJ Vet* Sci 2(1): 1-2.

DraftHorseandMuleAssociationofAmerica(1981):Youthandbignermanualhttps://www.google.com/url?sa=t&source=web&rct=j&url=http://drafthorsejournal.com/downloads/DraftHorse%26MuleYouth%26BeginnersManual.pdf&ved=2ahUKEwippIDAnsHlAhXtQUEAHeN2AUsQFjAMegQIAhAB&usg=AOvVaw3t5kMVV9-wXGlqoHQkmbcOaccessedon[October29,2019]

Eastman, TG. (2008): Overview of Ring bone in horse. You're Horse's Health Veterinary Medicine. Published in Bay area equestrian network, Pp. 1-3

Equine Lameness Examination [online]. [Accessed on April 19, 2017], available at https://www.noexperiencenecessarybook.com/AWyAJ/equine-lameness-examination-we-have-great-hopes-and.htm

Fekadu, A., Teshome H., and Worku, T. (2015): Epidemiology of Lameness among Cart Pulling Donkeys in Hawassa City Administration, Southern Ethiopia.*Academic Journal of Animal Diseases*, 4(2): 52-59

Garber, L. and Stanton, N. (2000): lameness and laminitis in U.S. Horse. [Online] available at https://www.aphis.usda.gov/animal_health/nahms/equine/downloads/equine98/Equine98_dr_Lameness.pdf accessed on [April 21, 2017].

Gill HE (1973). Diagnosis and treatment of hock lameness. Proc. AAEP. 257.

Grantz, T. (2015): diagnosing equine lameness early. [Online] available at <http://www.thehorse.com/articles/23244/diagnosing-equine-lameness-early> accessed on [April 21, 2017]

Head, M.J. (2016): Bicipital Bursitis in Horses. [Online] available at https://www.msdvetmanual.com/musculoskeletal-system/lameness-in-horses/bicipital-bursitis-in-horses. Accessed on [April 20, 2017]

Honnas, C.M., Dabareiner, R.M. and McCauley, B.H. (2003): Hoof wall surgery in the horse: approaches to and underlying disorders. Vet. Clinics of N. Am: *Eq. pract.* 19, 494-499.

Kaneps, A.J. (2016): Therapies for Equine Soft Tissue Injuries. *AAEP proceedings*, 62:241-244

Klayman, E. (2017): lameness in the horse. [Online] available at http://www.coltsheadvet.com/Elden%20Lameness%20Presentation.pdf accessed on [April 21, 2017].

Lloyd, K.C., Peterson, P.R., Wheat, J.D. Ryan, A.E. and Clark, J.H. (1988): Keratomas in horses: Seven cases (1975-1986) *J. Am. Vet. Med Assoc*. 193, 967-970.

Luciane Maria Laskoski, C. A. A.V., Rosangela L. D., I. D., Rafael R. F. (2016): An update on equine laminitis.*Ciência Rural, Santa Maria*, 46(3): 547-553.

Marc R. Desjardins, Mark B. Hurtig (1991): Diagnosis of equine stifle joint disorders: Three Cases. *Can Vet J*, 32:543-550

Nancy S. Loving (2015): what is Stringhalt? Available at <http://www.horsechannel.com/media/horse-health/what-is-stringhalt.aspx.pdf.> Accessed on [April 19, 2017]

Newman, J. (1914): *Washington 4-H Horse judging manual*, Washington state university cooperative extension, Washington, Pp. 12-19.

Norton, J. (2014): the top five causes of equine lameness. [Online] available at http://www.horsechannel.com/horse-health/causes-of-lameness-navicular-syndrome.aspx. Accessed on [April 20, 2017]

Norton, J. (2014): the top five causes of equine lameness. [Online] available athttp://www.horsechannel.com/horse-health/causes-of-lameness-foot-abscess.aspx. Accessed on [April 20, 2017]

Oke, S. (2011): thrush in horse. [Image] available at: http://www.the-horse-source.com/files/thrush.pdf [accessed April 19, 2017]

Pedigo, J. (2003): Equine Massage Therapy, Equus. Available at this site http://equusmagazine.com/horse-world/massage081099 date April 19, 2017 accessed at 3:58 AM

Pollitt, C.C. (1996): A feature of acute equine laminitis. *Equine Veterinary Journal*, 28:.38-46

Posnikoff, J. (2005): The truth about ring bone. Horse channel.com, Pp. 1-4

Pothiappon, P., Parthiban, S. and Sivasudharsan (2012): Bog spavin and its management in a in a Kathiawari Horse. *Intas Polivet*; 13(2):291- 292.

Prasad, V.D., Mahesh, R., Kamalakar, G. and Prasanna K. A.V. (2014): Therapeutic Management Of osselets in Horses Research Journal of Animal, *Veterinary and Fishery Sciences*: 2(9**),** 24-26

Rendle, D. (2017): Laminitis in Horses, NADIS. [online] available at https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=6&cad=rja&uact=8&ved=0ahUKEwiFmpKxgurSAhVC1BoKHeyHDHEQFgg3MAU&url=http%3A%2F%2Fwww.nadis.org.uk%2Fbulletins%2Flaminitis-in-horses.aspx%3FaltTemplate%3DPDF&usg=AFQjCNF1K_ziwMRQqgPT_rQMFRqbjxlUMw&sig2=XppZ13F-WMFygmpWSKPWvg. Accessed on [April 20, 2017].

Richard, D. and Mitchell (2013): Distal Limb Lameness in the Sport Horse: A Clinical Approach to Diagnosis. *AAEP Proceedings*, 59:244-249

Ron Riegel (2012): laser therapy in equine practice. *Veterinary practice news*, 30: 1.

Schitz, P. (2005): Diagnosing Lameness in the Horse. Equine medical service. [Online] http://www.equmed.com/?p=318 accessed on [April 21, 2017].

Stashak, TS. (1987): *Adams lameness in horses*. 4th Ed. Boltimore: Willium and Wilkins; pp. 357-360.

Sue stuska, Ed.D. (2002): detecting lameness in your horse-part 1. Equine health. [Online] available at

http://eclectic-horseman.com/detecting-lameness-in-your-horse-part-1/ accessed on [April 21, 2017].

Sullins, KE. (2011): The tarsus and Tibia. *In Adams and Stashak's lameness in horses*. 6th Ed. Editor Baxter GM. Wiley and Blackwell. p. 1109- 1204.

Swanson, TD. (2011): Aortic-Iliac Thrombosis in Horses. [Online] available at http://d1uhp0uy75me04.cloudfront.net/49/96ae10a25011e087120050568d3693/file/PV0511_Swanson%202.pdf, accessed on [April 20, 2017].

Venugopalan, A. (2009): *Essentials of Veterinary Surgery*, 8th Ed. India: Oxford and IBH Publishing Company Pvt Ltd. p. 257-258.

Wagner, P.C., Balch-Burnett, O. and Merritt (1986): F. Surgical management of keratomas in the foot of the horse. *Equine pract*, 8:11-14.

Draft Horse and Mule Association of America (1981): Youth and bigner manualhttps://www.google.com/url?sa=t&source=web&rct=j&url=http://drafthorsejournal.com/downloads/DraftHorse%26MuleYouth%26BeginnersManual.pdf&ved=2ahUKEwippIDAnsHlAhXtQUEAHeN2AUsQFjAMegQIAhAB&usg=AOvVaw3t5kMVV9-wXGlqoHQkmbcO accessed on [October 29, 2019]

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