

## Horseshoeing: An Overview

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### Abstract

The horseshoeing is one of the oldest surviving traditional craft popularly known as "Farriery". Shoeing was invented because even the best footed horses would become foot sore when traveling long distance or carrying heavy load. Physiological horseshoeing can be defined as the process that promotes a healthy functional foot, bio-mechanical efficiency and prevents lameness. A horse shoe is simply a bar of steel which is bent to the shape of the hoof and nailed to it. Different varieties of horses require different styles of shoeing. Shoe protects the foot from bruising, splitting and wearing, provides working comfort and also prevents slipping. Additionally, it is advocated in treatment of hoof defects. Assessment of horse shoeing includes measurement of hoof angle, position of hoof balance, tubular alignment of toe with heel, position of medio-lateral imbalance, tubular alignment of the toe alone, status of dorso-palmar balance along with hoof pastern axis and so also the hoof symmetry in contest to status of sole. Neglecting regular attention to a horse's feet, whether shod or not, can easily cause problems which can be hard to correct.

**Keywords:** Horse, horseshoe. Hoof, Lameness.

### Introduction

There may be no other routine procedure performed on the equine athlete that has more influence on soundness than hoof preparation and shoeing. Physiological horseshoeing could be defined as that which promotes a healthy functional foot, biomechanical efficiency and prevents lameness (Butler, 1986). A thorough knowledge of proper traditional horseshoeing enables the veterinarian to interact with the farrier to enhance and promote quality hoof care (Butler, 1986; Curtis, 1999 and Hickman *et al.*, 1988). Shoeing was invented because even the best footed horses would become foot sore when traveling long distance or carrying heavy load. Important aspects include hoof balance, hoof length and hoof angulations. Horse shoe has not been reported from any archeological site excavated in India. To the date no one has written on technique of horse shoeing in India. There was no firm evidence of nailed horse shoe before the end of ninth century (Qaisar, 1992).

### Anatomy

The hoof of a horse has a hard outer layer and inside it are a living flesh, blood and bone. A hoof is made up of horn and forms natural sleeper for the horse to walk in (Kacker and Panwar, 1996). The hoof

wall is about 1/2" (1 cm) thick. The hoof wall is divided into outer wall, inner wall and white line. The outer hoof wall is pigmented and contains a higher ratio of tubules. These tube-like structures grow down from the coronary band in a spiral configuration towards the ground. The primary purpose of the outer wall is to store and release energy during the different phases of the stride to help propel the horse. It also provides protection from the structures within, regulating ingress and egress of moisture (Kainer and McCracken, 1998). The white line is the name given to the junction between the inner hoof wall and sole. The nails must not pass inside the white line. The rate of growth is about 5/16" (8mm) every month. Coronary band is a very tough, vascular structure which sits at the top of the hoof wall. The wall at the front is called the toe. At the back it is called the heels and the parts of the wall at each side where nails are placed are called the quarters.

Planter surface of the hoof is cupped shape called sole, which is the area inside the white line, but not including the bars and frog. Its primary function is to protect the sensitive structures beneath the sole. The frog is a kind of pad and being flexible and squashy it helps to absorb shock, give the horse grip and assisting circulation. The bars are formed by the wall turning inwards and forwards at the heels. Its primary purpose

is to control the movement of the back of the hoof, adding strength to the heel area and protecting it from excess distortion. There are two and a half bones inside the hoof. The pedal bone, the navicular bone and the bottom half of the short pastern bone.

### Objectives of horse shoeing

Horse shoe prevent the feet of horses from being worn down excessively. It also prevent hoof wall from splitting. Horse shoe prevent slipping of feet. Proper shoeing kept the horse working in comfort. Shoe protects the foot from bruising (Humphrey, 1995). Shoeing achieve a balanced foot with normal axis. Horse shoeing keep the pastern and hoof axis unbroken. Shoeing reduce uneven concussion to the foot. Horse shoeing give better traction in unfavorable condition & terrain. It also help to cure hoof diseases & hoof defects (Stashak *et al.*, 2002).

### Evaluation of foot

Assessment of horse shoeing includes measurement of hoof angle, position of hoof balance, tubular alignment of toe with heel, position of medio-lateral imbalance, tubular alignment of the toe alone, status of dorso-palmar balance along with hoof pastern axis and so also the hoof symmetry in contest to status of sole (Stashak *et al.*, 2002).

**Hoof angle:** A normal hoof has a slope of about 45° for forefeet and 55° for hindfeet. Boxy feet are upright feet with an angle of more than 55°. If they are steeper than 60° they are called club feet. Club feet are abnormal and usually result from flexural deformity in early years or from tendon shortening due to injury. A horse with an angle of less than 45° will have flat sole and weak heels. It will be very susceptible to bruising and puncture wounds of the sole and may also be prone to navicular disease and tendon strain. Problems associated with high hoof angles includes coffin joint arthritis, extensor process injury, pedal oestitis and increases strain on the suspensory ligament and superficial digital flexor tendon (Colles, 1983; Balch *et al.*, 1995). Raising the toe (lowering the hoof axis) in normal horses impedes blood flow in lateral part of the hoof (Colles, 1983). Low hoof angles have also been shown to increase (prolong) the time for breakover (the interval between heel off and toe off) in both forelimbs and hindlimbs

**Hoof balance:** It may be defined as an equal weight or force around the center of gravity is identical with that of the foot (Butler, 1994).

**Medial-lateral balance:** ML balance refers to relationship between the medial (inside) wall of the hoof and the lateral (outside) wall of the hoof. Lowering the lateral wall tends to position the hoof more toward the midline of the horse, whereas lowering the medial wall tends to position the hoof away from midline of the horse. Problems associate with inappropriate ML hoof

balance that leads to disproportionate forces applied to hoof wall includes laterally distorted hooves, chronic heel soreness, sheared heels, quarter cracks, heel cracks, bar cracks, thrush, side bones, navicular syndrome and chronic metacarpophalangeal (fetlock) joint synovitis (Moyar *et al.*, 1975; Balch *et al.*, 1985).

**Length:** Hoof length (toe length) is determined by measuring from the toe at the ground surface proximally to the end of the horny wall at the coronary band. Long toes create a longer lever arm, a delayed breakover and increased tension on the palmar/plantar soft tissue support structure. Extreme toe length may cause a prominent flare of the distal border of the hoof wall and tearing of lamina (Balch *et al.*, 1995). The appropriate toe length of a freshly trimmed hoof ready for shoeing varies according to the horse size, body weight and breed. For example, the toe length of a small 360-400kg Arabian might be 7.6cm (3 inches), that of medium 425-475kg Quarter horse might be 8.25cm (3.3 inches) and that of large 525-575kg Warm blooded might be 8.9cm (3.6 inches) (Balch *et al.*, 1995).

**Levelness:** The entire bottom of the hoof wall should be level so that it, makes perfect (even) contact with a smooth ground surface or flat shoe. Any unevenness will cause the hoof to bear weight unevenly.

**Sole:** The natural sole is slightly cupped from side to side as well as from front to rear. Flatten sole may cause pathological cause (Colles, 1983). Inadequate sole depth commonly cause of chronic sub-solar bruising (Moyar, 1988).

**Dorsal-palmar balance:** It means the balance between the front and back of the hoof. The distance from the toe to the apex of the frog should be 1/3, and from the apex of the frog to the back of the heels should be 2/3 of the total length of the hoof. The very over grown hoof in front of the apex of the frog than behind it. Breakover is delayed putting extra strain on the tendons and ligaments of the leg (Stashak *et al.*, 2002).

**Symmetry of hoof pairs:** Forefeet are usually larger, rounder and wider at heels and have flatter soles than the hind feet. Hind feet are commonly smaller more pointed at the toe and have more concave sole and higher hoof angle (Stashak *et al.*, 2002).

**Toe heel tubular alignment:** The angle of hoof at the heel should be parallel to the angle of the toe (Stashak *et al.*, 2002).

### Methods of shoeing

**Cold shoeing** - Machine made shoes, all made to the standard pattern in graded sizes and were greatly used for cold fitting. It tends to be quicker and thus cheaper.

**Hot shoeing** – The shoe is specially made to fit the foot, it is tried hot, and adjustments are made before it is finally nailed on.

**Advantages of hot shoeing** – Exact juxtaposition

between iron and hoof can be obtained. Bearing surface of wall and sole is rendered impervious to water. Charring of horn renders hoof less liable to split when the nails are being driven. Shoe can altered with ease (Kacker and Panwar, 1996).

#### Farreir tools

Farrier's tools are 'shoeing tools' for preparing the foot and nailing on the shoe.

#### Shoeing tools includes

**Pincer-** It is used for levering of the shoe, to remove the old shoe pincers are used for raising each branch. Also for drawing the clenches, nails and for tightening the clenches finally.

**Clinch cutter/ buffer-** Used for cutting or knocking up clenches before removing the shoe and a point at the other for punching out broken nails.

**Nipper /hoof cutter-** It is used to trims the hoof wall to the desired length. Their most important use to trim the feet of young horse and unbroken colts.

**Hoof knife-** Trim the sole and frog of the hoof.

**Hammer and anvil-** It has two claws or lugs for twisting of the points of the nails or for withdrawing the nail if wrongly driven. Hammer used for nailing on the shoe.

**Rasper-** For lowering the wall and finally leveling the bearing surface of the foot, finishing off the shoe in the vice, to prevent the hoof from splitting.

**Toeing knife-** Cutting off overgrown portions of wall when preparing the feet of older broken in horses; it is driven through the horn with the driving hammer (Miller and Robertson, 1952).

The procedure of shoeing can be compiled into following steps namely; the removal of old shoe, preparation and trimming of hoof, fitting of shoe, nailing on, finishing and finally the inspection (Kacker and Panwar, 1996). Trimming the hoof is probably the most important part of the shoeing process. How a hoof is trimmed and shaped would have more influence on horse's balance and movement than the type of shoe or how it was fitted (Humphrey, 1995).

The procedure of shoeing/reshoeing falls into following stages:

**A] Removal of old shoe-** The foot if taken between the knees and all the clenches are cut by means of buffer and driving hammer. Each branch of shoe is raised with pincers, so nails are partly drawn out simultaneously. Care being taken not to twist shoe with the pincers, otherwise breaking of portion of wall occurred.

**B] Preparation of foot-** It comprises of trimming of overgrowth hoof wall and adjustment of foot for fitting new shoe. Trimming is the most important aspect of horseshoeing as it creates the base to which a shoe is attached. Before preparing the foot, the farrier should visually examine its conformation by viewing it from the front, the side and from behind the standing horse. The

primary object is leveling bearing surface of foot. The sole and cleft of frog are cleaned out with the drawing knife. Loose chips of horn from the lower outside edge of wall are cut off with drawing knife. Remove loose flakes from sole and loose or ragged portion of frog and sole. The rasper is then used to provide the foot with a level bearing surface. The heels are rasped according to the foot conformation or until the heel, angle of the sole and bar form a solid base. The heels should not be trimmed below the ground surface of the frog.

**C] Fitting of the shoe-** The shoe used should be the lightest and simplest possible that provides traction, protection, and adequate support to the foot for the work being performed. It is carried out when shoe is still hot. The shoe is held sufficiently long in contact with the foot to sear the horn. The length of the shoe should be long enough to cover the buttress of the heel and to support the leg. The concept of nailing is to use the fewest nails possible and the smallest nail that will hold the shoe securely in place during the shoeing interval

**D] Nailing on-** Nail should be chosen carefully, they will give sufficient grip in nail holes. If too large head nail will taken, it wear away to soon. Too small head will not properly fill the nail hole. The head not project more than 3mm from ground surface of shoe. The correct nail coarse judged by feel and sound of the blows. A hollow sound indicates that nail if not being driven through hard horn. In finishing, clenches are tidied up with the rasp.

#### Therapeutic shoeing

Corrective trimming and shoeing alters the hoof, affecting stance or stride, including breakover. Therapeutic shoeing is an important part of some lameness treatments. Therapeutic shoeing aims to restore DP balance, ML balance, shape and hoof integrity as well as to provide additional support, protection and traction. Therapeutic shoeing is an important part of some treatment protocols in management of the equine lameness as it helps in resolving movement abnormalities (Stashak *et al.*, 2002). The shoe which are commonly used are rolled toe shoe, extended toe shoe, extended heel shoe, lateral/medial extension shoe, three quarter shoe, squared toe shoe, half shoe, three quarter shoe, patten shoe, wedge heel shoe, trailer shoe, rocker toe shoe and egg-bar shoe.

#### Post shoeing faults

Easing the heels or springing the heels, opening the heels, stumping up or dumping the toe, uneven bearing surfaces, paring the sole, paring the frog, rasping the outside of the wall, pricks, presses or nail binds, injuries from the clips, injuries caused by the shoe (Miller and Robertson, 1952).

#### Future prospects

Professional farriery courses should be

introduced as continuing veterinary education to the equine practitioners. The art of farriery should be modernized incorporating the knowledge of computerized dynamics of horse foot during progression and while in work for different intended purpose. Quality shoes and nails suitable for Indian breeds of horses and ponies can be evolved in technical consultation of bioengineers and metallurgy experts.

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