Evidence-based Clinical Question
Do rolled or squared toes affect rate of breakover in horses?

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Introduction

Breakover is the phase of the stride that occurs at the end of the stance phase, at the transition between stance and swing. At this point, the hoof begins to leave the ground. It begins with a lifting of the heel, as the hoof begins its pivot at the toe, and finishes when the toe leaves the ground (Stashak 2002a).

Changes of toe position length can be made by either trimming of the hoof, or by applying shoes with different toe profiles. The toes of horseshoes are sometimes rolled, squared or bent up (‘rocked’) in an effort to assist limb movement. In orthopaedic conditions such as osteoarthritis of the interphalangeal joints (‘ringbone’), it is hoped that by rolling the toe, breakover may be ‘enhanced’ (Stashak 2002b). Although precisely what might constitute such enhancement may be a subject for discussion, shoes with rolled or rocked toes have traditionally been applied in an effort to speed up breakover. In some countries, rolling of the toe of the horse shoe is a standard practice, whereas in others, such shoes are used mostly for therapeutic purposes (van Heel et al. 2006). Regardless, there is little scientific evidence to support such applications.

Data acquisition

A MEDLINE search using search terms, ‘rolled toe’, ‘rocker toe’ and ‘breakover’, was used for initial search. Cross-referencing from search terms revealed additional resources. Books on lameness and equine biomechanics were also searched.

Studies on shoeing and breakover

Several studies show that breakover duration is no different between normal shoes and those with rolled, rocker or squared toes. Limb placement and timing characteristics (breakover duration) did not change significantly in one study of sound Warmblood horses shod with rolled toes (van Heel et al. 2006). When compared to conventional plain steel shoes, breakover does not appear to be not significantly different whether rocker toe, rolled toe or square toe shoes are employed (Clayton et al. 1991). Similar findings were found in a study that employed a motion analysis system and a force plate. This study showed that there are no differences between rocker-toed and standard flat shoes in the duration or ease of breakover, nor were differences shown in the proximity of breakover to the centre of the toe (Willemen 1996). Furthermore, these studies also show that the flight arc of the hoof remains unaffected by rolling the toe of the shoe. Lastly, while such studies have been conducted on hard ground, rolled toes would seem even less likely to be effective on soft surfaces, where the toe is able to cut into the ground at the end of the stance phase.

Any effect of rolled or rocker-toed shoes on the moment of force can only be exercised during the last 5% of the stance phase (during breakover). By this time, the forces acting on the lower limb of the horse have already decreased significantly. Thus, while the intent of applying shoes with altered toes is perhaps easy to understand, in fact, there is a very small moment in which such application could be effective, and that moment occurs at a time when limb forces are decreasing anyway. Thus, even if an effect of such shoes on breakover rate could be demonstrated, it is likely that such an effect would be negligible.

‘Natural Balance’ shoes

‘Natural Balance’ horseshoes have a somewhat square toe that moves the front of the shoe closer to the heel than do traditional shoes. Among other purported benefits, these shoes are said to help ‘improve breakover’. Although the moment arm - defined as the perpendicular distance from line of force application to the axis of rotation - of the ground reaction force on the distal interphalangeal joint becomes shorter the further back the toe of the shoe is pulled back from the toe of the hoof, when compared to toe clip and quarter clip shoes, the Natural Balance shoes did not reduce breakover duration and did not change the force exerted on the navicular bone by the DDFT (Eliashar et al. 2002).

Additional analyses

While all studies to date have failed to show any effect of rolling toes on breakover, a recent study has concluded that peak joint moment - a measure of force - on the distal interphalangeal joint is 14% less with a specially designed...
rolled-toe shoe. The authors of this study concluded that hoof movement was smoother and more gradual using the rolled-toe shoes, and suggested that this made it more likely that the horse would have more correct coordination with such shoeing (van Heel et al. 2006). While this may imply that using a shoe of this type is ideal for every horse, there is no clinical evidence to support such a notion. Indeed, even in this study, most studied parameters were unchanged, so, at least, the conclusions of the study would be strengthened by independent replication.

Conclusion

Based on currently available scientific information, the assertion that shoeing with a rolled or rocker toe significantly affects breakover in the horse cannot be supported. There may be other advantages to roller or rocker toed shoes; however, currently available evidence would suggest that any effects are modest, and such evidence needs independent replication. In addition, it would be useful to know what, if any, differences are seen when such shoes are used on soft, as opposed to hard, ground.

References


If you have a submission for a future Clinical Question to be included in EVE, please contact David Ramey at ponydoc@pacbell.net