

Endoscopic Determination of Exercise-induced Pulmonary Hemorrhage in Kurdish Horses

¹Mohammad Mashayekhi, ²Mehdi sakha, ²Mohammad G. Nadalian and ³Ali Hassanpour

¹Student of Large Animal Internal Medicine, Science and Research Branch, Islamic Azad University, Tehran, Iran.

²Department of Clinical Sciences, Science and Research Branch, Islamic Azad University, Tehran, Iran.

³Department of Clinical Sciences, Tabriz Branch, Islamic Azad University, Tabriz, Iran.

Abstract: Exercise-induced pulmonary hemorrhage (EIPH) is a common occurrence in race horses. The Kurdish horse is one of the oldest and fast breeds in Iran. Sixty pure Kurdish healthy horses aged 4 to 13 years and different sexes were examined endoscopically for detection of exercise-induced pulmonary hemorrhage within 2 hours after racing. 17(28.3%) of these animals had various degrees of hemorrhage in the tracheal lumen and no epistaxis detected in them. Statistically, a significant relationship observed between the occurrence of EIPH and the age of examined horses, but there was no significant relationship between EIPH occurrence and sex.

Key words: Kurdish horse, EIPH, Respiratory endoscopy

INTRODUCTION

Exercise-induced pulmonary hemorrhage (EIPH) occurs in horses throughout the world and does not appear to have any geographic distribution and it is a disorder of horses that run at high speed, such as thoroughbred or standardbred racehorses. The disorder is uncommon in endurance horses or draft breeds (McGorum *et al.*, 2007 and Radostits *et al.*, 2007). EIPH is associated with impaired performance in thoroughbred racehorses and Standardbred trotters (Hinchcliff *et al.*, 2005 and Richard *et al.*, 2010). Epistaxis due to EIPH occurs during or shortly after exercise and is usually first noticed at the end of a race, particularly when the horse is returned to the paddock or winner's circle and is allowed to lower its head (Hinchcliff *et al.*, 2004; McGorum *et al.*, 2007 and Smith, 2009). The cause of this disorder is tremendous increase in blood pressure and rupture of alveolar capillary membranes with subsequent extravasation of blood into interstitial and alveolar spaces (Jones, 2003; Manohar *et al.*, 1993 and Radostits *et al.*, 2007). Although rupture of alveolar capillaries occurs secondary to an exercise-induced increase in transmural pressure (pressure difference between the inside of the capillary and the alveolar lumen). Also some theories indicate that small airway disease, upper airway obstruction, stress failure of the pulmonary capillaries and blood abnormalities can role the pathogenesis of EIPH (Radostits *et al.*, 2007 and Reed *et al.*, 2004). During locomotion the force following ground-strike of the front legs is transmitted, when some attenuation through the forelimbs to the scapulae. As a result, pressure waves are transmitted through the lung paranchyma toward the dorsal and caudal regions, so the characteristic location of lesions of EIPH is in the caudodorsal lung fields (Radostits *et al.*, 2007 and Schroter *et al.*, 1998). The prevalence of EIPH varies with the method used to detect it and the frequency with which horses are examined (Smith, 2009). There are a variety of techniques available for determining the presence and severity of EIPH including direct examination of the airways through a flexible endoscope or examination of bronchial lavage or tracheal aspirates for evidence of hemorrhage. Radiography, pulmonary scintigraphic examination and lung function tests are useful in eliminating other respiratory disease as a cause of poor performance, but are minimally useful in confirming a diagnosis of EIPH or in determining the severity of hemorrhage (Hinchcliff *et al.*, 2004; McGorum *et al.*, 2007 and Smith, 2009). Endoscopic examination of the upper respiratory tract and detection of frank blood within the trachea is the usual method of diagnosis (Reed *et al.*, 2004). Age is considered a risk factor for EIPH, with the prevalence of the disorder being higher in older horses. There is no consistent association of sex with prevalence of EIPH. This disorder is common in high speed breeds such

Corresponding Author: Mohammad Mashayekhi, Faculty of Specialized Veterinary Medicine Science and Research Branch, Islamic Azad University Tehran, Iran. Tel: +982623295125; Fax: +982144865105
E-mail: Mashayekhi79@yahoo.com

as throughbred and Standardbred (Radostits *et al.*, 2007 and Smith, 2009). Among Throughbred race horses the prevalence of EIPH increases with increasing speed. Lesion of EIPH are not detected in young throughbred racehorses that have trained at speed of less than 7m/s (Radostits *et al.*, 2007). The objective of this study was to evaluate the prevalence of EIPH in one of the Iranian sport horse breeds for the first time.

MATERIALS AND METHODS

Sixty healthy pure Kurdish horses, thirty males and thirty females, weighing between 350- 500 kg and aged 4-13 were examined endoscopically to detect of EIPH after exercise. All of the animals were in stables with optimal ventilation and fed on a diet based on grain and alfalfa hay, as well as mineral and vitamin supplements. After taking history of any recently disorder or disease or exist of poor racing performance and trusting of absence any problem in them, the complete examination of body organs were performed and recorded.

After confirming of health in them, horses got a few minutes in warming-up phase of walking and trotting in the racecourse prior to testing. Horses galloped 1600 meters long at 12m/s. Respiratory endoscopic evaluation was carried out in all horses 90-120 minutes after exercise using a flexible fibreoptic endoscope introduced through one of the nostrils and passed down to the carina. The level of blood presence was determined. Animals which would not accept the endoscope, were sedated with single dose of xylazine hydrochloride (1mg/kg IV). The presence of blood for assessment of severity of EIPH using a 0-4 grading as follows: Grade 0- no blood detected in the pharynx, larynx, trachea or main-stem bronchi, Grade 1- Presence of one or more flecks of blood or ≤2 short (less than one-quarter the length of the trachea) narrow (<10% of the trachea surface area) streams of blood in the trachea or main-stem bronchi visible from the trachea bifurcation, Grade 2- one long stream of blood (more than half the length of the trachea) or >2 short streams occupying less than one-third of the tracheal circumference, Grade 3- Multiple distinct streams of blood covering more than one-third of the tracheal circumference; no blood pooling at the thoracic inlet, Grade 4 - Multiple, coalescing streams of blood covering >90% of the tracheal surface with pooling of blood at the thoracic inlet (McGorum *et al.*, 2007).

RESULTS AND DISCUSSION

Seventeen (28.3%) horses of the examined animals showed some degree of bleeding on endoscopic examination. Our results from respiratory endoscopy after exercise showed the increasing number of bleeders and severity of hemorrhage in aged horses. So on the basis of the data obtained there was a significant relationship between the increased values of EIPH prevalence and the age of animals ($r=0.343$, $p\leq 0.01$). But there was no significant correlation between horse's sex and prevalence of EIPH (Table 1).

Table 1: Age distribution of bleeders and the severity of EIPH in them.

Age	4	5	6	7	8	9	10	11	12	13
number	5	5	6	7	6	6	8	5	5	7
Degree 1 EIPH	0	0	1	2	2	2	3	1	0	0
Degree 2 EIPH	0	0	0	0	0	0	0	1	2	2
degree3 EIPH	0	0	0	0	0	0	0	0	0	1
Total	0%	0%	16.6%	28.5%	33.3%	33.3%	37.5%	40%	40%	42.8%

The breed of horses is an important risk factor for prevalence of EIPH (Smith, 2009). Based on a single endoscopic examination within 2 hours of racing, conducted by Pascoe *et al.* in 1981 43.8% of thoroughbred horses had various degrees of hemorrhage in the tracheal lumen and 0.8% of them had blood flow from the nostrils (Pascoe *et al.*, 1981). In the same manner, Raphael and Soma in 1982 reported that 75.4% of thoroughbred racehorses had some degrees of EIPH and 9.0% of them had blood at the nostrils (Raphael and Soma, 1982). Mason *et al.* in 1984 showed that from 1093 post-race endoscopic examination of thoroughbred racehorses in Hong Kong, 46.8% of them had EIPH (Mason *et al.*, 1984). In 2006 Costa and Thomassian showed that 62% of thoroughbred racehorses in Brazil had some degrees of EIPH (Costa and Thomassian, 2006). Therefore, the prevalence of EIPH in thoroughbred racehorses in single endoscopic examination within 2 hours of race is 43-75%, While the prevalence of EIPH in standardbred racehorses, in same method is 26-43% (McGorum *et al.*, 2007 and Smith, 2009). Lapointe *et al.* in 1994 reported that 87% of Quebec standardbred racehorses had some degrees of hemorrhage in endoscopic examination 1 hour after racing on at least 3 occasions. They concluded that no significant relation detected between the frequency of EIPH and

age, sex on gait (Lapointe *et al.*, 1994). Birks *et al.* in 2002 compared standardbreds and thoroughbred from this view point and showed that there was no apparent effect of breed (or possibly racing gait) on EIPH (Birks *et al.*, 2002). Considering the findings of the mentioned studies we suggest that this disorder is a common disorder in standardbred racehorses as it is in thoroughbred racehorses. Hillidge *et al.* in 1985 at retrospective survey of EIPH based on endoscopic examination within 30-90 minutes after racing in 94 appaloosa horses reported that approximately 52% of racing appaloosa horses had some degrees of EIPH and there was a significantly increased prevalence of EIPH with increasing age in that population (Hillidge *et al.*, 1985). The prevalence of this disorder is approximately 11% in polo ponies and 62% in Quarter horses used for barrel racing (Smith, 2009). Araya *et al.* in 2005 showed that the prevalence of EIPH in Chilean Criollo horses in endoscopic determination within 90-120 minutes after exercise is 60.8% (Araya *et al.*, 2005). To the best of our knowledge there is no published article about prevalence of EIPH in Iranian horses of any breeds. The Kurdish horse is one of the oldest and fast breeds of horses from Iran that used in flat racing and game of polo. Our results showed that 17 horses from 60 had some degree of hemorrhage in trachea and bronchi in endoscopic determination, so the prevalence of EIPH in Kurdish horse is 28.3%. In addition, our findings showed a significant relationship between increasing prevalence of EIPH and increasing age but there was no significant relationship between prevalence of EIPH and sex that is in agreement with previous studies (Hillidge *et al.*, 1985; Pascoe *et al.*, 1981 and Raphel and Soma, 1982).

Conclusion:

From this study it can be concluded that the Kurdish horse suffers from EIPH same as throughbred or other sporting breeds.

REFERENCES

- Araya, O., P. Palma, M. Salvi, H. Bustamante and L. Vits, 2005. Endoscopic determination of exercise-induced pulmonary haemorrhage in Chilean Criollo horses. *The veterinary Journal*, 169(2): 311-313.
- Birks, E.K., K.M. Shuler, B.B. Martin, L. Marconato, F. Del piero, D.C. Teleis, D. Schar, A.E. Hessinger and C.E. Uboh, 2002. EIPH: Posttrace endoscopic evaluation of Standardbred and Thoroughbreds. *Equine Veterinary Journal Supplement*, Sep;(34): 375-8.
- Costa, M.F. and A. Thomassian, 2006. Evaluation of race distance, track surface and season of the year on exercise-induced pulmonary haemorrhage in flat racing thoroughbreds in Brazil. *Equine Veterinary Journal Supplement*, Aug; (36): 487-9.
- Hillidge, C.J., T.J. Lane and T.W. Whitlock, 1985. Exercise-induced pulmonary hemorrhage in the racing appaloosa horse. *Journal of Equine Veterinary Science*, 5(6): 351-353.
- Hinchcliff, K.W., M.A. Jackson, P.S. Morley, J.A. Brown, A.E. Dredge, P.A. O'Callaghan, J.P. McCaffrey, R.E. Slocombe and A.E. Clarke, 2005. Association between exercise-induced pulmonary hemorrhage and performance in Thoroughbred racehorses, *Journal of the American Veterinary Medical Association*, 227(5): 768-7.
- Hinchcliff, W.K., J.A. Kaneps, J.R. Geor and W.vBayly, 2004. *Equine sports medicine and surgery, Basic and Clinical Sciences of the Equine Athlete*. Saunders press.
- Jones, E.W., 2003. What do we know today about EIPH? *Journal of Equine Veterinary Science*, 23(6): 283-284.
- Lapointe, J.M., A. Vrins and E. McCarvill, 1994. A survey of exercise-induced pulmonary haemorrhage in Quebec standardbred racehorses. *Equine Veterinary Journal*, 26(6): 482-5.
- Manohar, M., E. Hutchens and E. Coney, 1993. Pulmonary haemodynamics in the exercising horse and their relationship to exercise-induced pulmonary hemorrhage. *British Veterinary Journal*, 149(5): 419-28.
- Mason, D.K., E.A. Collins and K.L. Watkins, 1984. Effect of bedding on the incidence of exercise-induced pulmonary haemorrhage in racehorses in Hong Kong. *Veterinary Record*, 115(11): 268-9.
- McGorum, C.B., M.P. Dixon, E.N. Robinson and J. Schumacher, 2007. *Equine Respiratory Medicine and Surgery*. In *Disorders of the lower respiratory tract: Exercise-induced pulmonary hemorrhage*, Hinchcliff, K.W., Saunders Elsevier press.
- Pascoe, J.R., G.L. Ferraro, J.H. Cannon, R.M. Arthur and J.D. Wheat, 1981. Exercise-induced pulmonary hemorrhage in racing thoroughbreds: a preliminary study. *American Journal of Veterinary Research*, 42(5): 703-7.

Radostits, M.O., C.C. Gay, W.K. Hinchcliff and D.P. Constable, 2007. *Veterinary Medicine, A textbook of the diseases of cattle, horses, sheep, pigs and goats*. In *Diseases of the respiratory system*, Tenth edition, Saunders elseviere press.

Raphel, C.F. and L.R. Soma, 1982. exercise-induced pulmonary hemorrhage in Thoroughbreds after racing and breezing. *American Journal of Veterinary Research*, 43(7): 1123-7.

Reed, M.S., M.W. Bayly and C.D. Sellon, 2004. *Equine Internal Medicine*. In *Disorders of the respiratory systems*, Ainsworth, D.M. and R.P. Hackett, Second Edition, Saunders press.

Richard, E.A., G.D. Fortier, P.H. Pitel, M.C. Dupuis, J.P. Valette, T. Art, J.M. Denoix, P.M. Lekeux and E. Van Erck, 2010. Sub-clinical diseases affecting performance in Standardbred trotters: Diagnostic methods and predictive parameters. *The Veterinary Journal*, 184(2010): 282-289.

Schroter, R.C., D.J. Marlin and E.Denny, 1998. Exercise-induced pulmonary haemorrhage (EIPH) in horses results from locomotory nduced trauma - a novel, unifying concept. *Equine veterinary Journal*, 30(3): 186-92.

Smith, P.B., 2009. *Large Animal Internal Medicine*. In *Equine respiratory system*, Wilkins, P.A., fourth edition, Mosby Elsevier press.