

A Survey on the Prevalence of Heart Murmurs in Polo Horses

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Abstract:

BACKGROUND: Cardiac murmur and subsequently cardiac failure is one of the poor-performance causes in athletic horses. Attention to murmur character is vital during heart examination. Polo is a sport which demands very high stress on horses, which may result in more stress on cardiovascular system.

OBJECTIVES: In this study we assume that high pressure on polo horses makes them more susceptible to valves insufficiency as a result of high velocity across valves.

METHODS: 136 polo horses were evaluated in this study, and all participated in polo matches. Both sides of chest were heard carefully by two clinicians and murmur characters recorded in detail. Afterward the accuracy of auscultation finding was proved by echocardiography, in echocardiography examination all the valves were evaluated carefully for any trace of regurgitation or stenosis across valves.

RESULTS: Forty-seven horses showed cardiac murmurs during auscultation (34.55%). Thoroughbred had the highest rate of murmur, with 71% of murmurs observed in this breed. Grade 2 murmurs were more frequent than others and 24 horses showed Grade 2 murmurs. And tricuspid had the highest involvement and 24 horses had tricuspid regurgitation.

CONCLUSIONS: This study is the first report of cardiac murmur in Polo horses, which showed the high presence of tricuspid and aortic murmur. The difference between prevalence of murmurs in this study and other ones was not remarkable.

Keywords:

Cardiac auscultation, Horse, Murmur, Prevalence, Valve

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Introduction

Polo is one of the world's oldest recorded equestrian sports, having been played over 2000 years ago in ancient Persia (Marlin and Allen, 1999). Polo demands ongoing changes in speed as galloping is interrupted to immediate stopping, and horses should turn to the sides during the game and this characteristic of the game makes it a high stress sport and therefore we expect high pressure on the cardiovascular system.

Several researchers performed different series of experiments to investigate the cardiac abnormalities in athletic horses (Rostami et al, 2014; Young et al, 2008; Kriz et al, 2000). For general approach in equine athlete clinical expertise in equine auscultation, echocardiography, electrocardiography and exercise test are recommended (Young and Loon 2014). The first comprehensive study on the prevalence of murmur in horse's population was done by Niemetz (1924) who reported 66% of murmur heard on the base of the heart (Patteson and Cripps, 1993). The most complete survey was conducted by Else and Holmes (1972) on 1557 horses auscultated and thereafter the pathologic findings were evaluated in slaughtered horses.

Cardiac murmurs are a very common finding in horses and in a recent study reported that 81% of 846 Thoroughbred horses in race training had a kind of murmur (Hewetson, 2013). In the other research physiologic murmurs associated with ventricular filling and ejection were reported as high as 15% and 50% respectively (Hewetson, 2013).

The significance of heart murmurs auscultated in horses is often difficult to determine if the horse is not exhibiting any

clinical signs or if the signs, such as poor performance, are nonspecific (Reef, 1995. Buhl et al., 2013). The timing and short duration of physiological murmur are the characteristics which help distinguish it from pathologic ones (Jago and Keen, 2013). Echocardiography is gold standard method for evaluating murmurs and is recommended: 1) when clinical and auscultatory findings do not meet the physiologic murmurs, 2) if murmur is moderate to loud; 3) when murmurs were heard on pre-purchased examination (Reef et al, 2014).

In this study we report prevalence of heart murmurs in polo horses' population. This is the first study on polo horses and we hypothesized that murmurs frequency should be different according to the sport horses play.

Material and Methods

All 136 horses underwent thorough clinical examination at rest. Examination was performed by two clinicians. Both sides were auscultated carefully with a 3M Littmann Master Classic II S.E. Cardiac rhythm, and murmurs characteristics including: intensity, point of maximum intensity (PMI), period in cycle and its quality were recorded.

Intensity of cardiac murmurs was graded by the method originally described by Levine and Harvey and adapted by Patteson and Cripps, 1999.

Afterward, the accuracy of auscultation finding was proved by echocardiography, in echocardiography examination all the valves were evaluated carefully for any trace of regurgitation or stenosis across valves. Echocardiographic images were acquired with an ultrasound device (Micro

Maxx: SonoSite Inc., Bothell, WA, USA) with a phase array transducer (1-5 MHz). A right parasternal window was used to evaluate all valves. Color Doppler images were also recorded on all valves and any regurgitation was evaluated based on the area of the blood jet in comparison with the approximate size of the atrium for the mitral and tricuspid regurgitations.

At the end complete history was taken from the owner or rider of horses. Any history of poor performance or other signs of cardiac disorders like edema, jugular pulsation and so on was noted.

Results

In total 136 horses were evaluated. Their breeds were Thoroughbred, Arabian and Anglo-Arabian (61 males, and 75 females), with average age of 13 ± 3 years and average weight of 390 ± 18 kg. Forty-seven horses showed cardiac murmurs during auscultation (34.55%). 71% of murmurs belong to thoroughbred; 25% Anglo-Arabian and 4% Arabian horse so the highest prevalence was seen in thoroughbred (Table 2).

The most common murmur was early diastolic Grade 1 to 2 with PMI over mitral and tricuspid valves, 28 horses had this type of murmur, 24 with tricuspid and 4 with mitral valve origin.

Aortic valve (AoV) insufficiency was heard in 15 of 47 murmurs and was holo-diastolic decrescendo murmur with a PMI over AoV (Table 3).

Grade 2 murmurs were more frequent than others and 24 horses showed Grade 2 murmurs. All the grade 3 murmurs had PMI on the AoV which was confirmed by echocardiography. Also, 3 horses with Grade 4 intensity had characteristic AoV insufficiency in auscultation. So AoV murmurs

Table 1. Frequency of different breed of examined population.

Breed	Number	Percentage
Thoroughbred	99	73%
Anglo-Arabian	27	20%
Arabian	9	7%

Table 2. Frequency of cases with cardiac murmur based on horse breed.

Breed	Number	Percentage in 47 horses with murmur	Percentage in 136 horses
Thoroughbred	17	71%	12.5%
Anglo-Arabian	6	25%	5%
Arabian	1	4%	0.7%

Table 3. Frequency of murmurs across different valves.

Type of murmur	Number	Percentage in 47 horses with murmur	Percentage in 136 horses
Tricuspid	24	50%	17%
Mitral	4	9%	3%
Aortic	15	32%	11%
Pulmonary	4	9%	3%

were heard in 15 of 47 horses with the intensity of AoV murmurs varied from Grade 1 to 4 in our study (Table 4).

Ejection type murmurs with PMI over left base was heard in 7 horses and varied in intensity from Grade 1 to 2. Early diastolic murmur with PMI over the left base were heard in 2 and with intensity grade from 1 to 2. Twenty-four horses showed early diastolic murmur with PMI over the right base with intensity grade 1 to 2. No murmurs with intensity equal to or more than 4 were heard (Table 4).

Echocardiography was used to confirm our findings. Color Doppler echocardiography across valves was taken and all the findings evaluated.

Discussion

Regular examination of exercise function

Table 4. Frequency of different grades of cardiac murmur in positive cases.

Type of murmur	Grade 1/6	Grade 2/6	Grade 3/6	Grade 4/6	Grade 5/6	Grade 6/6	Total
Tricuspid	6	18	0	0	0	0	24
Mitral	2	2	0	0	0	0	4
Aortic	1	2	9	3	0	0	15
Pulmonary	2	2	0	0	0	0	4
Total	11	24	9	3	0	0	47

and efficiency of horse is essential in championship competitions. Cardiovascular disorders alongside respiratory and neuromuscular system disorders have substantial adverse effect on horse's physical performance (Menzies, 2001). Cardiac murmurs are known as a common finding in the horse and are classified into functional and pathological types (Hewetson, 2013). Murmurs are defined as abnormal audible vibrations caused by turbulent blood flow that causes vibration of cardiac structures (Marr and Bowen, 2010). They are commonly diagnosed in horses as either an incidental finding during elective clinical examinations or when an animal is presented with clinical signs related to cardiac disease (Jago and Keen, 2017). Despite the high occurrence of murmurs in the horse (Kriz et al, 2000), it is found that they are not necessarily associated with performance limitations or heart disorders (Hewetson, 2013). However, in athletic and racehorses when the full cardiac reserve is required, the presence of pathological cardiac murmurs may impose detrimental effects upon an affected animal's performance capabilities, expected longevity, rider safety, resale value and prevent it from being accepted for mortality and veterinary insurance (Young et al, 2008; Hewetson, 2013). Therefore, the precise assessment of cardiac murmurs is essential in order to determine their clinical significance (Blissit and Patteson, 1996; Hewetson, 2013). In 136 horses in this study, 47

(34.5%) showed cardiac murmurs. Different prevalence of cardiac murmurs has been reported previously by many authors: 32% in Standardbred racehorses (Zucca et al, 2010), 81.1% in Thoroughbred racehorses (Kriz et al, 2000), and 16.4% in population of 545 horses (Reef, 1995). Compared to other studies, the prevalence of cardiac murmurs in Polo horses is low, among 47 cases with cardiac murmur, the prevalence proportion was 11%, 3%, 3% and 17% for aortic, mitral, pulmonary and tricuspid valves respectively. In a similar study in Thoroughbred racehorses the prevalence in flat and national hunt (NH) horses was 22%, 9% and 1% in flat horses and 43%, 19% and 4% in national hunt (NH) horses for tricuspid, mitral and aortic valves respectively (Young et al, 2008). The prevalence of aortic murmur was considerably higher compared to similar studies. The moderate and severe type of aortic murmur cause reduces performance and longevity especially when detected first in younger horses (< 10 years of age). Degenerative valve thickening, aortic valve prolapses, congenital malformations, aortic root disease and infective endocarditis are the main causes (Reef et al, 2014).

In this study, cardiac murmurs grade 1 and 2 were identified in 74% of all murmur population. Pathological murmurs are mainly caused by incompetent valves, stenotic valves and inappropriate communications between cardiac chambers/vessels (Jago and Keen, 2017). If therapeutic and preven-

tive measures are not conducted it may lead to congestive heart failure and poor prognosis for longevity.

Polo is a physically demanding activity which requires a horse with high speed, stamina and agility (Marlin and Allen, 1999). Furthermore, extended polo season and repeated exercise, training and competition impose further demands on polo horses (Pfau et al, 2016). The presence of a cardiac murmur in this situation can have significant diverse effect on horse performance. It has been shown that prolonged intense athletic training might result in the development of cardiac murmur and valvular incompetence (Marlin and Allen, 1999). Because Polo horses are kept for the purpose of athletic endeavors, the presence of a high graded cardiac murmur can have highly adverse effects upon an affected animal. Regular studies therefore are needed to determine the presence of cardiac murmurs and their associated with impaired physical performance. This study is the first report of cardiac murmur in Polo horses. which showed the high presence of tricuspid and aortic murmur. This information should contribute to increasing the safety and appropriate levels of care for both the horse and the rider.

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Conflicts of interest

The author declared no conflict of interest.

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بررسی شیوع مرم‌های قلبی در اسب‌های چوگان

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چکیده

زمینه مطالعه: مرم‌های قلبی و متعاقباً نارسایی قلب یکی از علل کاهش کارایی در اسب‌های مسابقه است. توجه به ویژگی‌های مرم حین معاینه سیستم گردش خون در اسب بسیار حیاتی است. چوگان ورزشی پراسترس است که ممکن است این استرس بر دستگاه گردش خون وارد شود.

هدف: فرضیه ما در این مطالعه این بود که، فشار زیادی که طی مسابقه به اسب وارد می‌شود احتمالاً اسب‌های چوگانی را به نارسایی‌های درجه‌ای مستعدتر می‌کند.

روش کار: ۱۳۶ اسب چوگانی در این مطالعه مورد ارزیابی قرار گرفتند که همگی سابقه شرکت در مسابقات را داشتند. هر دوسمت سینه به دقت توسط دو متخصص مورد سمع قرار می‌گرفتند و اطلاعات مربوط به ویژگی مرم‌ها به دقت ثبت می‌شد. بعد از آن یافته‌های سمع با اکوکاردیوگرافی تأیید می‌شد در اکوکاردیوگرافی با استفاده از Color Doppler هرگونه تغییری در دریچه‌ها مورد ارزیابی قرار می‌گرفت.

نتایج: ۴۷ رأس اسب (۳۴/۵۵ درصد) مرم قلبی داشتند. ۷۱ درصد مرم‌ها در نژاد ترابرد دیده شد. مرم‌های درجه ۲ بیشترین تعداد را داشتند و ۲۴ رأس اسب مرم درجه ۲ نشان دادند. تریکوسپید هم در ۲۴ اسب درگیر بود که بیشترین درگیری را در بین دریچه‌ها داشت.

نتیجه گیری نهایی: این مطالعه اولین ارزیابی شیوع مرم‌ها در اسب‌های چوگانی است. و در آن درگیری فراوان تریکوسپید و آئورت دیده شد. تفاوت چندانی بین یافته‌های این مطالعه و موارد مشابه دیده نشد.

واژه‌های کلیدی:

سمع قلب، اسب، مرم، شیوع، دریچه