

# How to Perform Endoscopy During Exercise Without a Treadmill

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Exercising endoscopy can be performed without a treadmill using specifically developed equipment that enables real-time visualization and recordings in natural exercising conditions. The more stable images obtained with this system also improve the quality of images obtained during treadmill endoscopy. Authors' addresses: Equine Internal Medicine, Ecole Nationale Vétérinaire, 23 chemin des Capelles, 31076 Toulouse, France (Tamzali); and Clinique Vétérinaire Equine de la Brousse, 31330 Grenade, France (Serraud, Baup, Desmaizieres); e-mail: y.tamzali@envt.fr. © 2008 AAEP.

## 1. Introduction

Dynamic obstructions of the equine upper respiratory tract may be underdiagnosed or misdiagnosed when resting endoscopic examination is performed. Dynamic endoscopy on a high-speed treadmill provides a far better true assessment and diagnosis of the dynamic obstructions of the upper equine respiratory tract.<sup>1-6</sup> However, treadmill-exercising endoscopy is still only available in limited facilities that have the suitable equipment and personnel.

The availability of embarked endoscopes that could be used without a treadmill may make exercising endoscopy readily available to most equine practices. The development of the dynamic respiratory scope (DRS)<sup>a</sup> has taken 2 yr of close collaboration between the engineers of a company<sup>b</sup> manufacturing endoscopes and clinicians.

## 2. Materials and Methods

### Equipment

DRS is a video-endoscopic system that features four parts: (1) a malleable insertion tube fixed to a pur-

pose-made, non-traumatic bridle system, (2) a auto-lighting head tube that negates the need for a heavy and energy-consuming light source, (3) an integrated lavage system, and (4) control levers. The endoscope is connected to a 3-kg solid polyvinylchloride (PVC) box fixed onto the sulky or the rider. The video-endoscopic images are recorded continuously in a digital format onto a secure digital (SD) card, and they can be transmitted to a remote receiver up to 600 meters away. The PVC box contains all of the electronics as well as a supporting battery power source. The latter provides sufficient power for  $\leq 45$  min. The light intensity can be reduced during the equipment adjustment to save energy. The selected color temperature (4000–6000°K) provides high-quality images. The receiver for the tele-transmitted images contains a control screen for real-time visualization as well as a battery and a tripod. A remote control initiates the recording start and stop functions.

### Animals

Over the 2 yr of development of the DRS, prototypes were tested on >20 normal cooperative horses that

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## NOTES



Fig. 1. The insertion tube is fixed with a non-traumatic specific bridle system.

performed during trot, gallop, jumping, or endurance events.

From February to June 2008, 18 performance horses presented for investigation of abnormal respiratory noises at exercise and/or poor performance. These horses were subjected to exercising endoscopy without a treadmill in a medium-sized equine livery yard.

**Procedure**

Horses were prepared in three stages (Figs. 1–3).

1. The malleable insertion tube was inserted into the ventral meatus of one of the horse's nostrils.
2. The tube was attached to the purpose-made bridle system.
3. The battery processor source and the transmitting/recording device were fixed onto the sulky or the rider. Start and stop recording functions were controlled by the remote control hand piece. The video-endoscopic images were recorded onto the SD card for subsequent computer visualization. Real-time visualization was achieved by the receiver console either on the center of the training arena for saddle horses with riders



Fig. 2. A solid PVC box is fixed on the rider with a harness.

or in a car following the horse on a parallel track for racehorses with sulkies (Fig. 4).

**3. Results**

All the examinations were performed with total safety for horses, drivers, riders, and equipment; 16



Fig. 3. A solid PVC box is fixed on the sulky.



Fig. 4. Exercising endoscopy performed on a trotter in natural conditions



Fig. 5. Dorsal displacement of the soft palate (DDSP).



Fig. 7. Subepiglottic cyst with epiglottis retroversion.

of 18 horses had a positive diagnosis of upper airway dynamic obstruction (Figs. 5–9). The type of performance and the diagnoses are shown in Table 1.

#### 4. Discussion

Preliminary results established the safety and reliability of the system. High-quality images were achieved directly on site. The number of horses examined was limited mainly for two reasons. First, the work involved only a moderately sized yard. Second, dynamic endoscopy was largely unknown in the region, because no facility had existed previously. The clinicians had to explain and convince the owners that exercising endoscopy was necessary to identify the origin of abnormal respiratory noises.



Fig. 8. The same horse as in figure 7 between the periods of epiglottis retroversion.



Fig. 6. The same horse as in figure 5 controlled with the throat support device before tie-forward surgery.



Fig. 9. Axial deviation of aryepiglottic folds.

TABLE 1: Horse Type of Performance and Diagnosis Established

DIAGNOSIS (N) Case number	HORSES																	
	Trotters (13)													Gallopers (4)				Jumpers (1)
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
LLH	X													X	X	X		X
DDSP			X	X	X	X	X	X										
ADAF									X	X	X							X
SEC		X																
NA												X	X					

LLH: Left Laryngeal Hemiplegia, DDSP: Dorsal Displacement of Soft Palate, ADAF: Axial Deviation of Aryepiglottic Folds, SEC: Sub Epiglottic Cyst, NA: No Abnormality

The number of trotters examined was greater than the number of gallopers, but this was consistent with the breed proportion of the clientele.

The main interest for the practitioners involved in this study was the sudden “appearance” of upper respiratory dynamic obstructions among their horse population. Previously, they were unable to correctly diagnose these diseases. They found the system easy to perform on any type of horses and during any type of performance. Moreover, they were able to perform the examination at low cost (compared with a treadmill endoscopy) and repeatedly from one day to another without delay and transportation to a treadmill center. The technique also seemed safer, because it avoided the specific risks inherent to the treadmill (e.g., the horse falling or jumping out).

The malleable rigid tube provided more stable video images than classical treadmill endoscopy. The equipment has subsequently been tested on the treadmill by other clinicians. The more stable images and the usefulness of the equipment improved the quality of the interpretation significantly.

Some problems were encountered during both the development period and the preliminary trial. A number of key practical points may help the clinician avoid these disagreements when starting to use the equipment.

- The preparation of the horse should be optimal, because it may be difficult to readjust or reposition the system after the exercise has started, especially on racehorses.
- A prior resting endoscopy is necessary not only for detecting any abnormality at rest but also for evaluating horse compliance/cooperation.
- Mounted endoscopy (gallopers and saddle horses) should be performed with an experienced rider, because any fall may be dangerous for the equipped rider and for the equipment.
- Examinations should not be performed during rain, because the system is not watertight.
- The battery should be fully charged before the examination to avoid loss of video records. The

battery can last 45 min at full light power. This allows two successive examinations on trotters, but sometimes only one examination on gallopers is possible. Battery charging time is 2 h. Additional batteries may be needed if several examinations are run sequentially.

- The lens is rinsed with a mercorobutol solution before the tube insertion to avoid secretions adherence because the lens lavage cannot be performed during exercise. This is of particular importance with racehorses.
- The noseband should be carefully tightened, because it is a “fix” point.
- Tube excess should be guided onto the horse’s neck to avoid floating.
- The PVC box should be fixed with the designed attachment system. This is especially important on sulkies where a perfect stability should be ensured before starting the examination.
- Head movements should be controlled and limited, especially in large horses, to avoid wrenching the tube from the PVC box or displacing/extracting the tube from the nasopharynx.

Some recommendations have been made to the manufacturer to improve the usefulness of the equipment. The following modifications are available.

- An automatic water pump pulsing at 30-s intervals.
- A new harness for PVC-box positioning on the rider’s back.
- A new aluminum plaque for better fixation onto the sulky.
- A water tight bag for convenience and PVC box protection during rain.

5. Conclusion

In addition to the usefulness and the reduced cost of the examination, it is expected that some abnormalities that occur only in natural conditions, such as the impact of the training system, the ground quality, the rider’s weight, the sulky’s weight, and the

lack of speed limitation for gallopers, could be detected with the DRS system. The DRS system's findings will need to be properly compared with endoscopic findings obtained during high-speed treadmill trials.

The authors have no economic interest in the promotion or sale of this system.

#### References and Footnotes

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<sup>a</sup>Dynamic Respiratory Scope, OPTOMED, 91974 Les Ulis, France.

<sup>b</sup>OPTOMED, 91974 Les Ulis, France.