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SURGICAL RESECTION OF THE ALAR CARTILAGE IN EQUINES

(With 7 Fig.ures)

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الإزالة الجراحية لجزء من الغضروف الجناحي الأنفي في الفصيلة الخيلية

حسين المغربي

تم تسجيل عدد (١٠) خيول وعدد (٢) بغال تعاني من مشاكل تنفسية نتيجة لضيق فتحة الأنف، وكان تاريخ هذه الحالات هو الشكوك في صعوبة التنفس وعدم الكفاءة عند التدريب بالإضافة لحدوث أصوات أثناء التنفس وباستخدام الفحص باليد تم اكتشاف وجود زيادة في حجم الغضروف الجناحي الأنفي، وتم إجراء عملية جراحية لإزالة جزء من ذلك الغضروف وذلك لتوسيع الفتحة الأنفية، وتم التأكد من أن العملية الجراحية أدت إلى تحسن في كفاءة الحيوان عند التدريب كذلك قلت الأصوات أثناء التنفس وتم الالتئام بشكل جيد وبدون مشاكل. كما تم إجراء دراسة تشريحية على خمسة جثث من الخيول لتحديد التشريح الجراحي للغضروف الجناحي الأنفي والأنسجة المحيطة به ودراسة أنسب الطرق للتدخل الجراحي لتلك الأنسجة.

SUMMARY

Ten draft horses and two mules with respiratory problems due to abnormal alar cartilage were recorded. These animals were presented with a case history of exercise intolerance, mild respiratory noise and dyspnea. Digital palpation revealed abnormal thickening of the cornual part of the alar cartilage. Temporary dilatation of the nares with mattress sutures lessened the respiratory noise during exercise. Surgical trimming of the cornual part of the alar cartilage and subsequent skin closure maintained patent nostrils. Alar cartilage resection was effective in improving exercise intolerance with marked reduction in airway respiratory noise. All surgical incisions healed cosmetically. Dissection

of five horse cadavers to determine the surgical anatomy of the alar cartilage and its folds had been performed, described and discussed.

Key words: *Alar Cartilage*

INTRODUCTION

The causes of respiratory distress in equines are numerous and may be due to either respiratory or non-respiratory reasons. Upper airway resistance constitutes a significant fraction of total airway resistance; about 80-90% of this fraction can be attributed to the nasal cavity (Robinson and Soreson,1978, Robinson et al., 1975).

Stenotic external nares are one of the uncommon respiratory causes of respiratory distress in the horse (Smith 1990). In equines, nostrils have a major conduit for inspired air during strenuous activity, as they are limited to nasal breathing (Robinson and Soreson,1978). Flaccidity or redundancy of the alar fold has been previously reported and it's surgical removal has been recommended to correct it (Foerner, 1967, Boles, 1979, Nickels and Tulleners, 1992, Torre et al., 1993, Hawkins et al., 1995). However, diseases that affect the alar cartilage have not been mentioned in the available literature. The purpose of the study reported here is to report unknown cause for stenotic external nares in equines and to describe the technique for surgical resection of the cornual part of the elongated alar cartilage. Also, the surgical anatomy of the nasal folds and alar cartilage in horses which is essential for much other surgical interference had been studied and illustrated.

MATERIALS and METHODS

Cadavers of five horses were used in this study to determine the surgical anatomy of the alar cartilage and the related structures. Ten draft horses and two mules were admitted to the clinic with a case history of exercise intolerance, dyspnea and/ or mild respiratory noise. Their average age was 6 years (ranging from 2- 10 years). Case history and complete clinical examination for each case was performed. All cases had physical examination at rest and again shortly after exercise. Digital palpation of the alar fold, false nostrils and the vestibule of the nostrils were performed to detect any abnormalities (Fig. 1). Temporary dilatation of the nares with mattress sutures were performed and the

animals were examined shortly after excercise. Surgical resection of the elongated cornual part of the alar cartilage was performed. The cornual part of the alar cartilage was resected either bilateral or unilateral. The surgeries were performed under the effect of chloral hydrate narcosis in a dose rate of 12 gm/100 kg b/w. 10% solution injected intravenously. Infraorbital nerve block was performed either unilaterally or bilaterally using 2% Xylocaine Hcl solution (Hall and Clark,1991). The animals were restrained on lateral recumbency with the affected side uppermost. The area was aseptically prepared for surgery as usual. A 5-cm skin incision was made just under the lateral border of the nostril (Fig. 2). After muscles and subcutaneous tissues were dissected, the cornual part of the alar cartilage was exposed and excised by a pair of scissors (Fig. 3). Hemorrhage was scanty and arrested by tampoonad. Subcutaneous tissue was coopetated using N°.0 chromic catgut and the skin was closed with simple interrupted sutures using non-absorbable silk N° 2. The horse was then turned over to repeat the procedure on the other side in bilaterally affected cases. The excised cartilage was fixed in 10% formalin solution. Five-micron thick paraffin sections were prepared, stained with haematoxylin and eosin stain and examined microscopically.

RESULTS

Surgical Anatomy of the Nasal Folds and Alar Cartilage:

In the rostral portion of the nasal cavity, the mucosa of the lateral wall forms a number of folds, which extends from the nasal conchae to the nostril. It includes three folds (straight fold, alar fold and basal fold) (Fig. 4). The straight fold is continuous with the dorsal nasal concha, while the alar fold attaches to the rostral border of the nasal septum (Fig. 5). The alar fold forms a nearly horizontal shelf which divides the nostril into dorsal and ventral passages. Dissection of the alar fold reveals that it contains two cartilages; the supporting medial accessory cartilage and the lamina of the alar cartilage. The alar cartilage consists of two parts; flat part (lamina) dorsally and a comma-like part (cornu) ventrally (Fig. 6). The cornual part attaches to the rostral border of the nasal septum and supports the nostrils dorsally, medially and ventrally. The medial accessory cartilage originates from the ventral nasal concha and the ventral lateral nasal cartilage while the basal fold originates from the ventral concha.

Clinical cases:

Alar cartilage was recorded abnormally thick and elongated in 12 animals (10 horses and two mules). This abnormality was either bilateral (8 horses and two mules) or unilateral (two horses). The respiratory noise had been heard after exercise in both inspiration and expiration. Snoring was heard in two horses. Marked reduction in respiratory noise was observed after dilatation of the nares with mattress sutures. Recovery was uneventful and the non-absorbable sutures were removed 10 days post-operatively. Follow up evaluation for the operated animals within two to four weeks postoperatively showed marked reduction in airway resistance and rapid and cosmetic wound healing. Histopathological examination of the excised cartilage revealed a normal picture of hyaline type cartilage with round chondrocytes. Some lacunas had a dark basophilic matrix (around chondrocytes) while others had light a basophilic matrix (far from chondrocytes). Normal perichondrium is evident (Fig. 7).

DISCUSSION

Diseases of the nares and nasal passages are rare in horses and poorly tolerated because they have a profound effect on airflow (Freeman, 1991). The most common problems of the nares and nasal cavity in horses are atheroma, paralysis of the nasal diverticulum, wry nose, laceration and/or foreign bodies in the nostrils, nasal amyloidosis, fungal diseases and false nostril noises (Shaw et al., 1987, Freeman 1991, Kasper and Fretz,1994; Robertson and Rooney, 1997). Tumors of the nasal cavities, nasal polyps, osteodystrophia fibrosa and progressive ethmoidal hematoma have also been incriminated for nasal airflow impedance in equines. (Stickle, 1978, Moulton, 1978, Misk et al., 1994 and Leyland and Baker, 1975). Moreover, some congenital anomalies such as maxillary cysts can distort the profile of the maxillary bone, sufficiently to cause obstruction of the ipsilateral nasal passage (Carlton and McGavin, 1995).

The horse has large and widely spaced nostrils with a comma shape structure (Freeman, 1991 and Lakritz et al., 1997). The muscles of the nostrils in equines have a major role in the process of respiration. The well-developed muscles of the nose and upper lip in the horse act together to dilate the nostrils, so they can transform the normally semilunar nostrils to become circular (Nickel et al., 1973). During

inspiration, the muscles of the nostrils dilate and tense the alar fold, thereby obliterating the nasal diverticulum (Nickels,1993).

The nostril at its dorsal and lateral margins is supported by some cartilages which serve to determine the form of the nasal opening (Nickel et al., 1973). It is also supported medially by the alar cartilage that is especially large in the horse (Freeman, 1991). Alar cartilage accounts for the curious comma form of the nostril which is divided into a ventral part (true nostril) and a dorsal part (false nostril) (Dyce et al, 1987). The alar cartilage is supported medial to the nasal septum by fibrous tissue and or even, in some horses, a joint to allow it to undergo considerable movement (Freeman,1991). The anatomical studies in this study didn't reveal any joint between the cornual and laminar parts of the alar cartilage.

Impedance to the nasal airflow related to abnormal alar cartilage is an unknown cause for exercise intolerance in horses. One of the common practices at standerbred tracks in USA is to place metal rings in the nostrils of horses so that they can be tied open with a string during the race. Abnormal thickening or enlargement of the alar cartilage may affect the flexibility of the muscles of the nostrils. This will affect the spontaneous widening of the nares from semicircular to circular opening during strenuous activity or stress which in turn will increase upper airway resistance, exercise intolerance and/or respiratory noise. Horses with small nostrils or narrow nasal passages might have a high chance of upper airway resistance.

Enlarged alar cartilage should be carefully differentiated from flacidity or redundancy of the alar fold. Flacidity of the alar fold is also one of the uncommon causes of respiratory noise and has been described originally in American Saddlebreds (Foerner, 1967; Nickels,1993). The pathogenesis of alar fold flaccidity or redundency resulting in respiratory tract obstruction is unknown (Hawkins et al.,1995). It was postulated that malfunction of the transversus nasi muscle which elevates the alar cartilage would result in flaccidity of the alar folds and medial wall of the nasal diverticulum (Foerner, 1967 and Freeman, 1991). However, abnormal alar folds may be associated with collapse of the alar cartilage, slightly abnormal and pinched appearance of the nostrils or deep nasal diverticulum (Foerner, 1967). The noise of thickened alar folds is similar to that of laryngeal hemiplagia but it is primarily heard during expiration and has obvious external origin (Foerner, 1967). Surgical resection of the alar fold has been recommended to correct or improve airflow in the

affected horses (Foerner, 1967; Boles,1979, Nickels and Tulleners, 1992, Torre et al., 1993 and Hawkins et al., 1995).

The skin and muscles of the nares derives it's innervation from the infra-orbital and facial nerves (Lakritz et al., 1997), so resection of the cornual part of the alar cartilage has been easily performed under the effect of narcosis and infra-orbital nerve block .

It is concluded that thickening and enlargement of the alar cartilage should be considered as one of the causes of upper airway resistance in equines. Surgical resection of the cornual part of the alar cartilage is a simple and safe technique. It has proved to be effective in improving exercise intolerance with marked disappearance of airway respiratory noise.

REFERENCES

Boles, C. (1979): Anbnormalities of the upper respiratory tract. Vet Clin North Am Large Anim Pract; 89-111.

Carlton, W.W. and McGavin, M.D. (1995): The Respiratory System .In:Thomon's special veterinary pathology. 2 *nd* Ed, Mosby, st. louis Missouri, pp123-

Dyce, K.M.; Sack, W.O. and Wensing, C.J. (1987): Textbook of Veterinary Anatomy. 1st Ed, W.B. Saunders Company, pp 143-147.

Foerner, J.J. (1967): The diagnosis and correction of false nostril noise, in proceeding, 13th Annu Meet Am Assoc Equine Pract : 315-327.

Freeman, D.E. (1991): Nasal Passages. In: Equine Respiratoy Diseases. Ed by Beech, Philadelphia, Lea & Febiger , pp 239-255.

Hall, L.W., Clark, K.W. (1991): Veterinary Anaesthesia ; 9 *th* ed. Bailiere Tindall London , pp196.

Hawkins, J.F.; Tulleners, E.P. ; Evans, L.H.; Orsini, J.A. (1995): Alar fold resection in horses: 24 cases (1979-1992) JAVMA ; 206 (12): 1913-1916.

Kasper, C.A. and Fretz, P.B. (1994): Nasal amyloidosis : A case report and a review. Equine Practice; 16 (3): 25-30.

Lakritz, J.; Wisner, E.R. and Plopper, C.G. (1997): The respiratory system of the horse:Selected aspects of the functional anatomy and cell biology of normal equine respiratory system. Proceeding of Dubai international Equine Symposium . pp 1-22.

Leyland, A.; Baker, J.R. (1975): Lesions of the nasal and paranasal sinuses of the horse causing dyspna. Br.Vet J., 131: 339-344..

Misk, N.; Ismail, S. and Seleim, S. A (1994): Clinical aspect in the management of some tumors in donkeys-case report. Assiut Vet Med J 31 (62) 206-214.

Moulton, J. (1978): Tumors of the respiratory tracts. In: Moultn JE (ed) : Tumors of domestic animals, ed 2. los Angles, Univ. of California Press, pp 211-220.

Nickel, R.; Schummer, A.; Seiferle, E. and Sack, W..O (1973): Respiratory system In: Viscera of the domestic mamales. Verlag Paul Parey, Berlin pp 211-222.

Nickels, F.A. (1993): Diseases of the Nasal Cavity. Vet Clin North Am: Equine. Pract., 9: 111-121.

Nickels, F.A. and Tulleners, E.P. (1992): Nasal passages. In : Equine Surgery, 1st Ed. Ed by Auer JA, W.B. Saunders Company, pp 435-437.

Robertson, J.L. and Rooney, J.R. (1997): The pathology of the equine respiratory system. Proceeding of Dubai International Equine Symposium, pp 1-22.

Robinson, N.E and Sorenson, P.R. (1978): Pathophysiology of airway obstruction in horses: A review. J Am Vet Med Assoc; 172: 299- 310.

Robinson, N.E.; Soreson, P.R. and Goble, D.O. (1975): Patterns of airflow in normal horses and horses with respiratory disease. Proc Am Assoc Equine Pract 21:11-17.

Shaw, D.P.; Guson, D.E.; Evans, L.H. (1987): Nasal amyloidosis in four horses. Vet.Path. ; 24:183-185.

Smith, B.P. (1990): Large Animal Internal Medicine. 1st Ed, C.V. Mosby Company, pp 67-77.

Stickle, R.L. (1978): Nasal polyp in a horse: follow-up of a previously reported case. Vet Med/ Small Animal Clinic : 911-914.

Torre, F.; Decker, R. and Fadiga, G. (1993): Dyspnaea due to a malfunction of the false nostril and its surgical correction in three horses. Pferdeheilkunde 9(2): 87-91.

LIST OF FIG.URES

Fig. 1: Abnormal alar cartilage in a horse.

Fig. 2: The cutanous incision just under the lateral border of the nostril.

Fig. 3: The excised cornu of the alar cartilage.

Fig. 4: Median section of the head of a horse; the nasal septum has been removed.

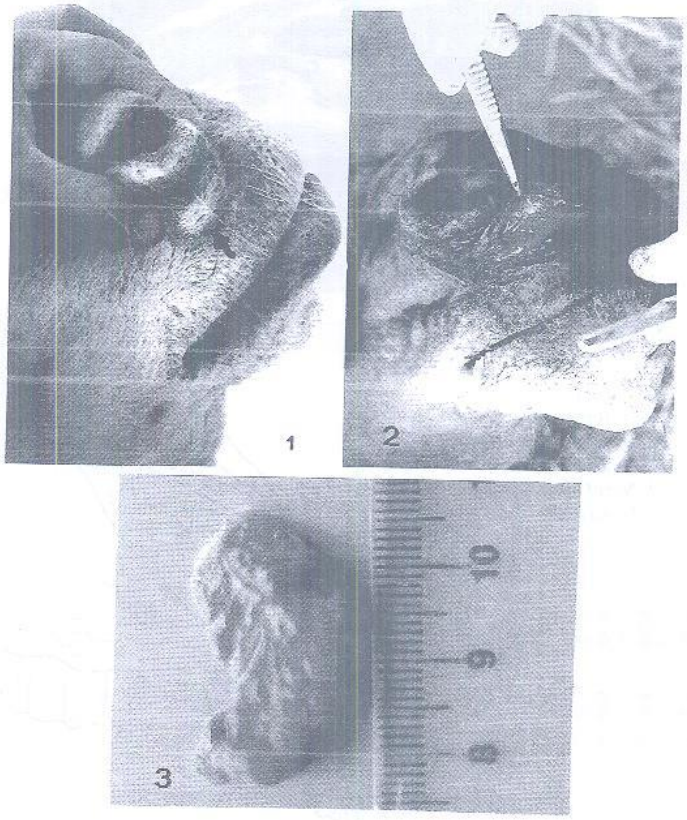
Notice: a. Alar fold b. Straight fold c. basal fold
d. Medial accessory cartilage e. Incisive bone

Fig. 5: Scheme of the nasal cartilage. Notice: a&b Alar cartilage (a.Lamina b. Cornu)
c. Medial accessory cartilage d. Nasal bone e. Incisive bone

Fig. 6: Surgical exposure of the alar fold through the lateral alae of the nostril.

Notice: a.Incised lateral alae b. Lamina of the alar fold
c. Medial accesory cartilage.

Fig. 7: Photomicrograph of the alar cartilage (H&E).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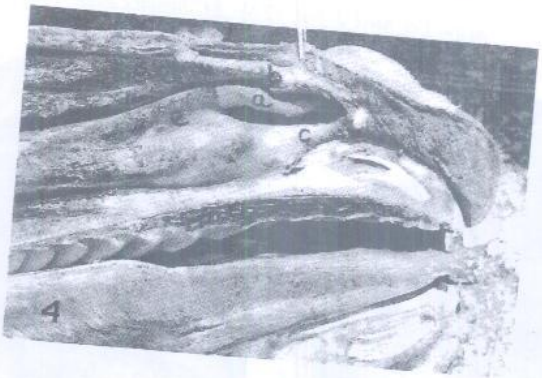
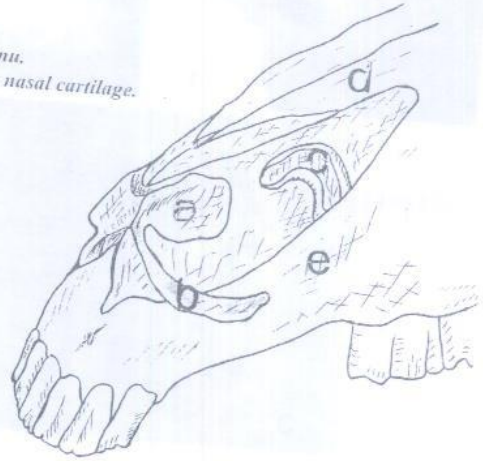
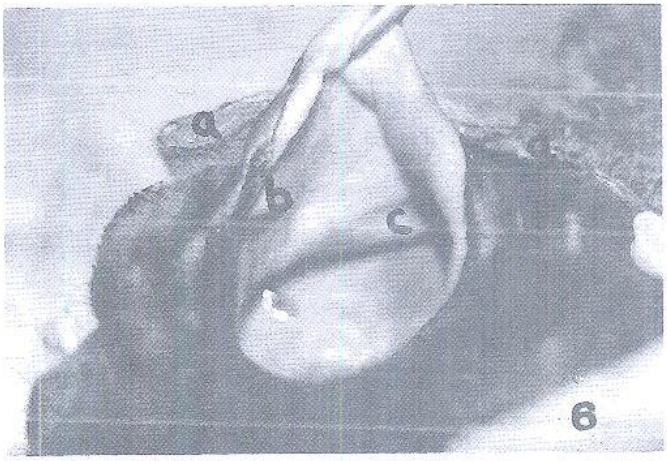


a&b Alar cartilage
a. Lamina b. Cornu.
c. Medial Accessory nasal cartilage.
d. Nasal bone.
e. Incisive bone.

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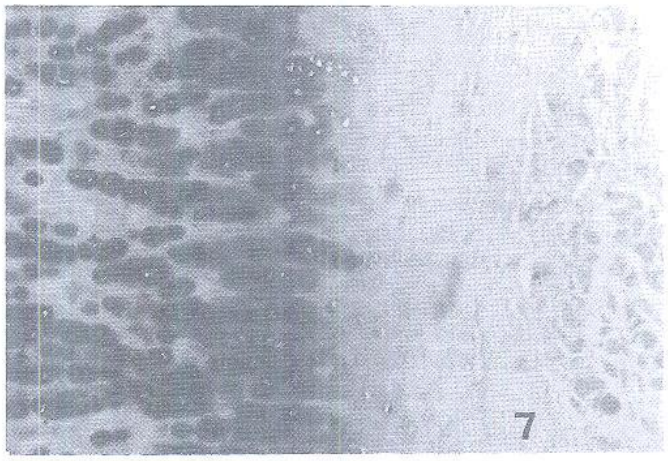
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