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عضلات الرأس في الديك - ديك والماعز

1- عضلات المخطم والانف والشفة والخدود

أشرف صبحي

وصف في هذا البحث - ولأول مرة - مورفولوجيا عضلات المخطم والأنف والشفة والخدود في حيوان الديك - ديك وهو أصغر نوع من أنواع المجترات في شرق أفريقيا • كذلك وللمقارنة وصفت نفس العضلات في الماعز المستانس •

استخدمت لدراسة عضلات منطقة الوجه ثلاثة رؤوس لكل من النوعين، الديك - ديك والماعز • وقد أبرزت النتائج في ثلاثة رسومات توضيحية ، كما نوقشت النتائج مع مثيلاتها في المجترات الصغيرة والكبيرة ، كذلك المجترات البرية •

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**THE MUSCULATURE OF THE HEAD OF DIK-DIK (*MADQUA
GUENTHERI SMITHI*) AND GOAT (*CAPRA HERICUS*)**
(With 3 Figs.)

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SUMMARY

The morphology of the muscles of the muzzle, nostril, lip and cheek of the smallest ruminant species in East Africa (dik-dik) is described for the first time. In addition, those of the domestic goat are also described in this study.

Three heads of the dik-dik and three of the goat were used for the study of the myology of the face region.

The results obtained were illustrated by three diagrams, and were discussed with the available literature in the small, large and wild ruminants.

INTRODUCTION

Günther's dik-dik (long-snouted dik-dik) is the smallest, most delicating built of all East African ruminants (fig. 1). Its shoulder height ranges between 34.5-36.5 cm, while its sacral height measures 35.5-39 cm. The trunk length, from the point of the shoulder to the anus varies from 34-37 cm. The weight of the adult animals varies between 3.7 and 4.5 kg. Günther's dik-dik or the long-snouted dik-dik is, at present, the object of detailed study with the aim to introduce this species as a miniature model ruminant for comparative physiological, nutritional and morphological investigations (HOFMANN, 73). In this study, the musculature of the head of the Günther's dik-dik is compared with another small ruminant species, the goat.

MATERIAL and METHODS

This study was carried out on three Günther's dik-dik, from North Kenya. The animals were killed, bleed and formalized with 10% formalin solution. The goats used for the comparison (3) were of the Egyptian native breeds (Balady goats). The origin, insertion, action and the most important relations were described.

The nomenclature used is that adopted by the Nomina Anatomica Veterinaria (1983) and the results were supported by 3 figures.

RESULTS and DISCUSSION**M. CUTANEUS FACIEI (3/12)**

The muscle fibers are located on the ventrolateral portion of the head and the caudal part of the mandibular space. It blends caudally with M. cutaneus colli, while rostrally the fibers blend with Mm. orbicularis oris, buccinator (pars buccalis) and zygomaticus near the angle of the mouth. The muscle is thickest ventrally and at the mandibular space.

ALI, KHIDR and EL-HAGRI ('79) mentioned that M. resorius of the one-humped camel is remarkable for its great extent and it seems to represent M. cutaneus faciei of other domestic animals.

M. ORBICULARIS ORIS (2,3/4)

It is the sphincter muscle of the mouth. Its fibers encircle the mouth opening and lies between the skin and mucous membrane and according to its site it is divided into marginal and labial parts. The muscle is thick at the lateral parts of the maxillary lip and at the angle of the mouth. In dik-dik, the muscle get thinner at the rostral, elongated part of the maxillary lip (i.e. under the external nostrils), as well as in the mandibular lip.

In the goat, the muscle is absent from that part of the maxillary lip between the muzzle. The M. orbicularis oris closes the oral opening.

The M. orbicularis oris is described by GETTY ('75) in the sheep and RAMISCH ('78) in the roe deer as forming a closed circle. In the ox the former author emphasized that the muscle is absent in the maxillary lip below the muzzle and this is in agreement with NICKEL, SCHUMMER and SEIFERLE ('68) and KOCH ('76) in the ox and POHLMAYER and ABDULLA ('86) in the fallow deer. GETTY ('75) added that the muscle is thickest at the angles of the mouth and in the lateral portion of the maxillary lip. This description agreed our findings in dik-dik. In the camel, ALI, *et al.* ('79) reported that the muscle is a well-developed sphincter and that the muscle fibers in the maxillary lip are interrupted by the median labial fissure.

M. INCISIVUS MAXILLARIS

Is an indefinite group of fibers extending from the rostralateral angle of the premaxilla to the deep surface of the maxillary lip. The muscle fibers pull the lip towards the premaxilla.

In the fallow deer POHLMAYER and ABDULLA ('86) mentioned a rostral and a caudal part to the muscle. However, RAMISCH ('78) in the roe deer described only a rostral part.

M. INCISIVUS MANDIBULARIS

The muscle fibers attach to the dental arch of the body of the mandible and insert in M. orbicularis oris. The muscle pulls the middle part of the lip towards the mandible.

In the sheep, MAY ('70) described M. incisivus mandibularis as to be extensive laterally than that of the maxillary lip and to extend to the level of the angle of the mouth. GETTY ('75) mentioned that the muscle is more extensive in the goat than in the ox, while RAMISCH ('78) in the roe deer, restricted the origin of this muscle to the level of the middle incisors.

M. LEVATOR LABII MAXILLARIS (2,3/7)**M. CANINUS (2,3/8)****M. DEPRESSOR LABII MAXILLARIS (2,3/9)**

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These three muscles form together a fan-shaped structure in the dik-dik, however, each muscle is cord-like. In the goat the three muscles did not form this characteristic fan shape.

In dik-dik the three muscles, each is cord-like, originate together from the facial tuber and extend rostrally, dorsally and then ventrally to end in the skin of the nostril and maxillary lip. The three muscles pass between the two layers of the levator nasolabialis.

The most dorsal muscle is the levator labii maxillaris. It is related at its origin from the facial tuber to the rostral portion of M. malaris. The muscle fibers run in the rostradorsal direction for about 10 mm before they separate from the other two muscles to terminate as a rounded cord in the skin between the nostrils.

The middle situated muscle (M. caninus) originates from the facial tuber, in common with the levator labii maxillaris and depressor labii maxillaris. The muscle runs rostrally as a cord to end in the lateral wall of the nostril.

The M. depressor labii maxillaris is the most ventral of the three muscles taking its origin from the facial tuber. It is covered at its origin by M. buccinator. The muscle then divides into two muscular cords which direct rostrally, then ventrally to terminate in the maxillary lip and the ventral portion of the nostrils.

In the goat, the M. levator labii maxillaris can be easily distinguished from the other two muscles. It is largest and originates, together with the caninus and depressor labii maxillaris, from the facial tuber and adjacent parts. The muscle has a fusiform belly which ends by a flat tendon. The tendon runs rostrally to the dorsal part of the muzzle where it unites with that of the opposite side forming a flat band that passes downwards to the maxillary lip. The muscle slightly elevates the muzzle (in the goat) and with it the maxillary lip.

The M. caninus of the goat is cord-like and is represented by two muscle fascicles. The dorsal fascicle is detached from the levator labii maxillaris about 19 mm from its origin, while the ventral fascicle do this about 25 mm from the origin of the M. depressor labii maxillaris. The two fascicles, each, ends by a long tendon (about half the length of the muscle). Each tendon splits into 2-4 very thin tendons which terminate in the lateral wall of the nostrils. The muscle dilates the external nasal openings.

The M. depressor labii maxillaris of the goat is covered at its common origin by M. malaris. The muscle, after 13 mm from its origin, divides into two muscle fascicles, each of which ends by 2-3 thin tendons. The tendons terminate in the maxillary lip and the ventral portion of the nostril in the form of a network. The muscle retracts the rostral part of the maxillary lip and the lower part of the nostril.

NICKEL, et al. ('68) in the ox and MAY ('70) in the sheep, reported that M. levator labii maxillaris is inserted by a number of tendinous bands to the skin between the nostrils and that the most dorsal band is the largest and longest. The latter author added that the muscle assists in everting the lip. GETTY ('75) mentioned that the muscle is very prominent in the sheep and goat.

The M. caninus of the sheep has only one very thin tendon which inserts in the skin at the lateral end of the ventral wing of the nostril (MAY, '70). In the ox, the muscle lies between the two portions of M. levator nasolabialis and terminates by means of 2-3 thin tendons (NICKEL, et al. '68 and GETTY, '75) and this is in agreement with the results of this study in the goat.

MAY ('70) did not refer to the division of *M. depressor labii maxillaris* in the sheep. GETTY ('75), in ruminants, said that the muscle arises as a strong bundle which soon bifurcates into two fascicles, which becomes very thin to form a network in the maxillary lip and muzzle. This is in agreement with NICKEL, *et al.* ('75), KOCH ('76) in the ox and with the results of this study in the goat and dik-dik.

BOAS and PAULLI ('08), AKAJEWSKY ('31) in the domestic mammals as well as POHLMAYER and ADBULLA ('86) in the fallow deer referred to the three muscles together as *M. maxillolabialis* on the base of their common origin. This base was also followed here in dik-dik and goat. RAMISCH ('78) mentioned in the roe deer that the three muscles could be separated from each other. MEINERTZ ('56) described, in the elk, only two separable parts of the *M. maxillolabialis*.

M. DEPRESSOR LABII MANDIBULARIS (2,3/1)

Is a thin narrow muscle in both dik-dik and goat. It lies along the ventral border of *M. buccinator* and originates beneath the masseter from the alveolar border of the molar part of the mandible. The muscle inserts in the mandibular lip and adjacent skin of the chin area (by blending with *M. orbicularis oris*). The muscle fibers direct rostrally and blend dorsally with *M. buccinator*. The muscle depresses and retracts the lower lip. The muscle is related to the mandibular labial artery and vein, ventral buccal gland and the ventral buccal nerve.

In the sheep, the *M. depressor labii mandibularis* originates also from the masseteric fascia (MAY, '70). GETTY ('75) and KOCH ('76) in the ox and POHLMAYER and ABDULLA ('86) in the fallow deer mentioned that the muscle extends from the mandibular lip caudally along the ventral border of *M. buccinator*, blending with it inseparably to pass under the rostral portion of *M. masseter*. MEINERTZ ('56) in the elk described only one origin to the muscle from the middle of the molar part of the mandible.

M. MENTALIS

Is a very poorly developed muscle. The fibers extend from each side of the body of the mandible to end in the skin of the chin. The muscles of both sides meet in a median raphe. The muscle fibers wrinkle the skin and pull it forward.

M. BUCCINATOR (2,3/5)

Is a long flat strong muscle which forms the major part of the cheek in both dik-dik and goat. It is divided into a caudal (molar) part which is covered by *M. masseter* and a rostral (buccal) part which extends from the rostral border of the masseter to the angle of the mouth. The muscle originates from the alveolar border of the maxilla and the mandible (from the level of the angle of the mouth to the ramus). The muscle fibers run in a rostral and slightly ventral direction to blend with that of the depressor labii mandibularis and with the orbicularis oris at the angle of the mouth. The action of muscle is to flatten the cheek and push food from the buccal cavity into the proper cavity of the mouth to retract the angle of the mouth.

NICKEL, *et al.* ('68) reported that the two parts of *M. buccinator* are easily separable and that the muscle fibers of the buccal part run ventrally while that of the molar part run parallel to the alveolar border. KOCH ('76) said that the angle between the muscle fibers of the buccal part of *M. buccinator* in ox reaches 90° while this angle becomes acute between the muscle fibers of the molar part. In the camel, ALI, *et al.* ('79) said that *M. buccinator* constitutes the chief muscle of the cheek region and it consists of superficial and deep portions. In the elk (MEINERTZ, '56) and in the roe deer (RAMISCH, '78) the authors described three parts to the *M. buccinator*, superficial and deep parts which together form the pars buccalis and a third middle part constituting the pars molaris.

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M. LEVATOR NASOLABIALIS (2,3/6)

Is a thin extensive muscle with fibers extending from the median plane in the rostroventral direction. The muscle is difficult to separate from M. frontalis. It is formed of a superficial and a deep layer in dik-dik and goat. It takes its origin from the rostral part of the frontal bone as well as from M. frontalis. The superficial layer ends in the lateral part of the nostril and maxillary lip. The deep layer is relatively thick and passes ventrally and rostrally medial to Mm. levator and depressor labii maxillaris and M. caninus to terminate on the nasal process of the incisive bone and the lateral part of the nostril. The muscle raises the maxillary lip and the lateral part of the nostril.

In the sheep, MAY ('70) described M. levator nasolabialis without referring to its superficial and deep divisions. He added also that the muscle produces a wrinkling of the skin over the nasal bone. In the ox, GETTY ('75) emphasized the division of the muscle into two layers while dorsal to the M. levator labii maxillaris and M. caninus, the matter which is agreed with NICKEL, *et al.* ('68) in the ox, with RAMISCH ('78) in the roe deer and with this study in the dik-dik and goat. MEINERTZ ('56) in the elk, described M. Nasolateralis profundus which corresponds to the deep part of M. levator nasolabialis. He described also M. nasolabialis dorsalis which is not exist in the fallow deer (POHLMAYER and ABDULLA, '86) and in the dik-dik and goat of this study.

In his atlas, POPESKO ('79) illustrated M. levator nasolabialis of the goat and sheep as originating from the frontal and nasal bones by widely separate fibers which direct rostroventrally towards the nose and the maxillary lip, and this disagrees with our results in the goat. According to ARNAUTOVIC, ABU-SINEINA and SIANIG ('70) the common levator muscle of the nose and maxillary lip of the camel corresponds to M. levator labii superioris proprius, M. dilator naris lateralis and M. depressor labii maxillaris of the ox.

M. ZYGOMATICUS (2,3/2)

The muscle is long and narrow and originates from the lateral surface of the zygomatic bone by a tendinous attachment (about 12 mm long in dik-dik and 10 mm in goat) ventral to the lateral canthus of the eye lids. It is relatively thicker at its middle in goat than that in dik-dik. The muscle extends upon the surface of the masseter (the deep part) and continues rostrally to end at the angle of the mouth by blending with M. orbicularis oris. The action of the muscle is to retract the angle of the mouth.

In the ox, GETTY ('75) and KOCH ('76) said that M. zygomaticus originates from the masseteric fascia and the temporal process of the zygomatic bone. While, in the sheep and goat, the former author agreed with ALI, *et al.* ('79) in the dromedary and with the results of this study in the goat and dik-dik. In the roe deer, RAMISCH ('78) mentioned the M. zygomaticus is 10 mm wide and forms a slight ventral convexity during its course rostrally to insert in the upper lip. Moreover, RAMISCH found that the muscle splits at its insertion into a large superficial part and a smaller deep part between which M. orbicularis oris lies.

REFERENCES

- Akajewsky, A. (1931): Zur Morphologie des M. levator nasolabialis und des M. malaris bei einigen Haustieren. Anat. Anz. 73, 1-23.
- Ali, M.A.: I.M.S. Khidr and M.A.A. El-Hagri (1979): Myology of the face region of the one-humped camel (*Camelus dromedarius*). Zagazig Vet. J. Vol. II, 151-160.

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- Arnautovic, M.E. and Abu-Sineina and Sianig (1970): The course and branches of the facial nerve of the one-humped camel. *J. Anat.* 106, 141-148.
- Boas, J.E.V. and Paulli (1908): Über den allgemeinen Plan der Gesichtsmuskulatur der Säugetiere. *Anat. Anz.* 33, 497-512.
- Getty, R. (1975): Ruminant myology in Sisson and Grosman's: The anatomy of the domestic animals, edited by R. Getty. Vol. 1, 5th ed. W.B. Saunders Company.
- Hofmann, R.R. (1973): The ruminant stomach (Stomach structure and feeding habits of East African game ruminants), Vol. 2. East African Monographs in Biology. Nairobi: E.A. Litterature Bureau, 1-345.
- Koch, T. (1976): Lehrbuch der Veterinär-Anatomie. Band I, Bewegungsapparat. VEB Gustav Fischer Verlag Jena.
- May, N.D.S. (1970): The anatomy of the sheep, a dissection manual. 3rd ed. University of Queensland Press.
- McLeod, W.M. (1960): Bovine anatomy. Burgess Publishing Company, Minnesota.
- Meinertz, Th. (1956): Das Facialisgebiet beim Elch (*Cervus alces*). *Morpholog. Jahrbuch* 96, 523-598.
- Nickel, R.; A. Schummer and E. Seiferle (1968): Lehrbuch der Anatomie der Haustiere. Band I, Bewegungsapparat. Paul Parey in Berlin and Hamburg.
- Nomina Anatomica Veterinaria (1983): Ithaca, N.Y. World Assoc. Vet. Anat.
- Pohlmeyer, K. and K.E.H. Abdulla (1986): Beitrag zur vergleichenden Anatomie der Skelettmuskulatur von Dämstier (*Dama dama* L. 1758), Schaf (*Ovis aries* L. 1758) und Ziege (*Capra hircus* L. 1758). Teil II: Die Hautmuskeln des kopfes und die Gesichts- oder Fazialis-muskulatur). *Drsch. Tierärztl. Wschr.* 92, 228-231.
- Popesko, P. (1979): Atlas der Topographischen Anatomie der Haustiere. Band I, Kopf und Hals. Ferdinand Enke Verlag, Stuttgart.
- Prince, J.H.; C.D. Diedem, I. Eglitis and G.L. Ruskell (1960): Anatomy and histology of the eye and orbit in domestic animals. Charles C Thomas, Springfield.
- Ramisch, W. (1978): Topographie und funktionelle Anatomie der Kaumuskeln und der Speicheldrüsen des Rehes, *Capreolus capreolus* (Linné, 1758) *Vet. Med. Diss.* Giessen.

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LEGEND

Fig. (1): Güntheré dik-dik.

Fig. (2): Superficial dissection of the lateral aspect of the face of dik-dik.

Fig. (3): Superficial dissection of the lateral aspect of the face of the goat.

1 M. depressor labii mandibularis, 2 M. zygomaticus, 3 M. malaris, M. levator buccalis (3), M. depressor palpebra inferioris (3'), 4 M. orbicularis oris, 5 M. buccinator (buccal part). 6 M. levator nasolabialis, 7 M. levator labii maxillaris, 8 M. caninus, 9 M. depressor labii maxillaris, 10 M. masseter (superficial part). 10' deep part of 10, 11 M. orbicularis oculi, 12 M. cutaneus faciei, 13 Gl. parotis.

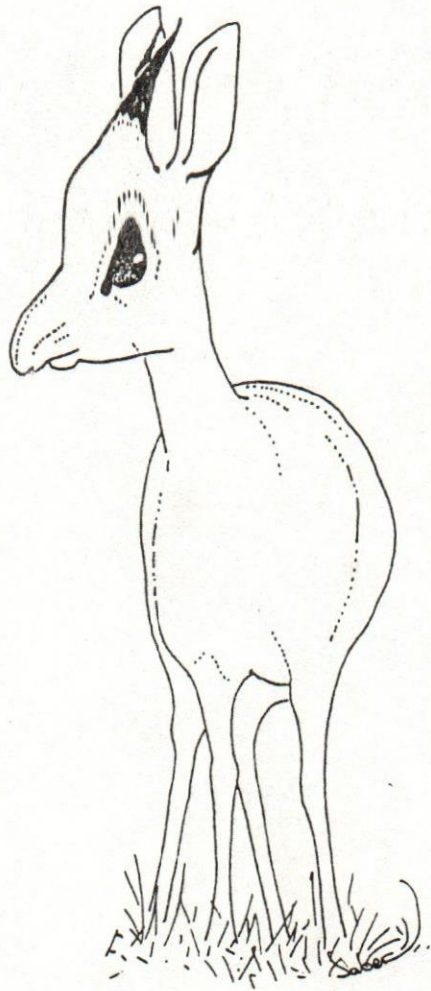


Fig. 1

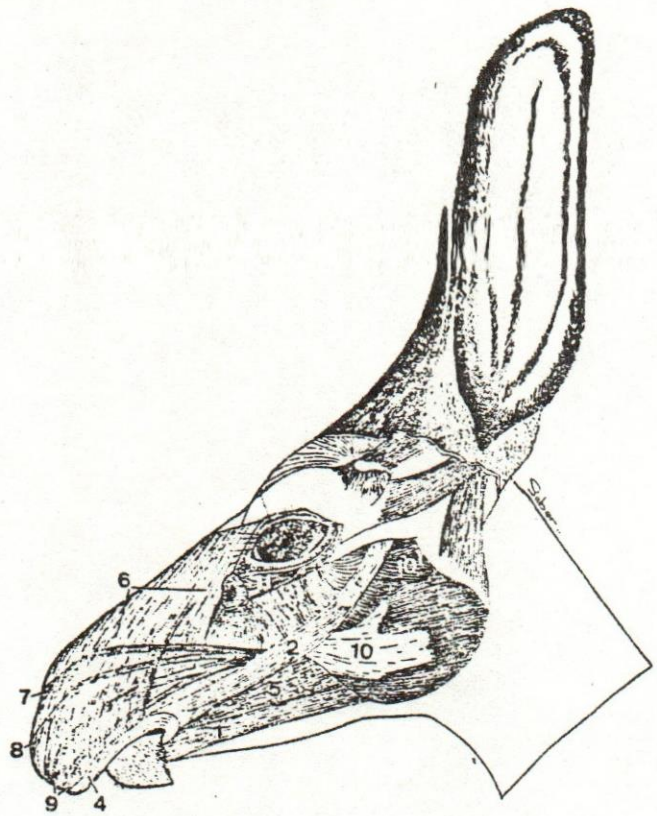


Fig. 2

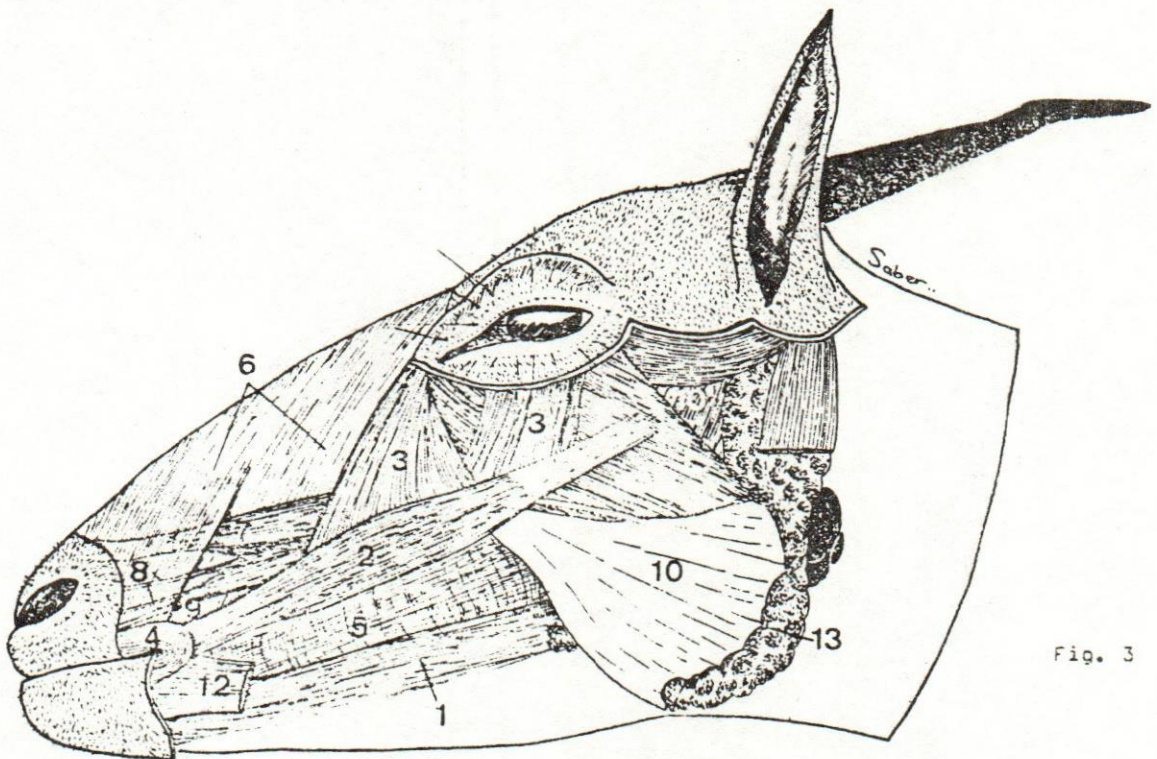


Fig. 3