

## THE COMPARATIVE MORPHOLOGY OF THE PLATYSMA

A COMPARATIVE STUDY OF THE SPHINCTER COLLI PROFUNDUS  
AND THE TRACHELO-PLATYSMA

By G. S. LIGHTOLLER

*Department of Anatomy, University of Sydney*THE SPHINCTER COLLI PROFUNDUS AND THE  
TRACHELO-PLATYSMA

THOUGH Ruge considered the extensive platysma of the Cercopithecidae and anthropoids to be derived from a single matrix, he suggested its subdivision into a Nacken-platysma, whose fibres took origin dorsal to the point of the shoulder, and a Hals-platysma, which took origin from the front of the chest. To avoid the hybrid words the terms noto- and trachelo-platysma have been suggested for these two subdivisions of the platysma (Lightoller, 1928). The derivation of the noto- and trachelo-platysma from a common matrix has many objections: amongst them may be mentioned the very great size and wide distribution of the total sheet; the late appearance, phylogenetically, of the trachelo-platysma, and that its appearance, in Placentalia, is always accompanied by the loss of the sphincter colli profundus. Also that the trachelo-platysma gradually replaces the noto-platysma (Lightoller, 1928); and there is noticeable, at times, a definite difference in the texture and colour of these two portions of the platysma. In these cases the trachelo-platysma appears more delicate in character and paler in colour than the noto-platysma.

Recently (Lightoller, 1939) it has been suggested that the trachelo-platysma is not derived from the noto-platysma, but from the sphincter colli profundus. This suggestion was based upon the observation that a full development of the sphincter colli profundus and the trachelo-platysma never occurred in the Placentalia, though both were present in marsupials. In the latter, it was noticed that the fibres of the one muscle ran in the same direction as, and a proportion were continuous with, those of the other. This was demonstrable even when the two muscles were inseparable.

In the following description three phylogenetic stages will be described:

A. *Sphincter colli profundus*. In its simpler and more usual form this sheet is found in the lower mammalia and lesser primates (Fig. 1 A); it has been so adequately described by various authors that a brief summary of its morphology will suffice here. It is a large sheet of muscle which takes origin in the mid-ventral plane by interlacement with the corresponding fibres from the opposite side. The origin may be an extensive one, extending from the middle or lower end of the sternum to the mentum. From their origin the fibres pass

at first laterally, then dorsally to cover the side of the neck and face. In this region it lies deep to the noto-platysma. For convenience of description and reference the sheet has been divided into five portions: P.p. cervicalis, auris, intermedia, palpebralis and oris. A point to which very little attention has been paid is the marked contrast between the rostral and caudal fibres. The rostral fibres are transverse in direction, and often feebly developed; the caudal fibres are not only powerfully developed, but are markedly oblique in direction. They often form a well-marked "tail" which lies ventral to the sternum (Figs. 4, 5).

B. *Sphincter colli profundus and sphincter transitus.*<sup>1</sup> In some mammals two sphincter sheets are present in the ventral region of the neck. In the dog (Huber) these are the sph. colli profundus and sph. colli superficialis. The latter

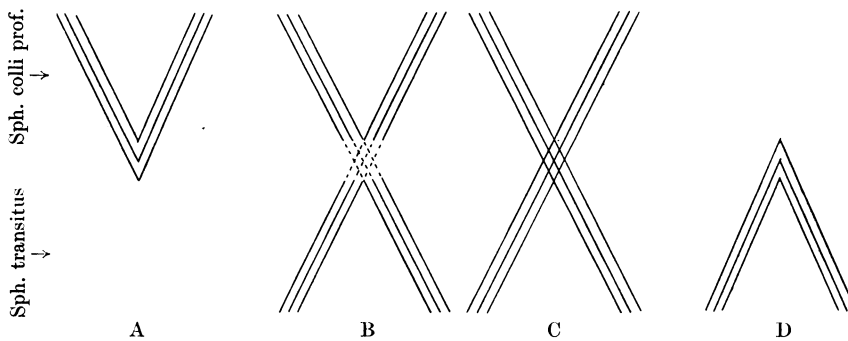


Fig. 1. A line schema to illustrate the transition from the sph. colli profundus to the trachelo-platysma.

A. In lower mammals and lesser primates is seen the simple type of sph. colli profundus. B. In rodents the sph. colli profundus has crossed the mid-ventral line to form a sph. transitus. C. In marsupials there is a well-marked break in the continuity of the two sphincters. D. In monotremes and anthropoids the sph. colli profundus disappears leaving the sph. transitus as the trachelo-platysma.

is a delicate and feeble sheet. It may be a Rest or it may be a detached sph. transitus; at present its matrix and its comparative morphology are undetermined. It has never been suggested as the matrix of any other mammalian muscle.

In rodents and marsupials, also, two sphincters are present (Figs. 1 B, C). Here the outer sheet is not the sph. colli superficialis; it is formed by an extension of the sph. colli profundus. The fibres of the muscle no longer merely interlace in the middle line with those of the opposite side; after interlacing they spread across the front of the neck and chest to end upon the arm, shoulder and noto-platysma of the opposite side. There can, thus, be formed an extensive secondary sphincter sheet which lies superficial to the sph. colli profundus. This has been called the sph. transitus. As the relations of the sph.

<sup>1</sup> This term has been coined to avoid using the term sph. colli superficialis falsus, which lacks definition and is both clumsy and misleading. For its definition see text.

transitus are different in rodents and marsupials they will be described separately.

**Rodents.** The sph. transitus is frequently, though not invariably, present in these mammals; its development is variable. The most complete development is that described by Meinertz in *Cavia cobaya* (1932), where practically the whole of the sph. colli profundus fibres take part in its formation. Here there is no special extension of the caudal fibres.

In the rabbit, on the other hand, the development of the sph. transitus is so feeble that the sph. colli profundus, in this respect, differs little from that seen in other mammalia. Between these extremes many stages have been described by Schreiber (1929). One variety is of particular interest. It is

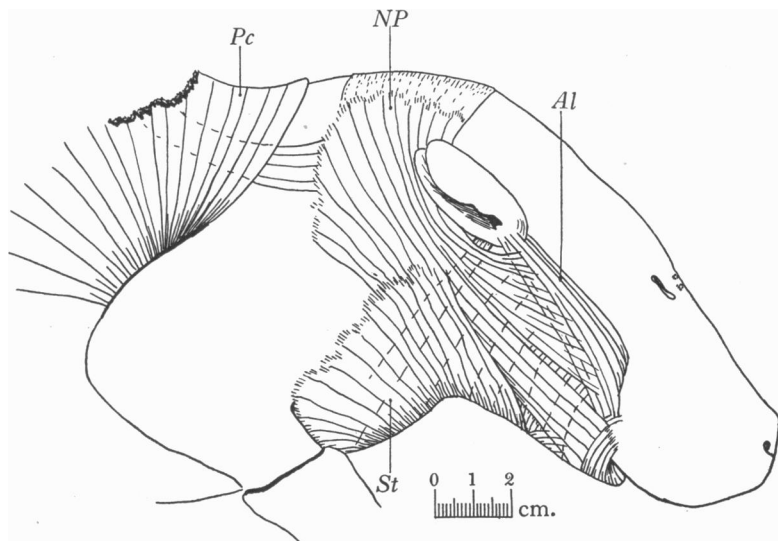


Fig. 2. A dioptogram of the right side of the head and neck of *Hydromys chrysogaster* to show the sph. transitus. The rostral fibres are very feebly developed, but the caudal fibres form a powerful sheet which invests the shoulder and side of the neck and partially covers the noto-platysma. The deeply situated sph. colli profundus is indicated by interrupted lines. (Z.B. 17.)

described by Schreiber in *Castor canadensis*, but is seen more simply displayed in *Hydromys chrysogaster*. In both there is a special extension of the caudal fibres.

**Hydromys** (Figs. 1 B, 2, 3). The sph. colli profundus is well developed and needs no description. A well-developed sph. transitus is present; rostrally its fibres are so few, delicate and short that they may easily be overlooked; the caudal fibres, however, are very numerous, strong and lengthy; they form a powerful sphincter sheet. Their interlacement in the mid-ventral line extends considerably caudal to the rostral end of the sternum (Fig. 3). The fibres partially cover the anterior chest wall and encircle the arm, investing its medial as well as its lateral aspect, but not reaching the antecubital fossa.

They also clothe the shoulder and, more rostrally, lie superficial to the *M. cervicalis transversus* and the *noto-platysma* (Fig. 2). The ventral view of the *sph. transitus* strikingly resembles that seen in the marsupials; laterally this resemblance is lacking as the muscle passes superficial to, instead of being in the same plane as, the *noto-platysma*. The fibres of the *sph. transitus* can readily be traced; they are continuous with those of the *sph. colli profundus* of the opposite side.

*Marsupials.* In these animals the *sph. transitus* lies in the same plane as, is inseparable from and appears to be an expansion of, the *noto-platysma*; some of the fibres, however, are continuous with those of the *sph. colli profundus*.

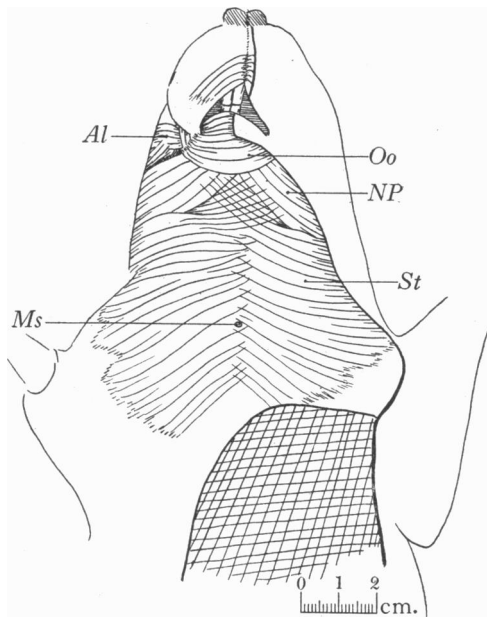


Fig. 3. A dioptogram of the ventral aspect of the head and neck of *Hydromys chrysogaster*. The *sph. transitus* extends considerably caudal to the rostral end of the sternum; it clothes the front of the chest and arm, but does not reach the antecubital fossa (cf. Fig. 4). (Z.B. 17.)

Some attributes of the sheet, therefore, are distinctive of *trachelo-platysma*, others distinctive of a *sphincter transitus*; it would appear to be a stage in transition between the two. As far as could be judged, not more than 50% of the fibres of the *sph. transitus* are continuous with those of the *sph. colli profundus*. The remainder of the fibres of both muscles remain discrete. The relationship between the sphincters is of two kinds: The first, and most usual, is that the two muscles are so closely united in the mid-ventral plane as to be inseparable. This fusion is not a linear one, but band-like in character and is due partly to a binding by fibrous tissue, and partly to an irregular extra-medial exchange of fibres between the two sheets. If the sheets be removed

*in toto*, carefully cleaned and mounted in Canada balsam between sheets of glass, it will be seen that the fibres of the sph. transitus run in the same direction as those of the sph. colli profundus, and that, at times, the fibres of the two sphincters are continuous. This is well seen in *Trichosurus vulpecula* (Lightoller, 1939).

In the second arrangement, which is less common, the two sphincters can be separated as far as the mid-ventral line. Here they are bound to each other by the interchange of a number of fibres. The best example of this type, so

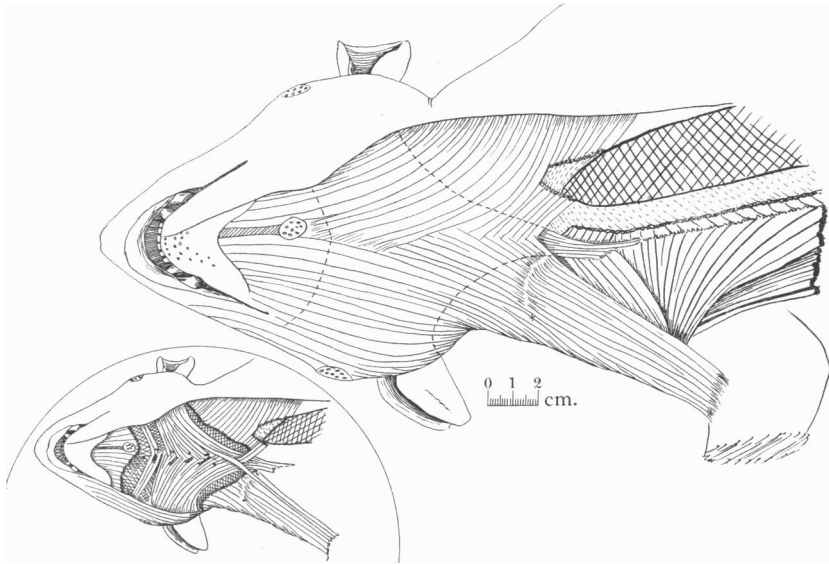


Fig. 4. A dioptogram of the ventral aspect of the head and neck of *Sarcophilus harrisi*. The "tail" of the sph. colli profundus is clearly seen. The decussation of the sph. transitus in the mid-ventral line does not extend caudal to the rostral end of the sternum; its fibres clothe the front of the chest and the arm and extend beyond the antecubital fossa to reach the forearm. The sph. transitus lies in the same plane as the noto-platysma and, superficially, is indistinguishable from a trachelo-platysma. *Inset*. The noto-platysma and the sph. transitus have been partially removed to display the sph. colli profundus. Caudally, some of its fibres are shown crossing the middle line to join the sph. transitus. The other fibres of the sph. colli profundus which crossed the middle line are shown cut across; it is only a percentage of the fibres of the two sphincters which are continuous one with the other. (Z.M. 20.)

far seen, was in *Sarcophilus* (Figs. 4, 5). In the inset (Fig. 4) a large portion of the sph. transitus and noto-platysma has been removed to reveal the sph. colli profundus. To do this numerous fibres were cut which passed between the sph. colli profundus and the sph. transitus; these are indicated. Fig. 5 is a photograph (unretouched) of an actual dissection. Here portions of the sph. transitus and noto-platysma have been freed from the sph. colli profundus and pinned to the opposite side of the neck. The interchange of fibres between the sph. colli profundus and the sph. transitus is revealed. In marsupials the sph.

transitus (trachelo-platysma) covers a portion of the chest wall, clothes the arm medially and laterally and crosses the antecubital fossa to gain insertion into, or become continuous with, the fascia of the forearm. Considered as a primitive trachelo-platysma it fulfils the conditions that were anticipated when the trachelo-platysma of the Cercopithecidae, Anthropoids and Man were investigated (Lightoller, 1928). Four stages in the phylogenetic development of the trachelo-platysma can be recognized: (1) its fibres interlace in the mid-ventral line caudal to the hyoid; (2) its fibres interlace in the mid-ventral line between the hyoid and the chin; (3) some of its fibres are inserted into the

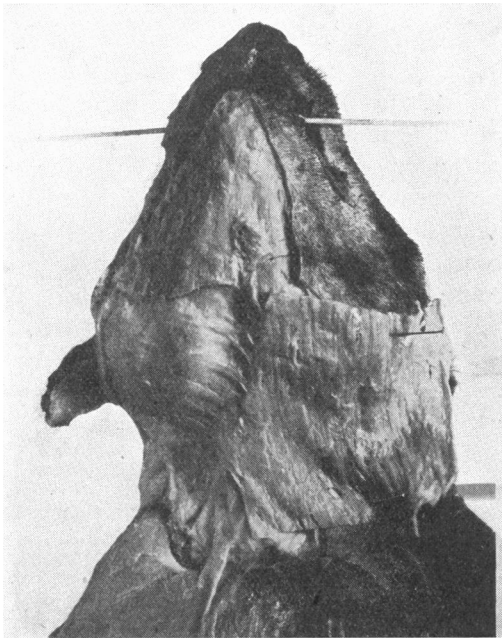


Fig. 5. Photograph (unretouched) of an actual dissection of the neck of *Sarcophilus* to display the interchange of fibres between the sph. colli profundus and the sph. transitus. Portion of the noto-platysma and the sph. transitus of the right side has been reflected as a sheet, and pinned to the left side of the neck.

lower lip, partially replacing the noto-platysma; (4) its fibres are inserted into the modiolar area as well as the lower lip and entirely replace the noto-platysma. Overlapping of these stages is met with.

C. *Sphincter transitus* (*trachelo-platysma*). Here the sph. transitus persists, but its matrix—the sph. colli profundus—is not present in the adult. Work, so far, has not been done to ascertain the conditions present in the embryo.

The only order of mammals in which the whole of the sph. transitus persists without its matrix—the sph. colli profundus—is that of the monotremes. Here the sph. transitus is exceedingly well developed, and not dissimilar in

appearance to that of the *Cavia cobaya* figured by Meinertz. This sheet has hitherto been regarded as a sph. colli superficialis.

More usually only the caudal fibres of the sph. transitus persist. This is the condition which forms the trachelo-platysma in all the higher primates and in Man.

#### SUMMARY

An attempt has been made to show that the trachelo-platysma of primates may have been derived from the sph. colli profundus of lower mammals. In most mammals the sph. colli profundus consists of a sheet of muscle which covers the ventral and lateral aspects of the neck and the side of the face. It passes deep to the noto-platysma. In rodents, however, the fibres of the sph. colli profundus cross the mid-ventral line to form a second powerful sphincter—the sph. transitus. It covers a portion of the front of the chest, clothes the medial and lateral aspects of the arm and invests the side of the neck and face. It passes superficial to the sph. colli profundus and to the noto-platysma. In certain rodents the rostral fibres of the sph. transitus are very feeble, but the caudal fibres are greatly developed. In marsupials it is the caudal fibres of the sph. transitus that persist. These lie in the same plane as the noto-platysma and are intimately associated with it; they are, however, only partially dissociated from their underlying matrix—the sph. colli profundus. They represent a stage of transition between the sph. transitus of rodents and the trachelo-platysma of primates. In primates the sph. colli profundus is no longer seen and the well-developed caudal fibres of the sph. transitus persist as the trachelo-platysma.

In conclusion I wish to thank Prof. A. N. Burkitt for his continued assistance and the Department of Anatomy, University of Sydney, for granting facilities and material for this work.

#### ABBREVIATIONS

Figures accompanied by a scale are dioptograms. *At* = M. auriculo-labialis; *Ms* = rostral end of the sternum; *Oo* = M. orbicularis oris; *NP* = noto-platysma; *Pc* = panniculus carnosus; *St* = sphincter transitus.

#### REFERENCES

- HUBER, E. (1922-3). *Morph. Jb.* **62**, 1-353.  
 LIGHTOLLER, G. H. S. (1928). *J. Anat., Lond.*, **63**, 19-81.  
 — (1939). *Trans. Zool. Soc., Lond.*, **24**, pt 5, 349-444.  
 MEINERTZ, T. (1932). *Morph. Jb.* **69**, 110-220.  
 SCHREIBER, H. (1929). *Morph. Jb.* **62**, 243-318.