Original article

# Variations in the morphology of platysma muscle in central Indians

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## Abstract

**Objectives**: To determine the extent of the platysma muscle bilaterally, and also its facial extent and variations in its morphology, if any. **Introduction**: Platysma muscle is considered insignificant functionally. It helps in the depression of mandible, drawing the lower lip, and angle of mouth downwards and laterally in expression of horror and surprise. The extent of the muscle may be variable; the medial margins may meet in the midline, above as well as below the hyoid. **Methods**: In 20 cadavers bilaterally we have measured the distance between the medial borders of the platysma: i) 5 cm and 10 cm above the suprasternal notch (SSN); ii) the width of the muscle in the middle of the neck and iii) where it crosses over the angle of the mandible. We have also observed the number and extent of the decussation of fibers in the mid-line. **Result**: The distance between the medial margins above the SSN was variable at different levels: 5cm above SSN - 24.05 mm, and 10 cm above SSN - 21.77 mm, thereby indicating the convergence superiorly. Below the symphysis menti the decussation was absent in 32%. The width of the muscle was variable and ranged from 35.72 mm to 76.57 mm. Width of the fibres crossing superficial to the the angle of the mandible ranged from 16.84 mm to 53.56 mm. In some cases there was no attachment to the base of mandible and the fibres passed on to the face. In two instances there was broad decussation above suprasternal notch. **Conclusion**: The platysma muscle may have significant facial extension and variations.

**Keywords:** aging face, facelift, facial rejuvenation, jowling, rhytidectomy.

## 1 Introduction

Platysma is a Greek word meaning plate like broad muscle present on the side of the neck. Platysma represents the panniculus carnosus of many mammals, which produces the movements of the skin, as in the horse (DATTA, 2005). The importance of the platysma in plastic surgery is well known. It has a significant facial extension and has been shown to constitute a critical component in the facial aging process. It plays an important role in surgical procedures on the aging face than was previously thought of (SHAH and ROSENBERG, 2009). The platysma flap is considered to be an ideal donor source due to its thin, pliable and sufficient colour-matched skin nature. This flap can provide adequate donor tissue that is particularly valuable for the repair of large facial defects (CHEN, YANGGUN and WANG, 2010). Many factors contribute to the loss of shape and contour of the aging neck. These anatomic changes include loss of tone of the dermal elastic fibers with sagging of the skin; ptosis of the soft tissues in the neck and chin, banding of the platysma muscle, etc (GIAMPAPA, BITZOS, RAMIREZ et al., 2005). Direct infiltration of platysma by the nodal mass causing contracture of the muscle fibers of platysma is called "Platysma sign": "Puckering of the platysma and the overlying skin like an inverted Japanese fan". This Puckering is below the level of nodes and finishes at the level of the clavicle (CHATURVEDI and AGRAWAL, 2010).

Functionally, Platysma diminishes the concavity of the side of neck below the jaw. Anterior portion assists in depressing the mandible. Labial and modiolar fibers draw the lower lip and corners of the mouth in expressions of horror or surprise. It is active in sudden deep inspiration & contracts vigorously during sudden, violent effort (STANDRING, BORLEY, COLLINS et al., 2008).

Shah and Rosenberg (2009) while discussing the developmental basis of platysma have stated that it is derived from the more superficially lying platysmal fascia rather than the deep lying sphincter colli in which the muscles of the face arise. The directions of the fibers of the platysma muscle distinguish it from other underlying muscles of the face.

Looking to its importance in aging and the role it plays in procedures like Rhytidectomy and other face-lift operations it was thought pertinent to undertake this study as no data is available for the population of central India.

## 2 Materials and Methods

The study was carried out on 20 Cadavers bilaterally available in the Department of Anatomy of our institute (SAIMS, Indore). Neck was extended and platysma was exposed bilaterally and cleaned from its inferior to the superior extent. Following measurements were taken:

1. Width of platysma at its middle, 2. width of platysma crossing over the angle of mandible, 3. distance between medial borders 5 cm and 10 cm above the suprasternal notch (SSN), 4. pattern of the decussating fibers below the symphysis menti were observed, recorded, and photographed, where necessary.

## 3 Results

As shown in Table 1 following are the observations of the present study:

- Maximum width of platysma at its middle on the right side was 76.57 mm and minimum was 35.72 mm. (Figure 1A);
- Maximum width of platysma at its middle on the left side was 70.92 mm and minimum was 43.63 mm;
- Maximum width of platysma crossing over the angle of mandible on the right side was 53.56 mm and minimum was 16.84 mm;
- Maximum width of platysma crossing over the angle of mandible on the left side was 43.95 mm and minimum was 19.59 mm;
- The proportion of fibers of platysma going to the lower lip as well as angle of mouth was found to be variable;
- Maximum distance between medial borders of platysma 5 cm above the SSN was 44.76 mm and minimum was 11.45 mm. (Figure 1B);
- Maximum distance between medial borders of platysma 10 cm above the SSN was 38.84 mm and minimum was 7.83 mm;
- Submental decussation was seen only in 68% cases. In 4 cases (30%) 1 fasciculus decussated 16.53 mm below the symphysis; in 3 cases (23%) 2 fasciculi decussated 22.12 mm below the symphysis, and in six cases (46%) more than 4 fasciculi decussated 19.61 mm below the symphysis. (Figure 2A, B: Table 2);
- Besides submental decussation, in 2 cases (10%) broad decussation of platysmal fibers was seen in the suprasternal region (Figure 3A, B). This was separated from submental decussation by 27.53 mm (Figure 3A) and by 11.02 mm (Figure 3B) respectively. It was 12.5 mm above the SSN in case one (Figure 3A) and in case two it was 23.17 mm (Figure 3B).

## 4 Discussion

Platysma is a broad thin sheet of muscle which arises from the fascia covering the upper part of pectoralis major and deltoid muscles. Fibers cross the clavicle and ascend forward and medially on the side of the neck. Its anterior fibers interlace across the midline with the fibers of the contralateral side below and behind the symphysis menti. Intermediate fibers get attached to the lower border of the mandibular body (pars mandibularis) or may pass upwards and medially, deep to the depressor anguli oris, to get attached to the lateral half of the lower lip (pars labialis). Posterior fibers cross the mandible and the anterolateral part of masseter to get attached to the skin and subcutaneous tissue of the lower face, many of them blending with modiolar muscles near the buccal angle (pars modiolaris) (STANDRING, BORLEY, COLLINS et al., 2008).

Levet (1987) has described that the platysma is divided into four parts: pars auricularis, pars zygomatica, pars buccalis, and pars mentalis. Platysma represents cervicomandibularis muscles of mammals. It forms the middle plane and can be distinguished from sphincter colli as its fibers lie in a perpendicular plane (LEVET, 1987). Fibers

**Table 1.** Measurements of Platysma of the two sides.

| Measurements | Maximum (mm) | Minimum (mm) | Average (mm) |
|---|---|---|---|
| Width of platysma at its middle on the **right** side | 76.57 | 35.72 | 55.13 |
| Width of platysma at its middle on the **left** side | 70.92 | 43.63 | 57.77 |
| Width of platysma where it crosses over the angle of mandible on the **right** side | 53.56 | 16.84 | 26.60 |
| Width of platysma where it crosses over the angle of mandible on the **left** side | 43.95 | 19.59 | 29.63 |
| Distance between the medial borders 5cm above the SSN | 44.76 | 11.45 | 24.05 |
| Distance between the medial borders 10cm above the SSN | 38.84 | 7.83 | 21.77 |

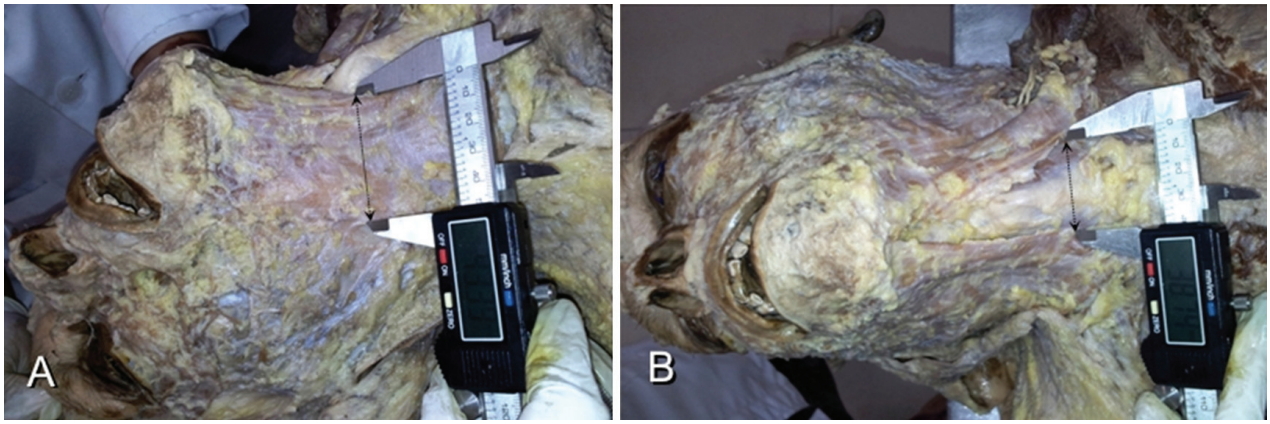


**Figure 1.** (A) width of platysma at its middle (Black arrow) (B) Distance between medial borders of platysma 5cm above SSN (Black arrow).

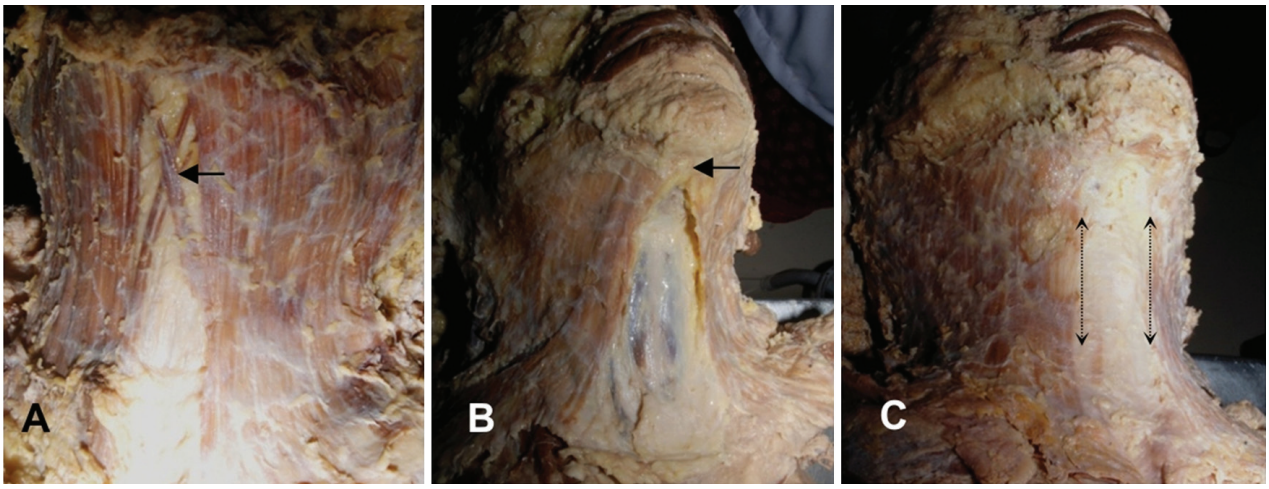


**Figure 2.** (A) Showing decussation of fibers. (Black arrow). (B) Submental platysma diaphragm. (Black arrow). (C) Parallel running medial borders of platysma (Black arrows). There is no decussation.

**Table 2.** Decussation of platysmal fibres in the submental region (Figures 2A, B, C).

| Number of fasciculi | Decussated below the symphysis (mm) | % |
|---|---|---|
| 1 | 16.53 | 30 |
| 2 | 22.12 | 23 |
| >4 | 19.61 | 46 |

extend across the face at an angle, rather than perpendicular to the Frankfort horizontal line (SHAH and ROSENBERG, 2009). It may be attached to the clavicle, mastoid process or occipital bone (OZCELIK, AKSOY and GAEKLER, 1997).

Shah and Rosenberg (2009) described the superficial musculoaponeurotic system (SMAS) in lower face and neck in conjunction with the depressor anguli oris. They described that superior extent of the platysma muscle along the 'Mandibular malar line' (MML) from the angle of the mandible was found to be 3.98 cm. Platysma muscle lifts the neck out accentuating platysmal bands and lowers the eyelids and midface accentuating the malar and nasolabial folds and making the neck shorter and wider. This makes it the major muscle responsible for the emotive response of surprise.

Platysma varies considerably in extent and may even be absent on one or both the sides (OZCELIK, AKSOY and GAEKLER, 1997). In our series platysma was present on both the sides in all the cases, and the proportion of fibers of platysma going to the lower lip as well as angle of mouth was found to be variable. Maximum width of platysma crossing over the angle of mandible on right side was 53.56 mm and on left side was 43.95 mm (Table 1).

Kim, Hu, Kang et al. (2001) described that the fibres of platysma decussate and interlace with each other but sometimes one side of the muscle overlaps and covers the other side. In their series decussation was found in 85.7% cases which they classified in to type I (43%) decussation which extended upto 20 mm below the symphysis menti; type II (43%) decussation which extended more than 20 mm. In (14.3%) there was no decussation. In 45% of their specimens, one side of the platysma covered and overlapped the other side. No decussation (14.3%) was considered as type lll.

In the present study submental decussation was seen in only 68% cases as compared to Kim, Hu, Kang et al. (2001) where it was reported to be 85.7%. In 46% cases it extended upto 19.61 mm below the symphysis menti (type I); no type II was observed, and in 32% cases no decussation was seen (type III).

In 30% cases only 1 fasciculus decussated at an average distance of 16.53 mm below the symphysis menti; in 23% cases 2 fasciculi decussated at an average distance of 22.12 mm below the symphysis, and in 46% cases more than 4 fasciculi decussated at an average distance of 19.61 mm below the symphysis. (Figure 2A, B, C; Table 2). No findings comparable to these were described in the literature searched.

Pogrel, Schmidt, Ammar et al. (1994) identified four distinct patterns of decussation depending on the mode of merging of medial margin of the two platysmal bundles, and found a complete platysmal diaphragm submentally in 15% cases, whereas, in 85% cases there was only some degree of midline dehiscence. Right and left fibers merged or crossed to form an inverted V or U shape. They have measured the width of dehiscence 1 cm posterior to its apex which was 11.8 mm (mean) and it was 20.00 mm (mean) 2 cm posterior to the apex. The wider and more divergent the dehiscence and the more U-shaped the dehiscence, the greater may be the tendency to a "turkey gobbler" deformity.

Claudio Cardoso de Castro (1984) found that medial fibers of the platysma showed anatomical variations in the submental region. He has shown that these fibers have three different methods of distributions in the submental area: Type I- Interlacing at about 2 cm below the chin. This was the most common. Type II- fibers decussate at the level of the thyroid cartilage. The placation of these fibers will produce muscle excess in the median line. Type III- The platysmal medial fibers insert directly at the cutaneous muscle of the chin without interlacing.

In the present study maximum distance between medial borders of right and left platysma 5 cm above the SSN was 44.76 mm and minimum was 11.45 mm (mean 24.05 mm).

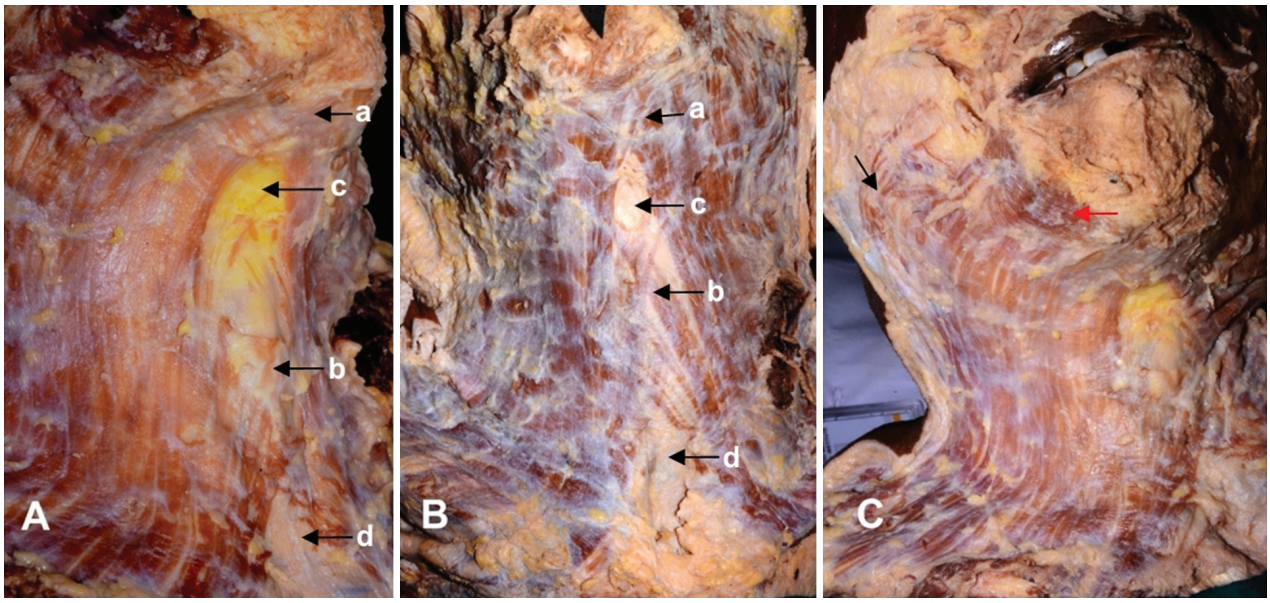


**Figure 3. A** (a) broad platysmal sheet showing a submental diaphragm. (b) broad supra sternal decussation. (c) diamond shape gap between a and b. (d) small broad supra sternal gap below b. **B** Broad platysmal sheet showing (a) submental diaphragm. (b) broad supra sternal decussation. (c) small gap between a and b. (d) a large diamond shape supra sternal gap. **C** Showing broad right platysma. Superiorly fibers are crossing the mandible without getting attached to its base and are seen passing deep to depressor anguli oris. (red arrow). A separate risorius is seen arising from parotid fascia (black arrow) distinct from the platysma.

Maximum distance between medial borders of right and left platysma 10 cm above the SSN was 38.84 mm and minimum was 7.83 mm (mean 21.77 mm) (Table 1).

Depending on the pattern of merging of the right and left platysma bundles, some cases showed platysmal diaphragm submentally to a variable extent. In some cases medial margins of right and left fibers merged or crossed to form an inverted V or U shape. (Figure 2B, C). The additional broad decussation of platysmal fibers (Figures 3A, B) found in the present series has hitherto not being described in the literature reviewed.

Maximum width of platysma at its middle on right side was 76.57 mm and on left side was 70.92 mm. There is no comparable data for these observations in the available literature (Table 1).

The differences of the present finding with that of the European workers may be due to racial or ethnic variations. Despite the myriad of face-lift techniques available, few surgeons who perform face-lifts would question the role that the platysma muscle plays in rejuvenation of the aging neck. With advancing age, the platysma tends to become thinner and less defined. Normal aging will cause the platysma muscle to sag and weaken, which creates unsightly platysmal bands or ptosis of the muscle and underlying tissues (SHAH and ROSENBERG, 2009).

The knowledge of extent of decussation is relevant to the removal of the subplatysmal fat in corset platysmaplasty, submental Z-plasty and vertical myectomy of the platysma muscle.

## 5 Conclusion

Besides the normal functioning of platysma & its role in facial expressions, it plays an important role in aging process and hence this study of its anatomical variants assume greater significance in rhitidectomy, jowling and neck wrinkle cosmetic surgeries.

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