

## **Variations in the Anterior Belly of Diagastric**

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**Abstract:** The anterior belly of diagastric is highly variable. Variation in anterior belly is most common amongst the submental region variations. We observed 6 such variations in the anterior belly of diagastric among 15 cadavers dissected (40%). Unilateral and bilateral variations were seen in equal number of cases. Accessory belly frequently cross midline and attached over the mylohyoid muscle. Knowledge of such variations is of significant importance while planning for surgeries in submental region and during staging of tumors.

**Key Words:** Anterior belly, Diagastric Muscle, Variation, Submental region.

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### Introduction

Diagastric muscle consists of two bellies, anterior and posterior. Posterior belly arises from notch on the mastoid process, runs downwards and forwards to the hyoid bone. Anterior belly attached to the fossa diagastricus on mandible. Both the bellies were joined at an intermediate tendon, which perforates the lower fibers of stylohyoid and held to the lesser cornu of hyoid by a fibrous sling. The anterior belly of diagastric lies superficial to the mylohyoid muscle<sup>(1)</sup>.

Diagastric is a branchiomeric muscle. Posterior belly of diagastric develops from second pharyngeal arch and is innervated by a branch from facial nerve. Anterior belly of diagastric develops from first pharyngeal arch and hence is innervated by a branch from inferior alveolar nerve which in turn is a branch from mandibular nerve<sup>(2)</sup>. The diagastric muscle elevates the hyoid when infrahyoid muscles are relaxed and depresses the mandible when hyoid is fixed<sup>(3)</sup>.

Sometimes accessory muscles are derived from diagastric or from mylohyoid muscle. Variations in the anterior belly of diagastric are observed by many workers<sup>(4-10)</sup>.

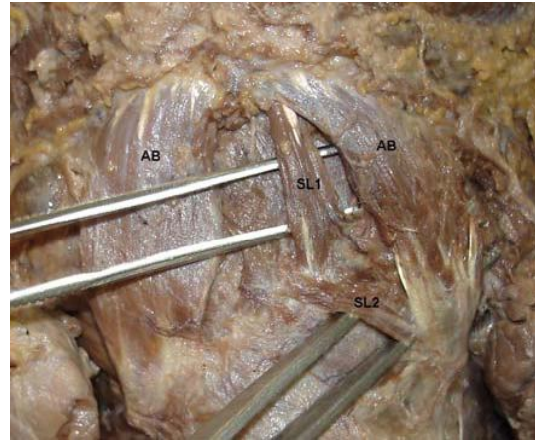
### Method

The study was carried out in the Department of Anatomy, People's College of Medical Sciences and Research Centre, Bhopal, India to see the variations in the anterior belly of diagastric. 15 cadavers were dissected during a period of three years.

### Observation

Anterior belly of diagastric is highly variable. We encountered six variations out of 15 cadavers during routine dissection. Variations in the anterior bellies of diagastric were documented.

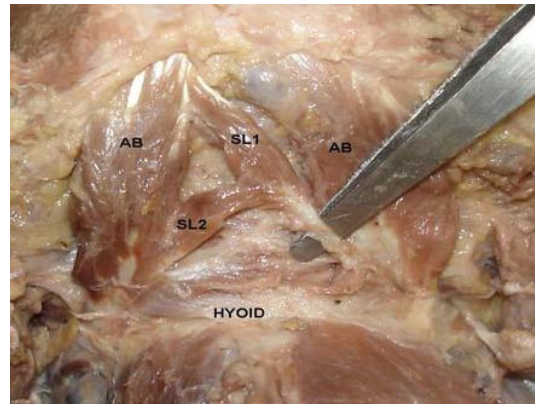
Case 1, a 67 year old male cadaver, presented with a bilateral variation in the anterior bellies of diagastric. Medial to the anterior bellies of diagastric there were additional slips present on both the sides which were thinner, lying in deeper plane (Figure 1). These medial slips of both the side join to form a common tendon which proceeds to join intermediate tendon on left side and some fibers forming an aponeurosis are attached to the body of the hyoid bone above the attachment of the mylohyoid. Both medial slips are attached above at the fossa diagastricus of mandible.



**Fig. (1). Photograph showing two accessory slips forming a common tendon.**

AB - Anterior Belly. CT – Common Tendon.

Case 2, a 63 year old male cadaver presented, with a unilateral variation on left side. There were two additional slips on left side. First slip is attached to the diagastric fossa above sweeps downwards and gets attached at the middle of the mylohyoid muscle without crossing the median raphe. Muscle fibers of second slip originating just below the insertion of the first slip from mylohyoid muscle and gets inserted on an intermediate tendon along with anterior belly on left side (Figure 2).



**Fig. (2). Photograph showing two unilateral accessory slips on left side**

AB - Anterior Belly, SL – Accessory Slips.

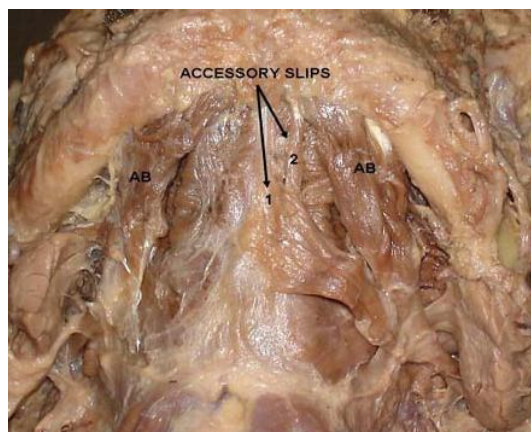
Case 3, a 70 year old male cadaver, presented with a unilateral variation of anterior belly on left side. Fibers of accessory slip emerging from intermediate tendon sweeps upwards and medially. At the middle of the

belly most of the fibers gets separated from the main muscle mass in the form of slip, crosses the midline and gets inserted over the right mylohyoid muscle. Remaining fibers from a thin slip runs upwards without crossing the midline and gets inserted in the form of tendon over lower border of mandible medial to the main belly (Figure 3).



**Fig. (3).** Photograph showing two accessory slips, slip 1 crossing the midline.  
AB - Anterior Belly.

Case 4, an 81 year old male cadaver, presented with a very unusual bilateral variation of anterior belly. Four accessory bellies were seen in out of which 3 on right side and one on left side (Figure 4).

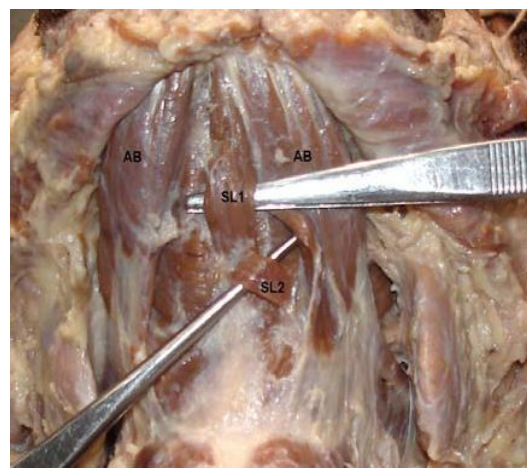


**Fig. (4).** Photograph showing bilateral variation. Three accessory slips on right side and one on left side.  
AB - Anterior Belly.

On right side two accessory anterior bellies arising from an intermediate tendon and out of which one gets inserted over fossa diagastricus medial to anterior belly and deep to the third accessory belly. The second one gets inserted over median raphe. Third accessory belly arising from diagastric fossa medial to the anterior belly and gets inserted over median raphe.

On left side there was only one accessory belly arising from intermediate tendon which gets inserted over the median raphe.

Case 5, a 74 year old male cadaver, presented with two accessory slips forming a 'Y' shaped configuration. Both accessory slips were originated from a common tendon on left side. The slips were diverted from each other and cross the midline, one slip gets attached to the diagastric fossa of mandible on right side deep to the anterior belly and second slip gets inserted on intermediate tendon on right side (Figure 5).

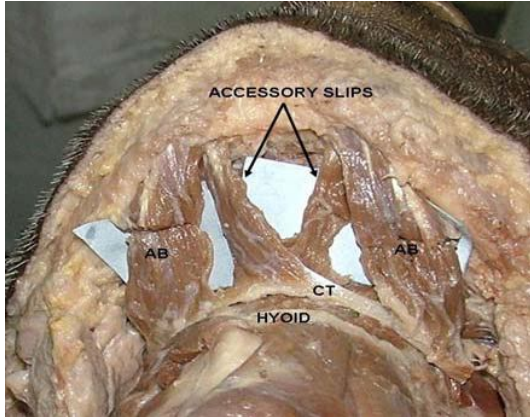


**Fig. (5).** Photograph showing two accessory bellies forming joined at a common tendon forming a 'Y' shaped structure.

AB - Anterior Belly, SL – Accessory Slips.

Case 6, a 71 year old male cadaver, presented with unilateral variation with two accessory slips on left side. The two anterior bellies are much broader while, the accessory slips were thin. Findings were similar as seen in the second case. First slip was attached above to the diagastric fossa runs downwards and gets inserted at the middle of the mylohyoid muscle on the same side. Muscle fibers of second slip extend from the insertion

of the first slip from mylohyoid muscle to an intermediate tendon along with anterior belly on left side (Figure 6).



**Fig. (6).** Photograph showing a unilateral variation on left side. Two accessory slips seen on left side. AB – Anterior Belly, SL – Accessory Slips.

### Discussion

Many variations are encountered in the submental region like, in diaphragm muscle and sometimes in mylohyoid muscle<sup>(11)</sup>. Amongst these, variation in the anterior belly is most common. Unilateral variations are more common than the bilateral<sup>(9, 12)</sup>. In present study we observed 3 unilateral and 3 bilateral variations.

Various studies on human fetuses have observed that the symmetrical variations are extremely rare<sup>(13)</sup>. Symmetrical variations were not observed in the present study. It is not uncommon for the anterior belly to cross the midline fuse with the mylohyoid muscle<sup>(14)</sup>.

Turan –Ozdemir et al<sup>(10)</sup> observed a bilateral accessory anterior belly of diaphragm. Aktekin et al<sup>(9)</sup> reported a bilateral and symmetrical variation of anterior belly of diaphragm in which accessory bundles were arranged in cross, superficial to the mylohyoid muscle. Traini M,<sup>(4)</sup> reported a case of bilateral accessory diaphragm muscles. Holibkova & Machalek<sup>(15)</sup> demonstrated bilateral accessory anterior bellies in two cases. Reyes et al<sup>(3)</sup> observed bilateral accessory anterior bellies forming a triangular configuration. Both the bellies running from intermediate tendon and get inserted over the mylohyoid raphe. Zuhail et al<sup>(16)</sup> reported case of bilateral quadrification of anterior belly of diaphragm muscle.

Peker et al<sup>(17)</sup> reported a bilateral anomaly of diaphragm muscle in which lateral fibers originating from the diaphragm fossa were inserted on a hyoid bone and medial fibers from both the sides were inserted on the median raphe of mylohyoid muscle.

Sargon & Celik<sup>(5)</sup> demonstrated an abnormal diaphragm muscle with three bellies where an accessory belly was originated from diaphragm fossa and was inserted on to the hyoid bone. Sarikcioglu et al<sup>(7)</sup> encountered a diaphragm muscle with the three accessory anterior bellies and a fibrous band attached to the median raphe.

Celik et al<sup>(8)</sup> observed an unilateral quadrification of anterior belly & all these gets inserted into an intermediate tendon. Guelfguat et al<sup>(18)</sup> observed a median accessory diaphragm muscle. A quadrilateral muscle attached with its base on hyoid and above on the mandible between diaphragm fossae. Michna H<sup>(19)</sup> reported asymmetric accessory diaphragm muscle in a submental region. Bakirci et al<sup>(20)</sup> observed accessory bellies of diaphragm in two cases. Liquidato et al<sup>(21)</sup> reported 4 cases of accessory anterior belly out of which two showing unilateral variations on right side and two showing bilateral variations.

Larsson & Lufkin<sup>(22)</sup> demonstrated a single case of unilateral accessory diaphragm muscle out of 45 patients using MRI. Fugimura et al<sup>(23)</sup> reported 13 cases of variations from 54 cadavers. De-Ary-Pires et al<sup>(24)</sup> reported accessory anterior bellies in 18 out of 146 diaphragm muscles from 73 cadavers. Liquidato et al<sup>(21)</sup> reported 4 cases out of 10 cadavers he studied. In present study variations in anterior belly were found in 6 (40%) cases out of 15 cadavers studied.

According to Sicher and Du Brul<sup>(25)</sup>, oblique connection between two anterior bellies was most frequent variation found among anterior bellies, while according to the Norton<sup>(26)</sup>, it was bilateral accessory bellies parallel to anterior bellies. In present study also we observed more often an oblique connection between the two anterior bellies instead of accessory bellies parallel to the anterior bellies.

Knowledge of anatomical variations could be of significance during diagnosis & various surgical procedures. Liquidato et al<sup>(21)</sup> stressed the importance of knowledge while differentiating cervical masses. Stockstill et al<sup>(27)</sup> stated that the variability of these muscles

may be related to the unusual jaw movements. Such cases of unilateral anatomical variations are of quite clinical importance as they produce asymmetry in neck or movements at the floor of mandible<sup>(17, 21)</sup> or may affect temporo-mandibular joint<sup>(28)</sup>.

Variations in anterior belly should be known especially in evaluation of submental region & also in evaluation of tumor in floor of mouth and staging of the tumors using CT Scan & MRI.

It is very essential to differentiate the anterior belly of diagastric during mobilization of myo-cutaneous flaps of platysma in reconstructive procedures or during removal of metastatic lymph nodes.

### Conclusion

Unilateral and bilateral variations in anterior belly occur equally. Symmetrical variations are uncommon. Accessory belly frequently cross midline and attached over the mylohyoid muscle.

Variations of anterior belly of diagastric have radiological as well as surgical importance. Since these may mislead while evaluating submental region for detection of tumors or staging of tumors using C. T. or M.R.I.

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