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Original Research Article

Variational Anatomy of Ansa Cervicalis and its Clinical Implications

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Abstract

Background: Ansa cervacalis is a nerve loop which gives branches to innervate the infrahyoid group of muscles. Any injury to these muscles would cause disturbance in phonation. The Ansa cervicalis nerve loop is formed by superior root i.e arise from the cervical spinal nerves (C1-C2) inferior root is descending from C2-C3 .In the present study, We aim to document anatomical variations of Ansa cervicalis and can be important acknowledgment in specific surgeries of the neck region and its clinical implications.

Materials & Methods: During routine dissection of adult cadavers of age 30-60 years old at department of anatomy, Rangaraya Medical College, Kakinada. while performing neck dissection, location and level of ansa cervicalis are observed in 25 cadavers on both sides of neck (50 hemineck dissections).

Results : Among 50 hemineck dissections (In 25 cadavers), 1 hemineck dissection on right side of neck showing abnormal location of ansa cervicalis i.e inside to the carotid sheath and in remaining 49 hemineck dissections ansa cervicalis is located on anterior aspect of carotid sheath.

.intermediate level ansa seen in 40 hemineck dissections ,low level ansa seen in 10 hemineck dissections but high level ansa not observed in any hemineck dissection.

Conclusion: Knowledge regarding the location & level of ansa cervicalis is very useful to ENT Surgeons ,Head and neck surgeons, Onco surgeons to minimize the complications like paralysis of infrahyoid muscles while performing surgeries over the neck.

Keywords: Ansa Cervicalis, Superior Root, Inferior Root, Branches to Muscles.

Introduction

The Ansa cervicalis formation is relatively complex. As its course and location along the great vessels of the neck may vary. It is a thin loop of nerves found in the neck [1]. It is formed by the ventral Rami of upper three cervical spinal nerves. It has 2 roots namely superior and inferior roots infront of common carotid artery [2]. The superior root is formed by ventral Rami of the first cervical spinal nerve fibres join with the hypoglossal nerve, few fibres of these descend down to form the superior root/ descendens Hypoglossi [9]. Superior root gives a branch to the superior belly of omohyoid muscle before it joins the inferior root. Inferior root is formed by ventral Rami fibres of the second (C2) and third (C3) cervical nerves [3], it passes downwards on the lateral side of the internal jugular vein crosses infront of the vein a little below the middle of the neck and joins the superior root infront of the common carotid artery [15].

The 2 roots forms a Ansa cervicalis which gives branches to infrahyoid muscles also called as strap muscles namely sternohyoid, sternothyroid and inferior belly of omohyoid muscles. These muscles depress the hyoid bone during deglutition and phonation [5]. In the past few years Ansa cervicalis has been utilized to innervate the muscles of the larynx which are paralyzed due to surgical procedures performed in the neck [14]. Ansa cervicalis also used in the laryngeal innervation in case of recurrent laryngeal nerve palsy. Right recurrent laryngeal nerve palsy is one of the most serious complication in oesophageal cancer surgeries, it also causes functional depression of deglutition & phonation ,aspiration pneumonia . Branches of Ansa cervicalis are used in such surgeries [12]. Iatrogenic damage to the Ansa cervacalis may occur during surgical procedures such as arytenoid adduction, thyroplasty, removal of

deep cervical lymphnodes & surgeries close to parotid gland [7].

Having good knowledge of topographical relationships of structures in the neck and their variations of Ansa cervicalis are having a greater clinical importance for the reconstructive surgeries which involve the infrahyoid muscles.

Materials and Methods

25 formalin fixed cadavers of both female and males of adult age groups approximately 30-60 years were dissected on both sides of neck during the routine cadaveric dissection for undergraduate students at Department of anatomy, Rangaraya Medical College, Kakinada. During dissection of neck over the anterior aspect of carotid sheath usual location & level of Ansa cervicalis are observed and photographed in all cadavers, While performing dissection we can also search for any abnormal location of ansa cervicalis on both sides of neck.

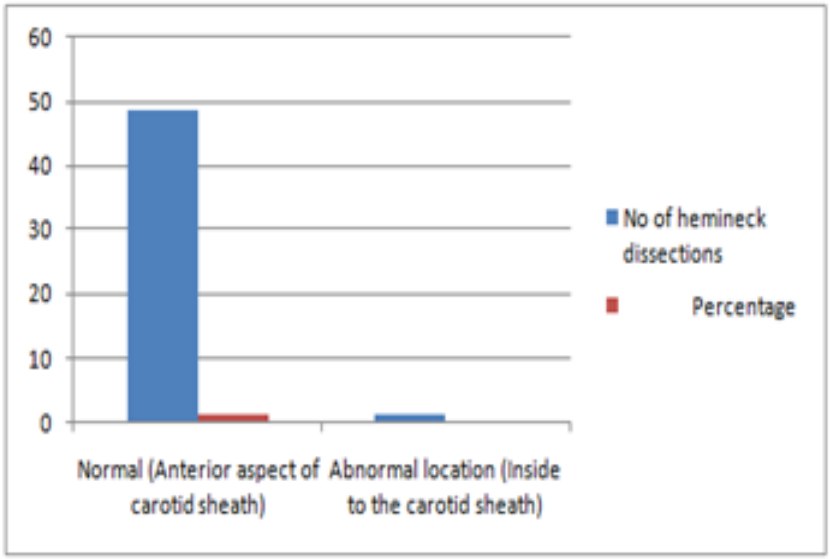
Results

During the routine dissection for undergraduate students Among 25 formalin fixed cadavers with hemi dissection of neck, one male cadaver Who is above 50 years of age at Rangaraya Medical College, Kakinada found an abnormal location (Anatomical variation) of the Ansa cervicalis was on the right side i.e. Inside the carotid sheath. Usually it is located on outside /anterior aspect of carotid sheath. The superior root of the Ansa cervicalis branched off the hypoglossal nerve at the posterior and lateral border of external carotid artery at its proximal part. Then descended beneath the one of the tributary of internal jugular vein (lingual vein) and then between the internal jugular vein and common carotid artery at its distal part. The nerve loop of superior root of Ansa cervacalis joins with inferior root at the level corresponds to upper margin of oblique line of thyroid cartilage beneath the other tributary of internal jugular vein (Middle thyroid vein) which is crossing the anterior aspect of common carotid artery. Further lies deep to internal jugular vein and common carotid arteries, from where the nerve loop gives off branch i.e nerve to omohyoid muscle. Whereas the left side neck of same cadaver showed normal formation of Ansa cervicalis which is outside the carotid sheath.

Based on the level of loop with respect to the omohyoid muscle, Ansa cervicalis divided into 3 categories. Among these first type is, The loop at the level of the hyoid Bone was classified as high level Ansa cervicalis which is not found in present study. 2nd type is the loop in between Hyoid bone and the omohyoid muscle was classified as intermediate Ansa - It was seen in 40 hemi neck dissections out of 50 (90%). 3rd type is the loop below the omohyoid muscle was classified as low level Ansa. It was seen in 10 hemi neck dissections out of 50 [10 %].

Table 1: showing no of hemineck dissections showing location of ansa cervicalis

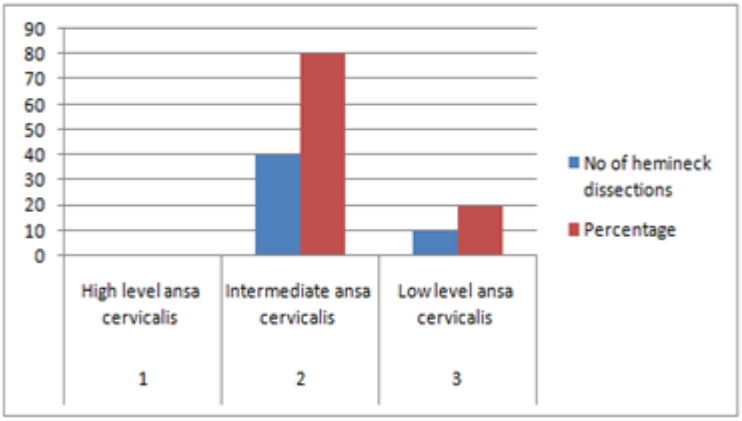
Location of ansa cervicalis	No of hemineck dissections	Percentage
Normal (Anterior aspect of carotid sheath)	49	98%
Abnormal location (Inside to the carotid sheath)	1	2%



Paragraph 1: Showing no of hemineck dissections showing location of ansa cervicalis

Table 2: Showing no of hemineck dissections showing different type of ansa cervicalis

S. No.	Type of ansa cervicalis	No of hemineck dissections
1	High level ansa cervicalis	0 (0%)
2	Intermediate level ansa cervicalis	40 (80%)
3	Low level ansa cervicalis	10 (20%)



Paragraph 2 : showing no of hemineck dissections showing different type of ansa cervicalis

Regarding the formation of Ansa cervacalis, its superior root is formed by C 1 cervical spinal nerve fibres which are joined with Hypglossal nerve only. Inferior root of Ansa cervicalis is formed by C 2 and C3 cervical nerve fibres joined together before they joins with superior root was seen in almost all the cases.

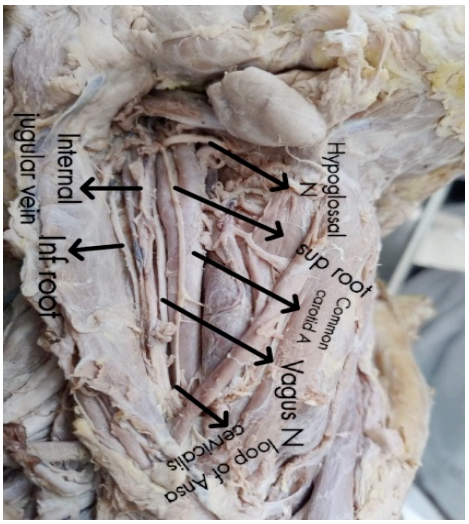


Figure 1: Showing lateral view of right neck with normal location of ansa cervicalis

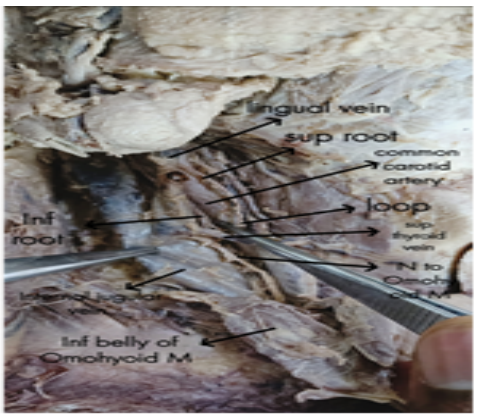


Figure 2: Showing lateral view of right side of neck showing abnormal location of ansa cervicalis [located inside to carotid sheath - distant view]

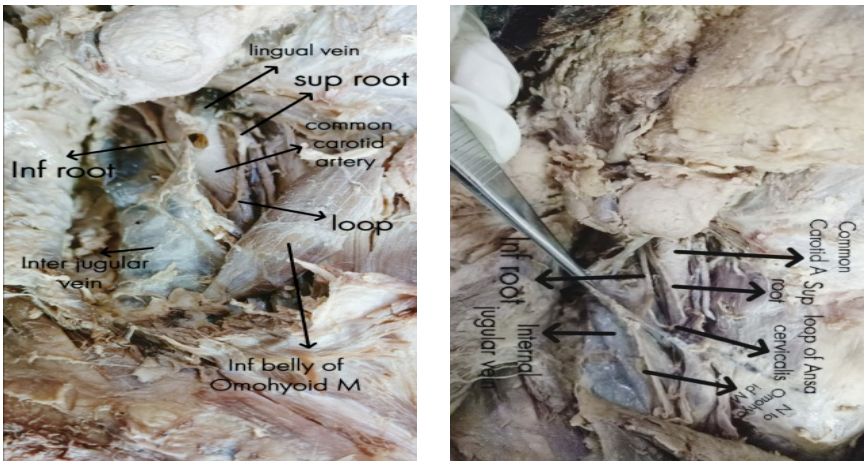


Figure 3: Showing lateral view of right side of neck with abnormal location of ansa cervicalis [located inside to carotid sheath – close view]

Discussion:

The Ansa cervicalis was also known as the Ansa Hypoglossi as it is arised from the fibres of Hypoglossal nerve. Superior root of Ansa cervicalis also known as "Descendens Hypoglossi". According to study conducted by Loukas M ,among 100 adult formalin fixed cadavers 70% cases showed long Ansa (Below the omohyoid muscle) and 30% showed short ansa (above the omohyoid muscle) [8]. Jelev L suggested a classification of the Ansa cervicalis (Tyoe I to V) with possible communication from 3 sources the C 1 – C 2 fibers via the Hypoglossal nerve. C 1-C 2 fibres within the vagus nerve and separate branches from the C 2-C 3 ventral rami of cervical nerve fibers. He also descsribed that typical Ansa cervicalis if superior root has a Hypoglossal component and inferior root has C2, C3 cervical component [6]. In the present study all the Ansa cervicalis were seen are typical Ansa cervicalis. Nayak SB et al have also reported a rare variant of the superior root branching off the vagus and hypoglossal nerves [10]. There is also a classification described by orly and Haines et al Ansa cervicalis based on its Relationship to the internal jugular vein they are three types i.e. medial type, lateral type and mixed type of Ansa cervicalis [11]. Chhetri DK and Berke classified the position of the loop of Ansa cervacalis as short and long Ansa cervacalis [5]. According to study described by caliot et al found superior root was symmetric in all most all cases, However the inferior root was asymetric in 75% of the cases [4]. Further studies described by Shvedavchenko Al, Ansa cervicalis was examined in 54 human formalin fixed cadavers and preparations of the head and neck by conventional dissection, in 66% of the cases the Ansa cervicalis displayed the typical course that was classified into internal type (located medial to the internal jugular vein inside the carotid sheath) Remaining 34 % external type (lateral to the internal jugular vein) [13]. According to Banneheka study, 2 types of communications are observed in between the ansa cervicalis & the vagus nerve using a surgical microscope. 1st is pseudo /false communication, in this nerves were connected only by connective tissue. 2nd is a true communication in which 2 nerves were connected by nerve fibers .majority of them are having a pseudo /false communication [2].

In present study high Ansa is not seen in any cadaver, intermediate Ansa was seen in 40 hemi neck dissections out of 50, low level ansa cervicalis seen in 10 hemi neck dissections out of 50. Therefore intermediate Ansa showed greater percentage (90%). Superior root is formed by C1 fibers joined by Hypoglossal nerve, Inferior root is formed by C3 and C4 cervical nerve fibres only and having a close relationship with internal jugular vein Ansa cervicalis is coursed in between and deep & medial to internal jugular vein and common carotid A (Laterally) in one cadaveric hemi neck dissection (which is internal type located medial to IJV and inside the carotid sheath)

Clinical Importance

Damage to the Ansa cervicalis can lead to change in voice quality may be because of the loss of support provided by the strap muscles to the laryngeal cartilages during movements of vocal folds. In the recent years, there has been a new techniques utilizing the Ansa cervicalis nerve to reinnervate the paralyzed laryngeal muscles such as nerve to nerve anastamosis with the recurrent laryngeal nerve. The knowledge of the possible variations of Ansa cervicalis in relation to the great vessels of the neck prevents the inadvertent injury to the vessels during neck vascular surgeries.

Conclusion

The precise knowledge of the anatomical relations and variations of Ansa cervicalis is very useful to the head and neck surgeons, ENT Surgeons to

accurately known the possible variation. while performing surgeries over the neck, risk is reduced to damage the nerves and vessels. While performing neural blocks in regional anesthesia and nerve grafts, this knowledge is very helpful to them.

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