

Variations of recurrent laryngeal nerve termination in foetuses of II and III trimesters

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Abstract

Embryologically the spinal nerves are formed due to migration of cells from their original site along with elongation of their nerve fibres. Vagus nerve has an extensive course and distribution than any other cranial nerve, traversing from upper part of the neck, through thorax and enters abdomen and supplying almost all the organs. Extensive study was made on the mode of termination of the Recurrent Laryngeal Nerve on right and left sides. 100 dead foetuses have been collected and analyzed the origin of RLN variation during II and III trimesters. The termination of RLN in between the branches was observed in detail as this information will be helpful to paediatric surgeons.

Keywords: Dead foetus, Inferior Thyroid Artery (ITA), Recurrent Laryngeal Nerve (RLN), II trimester, III trimester.

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INTRODUCTION

All the fibres from cranial portion of the accessory nerve pass through Inferior vagal ganglion without synapsing. Some of the accessory fibres descend in the trunk of vagus, to be distributed to larynx through recurrent laryngeal branch of vagus. RLN is a mixed nerve, carrying motor fibres which supply all the intrinsic muscles of larynx except cricothyroid, sensory fibres supply laryngeal mucosa below the level of vocal folds and trachea and secreto motor fibres supply all the mucous secreting glands present in the mucous membrane. The vagus nerve passes vertically down the neck within the carotid sheath, up till the root of the neck or superior aperture of thorax. Further course of the vagus

nerve differs on the two sides of the body. Near the lower pole of the Thyroid gland, the RLN is always intimately related to the inferior thyroid artery that is, the nerve may be

1. Anterior to the artery
2. Posterior to the artery
3. Passing between branches of the artery

All the above is the description of RLN in adults. As paediatric surgery is gaining importance, an attempt is made to study RLN in foetuses by dissecting, observing and comparing to similar studies of different scientists.

MATERIALS AND METHODS

The study was conducted in the department of Anatomy, Kakatiya Medical College, Warangal. 100 dead II and III trimester fetuses of have been collected from Chanda Kanthiah Memorial hospital, Warangal, Government Maternity Hospital, Hanamkonda and few private nursing homes in Warangal. All the specimens were either aborted, stillborn or premature deliveries resulting in neonatal death. Chemicals used are Formalin for preservation, Glycerine to keep the tissues soft and Copper Sulphate as antifungal agent. Specimens were collected within 10 hours after death. Depending on the size, the fetuses were embalmed with 10% formalin to expose the vagus nerve and RLN a systematic dissection

procedure has been adopted. The following parameters have been included:

- a. Length of all the fetuses have been measured in centimeters i.e. the Crown Rump length, to calculate approximate age of fetuses in weeks.
- b. Weight of all fetuses along with 5cm-6cm of umbilical cord has been taken in grams with the help of a simple balance.
- c. Biparietal diameters i.e., distance between two parietal eminences of all the specimens were measured with vernier calipers.

A detailed dissection was carried out on each specimen, on right and left sides. The RLN was traced on both sides from its origin till its termination into the larynx. The dissected specimens were blotted with blotting paper and were painted with fabric paint. Lemon yellow colour is used for RLN and its branches. The specimens thus painted were photographed.

OBSERVATIONS AND RESULTS

Larynx of human beings is a well-developed organ among vertebrates. Vocal cords are the special vibrating folds of larynx supplied by a branch of vagus named Recurrent laryngeal nerve. The position of RLN differs on right and left sides and a detailed knowledge of the nerve is essential for any surgery in the neck on the right side and additionally in the upper part of thorax on the left side. i.e. in Superior mediastinum. For the present study 100 fetuses of 2nd and 3rd trimester were considered. Routine departmental dissection cadavers numbering 20 have been considered and observed for RLN on both sides. Out of 20 cadavers observed, 16 were male, 4 were female and age ranging from 18-80 years.

II TRIMESTER

Right Recurrent Laryngeal Nerve

- a) Out of 38 fetuses the nerve was anterior to the artery in 14 fetuses
- b) The nerve was posterior to the artery in 5 fetuses
- c) The nerve was coursing between the branches of ITA in 19 fetuses

Left Recurrent Laryngeal Nerve

- a) Out of 38 fetuses the nerve was anterior to the artery in 7 fetuses
- b) The nerve was posterior to the artery in 14 fetuses

- c) The nerve was coursing between the branches of ITA in 17 fetuses

III TRIMESTER

Right Recurrent Laryngeal Nerve

- a) Out of 62 fetuses the nerve was coursing anterior to ITA in 24 fetuses
- b) The nerve was posterior to ITA in 7 fetuses
- c) The nerve was coursing between the branches of ITA in 31 fetuses

Left Recurrent Laryngeal Nerve

- a) Out of 62 fetuses the nerve was coursing anterior to ITA in 11 cases
- b) The nerve was posterior to ITA in 23 fetuses
- c) The nerve was coursing between the branches of ITA in 28 fetuses

DISCUSSION

At the site of termination RLN in II and III trimester fetuses is related to inferior thyroid artery and has been observed in detail. TAGUCHI in (1889) was the earliest Scientist to observe the relation of Recurrent laryngeal nerve with inferior thyroid artery. Out of 522 recurrent laryngeal nerves in 114 cases, the nerve was anterior to ITA, in 299 cases the nerve was posterior to ITA and in 109 cases the nerve was between the branches of ITA. Fowler and Hanson (1929) and Berlin DD in (1935) both from USA observed 400 nerves and 140 nerves respectively. They found 26% and 32.14%, the nerves anterior to ITA, 65.5% and 53.57% nerves posterior to ITA and 8.5% and 14.29% nerves between the branches respectively. Among all the scientists who observed the relation of recurrent laryngeal nerve with ITA, Simon (1943) from USA reported highest % that is Recurrent laryngeal nerve lies posterior to ITA i.e. in 75.5%. Hunt *et al* (1968) from Australia and Lekacos *et al* (1992) from Greece have reported that Recurrent laryngeal nerve is posterior to the ITA in 57% of cases. Flament *et al* (1983) from France reported that in 30.2% cases, Recurrent laryngeal nerve was posterior to the ITA. Lowest percentage i.e., 24.47% has been reported till now about the posterior position of the recurrent laryngeal nerve to ITA was by Compose and Heriques in 2000. Yalcxin B (2006) reported his study of 100 nerves and expressed that the relation of recurrent laryngeal nerve with the ITA is variable both on right and left sides.



Figure 1: Trimester II RLN posterior to ITA on left side RLN posterior to ITA on left side



Figure 2: Trimester III RLN anterior to ITA on right side



Figure 3: Trimester III RLN posterior to ITA on left side



Figure 4: Trimester III RLN anterior to ITA on right side



Figure 5: Trimester II RLN posterior to ITA on right side

OBSERVATION IN FETUSES

Table 1:

Sr. No.	Material	Total No.	Male	Female
1	II trimester fetuses	38	24	14
2	III trimester fetuses	62	49	13

Table 2: Observation in fetuses: Relation at termination: II Trimester

RLN position	Right side	Left side
Anterior to ITA	14	7
Posterior to ITA	5	14
Between branches of ITA	19	17
Total	38	38

Table 3: Relation at termination: III rd Trimester

RLN position	Right side	Left side
Anterior to ITA	24	11
Posterior to ITA	7	23
Between branches of ITA	31	28
Total	62	62

Figure 4: Termination – inferior thyroid artery

RLN Position	II Trimester (38)		III Trimester (62)	
	Right	Left	Right	Left
RLN anterior to ITA	14	7	24	11
RLN posterior to ITA	5	14	7	23
RLN in between the branches of ITA	19	17	31	28
Total	38	38	62	62

CONCLUSION

The main nerve supply is by a branch of vagus nerve anatomically but physiologically the nerve supply is by fibres of accessory nerve and this crossing of fibres occurs at the level of inferior vagal ganglion. The branches of vagus nerve, with accessory fibres are superior laryngeal nerve and recurrent laryngeal nerve. Both these nerves supply laryngeal muscles and sensation to mucous membrane above and below vocal folds respectively. An attempt to help the paediatric surgeons, 100 dead foetuses were collected and dissected on both sides to observe formation, course and termination of RLN. Foetuses were grouped as II and III trimester based on CR length. Out of 100 randomly collected foetuses 38 were grouped as II trimester and 62 as III trimester of which 73 were male foetuses and 27 were female foetuses. A detailed observation of termination of the nerve in relation to ITA and its branches showed that the nerve is mostly between the branches of ITA, in both the groups Flament *et al* from France reported the highest percentage i.e., 50.35 on left side between At the termination, the nerve was between the branches of ITA in more number of cases on the right side than on the left side. A detailed observation of RLN on both sides of foetuses in both the groups (II and III trimesters) has been taken up in the present study as most of the previous workers have observed RLN in adults either in cadaver’s or during cervical surgeries. As paediatric surgery is an up-coming branch, a detailed knowledge of RLN and its variations in foetuses will be a guide to surgeons in reducing postoperative complications.

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