

A MORPHOLOGICAL STUDY OF FOETAL FACIAL NERVE ANASTOMOSIS –VARIATIONS AND PATTERNS

***R. Ramana Rao and B.N. Rao**

*Department of Anatomy, GITAM Institute of Medical Sciences and Research,
(GITAM Deemed to be University) Rushikonda, Andhra Pradesh, India*

**Author for Correspondence: rrapeti@gitam.edu*

ABSTRACT

Objective: To study morphological variations occurring in the facial nerve branching and anastomosis patterns in unclaimed foetuses.

Materials: In the present study twenty five full terms formalin-fixed foetuses have been dissected following incisions as per Cunningham's manual.

Results: Six types of branching patterns have been mentioned so far in Adult cadavers. Three of the common varieties of branching have been observed to be common, but in one foetus the cervicofacial trunk is deep to the retromandibular vein, which is uncommon.

An Astonishing fact is that there had never been an incidence where an injury to the facial nerve branch (either by accident or iatrogenic) yielded expected degree of functional impairment. But resulted in impaired surgical out-come to the surgeons and agony to the patients in terms of cosmetic compromise. This can be attributed to the variations in the branching pattern of the facial nerve in the parotid gland and also its anastomosis in the face.

Keywords: *Anastomosis, Cervicofacial and Retromandibular*

INTRODUCTION

Surgeons consider clearing the growth in the parotid region and diagnosing it either as mixed tumor of parotid or vestibular schwannoma (Kim CH, 2004) as an important task rather than preserving the facial nerve and its branches. Though, Injury to the facial nerve would not result in life threatening consequences; however the damage would result in asymmetry of face, impairment of facial expression and phonation difficulty which is certainly a psychological agony to the patient. Amongst 10 cases of parotidectomy 9 resulted in marginal mandibular nerve damage (Zan mra, 1992). Earlier studies recorded a wide variation in the distribution of facial nerve, like bifurcation, trifurcation and plurification of facial trunk (Franc celsnik, 2005).

The present anatomic study of the foetal facial nerve branching was undertaken by disciplined dissection of 25 foetuses (50 half heads). This is to demonstrate the variations in the distribution of the facial nerve branching in the parotid gland to the students. These variations were probably caused by the variations in the morphology of the face. Emphasis was laid on the need to recognize these patterns so as to prevent the nerve injury during surgery. The most frequent type of parotid tumor in children is the mixed tumour. The knowledge of the facial nerve and its branches in the parotid gland is of great advantage in parotidectomy.

Aim of the study: To study the various patterns of Facial nerve anastomosis in foetuses

MATERIALS AND METHODS

This dissection work was done while working at MIMS during 2013. Around 25 unclaimed Full term still born foetuses were obtained from OBG Department of MIMS. They were formalin fixed. Amongst them

10 foetuses were male while 15 were female, according to crown rump length gestational age ranged from 32 to 38 weeks .

Routine dissection was carried by removing the superficial lobe of the parotid gland piece meal exposing the branching pattern of facial nerve in the parotid region on either side.

Inclusion criteria: Full term, Still born and unclaimed foetuses.

Exclusion Criteria: Foetuses with Neural tube defects, cleft lip and cleft palate, oblique facial clefts etc., were excluded from this study.

RESULTS

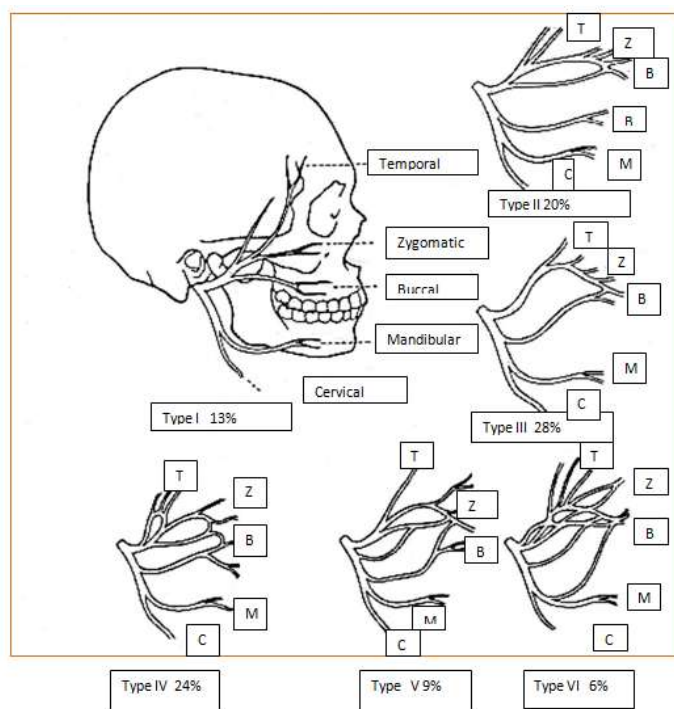


Figure 1: Depiction of general layout of all the six types of facial nerve branching patterns

Figure 2: Showing Type II pattern of facial nerve anastomosis features are detailed as follows

Type II Observations

Routine bifurcation of the Facial nerve trunk is 1cm distant from the external auditory meatus into

I. Temporofacial trunk gave

1. Temporal branch in an upward direction anterior to the superficial temporal vessels further branches as three rami
2. Zygomatic branch
3. Upper branch of the buccal

II. The cervico facial branch contributed

1. Lower buccal branch
2. Marginal mandibular branch
3. Cervical branches.

Anastomosis amongst the upper and lower buccal nerves observed



Figure 3: Showing Type III pattern of facial nerve anastomosis features are detailed as follows



Figure 4: Showing Type IV pattern of facial nerve anastomosis features are detailed as follows

Type III Observations

Facial nerve bifurcates at 9mm from the external auditory meatus. Temporofacial branch gave a temporal branch and a zygomatic branch. The cervicofacial trunk gave buccal branch, marginal mandibular and cervical branch.

Type IV Observations

The division of the Facial trunk occurred at 1.2cm from the external auditory meatus. The temporofacial branch gave a temporal branch and also a zygomatic branch which anastomosed with a branch of buccal nerve derived from cervicofacial branch. The cervicofacial branch gave a buccal branch, marginal mandibular and a cervical branch. Retromandibular vein is deep to temporofacial and the anastomosing buccal branch of the cervicofacial but it is superficial to marginal mandibular and cervical nerve.

DISCUSSION

The regular extracranial course of the facial nerve is that it emerges from the base of the skull at the stylomastoid foramen and almost immediately gives off three branches: first branch innervates posterior belly of digastric, stylohyoid receives one branch and posterior auricular nerve is the third branch. Then the facial nerve enters the parotid gland on its posteromedial surface and passes forwards and downwards behind the mandibular ramus within the substance of the gland it ramifies into a superior trunk (temporofacial) and an inferior cervicofacial trunk with variations in the further division of these two (Gray's anatomy 2008).

Studies were carried out on 110 (Haithem 1981), 54 (Liang, 1987) adult cadaveric facial halves. Studies were carried on the parotid gland and facial nerve of developing foetuses (Espin-Ferra, 1991,) facial

nerve was studied in first trimester fetuses (Guizetti, 1996) while 25 full term fetuses have been studied in the present work,

Davis *et al.*, 1956 notified six variations in the branching of the facial nerve in the parotid gland indicated by roman numbers I,II,III,IV,V and VI with an incidence of 13%,20%,28%,24%,9% and 6% respectively. In the present study three types that is II, III, IV with a progressive proportionate increase in the contribution of the cervicofacial branch innervating various muscles of facial expression was observed.

type IV pattern manifested an existing anastomosis between the zygomatic branch of temporofacial and buccal contribution of cervicofacial branch.

In the present study the bifurcation point of the facial trunk was 9mm to 12mm and the temporal rami ranging from 2 to 4 are in line with the study of Korean fetuses by Won Tae Lee, *et al.*, (2006).

In the present study the intimate relation of the facial nerve and its branches with the retromandibular vein is evident and contrary to what was mentioned in Gray's Anatomy 40th edition the branches of the facial nerve are not always superficial to the retromandibular vein this is in agreement with the study of (Gaoussou Toure *et al.*, 2010, Liang, 1987).

Conclusion

The variations in the branching pattern of the facial nerve in the parotid gland might be related to the morphological variations of the face determined by the proportionate increase or decrease in the prognathia which is a feature to classify the skull types into races which in turn influenced by the environment. Further detailed work is needed to establish this relation. The knowledge of the branching pattern of the facial nerve in the parotid gland is of utmost importance to the surgeon.

Limitations : Smaller sample size and unequal gender distribution in the present study cannot prompt any generalization of observations.

ACKNOWLEDGEMENT

I am indebted to my mentor, ideal and inspiration Dr. B. Narasinga Rao Retired Professor and Head, Department of Anatomy, GIMSR, Rushikonda, Andhra Pradesh for showing me proper direction always.

REFERENCES

- Davis RA, Anson BJ, Budinger JM and Kurth LR (1956).** Surgical anatomy of the facial nerve and parotid gland based upon a study of 350 cervicofacial halves. *Surgery, Gynecology and Obstetrics*, **102** 385-412.
- Espin-Ferra J, Merida-Velasco JA, Garcia-Garcia JD, Sanchez-Montesinos I, Barranco-Zaffra RJ (1991).** Relationships between the parotid gland and facial nerve during human development. *Journal of Dentistry Research* **70** 1035-1045.
- Fran CC (2005)** surgical anatomy of the intraglandular portion of the facial nerve. *Journal of Maxillofacial Surgery* **65-73**.
- Gaoussou Toure, Christian Vacher (2010).** Relations of the facial nerve with the retromandibular vein: anatomic study of 132 parotid glands *Surgical and Radiologic Anatomy*, **32**(10) 957-61. doi: 10.1007/s00276-010-0674-9.
- Guizetti B, Radlanski RJ (1996).** Development of the parotid gland and its closer neighboring structures in human embryos and fetuses of 19-67mm CRL. *Annals of Anatomy* **178** 503-508.
- Haithem A Ziarah BDS., and Martin E and Atkinson (1981)** The surgical anatomy of the mandibular distribution of the facial nerve. *British Journal of Oral Surgery* **19**(3) 159-170.
- Kim CH, Seol HJ, Kim CH, Kim DG and Jung HW (2004).** Recurrence and facial nerve function in relation to the extent of resection of vestibular schwannoma surgery. *Journal of Korean Neurosurgery Society* **36** 201-205.
- Liang MR, McKerrow W.S (2005)** Intraparotid anatomy of the facial nerve and retromandibular vein *British journal of Surgery* **75**(4) 310-312.

Pia F, Policarpo M, Dosdegani R, et al., (2003). Centripetal approach to the facial nerve in parotid surgery: personal experience. *Acta Otorhinolaryngology Italica* **23** 111-115.

Sushang Standring (2008). The Anatomical Basis of Clinical Anatomy Gray's Anatomy Churchill Livingstone, Elsevier, 40th edition, 494-495.

Won Tae Lee, Youn Young Chung, and Seok Won Kim (2006). A Morphological Analysis of the Facial Nerve in Korean Fetuses and Stillborn Infants Laboratory Investigation **40**(6) 445-449.

Zan Mra, Arnold K, Stanley MB Functional facial (2006) nerve weakness after surgery for benign parotid tumors: A multivariate statistical analysis. *Head and Neck* **15**(2) 147-152.