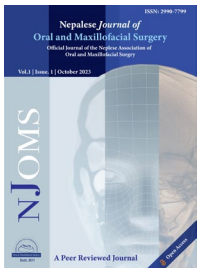
Nepalese Journal of Oral and Maxillofacial Surgery



Ultrasonographic measurement of parotid gland at a tertiary care center of Nepal

Prabhat Basnet[1], Ashutosh Kumar Singh[2], Hari Prasad Uphadhayay[3], Rajib Chaulagain[4]*

[1] *Department of Radiology, College of Medical Sciences, Bharatpur Nepal*
[2] *Department of Oral and Maxillofacial Surgery, Institute of Medicine, Kathmandu, Nepal,*
[3] *Department of Statistics, Birendra Multiple Campus, Chitwan, Nepal,*
[4] *Department of Oral Pathology, Chitwan Medical College, Chitwan, Nepal.*

ARTICLE INFO

Received: 6 Jan 2023
Accepted: 20 Apr 2023

Keywords:
Parotid gland, Salivary gland, Ultrasonography.

Corresponding author:*
Rajib Chaulagain,
Department of Oral Pathology,
Chitwan Medical College,
Chitwan, Nepal.
Email: drrajibchaulagain gmail com

Citation:
Basnet P, Singh AK, Upadhyay HP, Chaulagain R. Ultrasonographic measurement of parotid gland at a tertiary care center of Nepal. Nep. J. Oral Maxillofac. Surg. 2023 Sept 25; 01(01): 8-11

ABSTRACT

Introduction: The various parotid gland pathology can lead to change in size of the parotid gland. Normal parotid gland size determination is very important. Specifications about the normal size of parotid gland among Nepalese population is not available. This study was aimed to assess the normal range of parotid gland dimensions among the patients at a tertiary care centre of Nepal.

Methods: A descriptive cross-sectional study was conducted among 115 patients, in College of medical sciences, Bharatpur, Nepal. A convenience sampling method was used to collect the data. Patients who consented underwent ultrasonography of parotid glands. The data was entered into Microsoft Excel and transported to Statistical Package for the Social Sciences (SPSS) version 16. Then the data was analyzed using descriptive statistics.

Results: There were 115 patients who participated in the study. Among them, 29 (22.6%) were males and 86 (77.4%) were females. All the measurement of the left side of the parotid gland was more with the exception of depth lateral to the mandible in the right side. The depth of lateral to the mandible on the right side was 1.96±0.38 cms. The length of parotid gland of male was 3.79±0.43 cms while that of female was 3.12±0.56 cms. Overall measurement of male parotid gland was more than the female.

Conclusion: The present study concluded that except the depth lateral to the mandible, the measurement of left parotid gland was more than the right side.

Introduction

Among the major salivary gland, parotid gland is the largest, exocrine salivary gland. Anatomically it is situated between the sternocleidomastoid muscle and the mandible. The tip of the gland is positioned at the inferior aspect of zygomatic arch while the base of the gland is located at the angle of mandible. The parotid gland is pure serous gland and releases the saliva which is passed to the oral cavity through the Stensen's duct.[1-3]

Many pathologies involving the parotid gland including neoplasm, inflammation cause hypertrophic or hyperplastic changes in the gland. Due to this the normal dimension of the parotid gland vary. Gupta et al. in their study reported that the ultrasonographic measurement of parotid gland was higher in diabetic patients than the controls.[4] In another study done among patients with nasopharyngeal carcinoma undergoing intensity modulated radiotherapy, shrinkage of the parotid gland was reported.[5] Factors such as smoking, hypertension, alcoholic beverages consumption also cause changes in size and function of salivary gland.[6] Hence the evaluation of the normal size of the parotid gland is essential to differentiate the normal growth of gland or various pathological conditions.

Few studies have been conducted related to dimension of the parotid gland, However, in Nepal we don't have any baseline study of parotid gland. The present study was aimed to assess the ultrasonographic measurement of dimension of parotid gland among the patients at a tertiary care centre of Nepal.

Methods

A descriptive cross-sectional study was designed and conducted in the Department of Radiology and Imaging of College of Medical

Sciences, Bharatpur, Chitwan. The ethical approval for the study was obtained from the Institutional Review Committee of College of Medical Sciences, Bharatpur, Chitwan, Nepal (COMSTH-IRC/2021-49).

The study was carried out for the period of three months from March, 2021 to May 2021, among 115 patients. A convenience sampling method was used to collect the data. Both male and female patients who were referred to the Department of Radiology and Imaging for ultrasonography examination for reasons other than parotid ultrasound scan and who consented to participate in the study were included in the study. Patients with history of parotid gland enlargements, pregnant and lactating women were excluded from the study. Patients with cardiovascular disease, under chemotherapy or radiation therapy of head and neck regions, patients taking drugs such as steroids, immunosuppressive drugs, and drugs affecting salivary glands secretions were also excluded.

The patients were informed about study objectives and the steps to be followed. Then those patients who gave consent to participate in the study were taken for ultrasonography of parotid glands. An Aplio 500 Toshiba Machine, with superficial probe of frequency 7-10MHZ was used for the examination of the parotid gland. The patient was made to lie down and positioned in such a way that the patient's neck was in level with the ultrasonographic screen. During taking the measurement the head was turned slightly to the opposite side to the respective gland being examined. Before taking the image an ultrasonographic gel was applied over the skin of parotid gland and then a transducer was placed over the same area and slowly moved from preauricular region towards the postauricular region. Then the transducer was moved from zygomatic arch and external acoustic meatus (upper border of the gland) till the angle of mandible (lower border of the gland). The measurement of the gland was taken as described by Gupta et al.4 The images were taken for the right side and left side separately and then calculated.

All these measurements were taken by a single ultrasonographer. After the completion of the procedure, tissue paper was used to wipe the ultrasonographic gels applied over the skin.

All the data obtained was entered into Microsoft Excel and transported to Statistical Package for the Social Sciences (SPSS) version 16 (SPSS, Inc., an IBM Company, Chicago, IL). Then the data was analyzed using descriptive statistics and the results was presented in form of tables.

Results

Variables		Frequency (%)
Gender	Female	86 (77.4)
	Male	29 (22.6)
Age group	Above 30 years	68 (59.14)
	Below 30 years	47 (40.86)
Mean Age (years)±SD		30.98±12.03

In total 115 patients with the mean age of 30.98±12.03 years (age range 19- 55 years) participated in the study. Among them 86 (77.4%) were female and rest 29 (22.6%) were males (Table 1).

Table 2 shows the measurement of right and left parotid gland. Except depth lateral to the mandible (DLM) all the measurement of the left side was more than the right side. The length of the parotid gland was 3.56±0.37 cms, transverse dimension was 2.98±0.69 cms on the left side. The depth of lateral to the mandible on the right side was 1.96±0.38 cms.

Table 2: Measurement of the right and left parotid gland

Variables		Mean±SD
Right	Length (cm)	3.50±0.35
	Transverse dimension (cm)	2.64±0.41
	Depth lateral to the mandible (DLM) (cm)	1.96±0.38
	Depth dorsal to the mandible (DDM) (cm)	0.98±0.30
Left	Length (cm)	3.56±0.37
	Transverse dimension (cm)	2.98±0.69
	Depth lateral to the mandible (DLM) (cm)	1.84±0.32
	Depth dorsal to the mandible (DDM) (cm)	1.02±0.52

When the measurement was taken with respect to gender overall measurement of male parotid gland was more than the female (Table 3).

Table 3: Measurement of different dimensions of parotid gland among males and females

Variables		Mean±SD
Males	Length (cm)	3.79±0.43
	Transverse dimension (cm)	2.88±0.50
	Depth lateral to the mandible (DLM) (cm)	1.81±0.79
	Depth dorsal to the mandible (DDM) (cm)	1.21±0.51
Females	Length (cm)	3.12±0.56
	Transverse dimension (cm)	2.56±0.32
	Depth lateral to the mandible (DLM) (cm)	1.49±0.47
	Depth dorsal to the mandible (DDM) (cm)	1.16±0.20

Discussion

It is well known that different pathologies of salivary gland affect its morphology. Clinical examination of the gland, cannot alone help in diagnosing the type of pathology. This has to be evaluated with additional imaging of the gland.[10] There are various modalities for parotid gland imaging such as computed tomography (CT), magnetic resonance imaging (MRI) and ultrasound.[4] CT scan is more useful for parotid mass evaluation and staging in case of parotid malignant tumor. However, CT use ionizing radiation which is its main disadvantage and along with its less soft tissue contrast limits its use in parotid imaging.[11] Another important modality is MRI which also lacks ionization radiation like ultrasound and it has superior soft

tissue contrast, however its limited availability and expensive operative charge limits its use. The parotid glands anatomy and morphology can be easily evaluated using ultrasound. The main advantage of ultrasound is its easy availability in most of the health centers and less expensive. It lacks radiation exposure and various intervention can be carried out using the ultrasound guidance.[3, 4, 10, 12] In this study too, ultrasound was used to assess the dimensions of parotid gland.

Studies have been conducted related to measurement of parotid gland in adults[4,13] and in children.[9,14] Present study also focused on the normal measurement of parotid gland among 115 participants with the age range 19-55 years. In this study the authors assessed the measurement between right and left parotid gland and between genders. Except the depth lateral to the mandible (DLM) which was more on the right side, all the measurements were greater on the left side of the parotid gland. In a similar study performed in India, Gupta et al. reported the dimensions of parotid gland.[4] In their study all the measurements of parotid gland on both right and left side were greater than Nepalese except the DLM which was more in Nepalese population as reported in the present study. The small variation in the morphology of parotid gland may be due to the sample size, geography, diet.

Many studies have also reported differences between the parotid gland sizes and genders. Dost P in their study, reported that all the dimensions of parotid gland were greater in males than in females.[7] Gupta et al also showed differences in the findings between genders. However, the mean transverse dimension in female was more than male in their study.[4] In a study Hassan et al. have demonstrated the female had larger parotid than male.[15] The present study measured the parotid gland using the measurement as described Gupta et al.[4] Similar measurement was also described by Dost P[7] and Dost P and Kaiser S.[8] This study also undertook the measurement between male and female patients. The parotid gland dimension was observed to be more in male than in female patients. However, in the present study the vast difference between the number of male and female participants exists suggesting importance of additional studies taking more or equal sample sizes. Dost P and Kaiser S[8] also included body mass index, body weight which the present study has not included. Other variables such as height, habits such as alcohol, smoking can also add a relevant gap. The study was conducted in single centre so the study results cannot be generalized to other population. Th sample size was also small. Owing to the baseline study related to parotid gland, the authors were more focused to observe morphological variations among taken samples. Hence further multicentric studies taking additional variables are necessary.

Conclusion

In conclusion the result of our study provided the ultrasound dimension of the parotid gland which can be useful information for early diagnosis of the parotid pathology. The present study concluded that except the depth lateral to the mandible, the measurement of left parotid gland was more than the right side.

Conflict of Interest

None

Financial Disclosure

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Reference

1. von Arx T, Lozanoff S, von Arx T, Lozanoff S. Parotid glands. Clinical Oral Anatomy: A Comprehensive Review for Dental Practitioners and Researchers. 2017:29-45. DOI:10.1007/978-3-319-41993-0_4

2. Katz P, Hartl DM, Guerre A. Clinical ultrasound of the salivary glands. Otolaryngologic Clinics of North America. 2009;42(6):973-1000. DOI:10.1016/j.otc.2009.08.009 PMID:19962004

3. Neiman HL, Phillips JF, Jaques DA, Brown TL. Ultrasound of the parotid gland. Journal of Clinical Ultrasound. 1976;4(1):11-3. DOI:10.1002/jcu.1870040106 PMID:175095

4. Gupta A, Ramachandra VK, Khan M, Jha KS, Vedaraju KS, Channaiah NA. A cross-sectional study on ultrasonographic measurements of parotid glands in Type 2 Diabetes Mellitus. Int J Dent. 2021;2021:5583412. DOI: 10.1155/2021/5583412 PMID:33747082 PMCID:PMC7943275

5. Wu VW, Ying MT, Kwong DL, Khong P-L, Wong GK, Tam S-y. A longitudinal study on parotid and submandibular gland changes assessed by magnetic resonance imaging and ultrasonography in post-radiotherapy nasopharyngeal cancer patients. BJR| Open. 2020;2:20200003. DOI: 10.1259/bjro.20200003

6. Fang K-M, Wen M-H, Hsu W-L, Chang C-M, Hou P-Y, Liao L-J. Ultrasonographic and elastographic biometry in adult major salivary glands: a preliminary case-control report. Scientific Reports. 2019;9(1):1-7. DOI:10.1038/s41598-019-45230-y PMID:31222096 PMCID:PMC6586938

7. Dost P. Ultrasonographic biometry in normal salivary glands. Eur Arch Otorhinolaryngol. 1997;254Suppl1:S18-9. DOI:10.1007/BF02439713 PMID:9065617

8. Dost P, Kaiser S. Ultrasonographic biometry in salivary glands. Ultrasound in medicine & biology. 1997;23(9):1299-303. DOI 10.1016/S0301-5629(97)00152-X PMID:9428127

9. Sodhi KS, Bartlett M, Prabhu NK. Role of high resolution ultrasound in parotid lesions in children. Int J Pediatr Otorhinolaryngol. 2011;75(11):1353-8. DOI:10.1016/j.ijporl.2011.07.005 PMID:21816492

10. Onkar PM, Ratnaparkhi C, Mitra K. High-frequency ultrasound in parotid gland disease. Ultrasound quarterly. 2013;29(4):313-21.DOI:10.1097/RUQ.0b013e3182a0abe0 PMID:24263755

11. Ariji Y, Ariji E, Araki K, Nakamura S, Kanda S. Studies on the quantitative computed tomography of normal parotid and submandibular salivary glands. Dentomaxillofacial Radiology. 1994;23(1):29-32.DOI:10.1259/dmfr.23.1.8181656 PMID:8181656

12. Bialek EJ, Jakubowski W, Zajkowski P, Szopinski KT, Osmolski A. US of the major salivary glands: anatomy and spatial relationships, pathologic conditions, and pitfalls. Radiographics. 2006;26(3):745-63. DOI: 10.1148/rg.263055024 PMID:16702452

13. Choi I, Na DG, Paik W. Ultrasonographic echogenicity of normal salivary glands in adults: comparison of submandibular and parotid glands. Ultrasonography. 2021;40(3):342-8.DOI:10.14366/usg.20070 PMID:33115186 PMCID:PMC8217796

14. Cardona I, Saint-Martin C, Daniel SJ. Salivary glands of healthy children versus sialorrhea children, is there an anatomical difference? An ultrasonographic biometry

15. Int J Pediatr Otorhinolaryngol. . 2015;79(5):644-7. [Full Text] [DOI]

16. Hassan M, Gareeballah A, Mohammed A, Elzaki M, Elnour H, Yousif R. Measurement of parotid gland volume in a symptomatic adult Sudanese population using ultrasonography. Scholars Journal of Applied Medical Sciences. 2020;08. DOI:10.36347/sjams.2020.v08i05.005