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P. Dost

# Ultrasonographic biometry in normal salivary glands

**Abstract** Specifications about the sizes of normal salivary glands are not available. We used ultrasonography to determine the sizes of the submandibular and parotid glands in 50 subjects, who were not suffering from diseases of the salivary glands. Volunteers were distributed equally concerning sex and age. Body weight did not differ more than 20% from ideal weight. Dimensions of the submandibular glands were: anterior-posterior length, 35 ± 5.7 mm; paramandibular extension to gland depth, 14.3 ± 5.7 mm; extension in frontal scanning, 33.7 ± 5.4 mm. The parotid glands measured 46.3 ± 7.7 mm in the axis parallel to the mandibular ramus and 37.4 ± 5.6 mm in a transverse axis. The extensions of the parotid parenchyma were 7.4 ± 1.7 mm lateral to the mandible and 22.8 ± 3.6 mm dorsal to the mandible.

**Key words** Salivary gland normal dimensions · Ultrasonography · Submandibular gland · Parotid gland · Biometry

## Introduction

B-scan sonography is well accepted as a diagnostic test for head and neck pathology. Although it is known that some diseases may lead to changes in size of the glands, information about the normal size of the healthy salivary glands is lacking [1, 2, 4, 5, 7, 8, 11]. In some of these diseases a comparison between the two sides does not give adequate diagnostic information. Therefore, the present study was performed to ascertain the size of normal adult salivary glands.

P. Dost
Universitäts-Hals-Nasen-Ohren-Klinik, Hufelandstrasse 55, D-45122 Essen, Germany

## Materials and methods

Fifty adult European volunteers (25 female, 25 male) between 20 and 70 years of age were stratified to five groups according to decade of life. All subjects were free of diseases of the salivary glands. Body weight of each subject did not differ more than 20% from Broca's formula [13].

Dimensions of the submandibular glands were determined by ultrasonography using 7.5 mHz linear array. Paramandibular and frontal scans were performed. Length in anterior-posterior and lateral-medial directions and gland depth were measured and volume estimated by Simpson's formula [10]. Sizes of the parotid gland were determined in tranverse and ramus-parallel directions during dental occlusion. Parotid extensions were also measured both lateral and dorsal to the mandible. All examinations were performed at least 1 h following abstention from food and liquid.

To evaluate validity of the clinical ultrasound measurements, 16 submandibular glands from cadavers (fixed with formalin) were examined. All glands were measured with a ruler in all three dimensions and the volume was ascertained by displacement of water in a calibrated vessel.

## Results

Mean body weight of the subjects was 78 ± 8.5 kg in the males and 65.1 ± 10.2 kg in the females. Body weight did not show great variation concerning age.

### Submandibular glands

The mean value for the anterior-posterior length of the submandibular glands was 35 ± 5.7 mm (females, 32.7 ± 5.6 mm; males, 37.3 ± 4.9 mm), paramandibular extension to the gland's depth was 14.3 ± 5.7 mm (females, 13.3 ± 2.3 mm; males, 15.3 ± 3.1 mm). The length measured by frontal scanning was 33.7 ± 5.4 mm (females, 33.4 ± 6.4 mm; males, 34.0 ± 4.3 mm). The volume estimated by Simpson's formula was 3.5 ± 1.5 ml (females, 3.0 ± 1.4 ml; males, 3.9 ± 1.4 ml). Considering age, the size of the submandibular gland varied within the standard deviation in subjects between the third and seventh decades of life.

Parotid glands

The mean value for the anterior-posterior length of the parotid gland in its transverse direction was 37.4 ± 5.6 mm (females, 35.5 ± 4.9 mm; males, 39.4 ± 5.7 mm). In the ramus-parallel direction this dimension was 46.3 ± 7.7 mm (females, 45.0 ± 6.6 mm; males, 49.7 ± 6.7 mm). The extension from the subcutis to a depth lateral to the mandible was 7.4 ± 1.7 mm (females, 6.9 ± 1.3 mm; males, 8.0 ± 1.9 mm). The extension dorsal to the mandible was measured as 22.8 ± 3.6 mm (females, 22.0 ± 4.0 mm; males, 23.7 ± 3.1 mm). Considering age, the size of the parotid gland also varied within the standard deviation between the third and seventh decades of life.

Cadaver study

The mean value for the anterior-posterior lengths of the submandibular glands was 35.6 ± 4.8 mm. Measurements in the other two dimensions were found to be 31.9 ± 5.6 mm and 17.5 ± 3.4 mm. The volume measured by displacement was 6.9 ± 2.3 ml.

## Discussion

Normal values of salivary gland size can be helpful in the diagnosis of diseases in which the size of the glands changes symmetrically. Although many authors stress that enlargement or involution is seen in some diseases, they do not give information on which basis or data changes in size should be estimated, other than by comparison of sides [2–4, 6–9, 11, 12].

The mean measurement of the submandibular gland was 35 × 14 × 34 mm. These values correspond quite well to the outer size found in the cadaver salivary glands (36 × 18 × 36 mm). On the other hand, volume measurements by Simpson's formula and the use of ultrasonography (3.5 ml) differed markedly from the volume measurement by water displacement in the cadaver study (6.9 ml). This formula is of value in calculating the volume of symmetrically formed organs with an elliptical or spherical cross-section. In contrast to the thyroid gland, the submandibular gland is not formed in this way and therefore is not appropriate for use with this formula. Due to the distinct margins of the parotid gland, volume was not calculated. Most of the organ is located dorsal and lateral to the mandible and can be found by ultrasonography. The superficial extension of the parotid gland is larger in a ramus-parallel section than in its transverse direction. The extension to depth in the transverse section was 7.4 ± 1.7 mm lateral to the mandible and 22.8 ± 3.6 mm dorsal to this bone. These values of lateral and dorsal extensions may have some clincal importance in the diagnosis of bilateral diseases of the parotid glands with symmetrical swellings or involutions present. Study also showed that the sizes of the large salivary glands do not appear to vary markedly in the course of adult life.

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