Maturation of human lingual papillae during second and third trimesters: a fetal histo-morphological study

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Abstract

Introduction: The aim of this study was to describe the histological changes of tongue in a growing fetus. There are very few studies on histogenesis of tongue in human fetuses. Therefore the present study was carried out to describe the histogenesis of human fetal tongue at different gestational ages. Material and Methods: The present cross sectional study was conducted on 20 fetuses (both males and females). The tissue sections including both the anterior two thirds and the posterior one third of the tongue were dissected. The slides were stained with Hematoxylin and Eosin (H & E) for microscopic observation. The images were analysed digitally using ImagePro Premier 9.1 Software. Results: At 20th week, the tongue was lined by stratified squamous non keratinized epithelium and the different types of papillae were distinguishable. No taste buds were observed along the vallate papillae. The glandular and muscular components were well differentiated. At 24 weeks of gestation and the surface of the tongue was lined by non-keratinized stratified squamous epithelium. At 36 weeks the thickness of the epithelium was significantly reduced and the vascularity of lamina propria was increased. Conclusion: As the prenatal development of the human lingual papillae during the first trimester is already known through the literature, the present study highlighted the structural maturation of the papillae during second and third trimesters.

Keywords: papillae, taste buds, keratinized, epithelium, gestational age.
The thickness of the epithelium was measured at six random points and the average was taken. The total number of capillaries in the lamina propria per field per slide was calculated. The values were compared between months using one way ANOVA.

3 Results

3.1 Qualitative observations

The present study was carried out on 20 human fetuses with the gestational age ranging from 20 to 36 weeks. The image depicting the morphological changes during different gestational age groups is shown in Figure 2. Although the filiform, fungiform and the vallate papillae are differentiated by 20th week of gestation, no keratinization was observed on the filiform papillae at that time. The epithelial infoldings were observed projecting into the connective tissue core of the papillae (Figure 3).

At 20th week, the tongue was lined by stratified squamous non keratinized epithelium and the filiform, fungiform and vallate papillae were distinguishable. No taste buds were observed along the sides of the vallate papillae. The vascular and connective tissue components were well differentiated in the substance of the papillae. The glandular and muscular components were also identified. Numerous capillaries were found invading the lamina propria, indicating high vascularity of the tongue.

The surface epithelium of the tongue was made up of two to three layers of cuboidal cells with the flattened cells on the surface at 20th week. An increase in the number of layers was observed in the subsequent weeks up to five to six layers at 28th week.

At term, the tongue was lined by stratified squamous epithelium with keratinization over the filiform papillae. It was also observed that the thickness of surface epithelium appeared to be reduced at 36 weeks.

The appearance of taste buds was not visualized in any of the sections.

3.2 Quantitative observations

The mean thickness of the surface epithelium during different gestational ages is given in Table 1. The increase in the thickness of surface epithelium increased with the gestational age and reached its maximum at 28th week (p<0.001). There by the thickness decreased significantly at 32nd week (p<0.001) and did not show further significant decrease at 36 weeks. Although the number of capillaries showed an increase throughout the gestational period, the significant increase was noted between 33 to 36 weeks (p<0.001).

4 Discussion

Tichy observed the prenatal differentiation of papillae and surface epithelial keratinization in pigs as early as day 76. The taste buds were also seen at that time. Differentiation of the cells in the stratified squamous epithelium was appreciated.
by 81st day of development. The vallate papillae were more conspicuous structures by 94 days. The ducts of glands related to the vallate papillae with cuboidal lining were found regularly with several openings. Differentiation of cells in the taste buds were also observed at this period (TICHY, 1991).

A study carried out by Igbokwe et al on red sokoto goats highlighted the prenatal and prepubertal development of lingual papillae. Epithelial-mesenchymal differentiation was appreciated as early as 50th day of gestation. A few rudiments of lingual papillae were also observed at the apex of the tongue. Differentiation of filiform and fungiform papillae and the connective tissue core were observed by 65th day of development. Vallate papillae appeared by 80th day. Taste buds were observed by 90th day on the fungiform papillae but there was no evidence of keratinization on the filiform papillae. The keratinization and taste buds were well appreciated in the prepubertal period (IGBOKWE and OKOLIE, 2009).

The histogenesis of vallate papillae in rabbits was studied by Elnasharty et al in which the authors described the development of earliest primordia of the vallate papillae at 16th day of development. By 26th day, the surface epithelium was differentiated as stratified squamous and by 28th day, the taste buds made their appearance (ELNASHARTY, EL SHARABY and NOR EL-DIN, 2013). However, the process of their maturation and the changes in the surface epithelium are seldom mentioned. In the present study it was observed that there is no evidence of keratinization of the surface epithelium throughout the prenatal period. The epithelium also undergoes morphological changes with respect to the shape of cells and number of layers. Increased number of capillaries were also observed in the connective tissue core.

The study showed a significant increase in the surface epithelium during 25-28 weeks and showed a decline there after. Surface keratinization of filiform papillae was also not appreciated throughout the gestational period. Significant increase in the number of capillaries in the lamina propria with the gestational age indicated the high vascularity.

Even though the literature mentions about the early appearance of taste buds in the lingual papillae; in the present study, their appearance was not well appreciated. This could be due to the uneven distribution and relatively less number of the taste buds which were not included in the tissue sections.

Gender differences of the morphological changes were not described in the current study due to the lack of availability of equal number of fetuses of both the genders.

### 5 Conclusion

As the prenatal development of the human lingual papillae during the first trimester is already known through the literature, the present study included the second and third trimester fetuses to describe the structural maturation of the papillae. Evident structural changes were noticed which could be an additional source for the existing literature. The normal development of the papillae could also be compared with the disorders which would affect the development of tongue.

### References


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