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ORIGINAL ARTICLE

Does menstrual cycle effect buffer capacity of stimulated saliva?

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Abstract The present study was performed to analyze buffer capacity (BC) and flow rate of stimulated saliva during menstrual cycle. Two salivary samples were taken from 17 subjects during the menstrual cycle. BC was determined according to electrometric method. Both variables showed no hormone dependency. The results suggest that the salivary protection against acid attacks is constant in healthy nonpregnant women.

Keywords Saliva · Menstrual cycle · Buffer effect · Dental caries susceptibility

Introduction

The human mouth is quite frequently exposed to components whose pH differs from the saliva's normal pH. These components may cause damage to the teeth or mucosal surfaces. Buffering function try to bring the pH back to the normal range as fast as possible [1].

Studies [2, 6, 7] have indicated that salivary buffer capacity (BC) decreases toward late pregnancy. On the other hand, it has been shown that BC does not show variation during menstrual cycle [5]. However, in that study, salivary BC was determined with the rough method. Therefore, it is possible that as the fluctuations in hormone levels during menstrual cycle are slight [8], variations in BC during menstrual cycle may also be slight that it could not be detected with the rough method.

The aim of the present study is to analyze the BC of stimulated saliva during menstrual cycle with the sensitive method.

Materials and methods

The study was performed on 17 women aged 22–23 years. Inclusion criteria were as follows: a history of regular menstrual cycles, absence of a smoking habit, no ongoing hormonal treatment or other medicine usage, and no systemic disease.

Before the collection of saliva samples, each woman reported the date of her most recent menses and the length of her cycle (number of days from the onset of menstruation up to, but not including, the day of the onset of the next menstrual period) to calculate the phases. The length of the follicular phase was estimated longer or shorter in subjects with cycles longer or shorter than 28 days, respectively [8].

The first salivary sample (follicular) was obtained within the first 2 days of the menstruation, and the second one (luteal) at the 21st day of the cycle. For calculation of the intraindividual changes of the variables, the third samples were taken from eight women within the first 2 days of the subsequent cycle.

The samples were collected at the same time of the day (between 09:00 and 12:00 A.M.) and in a quiet place by the same dentist. Before the collection, the subjects had not eaten or drunk anything for 1 h. The subjects chewed a standardized piece of paraffin. After 60 s of prestimulation, saliva was collected for 5 min, and the flow rate was calculated as milliliter per minute.

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Immediately after the collection of saliva, BC was determined according to the electrometric method (Orion pH meter; Allometrics, Los Angeles, CA).

Statistical analysis of flow rate and BC values were performed with paired samples test and Wilcoxon signed ranks test, respectively. *P* values lower than 0.05 were regarded as statistically significant.

Results

Statistical analysis of the samples of eight women taken in two successive cycles showed that the intraindividual changes in BC and flow rate between the two collections were slight (Table 1).

There was no statistically significant difference between the phases with respect to flow rate. There was statistically significant difference between the phases with respect to BC values (Table 2). However, the difference in BC was clinically not significant.

Discussion

Although salivary volume and composition are constantly changing, repeated salivary samples collected under strictly standardized conditions seem to be fairly constant in the same individual. This is especially true for paraffin-stimulated flow rate and BC values [2, 6]. In the present study, the interval of 1 month did not affect any of the measured variables.

Specific components of saliva are effective in the maintenance of oral health. Over the years, many attempts have been made to relate the composition of saliva to the incidence of caries. The flow rate and BC seem to be the factors most likely to affect the ability of the bacterially produced acids to attack the mineral elements of the teeth [1].

Although it is widely believed that pregnancy is harmful to the teeth, the effect of pregnancy on the initiation or progression of caries is not clear. However, changes in salivary composition in late pregnancy may temporarily predispose to dental caries [2, 4, 6, 7]. So far, no mechanism to explain the variation of BC during pregnancy has been found [2]. Normally, salivary BC is highly dependent on the salivary flow rate in such a way that the concentration is low in cases of reduced salivary flow [1]. However, during pregnancy there is no concomitant decrease in salivary flow rate [2, 6, 7].

Table 1 Intraindividual changes of the variables

Variable	First collection median (range)	Second collection median (range)	*P*
Flow rate	1.6 (0.33–2.8)	2.1 (0.6–3.3)	0.1
BC	6.98 (5.81–7.61)	7.22 (6.21–7.45)	0.6

Table 2 Flow rate and BC of samples taken in follicular and luteal phase from 17 women

Variable	Follicular phase median (range)	Luteal phase median (range)	*P*
Flow rate	1.2 (0.3–2.8)	1.1 (0.2–2.7)	0.966
BC	6.78 (2.51–7.61)	6.8 (2.69–7.79)	0.015

Laine et al. [5] has demonstrated that paraffin-stimulated salivary flow rate was not influenced by the phase of the menstrual cycle. This is in accord with our result. On the other hand, Kullander and Sonesson [3] showed that the spontaneous and histamine-stimulated secretion from the submandibular gland was somewhat higher during the luteal phase. However, the pilocarpine-stimulated salivary flow rate was found not to vary with the cycle phase.

Salivary BC is measured with the electrometric or colorimetric (Dentobuff®) method. The latter method gives a rough approximation to the true pH, whereas more accurate values can be obtained with the former. No significant difference between the methods has been reported below pH 6.5; however, in higher regions, the colorimetric method underestimates the BC compared with the electrometric method [9]. The study that was performed with the colorimetric method [5] showed that salivary BC does not show variation across the menstrual cycle. In the present study, BC was determined with the electrometric method considering that variations in BC during menstrual cycle may be slight, which can be detected with sensitive methods. However, BC values were found not to vary during the cycle. Constancy of salivary BC during menstrual cycle could be due to limited variation of hormonal concentration that occurs in a brief interval as compared to the state of pregnancy.

Conclusion

The present study has shown that the most important components of salivary protection against acid attacks are stable during menstrual cycle.

References

1. Cole AS, Eastoe JE (1988) The oral environment. In: Cole AS, Eastoe JE (eds) Biochemistry and oral Biology. Wright, London, pp 475–489

2. Kivela J, Laine M, Parkkila S, Rajaniemi H (2003) Salivary carbonic anhydrase VI and its relation to salivary flow rate and buffer capacity in pregnant and non-pregnant women. Arch Oral Biol 48:547–551
3. Kullander S, Sonesson B (1965) Studies on saliva in menstruating, pregnant and post-menopausal women. Acta Endocrinol 48:329–336
4. Laine MA (2002) Effect of pregnancy on periodontal and dental health. Acta Odontol Scand 60:257–264
5. Laine M, Pienihakkinen K, Ojanotko-Harri A, Tenovuo J (1991) Effects of low-dose oral contraceptives on female whole saliva. Arch Oral Biol 36:549–552
6. Laine M, Pienihakkinen K (2000) Salivary buffer effect in relation to late pregnancy and postpartum. Acta Odontol Scand 58:8–10
7. Laine M, Tenovuo J, Lehtonen OP, Ojanotko-Harri A, Vilja P, Tuohimaa P (1988) Pregnancy-related changes in human whole saliva. Arch Oral Biol 33:913–917
8. Oktay, K (1996) Menstrüel döngü (siklus) ve nöroendokrin kontrolü. In: Kişnişçi HA, Gökşin E, Durukan T (eds) Temel Kadın Hastalıkları ve Doğum Bilgisi. Güneş Kitabevi, Ankara, pp 1119–1128 (in Turkish)
9. Wikner S, Nedlich U (1985) A clinical evaluation of the ability of the Dentobuff method to estimate buffer capacity of saliva. Swed Dent J 9:45–47