Journal of Labor and Childbirth

Extended Abstract Open Access

Spinnbarkeit and Cervical Discharge in the Fertile Window: A look at Biotechnology applied to NaProTechnology

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Keywords: Fertile Window, NaProTechnology, Cervical Secretion, Ovulation, Fertility Awareness, CrMS, Subfertility, Biophysical Biomarkers, Biotechnology

Design: Observational Study

OBJECTIVE:

The objective of the study was to contrast the evolution and progression of the viscoelasticity of the cervical secretion in the fertile window of ovulatory menstrual cycles compared with a software tool.

MAIN OUTCOME MEASSURE:

Peak day of cervical discharge "P" established as the estimated day of ovulation (EDO). The clinical window in this article was established as CFW: (mucus-mucus: CrMS/filancia) by retrospective evaluation of the aforementioned scale taking into account the previous 6 days at peak day: P (-6). The calculated fertile window was defined as SFW: (Soft-CrMS/filancia), which was obtained from an applied computer tool, SFW: (Soft-CrMS/filancia) was calculated without contributing EDO to the integration of the computer calculation. The verification and justification of the calculation of the fertile window was based on the analysis of the progression of the elasticity of the cervical secretion. The methodology used consisted of comparing the two fertile windows with EDO. To check the evolution in the characterization of the viscoelasticity parameter of cervical secretion, the last day of maximum fertility was established, with the letter "P" of peak day, according to the rules of recognition of the Peak day of CrMS.

INTERVENTIONS:

12 records obtained by vaginal discharge of the cervical secretion (VDRS) analyzed by means of the key filament of the Creighton Model Fertility (CrMS), and a computer software tool applied to the recognition of viscoelasticity.

MATERIAL AND METHOD:

This article includes 12 records of menstrual cycles in which the Viscoelasticity parameter is extracted from the CrMS scale of (VDRS). The lower level of sticky (6): 05 cm, tacky (8): 1 cm, stretchy (10): 2.5 cm. The progression of the elasticity parameter and its behavior throughout the menstrual cycle were studied. A comparative analysis was performed between the clinical window of the viscoelasticity parameter, and a computer tool programmed to predict the points of change of the fertile window (P.O.C). The interval between the two windows CFW: (mucus-mucus: CrMS/ filancia) and SFW: (Soft-CrMS/filancia) was assessed using a midpoint graph, and interval overlap correlation test. The correlation test was performed to calculate the percentage of coincidence of the intervals, and the points of change (P.O.C) between both windows. The purpose of this test was to assess the evolutionary behavior of cervical secretion, using the biophysical parameter of viscoelasticity.

Criteria for establishing CFW:(mucus-mucus:CrMS/filancia) and SFW: (Soft-CrMS/filancia)

The methodology used to evaluate the viscoelasticity factor was by measuring the approximate length in centimeters (cm) of the vaginal discharge from the cervical discharge (VDRS). To do this, the scale of the filament graph established by observing the filament VDRS of the Creighton Model Fertility Care System (CrMS) was used. The Spinbarkheit assessment of cervical discharge was exported to an Excel graph in cm, taking into account the following measurements: A: Sticky: 0.5 cm (less than 0.65 cm, equivalent to ¼ inch). B: Tacky: 1 cm, equivalent to the lower value of the CrMS classification interval between (1 - 2 cm); (1.27 - 1905 cm), which corresponds to (½ - ¾ inch of the CrMS system). C: Stretchy: 2.5 cm was recorded when the filament was equal to or greater than 1 inch. Higher values are not taken into account.

Maximum transparency was recorded with the letter "k" extracted from the CrMS registry, which was not taken into account to define, neither the fertile clinical CFW window: (mucus-mucus CrMS / filancia), neither EDO, neither was taken into account in the calculation of SFW: (Soft-CrMS / filancia). However, maximum transparency was recorded with the letter "k" extracted from the CrMS registry.

Software implementation phase and statistical study

The software to calculate SFW: (Soft-CrMS/filancia) was made up of two paired design applications. A software was contemplated to collect the measurements taken by the user, which are stored in a database. For them it has required the Microsoft Windows 10 system, and the Microsoft. NET Framework 4.0. The second application focused on the design of the software implementation based on a three-layer architecture. Each layer has been previously analyzed to achieve maximum efficiency. The first layer consists of a data access layer, implemented with the ORM ADO.NET, Entity Framework, to facilitate the readability of the code, which contains all the methods of querying, modifying and inserting data that reside in a database perfectly standardized online. This layer supports a system for quick and easy insertion and modification of data, as well as the elimination of evidence. The second layer contains all the actions that are performed on the logical entities abstracted from the data model. Finally, the presentation layer was used, which allows the

end user to make use of the previous layers in a totally simplified way. The programming paradigm used has been that of object orientation, since it is the one that best fits the domain model presented for solving the problem posed. Currently the trial version is fully implemented in C # and the multiplatform version in Java. The program code is documented to facilitate the incorporation of future implementers. A testing phase has been carried out in order to assess whether the operation of each of the methods of the software system, which behaves as expected as JUnit and NUnit have been used in Java and C # respectively to carry out the appropriate unit tests. The software of different variables was designed by establishing data structures, MySQL. Finally, an exhaustive study was carried out to find out the necessary algorithms, also carrying out a formal verification. A normality test was carried out to describe the study sample with the Shapiro-Wilk test. The correlation study was performed with Excel in conjunction with "R"; environment and programming language focused on statistical analysis of the correlation test. An intuitive graphical interface was developed.

RESULTS: The fertile window was detected in 100% of the cases with both methods. A correlation coefficient of 0.71 was obtained, between the clinical fertile window detected by means of the parameter of viscoelasticity of the cervical secretion, and the prediction of viscoelasticity by means of a software computer tool. Analysis of the interval using SFW (Soft-CrMS / filance) showed a normal distribution with a mean of 5.08 (SD of + - 2.87). In this context, it is evident that as soon as the cervical mucus stretches more, and the elasticity increases, both the days before the peak day and the days after the vescoelasticity parameter it was possible to record it. Within another of the biophysical parameters, the characteristics of the last days of maximum fertility were taken into account through the concept of: Last Max Spinbarkheit (LMS) & Transparency by "K" of CrMS LMS

CONCLUSION: The assessment of viscoelasticity using Spinbarkheit/ streching algoritm allowed in this pilot study to detect the fertile window, and to describe the evolutionary pattern of cervical discharge throughout the fertile window. The determination of the filancia and combination of transparency parameters may in conjunction detect by a clinical method to identify and describe the fertile window.

The assessment of viscoelasticity using Spinbarkheit allowed in this pilot series to detect the fertile window in 100% of the cases, and it was possible to describe the evolutionary pattern of cervical secretion throughout the menstrual cycle. The fertile window interval can be observed with a 75% accuracy rate by viscoelasticity. The prediction in the progression of the elasticity pattern of the cervical secretion allows detecting the typical evolution of the cervical secretion in 70% around the peak day of ovulation. The determination of the filancia is a parameter that in conjunction with a clinical method can help to identify and characterize the fertile window.