

Effects of natural and synthetic vaginal lubricants on sperm motility and DNA Fragmentation Index: a prospective comparative study

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Objective Infertility affects approximately 15% of couples and in about one-third; the primary cause is a male factor. Patients undergoing infertility investigations frequently experience sexual dysfunction, which often is due to inadequate vaginal lubrication. This can lead to increased use of coital lubricants. Sperm motility is one of the best prognostic indicators of fertilization and DNA Fragmentation Index (DFI) is index that showed cellular and intracellular health. In this study, we evaluated the effects of such lubricants on sperm motility and DNA fragmentation index (DFI).

Methods About 20 semen samples from normozoospermic donors were collected. Each sample is divided into five groups. Each tube first incubated in modified human tubal fluid (mHTF) and after treated by 10% KY jelly, Mineral oil (Fertipro®), sesame and olive oils, and normal saline as negative control groups. Total sperm motility and DFI was evaluated 30 min of incubation.

Results Control negative samples exhibited no significant decrease in sperm motility. All of the groups showed significant motility decreases ($P < 0.001$). But the amount of decrease was different in groups that mean differ with 95% confidence interval (CI), Sidak post hoc analysis showed it clear. Fertipro® and Natural oil was not significantly increase the DFI and slight drop down in motility after 30 min. Total sperm motility significantly declined under KY jelly and olive oil, but not significantly drop in sesame oil incubation. All other lubricants had significantly higher DFI than Fertipro and controlled group of sperms.

Conclusion Sesame and olive oil and KY jelly coital lubricants impaired sperm motility but only KY jelly® may hamper fertility. Fertipro® showed no deleterious effect and may be considered sperm-friendly coital lubricants with least DFI increment compared with control group. Natural oils, such as olive and sesame oil like Fertipro® have a little effect on DFI although effect on motility is considerable. We should consider that natural oil was used as a cured product and more study such as pharmaceutical formulation adjusted of these products is needed. So Fertipro® can be used to relieve vaginal dryness and preserve fertility.

Keywords coital lubricants, sperm motility, DFI, fertipro®

Introduction

For people trying to get pregnant, whether or not in about one-third the issue is on the male side. Vaginal lubricants are commonly used for symptomatic relief of dyspareunia and dryness at intercourse in nearly one-third to one-half of all sexually active couples.^{1,2} Approximately, one in six couples are seeking medical help for infertility. On this situation, it is demonstrated that mixing of those coital lubricants with sperms may affect sperm integrity and function and decrease its fertilization potential.^{3,4}

A survey of 900 couples who try to conceive showed that vaginal dryness was two-fold higher in them than in the general population.⁵ Therefore, confusion exists among physicians and lay people regarding the safety and use of vaginal lubricants when couples are trying to conceive. Loss of sperm function has been found in commercial coital lubricants, such as Astroglide, Replens, lubricants, and KY jelly^{4,6,7} and noncommercial lubricants, such as saliva, glycerin, olive oil, and vegetable oil.⁸⁻¹¹

In this study, we evaluated two synthetic products (KY jelly and mineral oil) and two vegetable oils (sesame and olive) for their effect on sperm motility and DNA fragmentation index (DFI) for sperm *in vitro*.

Material and Methods

Samples were collected from healthy subjects that refer to urogenital division of Imam Khomeini hospital and Jahad Daneshgahi infertility clinic. The subject who was the volunteer after filling consent form was entered to the study. All stage of study was under the supervision of ethical committee, Iran ministry of health with registry number: IR.AJUMS.REC.1395.163. This study was approved by the Institutional Review Board of the Jundishapur Medical University, Ahvaz, Iran.

After informed consent declaration, semen samples from 20 healthy normozoospermic donors were collected. Samples were collected by masturbation after 48–72 h of sexual abstinence into a plastic container. After liquefaction at 37°C for 30 min, the semen samples were evaluated according to the World Health Organization (WHO) criteria.¹² Semen samples were washed by centrifugation on a two layer (35% and 90%) discontinuous-density gradient (isolate). The washed sperm pellets were resuspended in 1.5 mL of modified human tubal fluid (mHTF).

The desired concentration of spermatozoa (20×10^6 /mL) was adjusted in mHTF for further division into aliquots. The following prewarmed (37°C) coital lubricants and oils were

adjusted to 10% concentration (v/v) in mHTF aliquots containing washed sperm: KY jelly, mineral oil (Fertipro®), sesame oil, and olive oil. The 10% concentration of each lubricant was chosen on the observation that the same concentrations of lubricants are potentially present after intercourse and ejaculation.¹³ The control motility and DFI measured by adjusting normal saline on the same concentration of containing washed sperm.

The contents of each aliquot were thoroughly mixed and incubated for 30 min at 37°C. The total sperm motility was evaluated for 30 min of incubation in coital lubricants and oils, and after 4 h for DFI. This time was chosen because the ability of sperm to penetrate cervical mucus is rapidly and irreversibly degraded within 35 min, and a majority of the penetrable sperms enter cervical mucus within 15–20 min from ejaculation. All sperm motility evaluations were performed microscopically in duplicate with the use of Makler counting chambers (Sefi Medical Instruments) by a single-trained technician.

Data are expressed as the mean and standard deviation. Because of expected inter- and intra-subject variation in baseline sperm motility and sperm chromatin, samples were analyzed by using repeated-measures analysis of variance (ANOVA). ANOVA test was applied when comparing percent change in motility and sperm DFI for each lubricant as compared with the control. For post hoc analysis, Sidak test was used and comparison was pair of treated group by N/S group as control negative group. Statistical significance was set at less than 0.05. The calculations were performed with the use of Graphpad Prism® version 5.02 for Windows statistical software (Graphpad Inc., Software, San Diego, CA).

Results

Among the synthetic and natural lubricant (Table 1), KY jelly® caused dramatic decreases (13.1 ± 9.1) in sperm motility after 30 min of contact with semen samples. On the

Table 1. Sperm motility and DFI 30 min after incubation with vaginal lubricants

Lubricant	Motility % (mean ± SD)	P-value*	DFI % (mean ± SD)	P-value*
KY jelly® (n = 20)	13.1 ± 9.1	<0.0001	22.7 ± 4.2	0.0001
Mineral oil (Fertipro®) (n = 20)	57.5 ± 8.2	0.003	11.9 ± 3.0	0.9974
Sesame oil (n = 20)	57.0 ± 12.1	0.0018	12.2 ± 3.5	0.9649
Olive oil (n = 20)	50.4 ± 13.4	0.0001	12.2 ± 2.8	0.9649
N/S (Control negative) (n = 20)	69.4 ± 10.4	–	11.6 ± 2.8	–

*P-value calculated from Sidak post hoc analysis with N/S group as negative control group.

other hand, semi-synthetic lubricant, Fertipro® cause a lesser amount of decrease (57.5 ± 8.2) among synthetic and natural lubricant but still decrease in sperm motility. In all of the treat group, sperm motility had significant difference between treat group with N/S group as control negative group by paired sidak analysis (ANOVA post hoc). Figure 1B showed that maximum difference of mean of each group with 95% CI belong to KY jelly® group. Although difference of mean with 95% CI with N/S group with Fertipro®, sesame oil and olive oil were not zero value are huge distance with KY jelly®. Mean difference with 95 CI of Fertipro®, sesame oil and olive oil with control negative group had no significant value with each other.

The DFI had maximum value in KY jelly® group. This study showed that this agent is sperm-cidal agent (Table 1). Figure 1C and 1D showed there were significant difference between N/S group by Fertipro®, sesame oil, and olive oil.

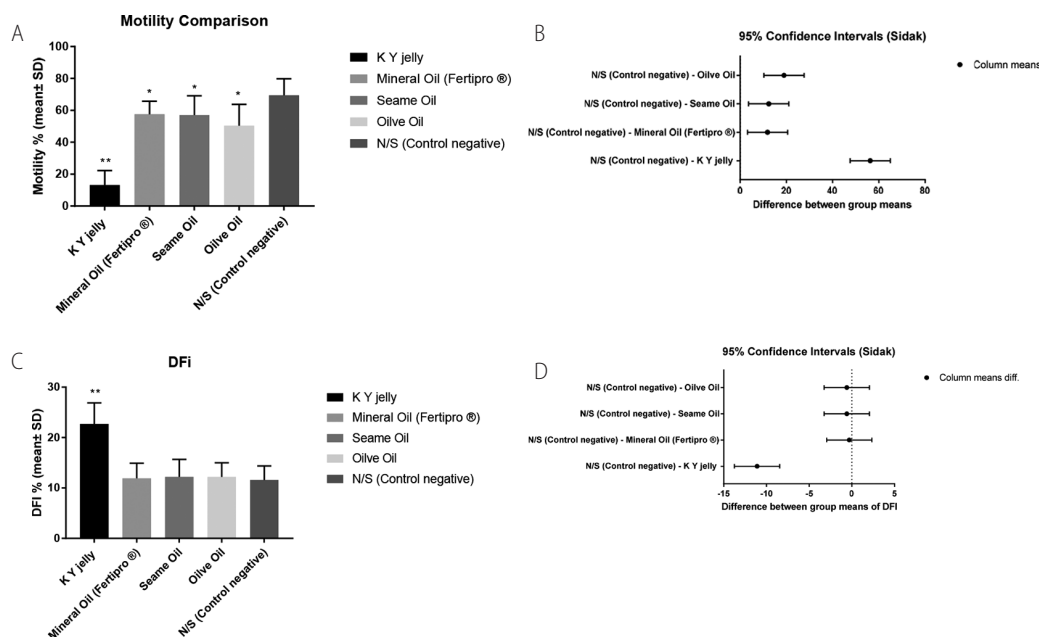


Fig. 1 (A) Motility comparison of treated group with N/S group. * $(P < 0.001)$ and ** $(P < 0.0001)$ show significant difference between groups with N/S group. (B) Show mean difference of each group of motility with N/S group as control negative group. (C) DFI comparison of treated group with N/S group. ** $(P < 0.001)$ shows significant difference between groups with N/S group. (D) Shows mean difference of each group DFI with N/S group as control negative group.

Discussion

Many couples trying to conceive require a coital lubricant when suffering from vaginal dryness or discomfort during intercourse.^{14,15} However, couples and physicians are concerned with their effects on fertility. Use of various available commercial products has been strongly discouraged by the previous investigators, who found a significant reduction in motility and viability of sperm with the use of these products in a number of *in vitro* and *in vivo* studies. In contrast to the previous studies, we studied the effects of vaginal dryness products on sperm DFI, in addition to the sperm motility.

Present findings revealed that commercial lubricants impaired sperm motility. The KY jelly® lubricants were the most detrimental to sperm. The negative effect on sperm motility has been attributed to the presence of toxic chemicals, low pH, and elevated osmolality of synthetic coital lubricants.^{6,11} Tagatz et al. found that no motile or viable spermatozoa after incubating the semen sample with KY Jelly for 30 min of incubation.¹⁶

Although Fertipro® showed significance decrease in sperm motility by N/S group, but this reduction was not significant according to sidak post hoc analysis. This study provided confidence that most likely would not physiologically hamper fertility. So it can be used to relieve vaginal dryness and preserve fertility. O'Connell et al. showed that using Fertipro® for protecting sperms has equal morphology and motility with control sperms.¹⁷ This result also can be described with low DFI for sperms that adjusted with Fertipro® than others, which is almost similar to DFI of the control group. Fertipro® was incorporated into the study owing to lack of information on its effects on sperm motility and DFI.

Among natural product, sesame oil showed a better effect in comparison to other natural oil (olive oil). In contrast, exposure of sperm to olive oil had more and significantly reduction in motility. Therefore, olive oil had no significant

damage to sperm during incubation and decreases its motility. Anderson et al. found that the decreased percentage of progressive motility and velocity with KY Jelly and olive oil³ this finding does not mention that olive oil or another natural agent that we use have the toxic effect. That is clear that olive oil, sesame oil, and Fertipro® had no toxic effect.

Conclusion

The present findings reaffirm the notion that not all coital lubricants and oils are similar and that individual lubricants and oils must be carefully evaluated for their effects on fertility. On the other hand, the coital lubricants and oils that were found to have negative effects on sperm motility should be avoided, but they also should not be considered to be effective contraceptives. However, based on inaccurate information, many physicians are still recommending lubricants or saliva to the infertile couples who are dealing with vaginal dryness. Our results suggest that Fertipro may be a promising treatment with fewer negative effects on sperm motility and DFI for vaginal dryness in infertile couples who are trying to conceive; however, large-scale *in vivo* trials and studies are needed to support our findings.

Conflict of Interest

There is no conflict of interest.

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