INVESTIGATION OF VIRGIN COCONUT OIL (VCO) THERAPEUTIC CONTACT LENS ROLE IN CHANGING TEAR VOLUME AND STABILITY OF DRY EYE SUBJECTS

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Exec Summary

Dry eyes is an extremely common symptom that affects as many as 337 million people globally. Almost everyone has probably had or will have dry eyes at some point in their life. Common treatment to dry eyes is by using lens lubricant or eye drops which gives short relief and comfort. Sufferers would have to endure the discomfort of having to instill drops frequently for which will indirectly affect their work and quality of life. This study will determine the role of VCO therapeutic contact Lens in changing the tear volume and improving tear stability on dry eyes patients by giving a long relief and effective remedy.

The study will be conducted at UKM Optometry Clinic using randomized, double-masked on 50 dry eye subjects in 4 different phases. Measurement of tears before and after (15 minutes) the therapeutic VCO contact lens are worn by the subjects will be recorded. Similar parameter will be measured 15 minutes post wear (Phase 1 & 2). The intra-variability and inter-variability of the parameters will also be measured accordingly after 2 months (Phase 3 & 4).

The outcome of this study is expected to enhance the volume and stability of tears in dry eye subjects. Sufferers of these symptoms will find prolonged relief through this new knowledge of management, thus will improve the quality of life of people who has dry eyes problems.

VCO therapeutic contact lens may provide the solution of prolonged relief for dry eye symptoms. This will provide a new knowledge amongst eyecare practitioners in managing patients with dry eyes due to ocular disease or environmental factors and using a local product will indirectly boost the economic growth of Malaysia.

Problem statement

It is known that VCO drops used as ocular rewetting agent on rabbit eyes has been tested and proven safe and effective in increasing tear volume. It has also been tested on humans with success. However, the use of contact lens as a vehicle to transfer the VCO need to be further investigated. It is significantly important to know the role of VCO therapeutic contact lens in changing the tear volume and stability in dry eye patients. Hence, this study will determine if VCO Therapeutic Contact Lens changes the tear volume and stability in dry eye patients.

Hypothesis

VCO Therapeutic Contact Lens can be significantly used to improve tear volume and tear stability in dry eye subjects.

Objective

The main aim of research is to investigate the changes of tear volume and tear stability from VCO Therapeutic Contact Lens wear.

The following specific objectives are: -

(i) To determine the tear break up time (TBUT) and tear volume (Schirmer's Test) at 0 and 15 minutes after therapeutic VCO contact lens wear.

(ii) To determine the tear break up time (TBUT) and tear volume (Schirmer's Test) at 15 minutes after lens removal.

(iii) To measure the inter-variability and intra-variability of the parameters measured for TBUT, after therapeutic VCO contact lens wear

Research Question

Literature review

Dry eye is an ocular condition which is characterized by reduction in tear volume, tear stability and increase in tear osmolarity as well as water evaporation. Visual disturbances including blurriness, visual discomfort and damage of the ocular surface are the most common dry eye-related sign and symptoms. Previous study had reported that 25 % of patients who visited ophthalmic clinic may report symptoms of dry eye. Thus, making this condition as one of the public health.The current study of dry eye prevalence of in Kuala Lumpur, Malaysia, showed the results of estimation that around 15% of the sample population suffering dry eye (Kaur et.al., 2016). However, the prevalence of dry eye varies between countries and was estimated to be around 7.4% to 33.7% (Buckley, 2018).

To ensure the accuracy of dry eye diagnosis, different tests of tear parameters including tear quantity and quality tests are used to detect the pre-existing condition (Masmali et al. 2016). One of the ways to assess for tear quality is by assessing the stability of the tear film which can be obtained through tear break up time (TBUT) measurement. Tear quantity can be obtained by measuring the tear volume and Schirmer's test is one of the objective measurements that is widely used by the practitioner to measure it (Miyake et. al, 2016). It becomes practically important as stability of the tear film and sufficient composition of each substances such as lipid, mucin, electrolytes, and including aqueous humor, are crucial in order to know the integrity of the tear film layer (Buckley, 2018).

At present, there are few dry eye remedies available in the market. Among all of those remedies, artificial tear and eye lubricants are still the most common initial management and prophylaxis that will be given by medical practitioners to dry eye patient regardless of the type of dry eye. Artificial tear is well known to given temporary relief of dry eye's sign and symptoms. Though, it might not be an effective treatment as they only contain polymers that is able to lubricate ocular surface and lack of numerous important biological factors such as antimicrobial growth and anti-inflammatory factors that present in natural tear and important to maintain ocular surface homeostasis (Mutalib et al. 2015)

Virgin coconut oil (VCO) is known as a local functional food and contain antiviral and anti-microbial agents (Marina & Man 2016). Study has been conducted on efficacy of VCO as ocular rewetting agent on rabbit eyes. It has been shown that VCO did not cause harmful effects when used on rabbit's eyes. The fatty acid and anti-inflammatory agents on VCO may act as protective layer over the tear film layers to reduce evaporation, which is useful for those with dry eyes problem (Mutalib et al. 2015). Similar study was done on human and it was found to increase the tear volume (Macmonnies, 2018)

However, one of the discomforts when using the VCO, it is oily and messy when used directly on eyes and it also causes temporary blurriness. In another successful study, contact lenses were used as a medium or vehicle of transportation of VCO to human eyes (Hussin, 2014). The contact lenses were immersed in a volume of VCO for several hours before placing it on the human eyes. In this study, VCO extracts will be injected out and will be vehicle to the eye by using hydrogel contact lens. This study will investigate the role of VCO Therapeutic Contact Lens in changing the tear volume and tear stability in dry eye subjects.

STATISTICAL ANALYSIS

After the data has been collected, IBM SPSS Statistics Version 25 (Armonk, NY, USA) will be use to analyze the data. The assessment of the efficacy will be based on the all subjects who completed the study. Shapiro-Wilk test will be used to test the normality of the data as the sample size is less than 100. All results are expressed as Mean ± SD. **Parametric test of Repeated Measured Anova** will be used to analyze the statistical difference of before, immediately and after treatment if the data is normally distributed. A probability value (p-value) <0.05 will indicate that the data is statistically significance.

Methodology

The study will be conducted at Optometry clinic UKM KL. Random sampling and double mask method will be used as in this study. A total of 50 subjects who meet the inclusion criteria will be invited to participate in this study once the ethics has been granted. The purpose of the study will be explained to the subjects and consent will be taken if agreeable to participate in the study. Enrollment of subjects and clinical trial will be carried out in staggered period within 5 weeks for each phase.

Inclusion Criteria:

a. Healthy male and female
b. Age: 20 to 40 years old
c. OSDI scores more than 15

Exclusion Criteria:

a. Subjects with ocular surface diseases such as meibomian gland blockage, meibomianitis and blepharitis
b. Subjects currently under topical anti-glaucoma and anti-inflammatory eye drops
c. Subjects with autonomic nephropathy and micro vascular disease e.g diabetic mellitus
d. Pregnant woman and woman who currently active in breastfeeding.

Protocol:

Subjects will be required to fill up the consent form and history taking will be carried out on all subjects. Subjects will be tested using the Ocular Surface Disease Questionnaire (OSDI) (Ngo et al., 2017) before recruitment in order to classify subjects if they have dry eye symptoms (inclusion criteria). Visual acuity testing using log MAR Acuity Chart (Johnston, 2016) as well as anterior segment assessment using slit lamp biomicroscopy will be done prior to the study in order to know the baseline Visual acuity and ocular condition of the subjects' eyes.

Phase 1

First measurement of TBUT (Mcmonnies, 2018) on both eyes will be taken before lens insertion. Then, subjects will be fitted with therapeutic VCO contact lens on one of their eyes and a placebo hydrogel contact lens on the other eye which acts as a control. The contact lenses will be fitted in randomized manner by a mask operator. Subjects will wear the contact lenses for 15 minutes. After the 15th minute, both contact lenses will be removed and second measurements of TBUT will be done. All tear breakup time (TBUT) measurements will be taken three times and the average value will be used as the data. These will be the immediate measurement after therapeutic VCO contact lens wear. Subjects will be given 15 minutes time interval before a re-measurement of TBUT test again. Once all the measurements are taken, subjects will be discharged from the study before being called again in Phase 2. From the data collected, an analysis will assist to understand the mechanism of tear integrity when VCO therapeutic contact lens is used on dry eyes.

Phase 2

First measurement using Schimer's Test (Miyake et al, 2016) on both eyes will be taken before lens insertion. Then, subjects will be fitted with therapeutic VCO contact lens on one of their eyes and a placebo hydrogel contact lens on the other eye which acts as a control. The contact lenses will be fitted in randomized manner by a mask operator. Subjects will wear the contact lenses for 15 minutes. After the 15th minute, both contact lenses will be removed and second measurements of Schimer's Test will be done. All measurements will be taken three times and the average value will be used as the data. These will be the immediate measurement after therapeutic VCO contact lens wear. Subjects will be given 15 minutes time interval before a re-measurement of Schimer's Test again. Once all the measurements are taken, subjects will be discharged from the study before being called again in Phase 3. From the data collected, an analysis will assist to understand the mechanism of tear volume changes when VCO therapeutic contact lens is used on dry eyes.

Phase 3

In Phase 3 a repeat will be done to measure the TBUT (2 months after the first fitting) where lenses will be refitted at random to check on inter-variability. First measurement using TBUT Test on both eyes will be taken before lens insertion. Then, subjects will be fitted with therapeutic VCO contact lens on one of their eyes and a placebo hydrogel contact lens on the other eye which acts as a control. The contact lenses will be fitted in randomized manner by a mask operator. Subjects will wear the contact lenses for 15 minutes. After the 15th minute, both contact lenses will be removed and second measurements of TBUT Test will be done. All measurements will be taken three times and the average value will be used as the data. These will be the immediate measurement after therapeutic VCO contact lens wear. Subjects will be given 15 minutes time interval before a re-measurement of TBUT Test. Once all the measurements are taken, subjects will be discharged from the study before being called again in Phase 4. From the data collected, an analysis will assist to understand the inter-variability between the measurement done in Phase 1 and Phase 3.

Phase 4

In Phase 4 a repeat will be done to measure the TBUT (2 months after Phase 3) where lenses will be refitted at random to check on intra-variability. First measurement using TBUT Test on both eyes will be taken before lens insertion. Then, subjects will be fitted with therapeutic VCO contact lens on one of their eyes and a placebo hydrogel contact lens on the other eye which acts as a control. The contact lenses will be fitted in randomized manner by a mask operator. Subjects will wear the contact lenses for 15 minutes. After the 15th minute, both contact lenses will be removed and second measurements of TBUT Test will be done. All measurements will be taken three times and the average value will be used as the data. These will be the immediate measurement after therapeutic VCO contact lens wear. Subjects will be given 15 minutes time interval before a re-measurement of TBUT Test. Once all the measurements are taken, subjects will be discharged from the study before being called again in Phase 4. From the data collected, an analysis will assist to understand the inter-variability between the measurement done in Phase 1 and Phase 3.

This study is at low risk as the subjects will not have any 'drop-out' issues and is anticipated to be able to go through the clinical trial successfully as the procedure only takes less than half an hour and in case of emergency, a medical officer is being put on standby.

The VCO therapeutic contact lens after used will also be tested for biocompatibility test as per ISO 10993 for Ocular Irritation Test (ISO 10993-10:2010 (E), Acute systemic toxicity test (ISO 10993-10: 2010 (E), Skin Sensitization Test (ISO 10993-10:2010 (E), In Vitro Cytotoxicity : Direct Contact Method (ISO 10993-5:2009 (E) by acrredited laboratory. This will be monitored by a toxicologist (co-researcher) and manufacturing is done by Supervision Optimax Sdn Bhd (industry collaborator).

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INFORMATION SHEET

Research Title:

THE EFFICACY OF THERAPEUTIC VIRGIN COCONUT OIL (VCO) CONTACT LENS ON SUBJECT WITH DRY EYE SYMPTOMS: A PILOT STUDY

Introduction:

You are invited to participate in a research study. Before participating in this study, it is important that you take time to read and understand the information in this Information Sheet.

Purpose of Study:

Dry eye is an ocular condition that characterized by a reduction in tear volume, tear stability and increase in tear osmolarity as well as water evaporation. Visual disturbances including blurred vision, visual discomfort and damage of the ocular surface are the most common dry eye-related sign and symptoms. For diagnosis, different tests of tears parameters including tear quantity and quality test can be used to detect the pre-existing condition. Study using VCO on rabbits eyes showed that it is effective as ocular rewetting agent and it does not cause harm to the rabbits eyes. VCO should be safe for use in human eyes but we do not know yet if it is effective for relief of dry eye. Thus, the aim of current study is to determine the ability of therapeutic VCO contact lens on relieving the subjects with dry eye symptoms.

What will the study involve?

Two different types of contact lenses will be fitted on each eye. Study eye will be fitted with Therapeutic VCO contact lens and control eye will be fitted with normal hydrogel contact lens as placebo. Both of contact lenses have to be wear for 15 minutes. Tear Break Up time (TBUT) and Schirmer's test will be measured. TBUT will be measured by slitlamp biomicoscopy and Schirmer's test I will be measured using fluorescein strips. TBUT measurements and Schirmer's test I will be measured before contact lens wear, immediately after the contact lens being removed, and 15 minutes after the contact lens being removed. After all the measurements have been taken, subjects will be discharged.

Risks and Benefits:

Improvement such as decrement of dry eye symptoms could be one of the possible benefits of participating in this study. Risk of each procedure will be unlikely as procedures that chosen are minimally invasive and there will be no drug or topical drops involved in this study. The discomfort feeling induce from schirmer's strips is tolerable.

Do you have to take part?

Participation in this study is voluntary. If you agree to take part, then you will be asked to sign the "Informed Consent Form". You will be given a copy of the form and this Information Sheet. Should you decide to participate, you can still withdraw from the study without penalty. Your data will not be used and will be discarded. The researcher may also remove you from the study for a variety of reason. In this event, you will not be penalised or lose your rights as a patient.

Data & Confidentiality:

The data from this study will be made into a report which may be published. Access to the data is only by the research team and the REC UKM. The data will be reported in a collective manner with no reference to an individual. Hence your identity will be kept private and confidential.

Payment and compensation:

You do not have to pay nor will you be paid to participate in this study. There will be no any compensation or travel allowance given as the participant of this study. However, during the 15 minutes time interval, light snakes will be provided by the research team.

Who can I ask about the study?

If you have any questions, you can direct them to the research team.

Research Team

INFORMED CONSENT FORM

Research Title: The Efficacy of Therapeutic VCO Contact Lens on Subjects With Dry Eye Symtoms: A Pilot Study.

Researcher's Name: Andi Marwa Armeelah Maurice Amelia Putri

I, ……IC No : …….....

- have read the information in the Patient Information Sheet **including information regarding the risk in this study**
- have been given time to think about it and all of my questions have been answered to my satisfaction.
- understand that I may freely choose to withdraw from this study at anytime without reason and without repercussion
- understand that my anonymity will be ensured in the write-up.

I voluntarily agree to be part of this research study, to follow the study procedures, and to provide necessary information to the doctor, nurses, or other staff members, as requested.

……. ……..

(Signature) (Date)

…….	Researcher
Witness (if any)	
	…….
…….	(Signature)
(Signature)	…….
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Saksi (jika ada)	Penyelidik
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