ORIGINAL RESEARCH—FSD PHARMACOTHERAPY

Effects of Korean Red Ginseng on Sexual Arousal in Menopausal Women: Placebo-Controlled, Double-Blind Crossover Clinical Study

Kyung-Jin Oh, MD, PhD,* Myeong-Jeong Chae, MS,† Hyun-Suk Lee, MS,* Hee-Do Hong, PhD,‡ and Kwangsung Park, MD, PhD*

*Department of Urology, Chonnam National University Medical School, Sexual Medicine Research Center, Chonnam National University, Gwangju, Korea; †Christian College of Nursing, Gwangju, Korea; ‡Korea Food Research Institute, Seongnam, Korea

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ABSTRACT

Introduction. Many menopausal women experience climacteric symptoms including impairment of sexual function. Recent reports have suggested that Korean red ginseng (KRG) has a relaxing effect on the clitoral cavernosal muscle and vaginal smooth muscle in rats.

Aim. We assessed whether KRG extracts would improve sexual function in menopausal women.

Methods. Thirty-two menopausal women participated in a placebo-controlled, double-blind, crossover clinical study with administration of either three capsules of ginseng (1 g per capsule) or placebo daily. After completing the KRG or placebo arm, the participants were crossed over to the other arm after a 2-week washout period. The efficacy and safety of the KRG extracts were measured by using questionnaires.

Main Outcome Measures. Female Sexual Function Index (FSFI) and Global Assessment Questionnaire (GAQ).

Results. Twenty-eight women completed the study. They were, on average, 51.2 ± 4.1 years old, and their mean menopausal state was for a duration of 37.4 ± 2.9 months. Few carryover effects were noted in either study arm. The ginseng extract significantly improved scores on the FSFI from 3.10 ± 0.87 to 3.50 ± 0.72 in the sexual arousal domain ($P = 0.006$). The GAQ was more significantly affected by ginseng extracts than by placebo ($P = 0.046$). There were no severe adverse events in the KRG group, although two cases of vaginal bleeding occurred during KRG treatment.

Conclusions. Oral administration of KRG extracts improved sexual arousal in menopausal women. Red ginseng extracts might be used as an alternative medicine in menopausal women to improve their sexual life. **Oh KJ, Chae MJ, Lee HS, Hong HD, and Park K. Effects of Korean red ginseng on sexual arousal in menopausal women: Placebo-controlled, double-blind crossover clinical study. J Sex Med 2010;7:1469–1477.**

Key Words. Ginseng; Menopause; Sexual Dysfunction; Sexual Arousal

Introduction

Korean red ginseng (KRG), the root of *Panax ginseng* C.A. Meyer, has been used as a traditional herbal medicine in Asian countries for several thousand years. KRG is taken orally as a health-promoting supplement. In the literature, KRG has been shown to have positive effects on various diseases such as anemia, chronic fatigue, diabetes mellitus, HIV-1 infection, decreased libido, and erectile dysfunction [1–4].

Female sexual dysfunction is a multifactorial, complex disease entity, and a well-established treatment modality has not yet been developed. Some animal studies have indicated a beneficial effect of KRG on erectile function. Choi et al. [5] showed that KRG has a dose-dependent relaxing effect on the rabbit corpus cavernosal tissue. A

clinical study showed that KRG can be an effective alternative for treating male erectile dysfunction [3]. In accordance with these studies, we previously reported that KRG extracts have a relaxing effect on rabbit vaginal smooth muscle and clitoral corpus cavernosal smooth muscle [6,7]. In an in vivo animal study, we found that KRG extracts may have an estrogenic effect on castrated female rats [8].

Women in menopause and perimenopause tend to experience declining sexual health because of a complex interplay of specific individual features including endocrine changes [9]. A population-based study found an age-related decline in sexual functioning but an added incremental decline associated with the menopausal transition. By the postmenopausal phase there was a significant decline in sexual arousal and interest, frequency of sexual activities, and total scores on the McCoy Female Sexuality Questionnaire [10]. We hypothesized that KRG may ameliorate menopausal symptoms and therefore enhance the sexual health of menopausal women. The aim of this study was to assess whether KRG extracts could improve sexual function in menopausal women.

Materials and Methods

A total of 32 menopausal women from a community-based population were recruited for the study from April 2005 to January 2006. To be eligible, the subjects had to be menopausal women aged 40–60 years who had not menstruated for at least 1 year and who had undergone menopause naturally and had no history of surgical or chemical menopause. Participants were required to have a steady sexual partner and more than one sexual intercourse interaction each month. For inclusion, the women had to have a follicular stimulating hormone (FSH) concentration (measured at the initial evaluation) greater than 40 mIU/mL.

Exclusion criteria were as follows: (i) significant medical conditions of cerebrovascular accident, myocardial infarction, or coronary artery disease or history in the past 6 months; (ii) present cardiomyopathy, angina pectoris, or fatal arrhythmia or history in the past 6 months; (iii) uncontrolled diabetes mellitus (fasting plasma glucose level >250 mg/dL or HbA1c >10%); (iv) a history of spinal cord injury or radical hysterectomy; (v) blood pressure lower than 90/50 mm Hg or greater than 170/100 mm Hg; (vi) anatomical deformity of the external genitalia (especially after cancer surgery); (vii) significant liver disease (liver enzymes more than three times the normal range); (viii) renal impairment (serum creatinine >2.5 mg/dL); (ix) a history of central nervous system dysfunction; (x) concurrent hormonal treatment for sexual dysfunction during the past 4 weeks; (xi) sexual dysfunction of psychogenic origins; and (xii) a history of chemotherapy or pelvic radiation treatment.

The study was carried out in accordance with the Declaration of Helsinki and was approved by the Institutional Review Board of Chonnam National University Hospital. Written informed consent was obtained from all subjects after they were provided a detailed description of the experimental procedures and assurance that they could withdraw from the study at any time.

Study Design

The study was a randomized, double-blind, placebo-controlled crossover study lasting 20 weeks. There was a 2-week period for collecting baseline data and two 8-week randomly allocated treatment arms with a 2-week washout period in between (Figure 1). All patients underwent an initial visit (visit 1) during which a medical interview and a physical examination were performed and baseline vital signs were assessed. Hormonal status, such as total testosterone, free testosterone, FSH, and estradiol, was measured at the initial screening visit. The subjects were then divided into two groups: a group taking three capsules of KRG (1 g per capsule) daily or a group taking placebo capsules. After 8 weeks of treatment, the subjects underwent the 2-week washout period and were then switched to the other treatment (crossover). The method of random permuted blocks was used to randomly allocate women to either the KRG first or placebo first treatment group. All participants, investigators, pharmacists, and study personnel were blinded to treatment allocation. Baseline parameters were measured twice at the beginning of each treatment arm (visits 2 and 5). The subjects visited the clinic once every 4 weeks during each 8-week treatment arm so that we could assess their present condition and any adverse events (visit 3, visit 4, visit 6, and visit 7). Hormonal levels were measured repeatedly after the end of each treatment arm (visit 1, visit 4, and visit 7). All patients served as their own controls. Clinical information and trial data were collected during individual interviews conducted by a well-trained female interviewer. A structured participants' interview and direct questions about adverse events were performed by the same female interviewer.

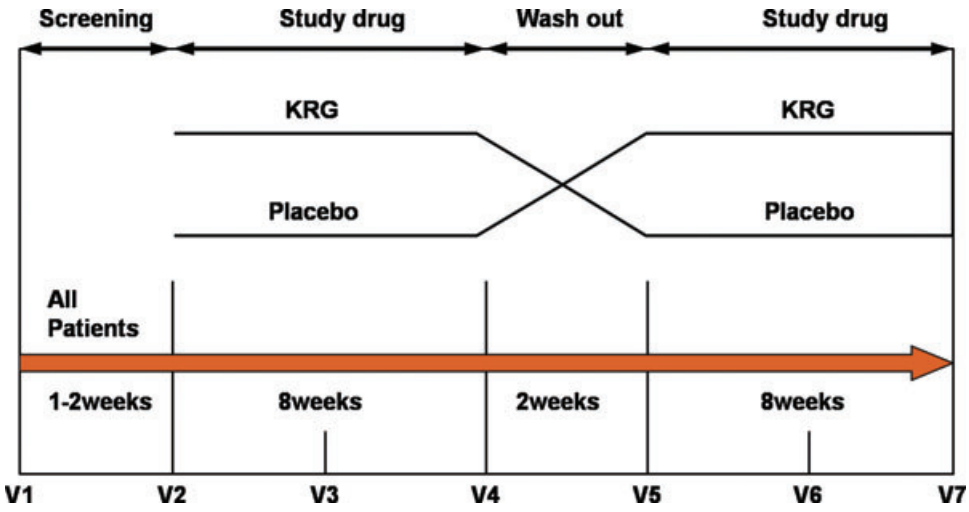

Figure 1 Design of the study.
KRG = Korean red ginseng; V = visit.

KRG and Placebo Capsules

The KRG capsules and placebo were produced by KT & G (Korean Tobacco and Ginseng, Seoul, South Korea). Each KRG capsule contains 1 g of dried ginseng powder. During the trials, three capsules of KRG (1 g per capsule) were given daily for 8 weeks. A placebo was made in capsule form containing starch to mimic the KRG capsule, and the capsules were identical in appearance with similar taste and flavor.

Measurements

The Female Sexual Function Index (FSFI) and the Global Assessment Questionnaire (GAQ) were used to evaluate the effectiveness of treatment on female sexual function. The FSFI consisted of six domains (desire, arousal, lubrication, orgasm, global satisfaction, and pain) assigned with 19 items. Full-scale and individual domain scores were derived from the computational formula described by Rosen et al. [11]. The GAQ consisted of a simple, single question asking whether sexual function had improved after each clinical trial arm. The FSFI was taken at the beginning and at the end of each treatment arm (visit 2, visit 4, visit 5, and visit 7). The GAQ was measured at the end of each treatment arm (visit 4 and visit 7). Primary efficacy was evaluated by three arousal items in the FSFI (item 3, item 4, and item 6) and by the GAQ. Secondary efficacy was measured by the total score and by each of the six domain scores of the FSFI.

Analysis

We compared all variables at the end of the 8 weeks of each treatment arm (visit 4 and visit 7) between the ginseng and placebo groups. Data are presented as the mean ± SD. Repeated measures with a chi-square test, *Z*-test, and *t*-test (crossover analysis) were performed to compare multiple variables. Repeated-measures analysis was also used to test the carryover effect and period effect associated with the crossover study. *P*-values less than 0.05 were considered to indicate statistical significance. Statistical analysis was performed with the National Center for Charitable Statistics software package, version 2005 (Urban Institute, Washington, DC, USA), and Statistical Package for Social Science PC$^+$, version 12.0 (SPSS Inc, Chicago, IL, USA).

Results

Of the total 32 subjects, 4 dropped out during the study because of a lack of subjective improvement. Twenty-eight subjects (15 in the KRG-placebo group and 13 in the placebo-KRG group) completed the study program. The patients' mean age was 51.2 ± 4.1 years, and their mean duration of menopause was 37.4 ± 25.3 months. Seven volunteers (25%) had a history of previous hormonal treatment for menopausal symptoms. Some had combined medical diseases such as hypertension (five volunteers) and diabetes mellitus (two volunteers). There was also one volunteer with pulmonary asthma, one with hypothyroidism, and one with a thyroid tumor. After completion of the trial, four subjects (one from the KRG first group and three from the placebo first group) were excluded from the analysis because of an absence of intercourse attempts during the trial. Thus, after the

Table 1 Changes on 3 arousal domain items of the FSFI during treatment with KRG and placebo

FSFI item	Treatment group (n = 24)	Baseline	After 8 weeks	Period effect *P*	Carryover effect *P*	Treatment effect *P*
Arousal: frequency	KRG	0.74 ± 0.32	0.90 ± 0.34	0.246	0.530	0.016
	Placebo	0.84 ± 0.38	0.78 ± 0.35			
Arousal: level	KRG	0.76 ± 0.23	0.89 ± 0.17	0.297	0.745	0.017
	Placebo	0.83 ± 0.20	0.79 ± 0.25			
Arousal: satisfaction	KRG	0.83 ± 0.24	0.89 ± 0.23	0.339	0.966	0.033
	Placebo	0.90 ± 0.31	0.79 ± 0.26			

Data are presented as mean ± SD.
FSFI = Female Sexual Function Index; KRG = Korean red ginseng.

18-week trial, data from a total of 24 participants (14 subjects in the KRG-placebo treatment group and 10 subjects in the placebo-KRG treatment group) were compared and analyzed.

Primary Efficacy Outcomes

Three items in the arousal domain of the FSFI (frequency, level, and satisfaction of arousal) and the GAQ were analyzed in the primary efficacy evaluation. Mean scores of arousal frequency (item 3), level (item 4), and satisfaction (item 6) were significantly higher with KRG treatment than with placebo treatment ($P < 0.05$, Table 1). There was no period effect or carryover effect between the two groups.

The GAQ was measured at the end of each treatment arm. In the KRG-placebo treatment group, 9 of 14 participants scored the ginseng treatment as "effective," and among these participants, 6 also scored the placebo treatment as "effective" (Table 2). In the placebo-KRG group, 4 of 10 participants scored the placebo treatment as "effective," and among these participants, 3 also scored the ginseng treatment as "effective." Thus, KRG showed a better treatment effect than did placebo ($P = 0.046$, Table 2). No carryover effect was observed.

Secondary Efficacy Outcomes

The changes in the total score and in each of the six domain scores of the FSFI after treatment with KRG and placebo and the treatment effect of both groups are shown in Table 3. Although total FSFI scores increased slightly from 21.10 ± 4.40 to 22.95 ± 4.74 after KRG treatment, this change was not significant compared with placebo ($P = 0.146$). As shown in Table 3, there was no significant difference in the six domains of the FSFI between the two groups except for the sexual arousal domain. Reciprocal to the reduction in the arousal domain score in the placebo group, there was a significant rise in the arousal domain score in the KRG group from 3.10 ± 0.87 to 3.50 ± 0.72 ($P = 0.006$). There were no period or carryover effects between the two groups.

Changes in sexual hormones from baseline to the end of treatment are shown in Table 4. Mean FSH decreased from 73.18 ± 24.28 to 68.13 ± 26.64 and estradiol increased from 15.58 ± 4.69 to 22.33 ± 36.29 in the KRG group. After 8 weeks of each treatment, there were no significant differences in FSH, estradiol, or total and free testosterone levels in either group.

The incidence of adverse events in the trial was low. Twelve events were reported during the clinical trial. These consisted of five common colds, two headaches, two allergic reactions, one case of transient hypertension, and two cases of vaginal bleeding. Of the 12 events, only the 2 events of vaginal bleeding were assumed to be possibly related to the trial. All symptoms resolved by the end of the trial. The two cases of vaginal bleeding presented once during the KRG treatment period and disappeared at the next placebo treatment arm.

Table 2 GAQ results for the group receiving KRG first and the group receiving placebo first

KRG first group (*n* = 14)				Placebo first group (n = 10)					
		Placebo arm				Ginseng arm		Carryover effect	Treatment effect
	GAQ	Yes	No		GAQ	Yes	No	$X^2(p)$	$Z(p)$
Ginseng arm	Yes	6	3	Placebo arm	Yes	3	1	0.933	0.046
	No	1	4		No	3	3		

GAQ = Global Assessment Questionnaire; KRG = Korean red ginseng.

Table 3 Total score and scores on the 6 domains of the FSFI in the KRG and placebo groups

		KRG group (n = 24) mean ± SD	Placebo group (n = 24) mean ± SD	Period effect *P*	Carryover effect *P*	Treatment effect *P*
Total score	Baseline	21.10 ± 4.40	21.56 ± 5.35	0.688	0.592	0.146
	8 weeks	22.95 ± 4.74	21.68 ± 5.16			
Desire	Baseline	3.00 ± 0.50	3.03 ± 1.05	0.766	0.145	0.092
	8 weeks	3.38 ± 0.81	2.90 ± 1.01			
Arousal	Baseline	3.10 ± 0.87	3.39 ± 0.91	0.228	0.756	0.006
	8 weeks	3.50 ± 0.72	3.10 ± 1.00			
Lubrication	Baseline	3.70 ± 0.79	3.95 ± 1.05	0.411	0.918	0.245
	8 weeks	4.06 ± 1.10	3.96 ± 0.97			
Orgasm	Baseline	3.57 ± 1.05	3.52 ± 1.25	0.795	0.780	0.801
	8 weeks	3.85 ± 1.26	3.75 ± 1.18			
Satisfaction	Baseline	3.68 ± 1.08	3.65 ± 0.88	0.793	0.709	0.438
	8 weeks	4.00 ± 0.80	3.78 ± 1.04			
Pain	Baseline	4.05 ± 1.43	4.03 ± 1.35	0.884	0.598	0.934
	8 weeks	4.17 ± 1.40	4.18 ± 1.32			

FSFI = Female Sexual Function Index; KRG = Korean red ginseng.

Discussion

Female sexual dysfunction is a complicated and multifactorial condition combining pathophysiologic, psychological, and interpersonal relationships. Sexual function problems in menopausal women are diverse, common, and complex. Sexual dysfunction is more often irremediable and progressive in menopausal women than in younger premenopausal women. Throughout history, there has been an effort to find effective treatment modalities for female sexual dysfunction. But none have passed scientific scrutiny. Moreover, knowledge of the normal female sexual response and all of its complexities remains incomplete [12].

Several medications have been tried and used for female sexual dysfunction. The medical therapies are estrogen, transdermal testosterone, oral methyl testosterone, dehydroepiandrosterone, antidepressants, yohimbine, apormorphine, and PDE5 inhibitors [13–19]. Because of the excellent results of PDE5 inhibitors on male sexual dysfunction, PDE5 inhibitors were considered as a new modality to treat female sexual dysfunction. Little scientific evidence is available, however, showing that PDE5 inhibitors are effective in managing female sexual dysfunction [20,21]. None of these medications have been approved for use in female sexual dysfunction.

It is still controversial whether pharmaceuticals or complementary medicine can recover sexual function in an aging population. One of the attractive alternative medicines for sexual dysfunction is ginseng. Ginseng, especially KRG, has a history of use in Asian countries for health promotion, including improvement of sexual function, and has the merits of being easily used with rare toxicity or adverse effects. Some studies have indicated that KRG is an effective alternative for treating male sexual dysfunction. In animal experiments, administration of KRG had a relaxation effect by modulating the intricate relation between nitric oxide and cavernosal smooth muscle. Those studies showed that nitric oxide is released from the vas-

Table 4 Hormone changes after 8 weeks of treatment in the KRG and placebo groups

		KRG group (n = 24) mean ± SD	Placebo group (n = 24) mean ± SD	Period effect *p*	Carryover effect *p*	Treatment effect *p*
FSH (mIU/mL)	Baseline	73.18 ± 24.58	72.14 ± 23.58	0.902	0.984	0.813
	8 weeks	68.13 ± 26.64	68.66 ± 20.99			
Total Testosterone (ng/mL)	Baseline	0.21 ± 0.20	0.18 ± 0.17	0.215	0.464	0.464
	8 weeks	0.17 ± 0.09	0.16 ± 0.09			
Free Testosterone (pg/mL)	Baseline	0.27 ± 0.31	0.14 ± 0.15	0.231	0.710	0.161
	8 weeks	0.15 ± 0.17	0.22 ± 0.25			
Estradiol (pg/mL)	Baseline	15.58 ± 4.69	20.29 ± 26.54	0.553	0.269	0.918
	8 weeks	22.33 ± 36.29	15.63 ± 10.73			

KRG = Korean red ginseng; FSH = follicular stimulating hormone.

cular endothelium, leading to relaxation of the cavernosal smooth muscle through calcium and potassium metabolism [5,22]. A double-blind crossover clinical trial showed that KRG is truly beneficial for erectile dysfunction according to the parameters of the International Index of Erectile Function and RigiScan [3].

Our present report is the first clinical study evaluating the effects of KRG on sexual function in menopausal women. Our findings show that KRG can improve overall sexual arousal function with few adverse effects. We previously reported that KRG extracts have a relaxing effect on the clitoral corpus cavernosal smooth muscle in rabbits mediated by the NO-cGMP pathway and in vaginal smooth muscle by the NO-cGMP pathway and the hyperpolarizing action of Ca^2-activated K^+ channels [6,7]. We showed that KRG has a dose-dependent effect and that the 95% relaxation rate in clitoral corpus cavernosal muscle is similar to the 96% rate in rabbit corpus cavernosal tissue with the same dose [5]. This relaxation effect was significantly reduced by an inhibitor of nitric oxide synthesis, N^w-nitro-L-arginine. Animal studies have shown that ginseng has both stimulatory and inhibitory effects on the central nervous system. Ginseng plays a role in rat brain synaptosomes, inhibiting the uptake of *r*-aminobutyric acid, glutamate, dopamine, noradrenalin, and serotonin in a concentration-dependent fashion [23]. This result agrees with those of other clinical studies indicating favorable effects on psychomotor performance in healthy volunteers receiving ginseng [24]. The central effect of ginseng through these multiple mechanisms is postulated as one of the possible explanations for improvements in sexual arousal.

The treatment of choice for menopausal symptoms has been hormone therapy (HT). Estrogen has been considered a panacea of sorts, not only to treat hot flushes, vaginal dryness, and bone loss but also to improve libido, mood, memory, and sleep [25]. In clinical trials, HT has demonstrated significant improvements in female sexual function [26]. These results differ from those of other studies that show HT increases vaginal lubrication and decreases atrophic conditions but does not consistently increase sexual desire or sexual activities [27]. Recent studies have raised substantial concerns regarding the long-term safety of HT, however, particularly in relation to cardiovascular events and breast cancer [28,29]. The possibility of estrogenic activity in KRG is relevant to these concerns. Estrogen bioassay shows no signs of estrogenic activity in ginseng [30]. Some reports suggest that the ginsenoside Rg1 exerts estrogen-like actions via ligand-independent activation of estrogen receptor pathways without receptor binding [31]. KRG can thus be recommended to patients seeking an alternative to HT for relief of specific menopausal symptoms.

In the present clinical study, two menopausal women experienced vaginal bleeding during the KRG treatment arm. They mentioned that the duration and amount of bleeding was similar to their natural menstruation before menopause. One of the two participants showed an increase in estradiol levels from less than 10 pg/mL to 27 pg/mL. However, the average estradiol level of all participants in this study was not influenced by KRG treatment. Vaginal bleeding after ginseng ingestion has been reported in the literature [32,33]. The estrogen-like effect of ginseng is postulated as one of the causes, but this is uncertain. The exact mechanism of KRG has not yet been completely elucidated.

In our study, the baseline score of the FSFI was 21.33, which was slightly lower than in other reports. Aslan et al. [34] reported total FSFI scores were 24.2 in adult women (mean age 38.6 years) and Nappi et al. [35] reported a total score of 25 (age range 45–65 years). The study populations of these reports were middle-aged women regardless of menopausal state. In a limited study of menopausal subjects, the mean score on the FSFI was similar to our data at 20.4 (age range 45–55 years) [36]. Although our participants were recruited from a community population through advertisements, the sample was not randomly selected. Menopausal women who had concerns about sexual function were more likely to participate in our clinical trial. The potential for selection bias could exist. Our study population featured two patients with thyroid disorder and two patients with diabetes mellitus. Although we excluded patients with severe uncontrolled diabetes mellitus, thyroid function and diabetes could affect female sexual function [37,38].

The present trial was designed as a crossover study. Among the 32 participants, 14 KRG-placebo subjects and 10 placebo-KRG subjects were included in the final analysis. All together, 24 subjects made up the KRG and the placebo treatment groups because of the crossover nature of the study. Although there was an uneven number of subjects in the two treatment order groups, this should not have affected our results because there was no carryover effect between the KRG and the placebo treatments.

Female sexual arousal disorder is difficult to describe accurately, and it has rarely been diagnosed independently of desire or orgasm disorder. Female sexual arousal disorder is subdivided into three specific categories: subjective, genital, and combined [39]. In our study, we did not make a sharp distinction between subjective and genital arousal disorder. We measured changes in sexual function after the subjects took the KRG extracts. We plan to further investigate the role of KRG in patients with various types of sexual dysfunction.

When dealing with sexual function, the evaluation of a partner's sexual status is an important issue. A study using a shortened version of the personal experiences questionnaire based on the McCoy female sexuality questionnaire showed that the partner's problems factor increases in the late perimenopausal state [40]. But in our study, we used the FSFI and lacked information on partners' sexual problems. We recruited menopausal women having a steady sexual partner and more than one sexual intercourse attempt each month, but we could not get enough information on the sexual function of the women's sexual partners.

We showed significant improvement on the arousal domain from a score of 3.1 to a score of 3.5; for the individual items of the arousal domain, frequency, level, and satisfaction of arousal showed statistically significant improvement. Although KRG was considered effective according to the GAQ item, it resulted in no significant changes on the sexual satisfaction domain of the FSFI. The sole improvement in the arousal portion was presumably not sufficiently great to have an impact on satisfaction. We do believe that this result was not merely a random association. In the castration rat model, KRG treatment increases the expression of estrogen receptor and also results in improvements in the vaginal epithelial layer and submucosal microvasculature [8]. This implies that KRG extracts may have an ameliorating effect on sexual function in menopausal women, especially on arousal and lubrication. Therefore, we focused on arousal sexual function in this study.

The optimal dose of KRG has not yet been scientifically validated. However, 3 g of KRG root powder per day were used in accordance with the adopted doses of KRG ranging from 1.8 to 3 g per day in studies of male sexual dysfunction [41]. There has been no comparative study regarding dose and concentration of KRG between animals and humans. There are also few pharmacokinetic studies about ginseng or ginsenoside in humans [42]. The optimal plasma concentrations achieved by oral ingestion of ginseng required to relax cavernosal and vaginal smooth muscle are still unclear. The lack of supportive pharmacokinetic data assuming optimal dose is one the limitations of this study. Adverse reaction was mainly associated with excessive dose of ginseng ingestion. In toxicity report, ginseng compounds to pregnant women may have a potential developmental toxicity [43]. Further research including the mechanisms of action, detailed pharmacokinetics, and toxicity of ginseng in animal models and human trials are mandatory.

Our study showed that KRG may be efficacious and safe for the improvement of the sexual function of menopausal women. Future studies will be required to ascertain the ideal dosage and treatment duration. We hope that the use of an optimal dose and longer duration will show generalized improvements in sexual function including satisfaction. Large-scale, multi-institutional studies are required to define the use of KRG in a clinical setting.

We have shown that KRG can enhance general sexual function, particularly sexual arousal, in menopausal women. To date, there is no miracle therapy to improve all aspects of female sexual dysfunction. Further studies will be needed to ascertain the efficacy and safety of KRG, focusing on symptomatic sexual dysfunction patients, such as those with sexual desire disorder or sexual arousal disorder. Moreover, efforts must be made to elucidate the exact mechanism by which KRG affects female sexual function.

Conclusions

We showed that an 8-week intake of KRG is associated with improvement of female sexual function, particularly arousal, without severe adverse events. KRG is thus an attractive option for maintaining and improving sexual function in menopausal women. Further research is needed to establish the optimal treatment duration and dose of KRG suitable for a specific category of female sexual dysfunction and as an alternative medicine in menopausal women.

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Corresponding Author: Kwangsung Park, MD, PhD, Department of Urology, Chonnam National University

Medical School, 8, Hakdong, Dongku, Gwangju, 501-757, Republic of Korea. Tel: 82 62 220 6701; Fax: 82 62 227 1643; E-mail: uropark@gmail.com

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Statement of Authorship

Category 1

(a) Conception and Design
Kwangsung Park; Myeong-Jeong Chae

(b) Acquisition of Data
Kyung-Jin Oh; Hyun-Suk Lee

(c) Analysis and Interpretation of Data
Myeong-Jeong Chae; Kyung-Jin Oh

Category 2

(a) Drafting the Article
Kyung-Jin Oh; Myeong-Jeong Chae

(b) Revising It for Intellectual Content
Kwangsung Park; Hyun-Suk Lee; Hee-Do Hong

Category 3

(a) Final Approval of the Completed Article
Kwangsung Park; Kyung-Jin Oh; Myeong-Jeong Chae; Hyun-Suk Lee; Hee-Do Hong

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