A Personalized Nutrition Plan Improves Outcomes of Facial Regeneration With Platelet-rich Fibrin Liquid Matrixes

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Abstract

Background: The importance of nutrition in the prevention of skin ageing has been shown by large observational studies. Despite this fact, there are no studies assessing dietary changes as adjunct procedures to aesthetic interventions. The objective of this manuscript is to study whether a personalized nutritional plan conveys additional benefits to Platelet-Rich Fibrin (PRF) facial regeneration

Methods: Forty seven healthy women (mean age 52.5 years old) were offered minimally invasive facial regeneration with the use of PRF liquid matrixes, as well as a personalized nutritional plan. The nutritional plan was informed by a nutrigenetic test based on 128 polymorphisms. Horizontal forehead lines, zygomatic wrinkles or mid-cheek furrows, nasolabial folds, perioral expression wrinkles, and marionette line were assessed separately with the use of the Facial Wrinkles Assessment Scale (FWAS)

Results: Total FWAS scores change was statistically significantly better in women who reported an at least partially adaptation of nutritional recommendations for a 3-month period or longer ($z=2.4$, $p=0.008$).

Conclusions: Personalized nutritional recommendations based on individual needs as well as on generally accepted dietary guidelines can improve treatment outcomes of minimally invasive facial skin aesthetics interventions.

Background

Over the last decade, the use of autologous blood concentrates, such as platelet-rich plasma (PRP) and platelet-rich fibrin (PRF), has gained importance in aesthetic medicine for dermal stimulation, augmentation, and rejuvenation.(1-3). Platelet-rich fibrin liquid matrices based on the low speed centrifugation concept have shown effectiveness in facial regeneration (4, 5) and are being increasingly applied in facial aesthetics either alone or in combination with other techniques.

At the same time, studies of cells in the laboratory, animal models and human trials also support roles for a variety of nutrients in preventing skin ageing (6). Large observational studies have suggested associations of vitamin C, linoleic acid, green and yellow vegetables with younger-looking skin (7, 8) indicating the need of more holistic approaches that incorporate nutritional advices into aesthetic treatments.

Personalized nutrition plans informed by knowledge of an individual's DNA are increasingly being utilized for health as well as general well-being purposes. Adherence to a nutritional plan that conforms to standard dietary guidelines and at the same time take into account the various individual needs may improve healthy skin parameters. In this study we sought to investigate whether a personalized nutrition plan convey additional benefits to a minimally invasive technique for facial regeneration.

Methods

A total of 47 otherwise healthy women offered PRF facial regeneration based on the low-speed centrifugation concept were included in the study. An ethical approval was granted by the Ethical and Scientific Committee of the Plastic and Reconstructive Surgery Department of Agioi Anargyroi General Oncological Hospital of Kifisia, Athens, Greece (No 1/26/09/2016) and the patients signed an informed consent prior to their treatment. All patients were treated by the same experienced physician (CN) using a standard protocol described in more detail in previous publications (4, 5). Briefly, four sessions of PRF treatments were offered with 2- to 3-week intervals. In each session, 60 mL of venous blood was collected in 10 mL PRF tubes (Orange tubes, Process for PRF, Nice, France) and centrifuged according to the following protocols.

- 40 mL (4 tubes) 5 minutes at 1300 rpm (208 g) that results in 10-11 mL of PRF
- 20 mL (2 tubes) 3 minutes at 700 rpm (60 g) that results in 2 mL of PRF.

Using a preprogrammed centrifuge with a radius of 110 mm (Process for PRF, Nice France) producing a total of 12-13 mL PRF of reduced density. PRF liquid matrixes produced by the two abovementioned centrifugation protocols were mixed and a full face injection technique was applied as described previously(5).

A personalized nutritional plan was offered by a specialized nutritionist during the treatment. A nutrigenetic test was utilized to aid personalized nutritional recommendations. In more detail, prior to the first PRF session, additional 5 mL of vein blood was collected for genomic DNA analysis using a Pure Link Genomic DNA Mini Kit Assay (Life Technologies), according to the manufacturer's instructions.

The nutrigenetic test offered to the health professional personalized recommendations based on the genotyping of 128 single nucleotide polymorphisms. Among others, this test examines polymorphisms related to macronutrient daily intake, e.g. *GIPR* SNP rs2287019(9), *IRS1* SNP rs294364(10), *APOA5* SNP rs964184(11), *PCSK7* SNPs rs236918(12), *TCF7L2* SNP rs7903146, *TFAP2B* SNP rs987237(13), fatty acid needs, e.g. *APOE* SNPs rs429358 and rs7412(14), *CETP* SNP rs708272 (15), *PPARγ2* SNP rs1801282(16), aging. *FTO* SNP rs9939609 (17), supplement response and special supplemental needs, e.g. *CYP2R1* SNP rs10741657(18), *VDR* SNP rs7968585(19, 20), *MTHFR* SNPs rs1801133, rs1801131(21), special antioxidant needs e.g. *COMT* SNP rs4680, oxidative stress, e.g. *MTHFR* SNP rs1801133 (22), micronutrient responses, e.g. *GPX1* SNP rs1050450(23), inflammation response, e.g. *IL-6* SNP rs1800795(24), *FTO* SNP rs9939609, *MC4R* SNP rs17782313, and *TMEM18* SNP, rs6548238(25), choline needs, e.g. *PEMT* SNP rs12325817 (26, 27), susceptibility to injury, e.g. *ACTN3* SNP rs1815739(28-30), *WNT16* SNP, rs2908004 and rs2707466(31, 32), telomere length, e.g. SNPs, rs2736100, rs7675998, rs9420907, rs8105767, rs755017, rs11125529, rs894160, rs4293393 (33, 34)

SNPs were genotyped using the TaqMan assays, provided by Life Technologies (<https://www.lifetechnologies.com/es/en/home/life-science/pcr/real-time-pcr/real-time-pcrassays.html>). We performed genotyping on the Open Array™ SNP Genotyping System (Life Technologies, Carlsbad, CA,

USA) using microscope slide-sized plates and the OpenArrayAccufill autoloader (Life Technologies, Carlsbad, CA, USA), following the manufacturer's instructions.

Adaptation of the nutritional recommendations was assessed with a simple questionnaire provided at the time of facial reassessment. In more detail, participants were asked whether they adapted any dietary changes ("none", "some" and "all or the majority") and for how long ("1-3weeks", "1-2 months", "3-4 months", "5-6 months"). An at least partially adaptation of recommendations for a 3-month period or longer was regarded as adherence to dietary recommendations.

Horizontal forehead lines, zygomatic wrinkles or mid-cheek furrows, nasolabial folds, perioral expression wrinkles, and marionette line were assessed separately with the use of the Facial Wrinkles Assessment Scale (FWAS), a simple and reliable tool for the assessment of wrinkles (35). Two authors (CN, AMV) blinded to "adherence on recommended diet" scored the scales prior to initial intervention and at a follow-up visit which took place about 6 months upon the completion of the four PRF sessions.

Statistical analyses.

Study participants were divided into two groups: those who reported an at least partial adherence to dietary recommendations for the majority of the time (group A) and the rest (group B). Changes in FWAS scores were compared with Mann-Whitney U Test. Unpaired t-tests were utilized for normally distributed variables and chi-squared test for nominal data. The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request

Results

In all, 43 out of 47 patients completed the study: Two patients ceased treatment; one for financial reasons and the other due to the level of perceived pain associated with treatment. Another was lost in the follow up. The forth patient reported a health problem (gynaecological cancer) which has not been reported during the PRF treatment and was excluded from the study.

Group A (subjects who reported an at least partial adherence to dietary recommendations for the majority of the time) consisted of 28 women and Group B of the remaining 15 women. Demographic characteristics, total FWAS scores and their changes for each group are presented in table 1. An improvement in FWAS scores was recorded in both groups. However, as shown in table 1, improvement in total FWAS scores was statistically more significant in group A (adherent to dietary recommendations) ($t=2.23$, $p=0.01$).

Table 1. Facial Wrinkles Assessment Scales and basic confounding parameters assessed in each group.

	Group A (n=28)	Group B (n=15)	
Mean age (SD)	52 (8.5)	53.4(6.1)	t=0.53, p=0.298
Mean initial total FWAS (SD)	13.7 (3.9)	14.3 (4.6)	z=0.23, p=0.409
Change of total FWAS (SD)	2.1 (2.4)	0.5 (1.9)	z=2.4, p=0.008
Smoking	9	6	x=0.2655, p=0.606
Smoking cessation	1	0	
Average weight loss (kg)	0.5	0	

Discussion

Blood concentrates are increasingly being utilized as autologous products for aesthetic purposes because they contain platelets for growth factor release, fibrin scaffold for tissue remodelling, plasma proteins for collagen synthesis, white cells for inflammation and recovery, and stem cells for tissue repair and regeneration. Their outcomes regarding rejuvenation of photo aged facial skin has been shown in small trials (4, 36).

This study was not intended to verify previous positive outcomes. In other words, whether surgeons' reported improvement in wrinkles scores is a biased or a true effect is beyond the scope of this observational study. A more appropriately designed study for this purpose has already been reported previously with positive results (4). Current study was performed with the intention to see whether a personalized nutritional plan has an impact on PRF facial regeneration outcomes. For this reason, scorers were blinded to adherence to this plan. Thus the additional skin aesthetics benefits conveyed by the dietary recommendations cannot be attributed to observer bias

An increasing amount of evidence suggests a protective effect of "healthy diet" on skin ageing. Current dietary recommendations promote higher intakes of fruit and vegetables and fish and PUFAs (37, 38). Nevertheless, several studies over the past few years have shown that what constitutes a healthy diet for an individual depends to some extent on his or her physiology and lifestyle (39-42). Individualized nutrition advice, informed by knowledge of genetic variants, are more and more favoured over standard dietary guidelines based on population-wide averages(43).

Whether a personalized approach based on genotyping results conveys additional benefits over current nutritional recommendations in skin aesthetics, obesity, and other health issues is under study by various teams around the world. Regarding facial skin aesthetics, this study conforms to previous indicating a beneficial middle or long term effect of healthy nutrition (7, 8). In our cases, the inclusion of genetic variants helped the specification of general dietary recommendation that quite often propose a wide range of concentrations regarding macro-and micronutrients. This means that our personalized nutritional plans conformed to "healthy diet" and the proposed optimal nutrition intake to stave off skin

ageing. In addition, the exact amounts of the various nutrients were further specified based on the genotype as exemplified above.

Assessment of all potential exposure variables as well as the various determinants of skin aging and appearance require hundreds or thousands of subjects. Nevertheless, as this study shows, nutritional interventions are potentially an important element in our era of minimally invasive and holistic care in facial aesthetics.

Conclusions

To our knowledge this is the first study that includes a nutritional intervention as an adjunct procedure to facial aesthetic interventions. Overall, our data indicates that nutritional recommendations based on individual needs can improve treatment outcomes and should be considered as an integral part of comprehensive care in facial aesthetics.

Declarations

Ethics approval and consent to participate

An ethical approval was granted by the Ethical and Scientific Committee of the Plastic and Reconstructive Surgery Department of Agioi Anargyroi General Oncological Hospital of Kifisia, Athens, Greece (No 1/26/09/2016) and the patients signed an informed consent prior to their treatment

Consent for publication. manuscript does not contain any individual person's data

Availability of data and material.

The datasets during and/or analysed during the current study available from the corresponding author on reasonable request.

Competing interests

KG is the owner of Embiodiagnostics laboratory that provides a range of comprehensive genomic services to assist individuals to reach decisions on diet and lifestyles based on their DNA profile. The remaining authors disclose no conflict of interest.

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Authors' contributions

CN, KG and IV designed the study; CN treated the patients; KG performed the molecular biology experiments and provided the nutrigenetic results; EL offered the individualized nutritional plans; AMV assisted with data recording; DC and KG supervised the whole process. CN, KG, IV, and AMV wrote and DC revised the initial draft.

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