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Research Article

Clinical Advancements in Genital Rejuvenation: Harnessing Argon Plasma and Fat Grafting for Optimal Outcomes

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Abstract

Background: The recent studies in the field of genital rejuvenation focus on novel techniques that enable use of more permanent, easier and practical applications.

Objectives: To perform genital area rejuvenation, by using the individual's own fat tissue and Argon plasma energy, named as Argon and Fat Genital Rejuvenation, with the advantage of a short recovery period and a minimally invasive approach.

Methods: A total of 114 female patients with no prior history of genital rejuvenation surgery were included. Argon plasma energy was applied to labium majora for genital area rejuvenation and lifting effect along with autologous fat transfer. All patients were preoperatively evaluated with The Female Genital Self-Image Scale (FGSIS) and re-evaluated with FGSIS on 6-12 months after the surgery.

Results: The parameters 1, 2, 3 and 7 of the FGSIS parameters increased at the postoperative 6th month compared to the baseline values. The mean FGSIS score was 18.5 ± 1.3 in the pre-treatment period, and this value increased to 20.3 ± 1.4 and 22.1 ± 1.6 at the 6th and 12th months after the treatment, respectively. The mean scores in the two periods after treatment were also significantly higher than the pre-treatment score.

Conclusions: The use of autologous fat transfer and Argon plasma energy, so called Argon Plasma and Fat concept for genital area, in the labia majora augmentation and rejuvenation appears to be a safe technique enabling an autologous fat tissue transfer and offering a high patient satisfaction and a minimally invasive approach than the surgical procedures.

Keywords: Argon Plasma; Genital Rejuvenation; Labium Majus; Fat Transfer; FGSIS

Introduction

The popularity of genital area rejuvenation procedures is increasing each day. According to the 2019 plastic surgery statistics report of the American Society of Plastic Surgery, the number of labiaplasty operations performed in 2019 is increased by 9% compared to the number of operations performed in 2018 [1].

The reduction in the amount of adipose tissue and collagen in the genital area that occurs due to aging, birth, genetic or environmental factors is important given that the loss of connective tissue in this area leads to sagging, wrinkling, crease and a volume loss in the labium majus [2].

The recent studies in the field of genital rejuvenation focus on introduction of novel techniques that enable use of more permanent, easier and practical applications with improved safety and lower cost in the real life clinical practice [3].

This study aimed to evaluate the utility of a minimally invasive approach that provides a short recovery period by using the individual's own fat tissue and Argon plasma energy, so called the Argon and Fat Genital rejuvenation approach, in genital area rejuvenation.

Methods

Study population

A total of 114 female patients admitted to our clinic with labium majora deformity, sagging, volume loss, deformity and wrinkle formation on the labium majora skin were included in this study conducted between 2019-2020. Patients who had labium majus volume augmentation via any filling material including fat transfer or surgery within the last 1 year, and those who have received radiofrequency treatment were excluded from the study.

A detailed informed consent was obtained from all participants. This study was conducted according to the standards of good medical practice (ICH-E6) and the principles of the Declaration of Helsinki.

Argon and Fat rejuvenation procedure

The liposuction part of the Argon and Fat rejuvenation procedure was performed under local infiltration anesthesia. For infiltration anesthesia, 1 ml of Bupivacaine hydrochloride (0.5%), 1 ml of Lidocaine hydrochloride (20 mg/ml), 0.1 Adrenaline (1 mg/ml) was mixed in 120 ml of Lactated Ringer's solution and 100 ml was injected to the abdominal region. After waiting for five minutes, lipoaspiration was performed from the abdominal region by using aspiration cannulas with a diameter of 3 mm and a hole width of 2 mm, and 100 cc lipoaspirate was obtained from each participant. Decantation was made by processing 1600 G for 8 minutes in the centrifuge device, and approximately 25-30 ml of infranatant fluid was removed. Doctor B Fat Juice Kit® (Smart Kit Adinizer Bio Solution Co., Ltd. Company, KOREA) was used to obtain nanofat from 70-75 ml adipose tissue.

A 60 ml of 70-75 ml the obtained fat was drawn into 3 different 20 ml locked injectors. Adinizer® filtering and micronizing kit was attached to the tip of the injectors, and 20 ml special injectors were attached to the other exposed end of the kit, ensuring that Adinizer® remained between the two injectors. The process was started with 2400 micron Adinizer® and 20 ml of fat was filtered, micronized and homogenized by being passed between one injector to another injector 30 times, each time passing through the kit. Adinizer with its bladed and microporous structure of different sizes and shapes as its patented design, provides non-enzymatic access to the stromal vascular fraction without damaging the extracellular matrix in the adipose tissue. The same process was carried out in the order of with 1200 micron, 600 micron and 400 micron Adinizer® 30 times passing from injector to another injector.

During the procedure, 2 cc of adipose tissue was mechanically lost in the form of residual adipose tissue, remaining in the adinizer during passing through adinizer of different sizes. After the procedure, approximately 55-60 cc nanofat was obtained.

Fat transfer procedure has been started for labium majora. A single entry point was created at the pubic region with the punch tool.[4] 20 ml of infiltration anesthesia previously prepared for the abdominal region was used. 10 ml was applied to the right and 10 ml to the left labium majora by using previously opened entry points. Infiltration anesthesia was applied to cover the superficial and deep layers of the labium majus. After waiting for 10 minutes, the fat transfer cannula was used to enter from these entry points and nanofat transfer was carried out to the upper 2/3 of each 2 labium majora in such a way that a pudendal cleft was formed between the labium majora. The fat transfer process has been applied to multiple superficial and deep layers to cover the subcutaneous and deeper tissues under the dartos fascia. When the pudendal cleft of both labium majora was considered as origin, nanofat transfer was performed at equal distance to the cleft and at equal height. Nanofat transfer was performed in the pubic region and the sulcus between the clitoral hood and the labium majora so that the clitoris and clitoral hood are not visible when viewed from the front and remain hidden within the pudendal cleft in the standing upright position. Approximately 50-55 cc of nanofat was transferred to the labium majora and mons pubis regions.

The same entry point is then further widened 2-3 mm to allow entry of the Argon plasma coagulator with a sharp scissor tip. The energy mode is set at 75 W gas flow rate of 2.5 L/min. Argon plasma was entered from the entry point and expanded to the lower end of

the labium majora. Afterwards, both labium majora were scanned with Argon plasma retrograde at a speed of 1 cm per minute, by applying 3 passes to the deep tissue and 3 passes to the superficial tissue. The gas accumulated in the tissue after the procedure was discharged by massaging slowly and gently from bottom to top. This procedure was applied 6 times to both labium majora. The entry point created after the procedure was closed with a small size sterile skin strip. No additional suturing was required. These strips were removed on the 3rd day of control. All patients were discharged on the same day of operation after a 4-hour vital follow-up.

Assessments

Early follow up was performed on the 3rd and 7th postoperative days, while late follow up period comprised the 1st, 3rd, 6th and 12th months postoperatively. Early surgical complications were followed-up on the 3rd and 7th days, and late surgical complications were followed-up on the 1st and 3rd months. All patients were evaluated with The Female Genital Self-Image Scale (FGSIS) preoperatively. They were re-evaluated with FGSIS 6-12 months after the surgery.

Statistical analysis

Statistical analysis was using the SPSS 22 software package program (IBM SPSS Statistics, IBM Corporation, Chicago, IL). Friedman test was used in the analysis of discrete data. Parameters were expressed as mean ± standard deviation (SD). $p < 0.05$ was considered statistically significant.

Results

Total of 114 patients were evaluated prospectively to compare the 6th and 12th month FGSIS scores before and after treatment.

The mean age of the patients was 34.7 ± 4.9, and the mean BMI was 25.6 ± 3.1. The treatment was associated with significant increase in scores of FGSIS parameters 1, 2, 3 and 7 from baseline to postoperative 6 month ($p < 0.001$ for the parameters 1, 2 and 3, $p < 0.05$ for the parameter 7). The scores of parameters 1, 6 and 7 did not change significantly at the 12th month ($p > 0.05$). The parameters 2 and 3 continued to increase significantly in the 12th month ($p < 0.05$). There was no significant change in parameters 4, 5 and 6 in the post-treatment period ($p > 0.05$). The mean FGSIS score, obtained by summing the scores of the FGSIS parameters was 18.5 ± 1.3 in the pre-treatment period, this value increased significantly to 20.3 ± 1.4 and 22.1 ± 1.6, at the 6th and 12th months after the treatment, respectively ($p < 0.001$ for each).

Discussion

Aging and fast weight gain and weight loss cause reduction in the amount of dermal collagen in the labium majora, the amount of hyaluronic acid and adipose tissue. As a result, loss of volume, wrinkles, sagging and loosening of the skin occurs in the labia majora.[2] There are several approaches for the rejuvenation of this atrophy in the labium majora. The most popular procedures are autologous fat injection and hyaluronic acid filling applications [3].

The first autologous fat graft lipofilling that was performed to correct the atrophy in the labium majora and to increase volume, was described by Felicio in 2007. In this study, 60 cc was applied to each labium majora [5]. Since then, many labium majora autologous fat graft applications have been described in the literature. Jabbour., *et al*. conducted a literature review on these applications, and different techniques has been reviewed [6].

Cihantimur and Herold defined a genital beautification technique where they performed a total of 18 cc autologous fat injection, 9 cc to each labium majora, for the rejuvenation of the existing atrophic appearance [7].

Vogt., *et al*. also performed autologous fat graft for the rejuvenation of labium majora atrophy in their study [8].

Hersant., *et al*. injected fat more intensely into the middle part of the labium majora through a single incision over the suprapubic region. They performed this injection as multi-layered to the superficial and deep layers of the labium majora, increasing tissue retention rate of the injected fat [9]. Gress., *et al*. performed 70 cc fat injection into multiple layers of the labium majora for each patient [10].

Similar to above mentioned studies, we also aimed to increase the tissue retention time and rate of adipose tissue by applying autologous fat injection to multiple superficial and deep layers of the labia majora.

In the current study, Argon plasma energy was used after nanofat application. Argon gas is used in the argon beam coagulator

and it turns into Plasma when it meets a thin electric current at the probe tip as the argon jet passes with the current. Argon beam coagulator is an electrocoagulation device operating in non-contact spray mode. Argon gas prevents oxidation, resulting in less burning, tissue destruction and necrotic tissue formation [11]. This seems to be the advantage of our study as it is a minimally invasive electrocoagulation application, causing little damage to the surrounding tissues during the procedure.

Any type of collagen tissue has an optimal contraction temperature range to induce a remodeling effect in collagen fibers without causing thermal destruction of the connective tissue. When the tissue reaches this temperature, a tightening effect is achieved. When this temperature is exceeded, connective tissue destruction is observed. Argon plasma has been used for reshaping and tightening of deep soft tissues and fascia due to this shortening effect on collagen fibers. With the principle of shortening the length of collagen in the skin and subcutaneous tissue, a tightening effect has been achieved in the labium majora skin and the supporting tissue under the skin. Thus, compared to other studies, the lifting effect, which decreases due to the melting of the filling materials over time, is provided to continue much longer by permanently shortening of the length of the collagen fibers.

Argon plasma energy theoretically slows the depth of the injury by diverting the conducted current from the treated target areas due to increased tissue resistance as tissue desiccation occurs after exposure to energy in the target tissue [12]. This provides that the thermal spread is limited to the target tissue in a minimally invasive manner without affecting large and deep tissues. This seems to be an advantage of the Argon plasma use compared to the use of conventional energy types.

In addition, since the entry point created for fat injection during the procedure is widened to only 2-3 mm, an extra entry point is not required. This seems to be an advantage of the method in terms of wound healing and cosmetics.

Hyaluronic acid filling applications are performed as well as autologous fat transfer in the treatment of labia majora atrophy. Zerbinati., *et al*. treated 37 patients suffering from labium majus atrophy with 28 mg/ml Polyethylene glycol cross-linked HA. For each labium majora, 2 cc HA has been described [13].

In other HA filling studies, 19 and 20 mg/ml HA products were used. Total of 2-6 ml HA was applied to the subcutaneous and deep tissues of the Dartos fascia as it can only be applied subcutaneously. Minor complications such as ecchymosis, edema, erythema and nodule formation are reported as a result of these applications [14,15]. Palpable nodule formation is a complication and its reason is the formation of capsule form around the injected material. In this case, intra-nodular corticosteroid or hyaluronidase use is required [15].

Dobbeleir., *et al*. reported partial melting and granuloma formation in the adipose tissue after fat transfer [16].

In our study, we did not experience any nodule or granuloma or lipoma formation after surgery, since we used fat products that were micronized with adinizer and reduced to a size of 400 microns. In addition, the expansion of the subcutaneous tissue of the labium majora with gas during the Argon plasma treatment prevents the fat graft from spreading and clustering more easily in the tissue. This seems to be the advantage of our study in terms of preventing lipoma and granuloma formation.

The use of autologous fat tissue transfer in the genital area as compared with other filling materials was reported to be associated with longer lasting effect and to be more permanent [17]. In our study, we also preferred autologous fat tissue transfer as it has a more permanent effect compared to other filling materials and does not require repetition of the procedure in a short time.

Karabağlı., *et al*. excised the protruding part of the labium minus and transferred it to a pocket formed inside the labium majora to provide augmentation [18], while El Danaf., *et al*., during the inner thigh stretching procedure, provided augmentation by placing a superiorly based de-epithelialized adipofascial flap in a pocket formed inside the labium majora [19].

Salgado., *et al*. provided augmentation by placing the dermal grafts that were excised during abdominoplasty and breast augmentation, into the tunnels formed in the medial parts of the labia majora [2].

In our study, there was no need for any incision and suturing compared to all these methods. The procedure seems to be a more minimally invasive approach, as fat transfer and Argon plasma can be

performed with only two entry points opened over the suprapubic region. Besides being a minimally invasive approach that reduces early and late postoperative wound healing complications, it also seems to be the advantageous in terms of better cosmetic results enabling a faster and better recovery process.

Conclusion

The use of autologous fat transfer and Argon plasma energy, so called Argon Plasma and Fat concept for genital area, in the labia majora augmentation and rejuvenation appears to be a safe technique enabling an autologous fat tissue transfer and offering a high patient satisfaction and a minimally invasive approach than the surgical procedures. Further randomized controlled studies are needed to compare different genital rejuvenation techniques and to evaluate their effects on functional outcomes.

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