Xanthelasma palpebrarum removed with Atmospheric Plasma technique: 11-year follow up

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Xanthelasma palpebrarum is a subcutaneous lesion of the lid and cause a cosmetical issue. The aim of the present study was to evaluate the atmospheric plasma treatment for the treatment of xanthelasma with an 11-year follow up. Seventy-two patients with bilateral xanthelasma and 26 patients with unilateral xanthelasma by atmospheric plasma technique known also as voltaic arc dermabrasion (VAD, Europe Medical s.r.l. Montesilvano (PE), Italy). Photographs were obtained at the baseline and after the procedure and analyzed by an independent observer. The evaluation of the results was made 2 months after this single treatment with 11 years of follow up. The subjects average age was 48.5 years (range 41–63 years). All subjects were elected for a single session for the lesion removal. The erosion is epithelialized from the lesion margins and the dermal basal cells. After 2 months from the treatment, the result was scored as 4 (clearing of lesions > 75%, complete resolution) in 66 patients for a total of 104 lesions treated; scored as 3 in 24 patients for a total of 48 lesions, and as 2 in nine patients for a total of 18 lesions. No subjects scored 0 or 1. A total of 8 lesions showed mild erythema in the treated areas for 1 month. Numerous approaches were proposed for xanthelasma exeresis such as a surgical treatment especially in case of excessively large lesions or lesions involving the medial canthus that could produce a more limited skin laxity rapidly induces a risk of ectropion. In conclusion, the effectiveness of the present investigation suggest that the atmospheric plasma is a useful therapeutic option for the treatment of xanthelasma palpebrarum.

Xanthelasma palpebrarum is a subcutaneous lesion and appear as flat or slightly elevated yellowish-tan lesions in middle-aged or elderly patients and is the most common form of xanthoma. It locates itself frequently located mostly at the medial angle of the eyelid (1), it is usually bilateral with prevalence ranging from 1 to 4 percent in the population (2). The females are more affected than men and is usually seen in middle-aged and older adults, especially between the age of 35. The lesions are initially situated in the medial canthus and gradually spread to all the periorbital region in advanced forms, and it rarely occurs calcified papules (3). Histological examination reveals esterified cholesterol deposits, macrophages, known as foam cells, situated in the middle and superficial layers of the dermis and epidermis is otherwise normal (4). For this histological appearance is

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consider a fibrohistiocytic tumor, in the category of stromal tumors, occurring in the evelids (5). Lesions typically occur bilaterally, permanent and with progressive increase in size and frequently involve the inner canthus of the upper lid and less frequently lower lid. Frequently it is associated with primary hyperlipidemia or secondary hyperlipidemia, and rarely is present in normolipemic individuals with a slightly female gender preference (6). The lesion mostly causes aesthetic concerns and the progressive enlargement; hence, patients want it removed. Surgical excision has been considered the elective procedure e for decades. This approach requires an orbicularis oculi muscle musculocutaneous flap elevation, dividing the retroorbicularis oculi fat (ROOF) and separating widely from the lower eyebrow to lateral canthal area. However, this usually effective measure bears a relevant risk of side effects, especially an ectropion, which could lead to other procedures, e.g., full thickness skin graft (7, 8). Another approach was today proposed such as microsurgical inverted peeling (9) including trichloroacetic acid (TCA) peeling, blepharoplasty with flap skin graft (10), excision by atmospheric plasma also known as voltaic dermabrasion (11, 12) or CO2 lasers, diode laser, erbium: YAG laser or pulsed dye laser (13-15).

The purpose of the present study was to the ability of Atmospheric Plasma treatment, to solve the xanthelasma with follow up of 11 years.

MATERIALS AND METHODS

Between November 2009 and September 2020, we

treated 98 patients affect xanthelasma, 72 patients with bilateral lesion and 26 with unilateral lesion. For these treatments was used a voltaic arc dermabrasion device (VAD, Europe Medical s.r.l. Montesilvano, PE, Italy).

A total of 51 subjects presented the same lesion size of 1.1 cm², 39 lesions were <1.0 cm², 8 patients reported extensive xanthelasmas (at least two xanthelasmas, both measuring >l cm²). Before the procedure, the evelids were anaesthetized by a topical eutectic mixture of lidocaine topical administration under occlusion for 20 minutes followed by intradermal injection of articaine 0.1 ml (Pierrel Pharma, Italy) with epinephrine 1:100.000. The patients were advised to keep their eyes closed during the entire procedure while no protection for the eye was provided. Between 2-10 applications of voltaic arc dermoabrasion were applied to perform the lesions macroscopic removal. Macroscopically, a sudden change of color and texture shows that the bottom of the xanthelasma has been reached, the carbonaceous layer has not been removed and topical antibiotic applied (Fig. 1 A-B). The subjects were informed to not touch the delicate crusts and to protect from sun exposure and tanning booths for at least 6-8 weeks. Moreover, no other indications were prescribed, and the subject could clean and rinse the face normally. The subjects were observed after 2 months (Fig. 1 C). The clinical photographs were obtained at the baseline and after the procedure by an independent observer. The measurements were made after two months from the single treatment. The measurements were assessed by a 4 grades score: 0, no result; 1, moderate result (< 25% clearing); 2, satisfactory result (25-50% clearing); 3, good result (50-75% clearing); 4, excellent result (> 75% clearing).The final evaluation assessed the presence or absence of hypochromic or achromic scars. A total of 45 patients were evaluated for 11 years.



Fig. 1. *A*) *Xanthelasma palpebrarum of the right eye. B*) *Immediately after the Atmospheric plasma irradiation. C*) *After 1 month from the treatment*.

RESULTS

The average subject's age was 48.5 years (range 41-63 years). All subjects were elected to a single session for lesion removal. The erosion is epithelialized from the margins and from dermal basal cells. After 2 months, the result was scored as 4 (i.e., with a clearing of lesions evaluated as being > 75% and in fact assessed by the independent observer as complete resolution) in sixty-six patients for a total of 104 lesions; scored as 3 in 24 patients for a total of 48 lesions, and as 2 in 9 patients for a total of 18 lesions. No subjects presented a result scored as 0, or 1. A total of 8 lesions reported a mild erythema in the treated regions that persisted for 1 month. Only one subjects reported an evidence of post-therapeutic hyperpigmentation, that lasted for 3 months. No complications such as hematomas, bleeding, infections, entropion or ectropion or other complications involving the lacrimal glandes were observed. No functional complications were reported in the treated subjects. A total of 45 patients were observed after 11 years and no relapse was recorded during follow up.

DISCUSSION

The effectiveness of the present investigation highlighted that atmospheric plasma therapy is an efficient approach for the removal of xanthelasma of lid with improvement of the appearance of the lid region. No relapse was reported at the study follow up.

Many different approaches were proposed for the removal of xanthelasma. A surgical flap or fullthickness skin graft could be indicated in association of wide lesions that involve the medial canthus area. The surgical resection is generally limited to the lower eyelid, as the more limited skin laxity rapidly induces a risk of ectropion (16). The surgical excision could produce a deficient appearance of the medial portion of the skin and worsen lateral hooding in elderly patients in a morbid state.

A large residual defect could produce a too strong tension and evolve to flap necrosis, scar, hypertrophic, and retraction of the eyelid. Moreover, an additional issue is associated in recurrent cases of xanthelasma, as the eyelid skin capital does not allow repeated resections. In accordance with this aspect and in order to spare evelid skin, the destruction of dermal layers containing cholesterol deposits by the using of TCA peeling or Carbon dioxide or erbium: YAG laser vaporization and lowvoltage radiofrequency has been evaluated, but these approaches could induce hypochromic or achromic scars (17). The size and location of the lesion could reflect the patients' preference influence the choice of a treatment procedure. CO₂ laser was proposed for the treatment of xanthelasma but the uncontrollable penetration depth of the laser beam in the continuous mode explains the high risk of scarring and post therapeutic pigmentary changes and potential injury of eye. In the present investigation, the effectiveness of the experimental procedure after a single session were encouraging, as a good or excellent result was obtained in 104 lesions of 170 lesions.

The radiofrequency is based on the application of an alternative electric current through a high voltage on a biological tissue producing a thermal effect to obtain a coagulation or an incision. These effects are determined by the electrode type, contact area, electrode movement speed and tissue properties. The cut effect is determined by the current passage though active and neutral electrodes and coagulation occurs as a result of tissue atrophy or desiccation when their heating is sufficiently slow. The parameters setting to obtain these results could be imposed manually or automatically (18).

The effectiveness highlighted in the present research confirmed the results described in a previous paper, while it was used a medical device based on plasma-based technology. Plasma is the fourth state of matter after solid, liquid and gas. An arc of plasma is emitted which is characterized by a glowing discharge with a thermionic emission of electrons from the electrodes supporting the voltaic arc tissues and the tip of the device dispenses energy. The atmospheric plasma was widely used for aesthetic treatment and the rationale has been discussed in a previously articles (19–23).

There is no electric passage zone, so the dermoabrasion it is not influenced from the tissue electric conduction resistance (7).

Some advantages have been related to the atmospheric plasma treatment, such as the complete tissues hemostasis during the procedure, lack of a smoke plume, no eye protection devices required such as laser treatments, and compact solid-state technology but a surgical mask as safety or hazards of exposure to the aerosols produced during dermabrasion (21–23). In a previous investigation the authors observed no thermal damage on the treated site dermal layer (24). The superficial necrotic layer is very thin on the healing process, while it could be seen an inflammatory infiltrate (17).

In our opinion, this is due to the absence of current tissue path and to the necessity to close the circuit between the active and neutral electrode which the patient is part of when using a radiosurgery unit. Atmospheric plasma can selectively burn the conductive hydrated tissues (25).

The electrons are substantially electric currents, that are able to move freely through the human body without damage (low power), providing a hydrating (water, lymph or blood) contact point (skin) and therefore, a good conductor. This stream is irradiated from the dermoabrasion needle tip, which, if it finds an electric conductor, tries to pass through.

In conclusion, the atmospheric plasma is a useful treatment procedure for xanthelasma palpebrarum. It is advisable to treat as soon as diagnosed. The advantages of this method are the accurately controlled ablation of thin skin layers, the option for a repeated application in case of recurrences, the unproblematic and safe treatment in delicate regions of the periorbital area, and the low risk of visible scarring, as well as the low recurrence rate (26). Voltaic arc dermoabrasion treatment had proven to be an ambulatory and fast protocol. The outcomes of this research suggest that the atmospheric plasma is a clever therapeutic option for the treatment of xanthelasma palpebrarum.

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