

## ORIGINAL ARTICLE

# Treatment of xanthelasma with fractional plasma

## Trattamento dello xantelasma con plasma frazionato

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### Abstract - Riassunto

**BACKGROUND:** Xanthelasma, which is a benign asymptomatic periorbital xanthoma, is not associated with cutaneous complications and treatment is often due to cosmetic reasons. Xanthelasma, which are depositions of yellowish cholesterol-rich material, and are associated with hyperlipidemia, or congenital disorder of lipid metabolism. Treatment modalities should be considered based on efficacy as well as cosmetic outcomes. There are different treatment modalities including: 1) surgical excision; 2) laser energy-based devices ablation; 3) topical therapy or systemic therapy; and 4) plasma-based device.

**METHODS:** The safety, patient satisfaction and cosmetic results of removal of xanthelasma with plasma-based device (Plasmage, Brera Medical Technologies S.r.l.; Ogliastro Cilento, Salerno, Italy) were shown in 50 patients after clinical evaluation.

**RESULTS:** All 50 cases of xanthelasmas were removed in our study with plasma-based device, Plasmage totally. No scars were left, and all patients were full satisfaction with almost no side effects, except local oedema and crusts which was solved quickly in few days.

**CONCLUSIONS:** The cosmetic outcome after removal of the xanthelasma with Plasmage, plasma-based device was excellent. The procedure of removal of xanthelasma with this plasma-energy device is safe, easy to perform, no scars, short downtime and very good patient satisfaction. This new noninvasive surgical device can be indicated also to other indications as therapy of dermatochalasis, removal of other facial or eyelids benign lesions as squamous papilloma and fibromas improving wrinkles and acne scars etc. More studies will be needed to confirm our results, but the clinical experience to date is excellent.

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**KEY WORDS:** Dermatology; Xanthomatosis; Plasma.

**OBIETTIVO:** Lo xantelasma, uno xantoma periorbitale asintomatico benigno, non è associato a complicanze cutanee e il trattamento è spesso dovuto a ragioni estetiche. Lo xantelasma consiste in depositi di materiale giallastro ricco di colesterolo, ed è associato a iperlipidemia, o disturbo congenito del metabolismo lipidico. Le modalità di trattamento dovrebbero essere considerate sulla base dell'efficacia e dei risultati cosmetici. Esistono diverse modalità di trattamento, tra cui escissione chirurgica, ablazione tramite dispositivi basati sull'energia laser, terapia topica o terapia sistemica, dispositivi basati su energia al plasma.

**METODI:** La sicurezza, la soddisfazione dei pazienti e i risultati estetici della rimozione dello xantelasma con uno strumento basato su energia al plasma (Plasmage, Brera Medical Technologies S.r.l.; Ogliastro Cilento, Salerno, Italia) sono stati dimostrati in 50 pazienti dopo valutazione clinica.

**RISULTATI:** Tutti e 50 i casi di xantelasma del nostro studio sono stati totalmente rimossi tramite lo strumento che utilizza l'energia al plasma, Plasmage. Non è stata lasciata nessuna cicatrice e tutti i pazienti hanno mostrato soddisfazione totale senza riportare quasi nessun effetto collaterale, fatta eccezione per qualche edema locale e alcune croste, che si sono risolti rapidamente in pochi giorni.

**CONCLUSIONI:** Il risultato estetico dopo la rimozione dello xantelasma tramite lo strumento basato su energia al plasma, Plasmage, è stato eccellente. La procedura di rimozione dello xantelasma tramite questo strumento che sfrutta energia al plasma è sicura, facile da eseguire, non lascia cicatrici, necessita di tempi di recupero brevi e ha un alto grado di soddisfazione tra i pazienti. Questo nuovo strumento chirurgico non invasivo può essere indicato anche per altre terapie, come la cura della dermatocalasi, la rimozione di altre lesioni benigne del viso o delle palpebre, ad esempio papilloma squamoso e fibromi, il miglioramento delle rughe e delle cicatrici da acne, ecc. Saranno necessari ulteriori studi per confermare i nostri risultati, ma l'esperienza clinica fino a oggi è eccellente.

With aging, the periorbital area undergoes profound transformations. Wrinkles appear and deepen more and more. Dermatochalasis occurs, eyebrow ptosis also, and lid lesions may appear. Atrophy of fat pads, fine suborbicu-

lar lines and festoons, and tear trough deformity may also occur (Figure 1).<sup>1,2</sup>

In the population over forty years of age, xanthelasmata are frequently present at the eyelids level.



Figure 1.—Example of xanthelasma.

## Materials and methods

### Anatomical pathology

The term xanthelasma (xanthelasma palpebrarum) is derived from the Greek ξανθός (*xanthos*: yellow) and έλασμα (*élasma*: foil) and identify a xanthomatous inflammation of the eyelid.<sup>3</sup> Xanthelasma consist in single or multiple soft yellow plaques/papules caused by localized accumulation of lipid deposits on the eyelids, mainly in medial canthal region of the eyelids. It can be bilateral.<sup>4</sup>

Xanthelasmata can be soft, semisolid, or calcareous. Frequently, they are symmetrical. The upper lids are more frequently involved than the lower lids. Often, the four lids are involved. Xanthelasmata tend to progress, coalesce, and become permanent (Figure 2).<sup>5</sup>

Xanthelasma is the most common form of xanthoma of the skin; it tends to manifest in middle-aged to elderly individuals, predominantly females, but can be seen over a wide age range and children have been reported with the lesions. While they are neither harmful nor painful, these minor growths may be disfiguring.<sup>4,6</sup>

Xanthomata are depositions of yellowish cholesterol-rich material that can appear anywhere in the body in various disease states. They are cutaneous manifestations of lipidosis in which lipids accumulate in foam cells within the skin.<sup>7</sup>

They are often associated with hyperlipidemia, or congenital disorder of lipid metabolism. In some cases, association with hyperlipoproteinemic states II and III is also referred.<sup>4</sup> The exact cause of xanthelasma is not known but several factors like lipid abnormalities, hormonal fac-

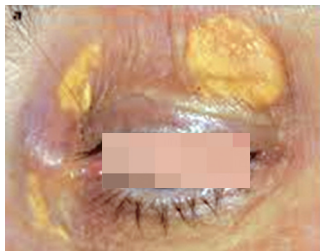


Figure 2.—Patient with xanthelasma.

tors, local factors and macrophages are attributed to play a role in its etiopathogenesis.<sup>5,8</sup>

Recently, the role of acetylated LDL and macrophages with their scavenger receptors has been observed in the causation of xanthelasma.

Although the exact pathogenic mechanism is not fully understood, cutaneous xanthelasma represents the deposition of fibroproliferative connective tissue associated with lipid-laden histiocytes, also known as foam cells. Foam cells are typically found in the middle and superficial layers of the dermis in perivascular and periadnexal locations, with associated fibrosis and inflammation. Consist of collections of histiocytes with foamy, lipid-laden cytoplasm distributed diffusely and often around blood vessels within the dermis. Deep extension into the Orbicularis oculi muscle can occur.<sup>5,9</sup>

The main lipid that is stored in both the hyperlipidemic and normolipidemic xanthelasmata is esterified cholesterol (Figure 3).<sup>5</sup>

Secondary causes of hyperlipidemia are physiological states and systemic diseases, as pregnancy, obesity, diabetes mellitus, hypothyroidism, nephrotic syndrome, and cholestasis. Certain medications also, as estrogens, tamoxifen, prednisolone, oral retinoids, cyclosporine, and protease inhibitors by leading to a state of hyperlipidemia.<sup>4,5,10</sup>

Xanthelasma can be found on other sites: neck, trunk, shoulders, axillae.<sup>4,7</sup>

There is no association between xanthelasmata and high-density lipoprotein (HDL) or triglyceride levels. Christoffersen *et al.* found that independent of well-known cardiovascular risk factors, the presence of xanthelasma palpebrarum appeared to be a predictor of risk for myocardial infarction, ischemic heart disease, severe atherosclerosis, and death in the general population.<sup>11</sup>

The differential diagnosis must be compared to chalazion, sebaceous hyperplasia, syringoma, nodular basal cell carcinoma, and necrobiotic xanthogranuloma (NXG), a form of non-Langerhans histiocytosis. The latter are red-brown, violaceous, or yellowish cutaneous papules and nodules that evolve to form infiltrated plaques, commonly in the peri-orbital region. They are frequently associated with monoclonal gammopathy and other hematological malignancies.<sup>4</sup>

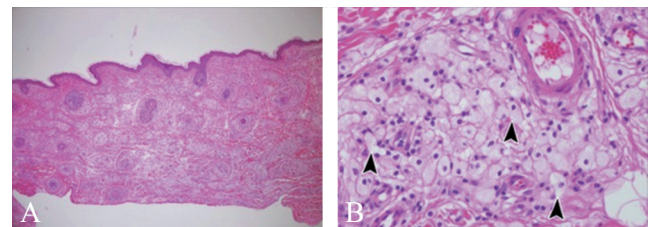


Figure 3.—Histopathologic findings of the upper eyelid xanthelasma lesion: A) pale areas containing foamy cells are dispersed throughout the dermis (H&E, ×40); and B) xanthoma cells. These foamy histiocytes are polygonal or rounded with a distinct cell membrane. Their nuclei were small and eccentric and their cytoplasm are stuffed with lipid vacuoles (black arrowheads) (H&E, ×400).

## Therapeutic background

Xanthelasma is a benign asymptomatic lesion, not associated with any cutaneous complications, treatment is often only cosmetic reasons.<sup>4,5</sup>

The available treatments are surgical excision, laser or other energy-based devices ablation, topical therapy, or systemic therapy.<sup>4</sup>

Depending on the type of treatment, there are possibilities of scarring after xanthelasma removal, according to damages caused to the dermis during the treatment, or infections following the treatment.<sup>4</sup>

Recently, an ablation therapy based on plasma was used for the removal of the xanthelasmata. To evaluate the efficacy and safety of this new technology, we have decided to treat several patients with xanthelasmata using a plasma device.

As already mentioned, the available treatments for xanthelasma are surgical excision, laser or other energy-based devices ablation, topical therapy, or systemic therapy.<sup>4</sup>

Surgical procedures can cause scarring, as well as being complicated by postoperative infections.<sup>4</sup>

A very effective procedure in removing xanthelasmata within one session is excision using a scalpel. However, it is a very invasive procedure, because bleeding will inevitably occur during the surgical procedure, the use of local anesthetic is mandatory, and there are risks of infections. This procedure will almost inevitably scar the patient (Figure 4).<sup>12</sup>

Lasers are widely used in the western world (Europe and North America). An experienced surgeon is usually capable of removing all the xanthelasmata within one session and without damaging the dermis, consequently minimizing the risks of scarring.<sup>4</sup>

Although this is the most popular treatment, unfortunately this is not the most cost effective and not the treatment that presents the least risks. This is because the success of this procedure is highly dependent on the surgeon's ability. The chances of infection after the treatment are very low. However, the areas treated with the laser must be kept dirt free and should be disinfected regularly until the treated area has healed completely. It is highly recommended that the patient wears eye protectors during laser excision. Argon laser in xanthelasma is an easy, effective, method of treatment for small lesions and YAG laser is better for large lesions than argon laser.<sup>13,14</sup>

Topical therapy includes cryotherapy, chemical peel, and intralesional injection of bleomycin (pingyangmycin).<sup>4</sup>



Figure 4.—Laser treatment.

Cryotherapy, also referred to as cryosurgery, is a dermatological method of removing warts, birthmarks, seborrheic keratoses and many other lesions. The most common substance used is liquid nitrogen. Treatments using cryotherapy are very effective in removing skin lesions, however, the effects of cryotherapy are difficult to control.<sup>4</sup>

It is not generally advisable cryotherapy to be used for xanthelasma removal for two reasons: relatively high potential dangers to the eyes (normal eye protectors used to protect the eyes during laser excision cannot protect the eyes against the deep cold of the cryosurgery), and the highest likelihood of causing scars amongst all the options available. The risks of infection after the procedure are instead very low.<sup>15</sup>

Peelings are an option for xanthelasma removal for three reasons: peelings can be performed by the patients themselves as the peelings are safe and easy to apply, formulated to suit the patient skin type; and the right peelings are safe as they do not cause damage to the dermis. The area treated is very unlikely to get infected. Therefore, chances of scarring are remote.<sup>4</sup>

The price for a xanthelasma removal peel is only a fraction of the cost of any surgical excision alternative. There is no need for anesthetic, however people usually experience a burning sensation for up to 5 minutes. Using the right specialized peel is provides the best chances of removing the xanthelasma without leaving any scars. Repeated use of specialized peels will inevitably remove xanthelasmata.<sup>4</sup>

The only disadvantage of using specialized peels for xanthelasma removal is that more than one treatment may be required to remove all the xanthelasma. Hypopigmentation is the commonest side effect, followed by hyperpigmentation.<sup>4</sup>

Intralesional injection of bleomycin (pingyangmycin) seems to provide good results, but the data in the literature are still insufficient.<sup>16</sup>

## Plasma to remove xanthelasma

Recently, an ablation therapy based on plasma was used for the removal of the xanthelasmata. Plasma is one of the four fundamental states of matter, the others being solid, liquid, and gas. A plasma has properties unlike those of the other states. A plasma can be created by heating a gas or subjecting it to a strong electromagnetic field. This decreases or increases the number of electrons, creating positive or negative charged particles called ions, and is accompanied by the dissociation of molecular bonds, if present (Figure 5, 6).<sup>17</sup>

A plasma generator produces a controlled and focused micro-plasma beam due to the ionization of the gases contained in the air, a small electric arc similar to a minute lightning, useful to treat epidermal areas affected by aesthetic blemishes.<sup>18</sup>



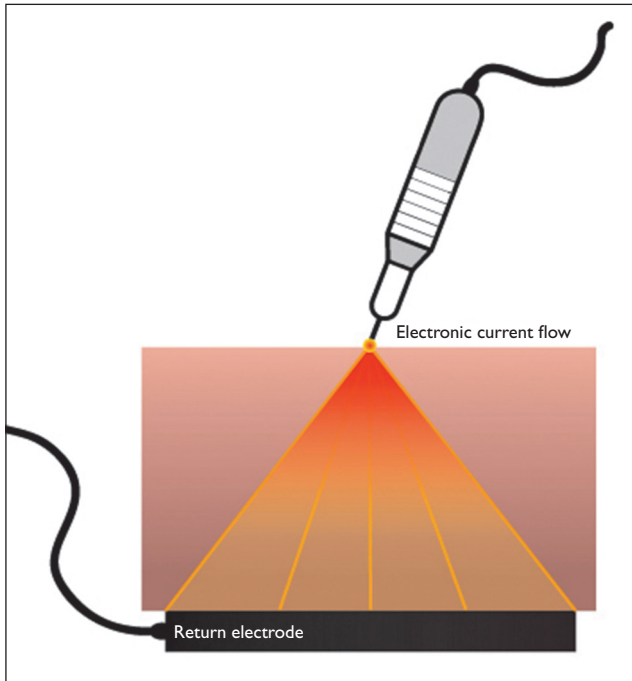


Figure 5.—Electrosurgical application.

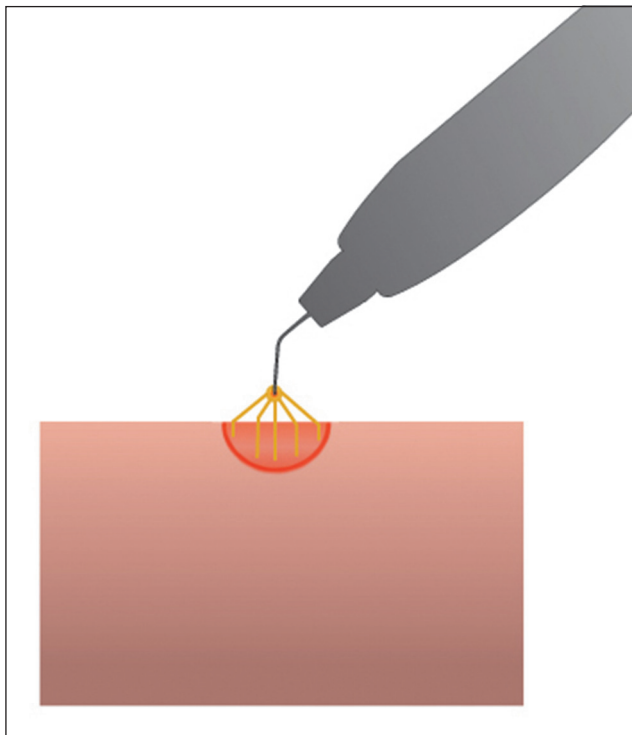


Figure 6.—Plasma application.

The risk is lower: you see what you do, you can control each step. It is a non-invasive technique, a type of electrosurgery.

The secondary effects can be occurring are edema,

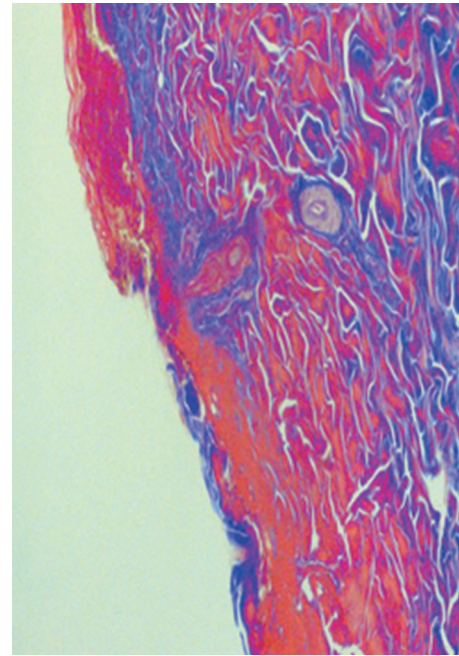


Figure 7.—Histopathologic comparison.

crusts, and solar sensitivity. The advantages are that you can act on any tissue, whatever the skin type, and with lower scars risk.

This technique is very safe, because no effraction of the dermo-epidermal junction and no damage for the surroundings tissues occurs. Furthermore, the basal membrane stays untouched, and no necrosis occurs (Figure 7).

## Results

Fifty patients were selected, with an average age of fifty-four, all suffering from xanthelasma palpebrarum. A clinical evaluation of each patient was performed and all those who did not present contraindications to the surgical therapy were enrolled in the study.

The used device was Plasmage by Brera Medical Technologies S.r.l. (Ogliastro Cilento, Salerno, Italy).

At the end of the treatment, all patients were given a satisfaction assessment test. The protocol that was followed for ablative surgery with Plasmage was: collect the patient's medical history, taking photos with open and closed eyes before and after treatment, explain the patient about the procedure, healing process and treatment at home, and collect informed consent. The area to be treated was cleaned and disinfected with alcohol 70%, topical anesthesia (if needed) with cream lidocaine 15% and prilocaine 5% was applied, secondary disinfection and local anesthesia in eyelid with Lidocaine 1% was done, again disinfection, and finally the specific program on the device was selected.

## Discussion

In our study we used Plasmage, according to specific program already set in the equipment. Indeed, for removing benign, non-pedunculated, plains lesions, you must use a spray technique, where the treatment is carried out with a continuous movement, on the entire surface of the lesion.

The protocol to be followed for ablative surgery with Plasmage is: 1) collect the patient's medical history; 2) taking photos with open and closed eyes before and after treatment; 3) explain the patient about the procedure; 4) healing process and treatment at home; and 5) collect informed consent (Figure 8).

After treatment antibiotic ointment could be prescribed to patients once a day for a week in the night, trolamine (Biafine, Johnson & Johnson, New Brunswick, NJ, USA) cream during the day for a week, and after one week protection from sun with sun block cream. Control after seven days, one month, two months.

All treatments carried out led to the disappearance of the lesions. In no case are scars left. Most patients presented modest local oedema/swelling and crusts within the next few days. All this was solved quickly. All patients expressed full satisfaction with the results obtained (Figure 9-13).

## Conclusions

Based on our experience, we can state that plasma ablative, is safe, easy to perform, does not produce scars, and is good for patients.

This new non-invasive surgical technique is also indicated for therapy of dermatochalsis (blepharoplasty), and of most benign eyelid lesions, as squamous papilloma (also called fibroepithelial polyp or skin tag). Finally, Plasmage



Figure 8.—Plasmage® device.



Figure 9.—Patient 1 before/after.



Figure 10.—Patient 2 before/after.



Figure 11.—Patient 3 before/after.





Figure 12.—Patient 4 before/after.



Figure 13.—Patient 5 before/after.

can be used for treatment of skin superficial dyschromias, and smooth out wrinkles. Surely, more studies will be needed to confirm our results, but the clinical experience to date is very positive.

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