Treatment of Xanthelasma Palpebrarum With 90% Trichloroacetic Acid: A Case Series

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Abstract. Xanthelasma palpebrarum is the most common cutaneous xanthoma and typically presents as yellowish plaques in the periorbital region. Although several therapeutic modalities are available, an inexpensive and technically simple treatment remains desirable, particularly in settings where laser or surgical procedures may not be readily accessible. Trichloroacetic acid (TCA) causes controlled chemical coagulation of tissue and has been used for the treatment of xanthelasma. This case series describes the clinical outcomes of 90% TCA treatment in patients with xanthelasma palpebrarum. This retrospective, single-center descriptive case series included 10 patients with clinically diagnosed xanthelasma palpebrarum treated with topical 90% TCA at Skin Clinic, Lhokseumawe City, Aceh, Indonesia, between October 2021 and June 2023. TCA was carefully applied directly to the lesions using a small wooden applicator until visible frosting developed. Patients underwent one to three recorded TCA applications, with some applications performed at different lesion sites, according to lesion distribution and clinical response. Treatment response and adverse effect were assessed clinically during follow-up and supported by serial clinical photographs. Written informed consent was obtained from all patients prior to treatment and for the use of their clinical data and photographs for scientific publication. Ten patients (nine women and one man), aged 32–60 years, underwent treatment with 90% TCA. Six patients underwent one recorded treatment session/application, two underwent two, and two underwent three, with repeated applications in some patients performed at different lesion sites. All 10 patients showed visible clinical thinning of the treated xanthelasma lesions during follow-up. One patient experienced an adverse effect in the form of scarring, post-inflammatory hyperpigmentation and one patient experienced crusting. Topical 90% TCA was associated with visible clinical improvement of xanthelasma lesions in this case series and represents a relatively simple and low-cost treatment option. Further prospective studies using standardized clearance scores, safety assessments, and longer follow-up are required to determine treatment effectiveness and recurrence rates.

Keywords: Xanthelasma palpebrarum; trichloroacetic acid; case series; chemical cauterization; dyslipidemia.

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F. Maulina and S. Wahyuni (eds.), *Proceedings of the 3rd Malikussaleh International Conference on Health and Disaster Medicine (MICOHEDMED 2026)*, Advances in Health Sciences Research 97,
https://doi.org/10.2991/978-94-6239-836-8_18

1 Introduction

Xanthelasma palpebrarum is the most prevalent form of cutaneous xanthoma. It typically presents as yellowish plaques, most often near the inner corner of the eyelid, with a greater tendency to appear on the upper eyelid rather than the lower one. The lesions are usually symmetrically distributed and can appear as either single or multiple, nodular or flat, soft or firm, and may have a semisolid or calcified texture1. Most research has shown that xanthelasma is associated with elevated levels of plasma total cholesterol or low-density lipoprotein (LDL) ch1olesterol in individuals with xanthelasma. It has been linked to several conditions, including atherosclerosis, coronary artery disease, insulin resistance, diabetes, hypertension, stroke, dyslipidemia, obesity, and hyperuricemia; however, the strength and clinical significance of this association remain heterogeneous across populations [2,3].

Histopathological examination of xanthelasma shows histiocytes with intracellular lipid deposits, particularly within the upper reticular dermis and in perivascular or periadnexal areas. Xanthelasma palpebrarum has been reported more frequently in women than in men [1]. The condition typically appears between the ages of 15 and 73, with the highest incidence occurring between 30 and 50 years. XP is generally diagnosed based on clinical evaluation. While the lesions of xanthelasma have no risk of malignancy and are painless, they can impact a patient's appearance and quality of life [1,4].

There are several treatment options for managing xanthelasma palpebrarum, including surgical excision, CO_2 or Er:YAG laser ablation, non-ablative Q-switched Nd:YAG laser, topical trichloroacetic acid, and radiofrequency-based techniques [1,4,5]. Lifestyle and cardiovascular risk-factor management may also be appropriate when dyslipidemia or other metabolic risk factors are present, including dietary modification, regular physical activity, weight control, and smoking cessation [1–3]. TCA is a relatively simple and cost-efficient treatment for XP and has produced satisfactory clinical responses in previous studies, particularly when repeated treatment is required [1,6,7]. TCA is a destructive chemical therapy commonly used topically at concentrations of approximately 50%–100%; application is performed carefully over the lesion, often in a circular fashion with particular attention to the lesion margin [1].

Although several modalities have been used for xanthelasma palpebrarum, including surgical excision, laser therapy, radiofrequency ablation, and chemical cauterization, the optimal treatment remains uncertain. Some procedures require specialized equipment, have relatively high procedural costs, or may be associated with scarring, pigmentary alteration, and recurrence [4,5]. Topical TCA represents a relatively simple and inexpensive alternative; however, clinical information regarding treatment response to high-concentration TCA, particularly 90% TCA, remains comparatively limited in routine clinical practice. Furthermore, variation exists in TCA concentration, application technique, number of treatment sessions, and duration of follow-up among previously reported studies [4–7]. Therefore, documenting treatment response and tolerability in a clinical series may provide useful practical information regarding the use of 90% TCA for xanthelasma palpebrarum.

Therefore, this case series aimed to describe the clinical characteristics, treatment response, number of treatment sessions, Adverse effects, and short-term outcomes of 10 patients with xanthelasma palpebrarum treated with topical 90% TCA.

2 Methods

2.1 Study Design and Setting

This retrospective, single-centre descriptive case series included patients diagnosed with xanthelasma palpebrarum who received topical 90% TCA. We included patients treated at the skin clinic, Lhokseumawe, Indonesia, between October 2021 and June 2023. Clinical follow-up continued until July 2023.

2.2 Participants

We recruited ten patients who were eligible for inclusion if they had a clinical diagnosis of xanthelasma palpebrarum, underwent topical treatment with 90% TCA during the study period, and had adequate clinical documentation and follow-up photographs. Patients were excluded if the clinical diagnosis was uncertain, if the lesion could not be treated safely because of its immediate proximity to the ocular surface, or if clinical records and follow-up documentation were insufficient to assess treatment response. Written informed consent for the use of clinical data and publication of clinical photographs was obtained from all patients.

2.3 Baseline Characteristics

The case series comprised nine women and one man, aged 32–60 years, with a mean age of 47.9 years.

2.4 Diagnostic Criteria

The diagnosis of xanthelasma palpebrarum was established clinically based on the presence of characteristic yellowish, soft-to-firm plaques or papules located predominantly in the periorbital region.

2.5 Treatment Procedure

Before treatment, the procedure, expected clinical response, and possible adverse effects were explained to the patients, and written informed consent was obtained. The xanthelasma lesion and surrounding skin were disinfected with povidone-iodine followed by 70% alcohol, cleaned with sterile water, and dried using sterile gauze. Petroleum jelly was applied to the surrounding normal skin to protect it from accidental chemical injury, and the eyes were protected during the procedure.

A small wooden applicator was coated with 90% TCA and carefully applied directly to the xanthelasma lesion while avoiding the surrounding normal skin and ocular surface. Application was continued until visible frosting developed, generally within approximately 15–20 seconds. Patients were subsequently observed for approximately 20–30 minutes. Moisturizer and topical antibiotic treatment were provided when clinically indicated.

Table 1. Baseline Characteristics, Treatment Details, and Clinical Outcomes of Patients with Xanthelasma Palpebrarum Treated With 90% Trichloroacetic Acid.

Patient	Age	Sex	Lesion location/type	TCA concentration	No. applications	Follow-up	Clinical response	Adverse effects
1	60	F	XP; multiple lesion sites / flat plaque	90%	1	3 Jan–10 Mar 2022 (66 d; 9.4 wk)	Visible thinning	-
2	39	F	XP; multiple lesion sites / flat plaque	90%	1	28 Jun–9 Aug 2022 (42 d; 6.0 wk)	Visible thinning	-
3	32	F	XP; multiple lesion sites / flat plaque	90%	1	21 Jan–6 Mar 2023 (44 d; 6.3 wk)	Visible thinning	-
4	41	F	XP; multiple lesion sites / papulonodular	90%	2	28 Dec 2022 & 14 Apr 2023; assessed 27 Jun 2023 (74 d after latest application)	Visible thinning	-
5	51	M	Xanthelasma; multiple lesion sites / papulonodular	90%	1	1 Mar–1 Apr 2023 (31 d; 4.4 wk)	Visible thinning	-
6	47	F	XP; multiple lesion sites /flat plaque	90%	1	1 Jan–7 Mar 2022 (65 d; 9.3 wk)	Visible thinning	-
7	57	F	XP; multiple lesion sites / flat plaque	90%	3	8, 13 & 28 Oct 2021; assessed 23 Dec 2021 (56 d after latest application)	Visible thinning	-
8	55	F	XP; multiple lesion sites / flat plaque	90%	3	16 Apr, 2 Jul & 18 Jul 2022; assessed 23 Aug 2022 (36 d after latest application)	Visible thinning	-
9	44	F	XP; multiple lesion sites / papulonodular	90%	1	16 Jun–20 Jul 2023 (34 d; 4.9 wk)	Visible thinning	Scarring, post-inflammatory hyperpigmentation
10	53	F	XP; multiple lesion sites / flat plaque	90%	2	8 & 14 Apr 2023; assessed 19 Apr 2023† (5 d after latest application)	Visible thinning	crusting

2.6 Treatment Sessions and Follow-up

The number of TCA applications was determined according to lesion distribution and clinical response. Six patients underwent one recorded application/session, two under-

went two applications, and two underwent three applications. In patients receiving multiple applications, some treatments were performed at different lesion sites. Patients subsequently underwent clinical follow-up to assess changes in the treated lesions.

2.7 Outcome Assessment

Treatment response was evaluated clinically by comparing the appearance of the xanthelasma lesions before treatment and during follow-up, supported by serial clinical photographs. Clinical photographs were obtained during routine practice and were not fully standardized with respect to lighting, camera distance, eyelid position, and image framing. The principal clinical outcome was visible reduction or thinning of the treated lesion. Because this was a descriptive case series, no validated quantitative clearance score was used. No recurrence was documented during the available follow-up period.

2.8 Ethical Considerations

This study obtained approval from the Health Research Ethics Committee, Faculty of Medicine, Universitas Malikussaleh No. 64/UN45.2.6/KEPK/2026. Written informed consent for the use of clinical data and publication of clinical photographs was obtained from all patients.

3 Results

Ten patients with xanthelasma palpebrarum (nine women and one man), aged 32–60 years, underwent treatment with topical 90% TCA. Six patients underwent one recorded TCA application, two underwent two applications, and two underwent three applications, with some repeated applications performed at different lesion sites. All 10 patients demonstrated clinician-observed visible thinning of the treated xanthelasma lesions during follow-up. One patient developed scarring and post-inflammatory hyperpigmentation, while another developed crusting during early follow-up after treatment.



Fig. 1. Clinical appearance of xanthelasma before and after trichloroacetic acid (TCA) therapy in three patients. Patient 1 (Mrs F, 60 years old): (1a) before TCA therapy on 3 January 2022 and (1b) follow-up on 10 March 2022. Patient 2 (Mrs S, 39 years old): (2a) before TCA therapy on 28 June 2022 and (2b) follow-up on 9 August 2022. Patient 3 (Mrs RZ, 32 years old): (3a) before TCA therapy on 21 January 2023 and (3b) follow-up on 6 March 2023. Follow-up images demonstrate a reduction in the thickness of the xanthelasma lesions.



Fig. 2. Clinical appearance of xanthelasma before and after trichloroacetic acid (TCA) therapy in three patients. (4a) TCA therapy on 28 December 2022, (4b) TCA therapy at a different lesion site on 14 April 2023, and (4c) follow-up on 27 June 2023. Patient 5 (Mr H, 51 years old): (5a) before TCA therapy on 1 March 2023 and (5b) follow-up on 1 April 2023. Follow-up images demonstrate a reduction in the thickness of the xanthelasma lesions.

Patient 6 was a 47-year-old woman (Mrs S) who underwent trichloroacetic acid (TCA) therapy for xanthelasma on 1 January 2022. She was subsequently observed and returned for follow-up on 7 March 2022. At follow-up, a reduction in the thickness of the xanthelasma lesion was observed. Patient 7 was a 57-year-old woman (Mrs II) who underwent TCA therapy for xanthelasma. TCA was applied to different areas of the lesion on three separate occasions: 8 October, 13 October, and 28 October 2021. The patient was subsequently observed and returned for follow-up on 23 December 2021. Clinical evaluation at follow-up demonstrated a reduction in the thickness of the xanthelasma lesions (Fig 3).



Fig. 3. Clinical outcomes following TCA therapy in Patients 6–7.

Patients 8–10 demonstrated varying clinical responses following TCA therapy. Patient 8 (Mrs Y, 55 years) received TCA applications at different lesion sites on three occasions, followed by a reduction in xanthelasma thickness at follow-up. Patient 9 (Mrs M, 44 years) also showed lesion thinning after treatment, accompanied by scarring and post-inflammatory hyperpigmentation. In Patient 10 (Mrs N, 53 years), TCA was applied to different lesion sites on two occasions; crusting remained visible at the subsequent follow-up (Fig 4).



Fig. 4. Clinical outcomes following TCA therapy in Patients 8–10.

4 Discussion

In this retrospective, single-center descriptive case series, 10 patients with xanthelasma palpebrarum, comprising nine women and one man aged 32–60 years, were treated with topical 90% TCA. All patients demonstrated clinician-observed visible thinning or reduction of the treated xanthelasma lesions during the available follow-up period. Patients underwent one to three recorded TCA applications; however, in several patients, additional applications were performed at different lesion sites rather than representing repeated treatment of the same lesion. One patient developed scarring and post-inflammatory hyperpigmentation, while another developed crusting during early follow-up after treatment. These findings are broadly consistent with previous studies showing that moderate-to-high concentrations of TCA can produce clinically apparent improvement in xanthelasma, although pigmentary alterations, scarring, and other local treatment reactions remain recognized complications [6–8,10]. Importantly, because treatment response in the present series was assessed descriptively by clinical examination and serial photographs, without a validated quantitative clearance scale, the observed improvement should be interpreted as clinician-observed lesion reduction rather than as evidence of 100% efficacy or complete clearance.

TCA is a caustic chemical peeling agent that produces controlled chemical tissue injury through protein precipitation and coagulation (keratocoagulation) within the epidermis and, depending on the depth of penetration, the superficial dermis. This protein coagulation produces the characteristic white “frosting,” which is commonly used as a visible clinical endpoint during TCA application, although it provides only an approximate indication of treatment depth [9]. Xanthelasma palpebrarum is characterized histologically by aggregates of lipid-laden foam cells or histiocytes, particularly around

dermal vessels in the superficial reticular dermis, providing a rationale for focal chemical destruction of superficial lesional tissue [1]. Following TCA-induced coagulative injury and tissue necrosis, epidermal regeneration and re-epithelialization occur as part of the subsequent wound-healing response [9]. The clinical effect and depth of TCA-induced injury are influenced by several factors, including TCA concentration, the amount or number of applications, application technique, and characteristics of the treated lesion; consequently, careful focal application is especially important in the thin periocular skin [4,6]. TCA also offers practical advantages for xanthelasma treatment because it is relatively simple, inexpensive, and does not require specialized laser or surgical equipment [5,7]. Nevertheless, higher concentrations and deeper penetration may increase the risk of pigmentary alteration and scarring, emphasizing the importance of controlled application and appropriate patient and lesion selection [4,6,7].

The clinical response observed in the present case series is broadly consistent with previous studies demonstrating that moderate-to-high concentrations of TCA can produce clinically apparent improvement in xanthelasma palpebrarum. In our series, all 10 patients showed clinician-observed visible thinning or reduction of the treated lesions after one to three recorded applications of 90% TCA; however, this finding represents descriptive clinical improvement rather than complete clearance. Haque and Ramesh evaluated 50%, 70%, and 100% TCA in 51 patients and demonstrated that treatment response varied according to lesion morphology: papulonodular lesions required fewer applications with 100% TCA, whereas 70% and 100% TCA produced similar responses in flat plaques, and macular lesions generally responded to a single application across the tested concentrations [6]. Similarly, Mourad et al. compared 35%, 50%, and 70% TCA with CO_2 laser and found that 70% TCA produced greater clinical improvement with fewer treatment sessions than the lower TCA concentrations [7]. More recently, Sapra et al. included 77 patients treated with 80% TCA and reported clinician-assessed improvement in 70 of 72 patients with available clinician assessments (97.2%) [10]. Taken together, these findings support the clinical activity of high-concentration TCA for xanthelasma; nevertheless, direct comparison of efficacy between these studies and the present series should be made cautiously because of differences in TCA concentration, lesion morphology, treatment schedules, follow-up duration, and outcome definitions. In particular, because no validated quantitative clearance scale was used in the present series, the observed response should not be interpreted as evidence of 100% efficacy or complete lesion clearance.

The number of TCA applications required for xanthelasma treatment may vary according to lesion burden, distribution, thickness, morphology, and the concentration of TCA used, supporting an individualized rather than uniform treatment approach. In the present series, patients received one to three recorded applications, and some additional applications were performed at different lesion sites rather than representing repeated treatment of the same lesion. Previous studies have demonstrated that the clinical response to TCA differs according to xanthelasma morphology. Haque and Ramesh found that papulonodular lesions required fewer applications with 100% TCA than with 70% or 50% TCA, whereas flat plaques responded similarly to 70% and 100% TCA, and macular lesions generally responded to a single application even at 50% concentration, indicating that higher TCA concentrations are not necessarily required for all

lesion types.6 Mourad et al. similarly showed that increasing TCA concentration from 35% or 50% to 70% reduced the number of treatment sessions, further suggesting that both lesion characteristics and treatment concentration influence the treatment course.7 More recently, Kumar et al. reported that papulonodular morphology was associated with treatment failure following 70% TCA, reinforcing the clinical relevance of lesion morphology when selecting treatment [11]. In our case series, seven patients had flat-plaque lesions and three had papulonodular lesions; however, lesion dimensions and thickness were not assessed using standardized measurements, the number of patients within each morphological subgroup was small, and treatment response was evaluated descriptively rather than by a validated quantitative clearance score. Therefore, no formal relationship between lesion morphology and treatment response can be established from the present series, and the observed differences should be interpreted descriptively.

The safety findings in the present series are consistent with the recognized adverse-effect profile of TCA, particularly when high concentrations are applied to the thin periocular skin. Patient 9 developed scarring and post-inflammatory hyperpigmentation following 90% TCA treatment, whereas Patient 10 showed crusting five days after the most recent application. Previous studies of TCA for xanthelasma have reported erythema, hypopigmentation, hyperpigmentation, and scarring as treatment-related adverse events, with pigmentary changes being among the most frequently observed complications [4,7]. Higher-concentration TCA produces deeper chemical injury and therefore requires precise focal application because excessive penetration may increase the risk of dyschromia, delayed healing, and scarring [4]. Protection of the surrounding normal skin with petrolatum and careful shielding of the ocular surface are particularly important during periocular application, as pooling or inadvertent contact of a caustic peeling agent around the eyelid may cause excessive tissue injury or potentially serious ocular complications [4,12]. In the present series, petroleum jelly was applied to the surrounding skin and ocular protection was used during treatment. Importantly, the crusting observed in Patient 10 during early follow-up should be distinguished from a persistent complication: crust formation can occur during the early healing phase after chemical injury, whereas persistent dyspigmentation or scarring, as observed in Patient 9, represents a more clinically significant adverse outcome. Accordingly, longer follow-up is necessary to determine whether early local reactions resolve as part of normal re-epithelialization or persist as treatment-related sequelae.

No recurrence was documented during the available follow-up period in the present case series; however, this finding should be interpreted cautiously because the duration of follow-up after the most recent TCA application was relatively short and heterogeneous, ranging from 5 to 74 days. Longer surveillance is particularly important in xanthelasma palpebrarum because recurrence may become apparent months or even years after apparently successful treatment. Cannon et al. evaluated 95% TCA in 102 patients and, among 44 patients who underwent clinical review, reported nine persistent lesions and four recurrences at a mean follow-up of 14.3 months; in a longer-term telephone assessment performed at a mean of 31.8 months after the last TCA treatment, 22 of 51 patients reported recurrence and nine reported persistent lesions.8 These findings indicate that short-term clinical improvement does not necessarily predict durable lesion

clearance. Therefore, the absence of documented recurrence in our series should be regarded as a short-term observation rather than evidence of sustained recurrence-free outcome, and longer, standardized follow-up is required to accurately determine recurrence after treatment with 90% TCA.

Topical TCA occupies a practical position among the available treatments for xanthelasma palpebrarum because it is technically simple, relatively inexpensive, and can be performed without specialized laser equipment or an operating theatre. However, treatment selection should be individualized according to lesion size, depth, morphology, and location, as well as operator experience, patient preference, the risk of dyspigmentation or scarring, and the local availability of treatment modalities.4 Alternative approaches include surgical excision, CO_2 laser, Er:YAG laser, and electrosurgical or radiofrequency-based techniques, each of which has distinct advantages and limitations. A systematic review of 49 studies involving 1,329 patients found that surgical treatment may be more appropriate for larger or deeper lesions, whereas laser and electrosurgical techniques are generally more suitable for smaller and more superficial lesions; CO_2 and Er:YAG lasers were among the most frequently studied laser modalities. Importantly, the available literature remains dominated by retrospective and single-arm studies, with relatively few direct comparative trials, and therefore no single treatment modality can currently be regarded as universally superior for all forms of xanthelasma palpebrarum [4]. Accordingly, the findings of the present case series should position 90% TCA as a feasible and accessible treatment option for selected patients rather than as a universally preferred or superior therapy.

This case series has several strengths, including its representation of real-world dermatologic practice, the inclusion of 10 eligible patients treated with a specifically documented concentration of 90% TCA in a consistent single-center clinical setting, and the availability of serial clinical photographs to support assessment of treatment response. Importantly, the series also reports adverse outcomes, including scarring, post-inflammatory hyperpigmentation, and early post-treatment crusting, rather than selectively presenting favorable results, thereby providing a more balanced description of the clinical experience with high-concentration TCA. Nevertheless, several limitations should be considered when interpreting these findings. The retrospective design, small sample size, single-center setting, and absence of a control or comparator group preclude conclusions regarding comparative efficacy. In addition, lesion dimensions and thickness were not measured using standardized methods, the number and anatomical location of TCA applications varied among patients, clinical photographs obtained during routine practice were not fully standardized, and treatment response was assessed as clinician-observed visible thinning rather than with a validated quantitative clearance scale. The follow-up period was also heterogeneous and relatively short, limiting reliable assessment of long-term recurrence. Furthermore, because eligibility required adequate clinical records and follow-up photographs, selection bias cannot be excluded. These limitations are consistent with broader concerns in the xanthelasma literature, in which most published studies remain retrospective and single-arm, highlighting the need for standardized prospective comparative studies [4-5]. Accordingly, the present findings should be interpreted as descriptive evidence supporting the feasibility and

short-term clinical utility of 90% TCA in selected patients rather than as proof of efficacy, superiority, or durable lesion clearance.

5 Conclusion

Topical 90% TCA was associated with clinician-observed visible reduction of xanthelasma palpebrarum lesions in all 10 patients in this retrospective, single-center case series. The treatment was technically simple and feasible in routine dermatologic practice, although adverse outcomes included scarring with post-inflammatory hyperpigmentation in one patient and early post-treatment crusting in another. No recurrence was documented during the available follow-up period; however, the relatively short and heterogeneous follow-up precludes conclusions regarding long-term recurrence. Because treatment response was assessed descriptively without a validated quantitative clearance scale or comparator group, these findings should be interpreted as short-term clinical improvement rather than evidence of complete clearance or definitive treatment efficacy. Topical 90% TCA may therefore represent a practical and accessible treatment option for selected patients with xanthelasma palpebrarum, provided that careful application and appropriate patient and lesion selection are undertaken. Prospective comparative studies using standardized outcome assessment, systematic adverse-event reporting, and longer follow-up are required to better establish its efficacy, safety, and recurrence profile.

Acknowledgements. None.

Disclosure of Interests. The authors declare no conflicts of interest.

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