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Evaluation and Comparison of the Efficacy and Safety of Cryotherapy and Electrosurgery in the Treatment of Sebaceous Hyperplasia, Seborrheic Keratosis, Cherry Angioma, and Skin Tag: A Blinded Randomized Clinical Trial Study

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ABSTRACT

Background: Cryotherapy and electrosurgery are two commonly used methods to remove sebaceous hyperplasia, seborrheic keratosis, cherry angioma, and skin tags, which can be bothersome and uncomfortable. We compare the effectiveness and adverse effects of cryotherapy and electrosurgery in treating these skin conditions.

Method: The study was conducted as an assessor-blind trial. The 32 lesions in each lesion group were divided into two treatment groups, cryotherapy and electrosurgery, using sealed envelopes. We collected baseline information, which included age, gender, lesion location, and consent, from the patients. Follow-up visits were scheduled at 2 weeks, 1 month, and 3 months after the initial treatment session to evaluate the response rate of the lesions. Based on before-after clinical images, this evaluation encompassed patient and physician satisfaction (no change, little, somewhat, good, and excellent), and any potential complications.

Results: The mean age of cryotherapy group was 52.04 ± 11.59 years, while the mean age in the electrosurgery group was 50.48 ± 10.70 years ($p > 0.05$). Regarding gender, 15 (23.4%) in the cryotherapy and 24 (37.5%) in the electrosurgery were female ($p > 0.05$). Physician and patient satisfaction increased significantly over time in the cryotherapy and electrosurgery groups ($p < 0.001$). For sebaceous hyperplasia, cherry angioma and skin tags, the degree of satisfaction of patients and physicians was significantly higher for electrosurgery than cryotherapy during follow-up ($p < 0.05$). However, seborrheic keratosis responded better to cryotherapy. Hypopigmentation and depigmentation occurred in 2 (3.1%) and 4 (6.3%) of the cryotherapy cases, respectively. Hypopigmentation and atrophic scars also occurred in 4 (6.3%) and 2 (3.1%) of the cases in the electrosurgical group in different sessions.

Conclusion: It appears that electrosurgery is more effective in the treatment of sebaceous hyperplasia, cherry angioma and skin tags, while cryotherapy is more effective in the treatment of seborrheic keratosis.

Afsaneh Sadeghzadeh-Bazargan and Mojtaba Shafiei contributed equally to preparing this article and are co-first authors.

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1 | Introduction

Skin conditions such as sebaceous hyperplasia, seborrheic keratosis, cherry angioma, and skin tag are common benign growths that can be esthetically bothersome and sometimes cause discomfort [1–3]. Cryotherapy and electrosurgery are two commonly used treatment methods to remove these skin abnormalities [4]. This comparative analysis aims to provide an in-depth examination of the advantages, disadvantages, and efficacy of cryotherapy and electrosurgery in treating skin tags, seborrheic keratosis, sebaceous hyperplasia, and cherry angioma.

Sebaceous hyperplasia refers to the enlargement of the sebaceous glands on the skin. Cryotherapy involves applying liquid nitrogen to freeze and shrink the affected glands. Electrosurgery utilizes a high-frequency electrical current to electrocoagulate and destroy the enlarged sebaceous glands [5–9].

Seborrheic keratosis is a common noncancerous skin lesion characterized by a waxy or scaly appearance which increases in number and size with age [10]. Cryotherapy targets and freezes the affected area, causing the growth to gradually flake off. Electrosurgery, on the other hand, utilizes a low-power electric current to burn and remove the seborrheic keratosis [1, 11].

Cherry angiomas are benign, small red or purple raised growths caused by an overgrowth of blood vessels. Cryotherapy freezes the cherry angioma, causing it to dry up and fall off. Electrosurgery involves delivering a high-frequency electric current to heat and cauterize the blood vessel, leading to the cherry angioma's removal [3, 4].

Skin tags are small, benign growths that often occur in areas of skin friction. Cryotherapy involves freezing the skin tag using liquid nitrogen, causing the tag to shrink and eventually fall off. Electrosurgery, on the other hand, uses a high-frequency electrical current to burn and remove the skin tag [4, 12].

Although cryotherapy and electrosurgery are widely known techniques, their effectiveness in treating sebaceous hyperplasia, seborrheic keratosis, cherry angioma, and skin tags has not been adequately studied. Furthermore, despite dermatologists frequently employing these methods as readily available, safe, and cost-effective options for treating the aforementioned conditions, no studies have been conducted to compare their therapeutic effectiveness and determine the preferred approach. By evaluating the therapeutic efficacy, side effects, treatment duration, and costs associated with both methods, this study aims to identify the optimal treatment approach for dermatologists and patients, aiding them in making informed decisions about the appropriate course of treatment.

2 | Materials and Methods

2.1 | Participants

This study included four groups of lesions diagnosed clinically by a dermatologist: sebaceous hyperplasia, seborrheic keratosis, cherry angioma, and skin tag. Each group consisted of 32 lesions. The lesions were randomly assigned to two treatment

groups: group A received cryotherapy, and group B received electrosurgery. Skin phenotype of all patients was 3 or 4 and baseline information, such as age, gender, and lesion location, was collected and recorded using a study checklist.

Patients were fully informed about the procedures and provided written consent before participating in the trial. They were assured that the procedures would not result in complications or incur any costs. The study population consisted of randomly selected patients between the ages of 18 and 70 who met the inclusion and exclusion criteria. Inclusion criteria involved having a clinical diagnosis of one of the specified conditions, while exclusion criteria included wound site infection, a history of keloid, pregnancy and breastfeeding, malignancy, and immunodeficiency. Patients with an intracardiac device were excluded from the electrosurgery group, and those with intolerance to cold, a history of Raynaud's phenomenon, or vesicular diseases involving surface sensation were excluded from the cryosurgery group. Discontinuation of treatment occurred if the patient could not tolerate the treatment or did not provide consent to continue.

2.2 | Randomization and Blinding

The patients were split into two intervention groups using a randomized list. The treatment for each patient was randomly selected by opening sealed envelopes containing codes A and B.

To ensure unbiased results, the study was conducted as a single-blind trial. The physician who evaluated the clinical images and the statistical expert analyzing the data were unaware of the treatment method used on each side of the face.

2.3 | Interventions

Electrosurgery was performed using biterminal monopolar electrocoagulation mode with a grade of 20 to 40, following anesthesia with 0.2 to 0.5 cc of 2% lidocaine. Cryosurgery involved the use of liquid nitrogen spray from a distance of 1 to 2 cm, ensuring the entire lesion was frozen with a 1 mm margin. For complete remission, in Group A lesions, if needed, electrosurgery was repeated 4 weeks later. For Group B lesions, cryosurgery was repeated 2 and 4 weeks later, if needed.

2.4 | Assessment Methods

Follow-up visits were scheduled at 2 weeks, 1 month, and 3 months after the initial treatment session. During these visits, the response rate of each lesion was evaluated by both the patient and a dermatologist using a global assessment scoring system ranging from 1 to 5 (no change, little, somewhat, good, and excellent) and based on clinical images. Any complications, such as discoloration, scarring, or infection, were also recorded.

2.5 | Statistical Analysis

Descriptive statistics including mean (standard deviation and frequency percentage) was used to analyze continuous and

categorical data respectively. To compare continuous and categorical data, an Independent sample *t*-test and chi-square, or Fisher exact test was used, respectively. The Friedman test was used to compare ordinal variables in more than two-time points. The statistical significance level was considered at α : 0.05 [13]. All data were analyzed using SPSS, version 22.0, Armonk, NY, USA: IBM Corp. Released 2015.

2.6 | Ethical Principles

All collected information was kept confidential and evaluated without specific names. The research adhered to the ethical principles outlined in the Helsinki Declaration (IRCT20211210053344N1). This study was approved by the Research Council under the ethics code number IR.IUMS.FMD.REC.1400.420.

3 | Results

3.1 | Basic Characteristics

The average age of cases in the cryotherapy and electro-surgery group was 52.04 ± 11.59 and 50.48 ± 10.70 , respectively, and there was no statistically significant difference between the two groups (P : 0.12). Regarding gender, 15 (23.4%) and 24 (37.5%) cases in cryotherapy and electro-surgery were females respectively (P : 0.35). The lesion location in 6 (9.4%), 28 (43.8%), 12 (18.8%), 16 (25.0%), and 2 (3.1%) of patients in the cryotherapy and electro-surgery group was scalp, face, neck, trunk and limb respectively (p -value > 0.05). More details are shown in Table 1.

3.2 | Comparison of Study Outcomes

3.2.1 | Patient's Satisfaction

In comparing the patients' satisfaction in different sessions after the treatment, at the end of the second session, 6 (9.4%) and 12 (18.8%) of patients in the cryotherapy and electro-surgery methods had excellent satisfaction levels (p -value < 0.001). At the end of the third session, 12 (18.8%) and 37 (57.8%) patients in the cryotherapy and electro-surgery methods had excellent satisfaction levels (p -value < 0.001). This amount reached 31 (48.4%) and 42 (65.6%) at the end of the fourth session in the

cryotherapy and electro-surgery methods. In other words, the level of patient satisfaction level in electro-surgery methods in different follow-up sessions was significantly higher than in the cryotherapy method. As shown in Table 2 the patient's satisfaction level increased significantly in cryotherapy and electro-surgery groups (p -value = 0.001) (Table 2).

The patient's satisfaction according to the lesion type at the end of the second session in each group is shown in Table 3. According to this table, in the cryotherapy group, patients with seborrheic keratosis had better satisfaction than other subgroups (p -value < 0.05). Also, in the electro-surgery group, patients with skin tags had better satisfaction levels than other subgroups (p -value = 0.001). At the end of the third session, the patient's satisfaction in the sebaceous hyperplasia was better compared to other subgroups in the cryotherapy (p -value = 0.001) but in the electro-surgery group patients who had the skin tag showed better satisfaction compared to other subgroups but the observed difference in subgroups was not significant (p -value > 0.05). Finally, in the last session, 13 (81.2%) cases in the seborrheic keratosis (p -value > 0.05) and 7 (43.8%) cases in the skin tag group (p -value > 0.05) had excellent satisfaction levels in the cryotherapy and electro-surgery groups, respectively (Table 3).

3.2.2 | Physician's Satisfaction

Regarding the physician's satisfaction in different sessions after the treatment, at the end of the second session, 4 (6.3%) and 8 (12.5%) patients in the cryotherapy and electro-surgery methods had excellent satisfaction levels (p -value < 0.01). At the end of the third session, 14 (21.9%) and 41 (64.1%) physicians in the cryotherapy and electro-surgery methods had excellent satisfaction levels (p -value < 0.01). These amounts reached 31 (48.4%) and 48 (75.0%) at the end of the fourth session in the cryotherapy and electro-surgery methods. In other words, the level of physician satisfaction level in electro-surgery methods in different follow-up sessions was significantly higher than the cryotherapy method. The physician's satisfaction level increased significantly in cryotherapy and electro-surgery groups (p -value < 0.001) (Table 2).

In the cryotherapy group, physicians were more satisfied with the results of the treatment of patients with seborrheic keratosis lesions (p -value < 0.001) at the end of the second session,

TABLE 1 | Baseline characteristics of included cases ($n = 24$).

Variables	Subgroups	Cryotherapy n (%)	Electrosurgery n (%)	p -value
Gender	Female	15 (23.4)	24 (37.5)	0.12
	Scalp	6 (9.4)	2 (3.1)	
Lesion location	Face	28 (43.8)	31 (48.4)	0.35
	Neck	12 (18.8)	9 (14.1)	
	Trunk	16 (25.0)	16 (25.0)	
	Limb	2 (3.1)	6 (9.4)	
	Mean (SD)		Mean (SD)	
Age		52.04 (11.59)	50.48 (10.70)	0.54

TABLE 2 | Comparison of physician and patient satisfaction between studied groups.

Variables	Patients satisfaction	Cryotherapy n (%)	Electrosurgery n (%)	p-value	p-value changes in cryotherapy group	p-value changes in electrosurgery group
Second visit	No response	5 (7.8)	0 (0.0)	0.006	0.001	0.001
	Little	10 (15.6)	6 (9.4)			
	Somewhat	33 (51.6)	24 (37.5)			
	Good	10 (15.6)	22 (34.4)			
	Excellent	6 (9.4)	12 (18.8)			
Third visit	No response	0 (0.0)	0 (0.0)	0.001	0.001	0.001
	Little	1 (1.5)	2 (3.1)			
	Somewhat	8 (12.5)	3 (4.7)			
	Good	43 (67.1)	22 (34.4)			
	Excellent	12 (18.8)	37 (57.8)			
Fourth visit	No response	0 (0.0)	0 (0.0)	0.14		
	Little	0 (0.0)	0 (0.0)			
	Somewhat	3 (4.7)	2 (3.1)			
	Good	30 (46.9)	20 (31.3)			
	Excellent	31 (48.4)	42 (65.6)			
	physician satisfaction	Cryotherapy n (%)	Electrosurgery n (%)	p-value	p-value in cryotherapy group	p-value changes in electrosurgery group
Second visit	No response	0 (0.0)	0 (0.0)	0.001	0.001	0.001
	Little	22 (34.4)	7 (10.9)			
	Somewhat	30 (46.9)	8 (12.5)			
	Good	8 (12.5)	41 (64.1)			
	Excellent	4 (6.3)	8 (12.5)			
Third visit	No response	0 (0.0)	0 (0.0)	0.001	0.001	0.001
	Little	0 (0.0)	0 (0.0)			
	Somewhat	23 (35.9)	7 (10.9)			
	Good	27 (42.2)	16 (25.0)			
	Excellent	14 (21.9)	41 (64.1)			
Fourth visit	No response	0 (0.0)	0 (0.0)	0.001	0.001	0.001
	Little	0 (0.0)	0 (0.0)			
	Somewhat	0 (0.0)	2 (3.1)			
	Good	33 (51.6)	14 (21.9)			
	Excellent	31 (48.4)	48 (75.0)			

Figure 1A–D, while the most satisfaction in the electrosurgery group was related to the skin tag (p -value > 0.05), Figure 2A,B. The results were the same at the end of the third and fourth sessions (Table 4).

3.2.3 | Side Effects

Regarding the side effects in different sessions after the treatment, at the end of the second session, 58 (90.6%) and 60 (93.8%) patients in the cryotherapy and electrosurgery methods

were without adverse effects. Also, 4 (6.30%) of patients in cryotherapy had depigmentation (p -value > 0.05). At the end of the third session, 58 (90.6%) and 59 (92.2%) of patients in the cryotherapy and electrosurgery methods were without adverse effects. Also, 4 (6.3%) of patients in cryotherapy had depigmentation. In this session, the 2 (3.1%) cases in electrosurgery methods experienced atrophic scar (p -value > 0.05). And finally, at the end of the fourth session, 59 (92.2%) and 60 (93.8%) of patients in the cryotherapy and electrosurgery methods were without adverse effects. Also, 4 (6.3%) of patients in cryotherapy had depigmentation. In this session 2 (3.1%)

TABLE 3 | The patient's satisfaction according to the lesion type in two groups.

Patients Satisfaction	Cryotherapy n (%)						Electrosurgery n (%)					
	Lesion type						Lesion type					
	Sebaceous hyperplasia (N:16)	Seborrheic keratosis (N:16)	Cherry angioma (N:16)	Skin tag (N:16)	Sebaceous hyperplasia (N:16)	Seborrheic keratosis (N:16)	Cherry angioma (N:16)	Skin tag (N:16)	Sebaceous hyperplasia (N:16)	Seborrheic keratosis (N:16)	Cherry angioma (N:16)	Skin tag (N:16)
Second visit												
No response	0 (0.00)	0 (0.00)	2 (12.50)	3 (18.8)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Little	3 (18.8)	2 (12.50)	5 (31.3)	0 (0.00)	1 (6.3)	2 (12.50)	3 (18.8)	0 (0.00)	2 (12.50)	3 (18.8)	0 (0.00)	0 (0.00)
Somewhat	13 (81.3)	3 (18.8)	9 (56.3)	8 (50.00)	11 (68.8)	8 (50.00)	2 (12.50)	8 (50.00)	8 (50.00)	2 (12.50)	3 (18.8)	3 (18.8)
Good	0 (0.00)	7 (43.8)	0 (0.00)	3 (18.8)	4 (25.0)	4 (25.0)	8 (50.00)	4 (25.0)	4 (25.0)	8 (50.00)	6 (37.5)	6 (37.5)
Excellent	0 (0.00)	4 (25.0)	0 (0.00)	2 (12.50)	0 (0.00)	2 (12.50)	0 (0.00)	0 (0.00)	2 (12.50)	3 (18.8)	7 (43.8)	7 (43.8)
P-Value						0.03						0.001
Third Visit												
Little	0 (0.00)	0 (0.00)	0 (0.00)	1 (6.3)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	2 (12.50)	0 (0.00)	0 (0.00)
Somewhat	0 (0.00)	9 (56.3)	4 (25.0)	4 (25.0)	0 (0.00)	3 (18.8)	0 (0.00)	0 (0.00)	3 (18.8)	0 (0.00)	0 (0.00)	0 (0.00)
Good	16 (100.0)	7 (43.8)	12 (75.0)	6 (37.5)	8 (50.00)	6 (37.5)	6 (37.5)	8 (50.00)	6 (37.5)	3 (18.8)	5 (31.3)	5 (31.3)
Excellent	0 (0.00)	0 (0.00)	0 (0.00)	5 (31.3)	8 (50.00)	5 (31.3)	5 (31.3)	8 (50.00)	7 (43.8)	11 (68.8)	11 (68.8)	11 (68.8)
P-Value						0.001						0.07
Fourth Visit												
Somewhat	0 (0.00)	0 (0.00)	2 (12.50)	1 (6.3)	0 (0.00)	2 (12.50)	0 (0.00)	0 (0.00)	2 (12.50)	0 (0.00)	0 (0.00)	0 (0.00)
Good	16 (100.0)	3 (18.8)	8 (50.0)	3 (18.8)	8 (50.0)	5 (31.3)	3 (18.8)	8 (50.0)	5 (31.3)	2 (12.50)	5 (31.3)	5 (31.3)
Excellent	0 (0.00)	13 (81.2)	6 (37.5)	12 (75.0)	8 (50.0)	13 (81.2)	12 (75.0)	8 (50.0)	9 (56.3)	14 (87.5)	11 (68.8)	11 (68.8)
P-Value						0.001						0.09



FIGURE 1 | (A, B) Seborrheic keratosis treatment with one session of electro-surgery. (C, D) Seborrheic keratosis treatment with one session of cryotherapy.

of cases in electro-surgery methods had atrophic scar (p -value > 0.05) (Table 5).

4 | Discussion

Skin diseases are among the most important challenges of health systems and impose a great economic burden on health systems globally [14]. Regardless of economic costs, these disorders affect the physical and mental health of patients and affect their quality of life [15]. Using traditional methods to treat these lesions leads to prolonged recovery time, relapses, and many side effects [16]. Recently various methods have been introduced to treat skin lesions. Among these treatment methods, light-based methods such

as argon YAG, Nd, KTP, intense pulsed light, and PDL, along with non-light-based interventions such as cryotherapy, electro-surgery, and sclerotherapy, are among the most common methods in the treatment of skin lesions [17]. As mentioned, even though dermatologists frequently use these methods as available, safe, and cost-effective options for the treatment of skin lesions, few studies have been conducted comparing the effectiveness of these methods. So due to the importance of the issue, the current study aimed to compare the therapeutic effectiveness and side effects of cryotherapy, and electro-surgery in the treatment of different skin lesions.

The current study results showed that the patient's satisfaction level increased significantly in cryotherapy and electro-surgery

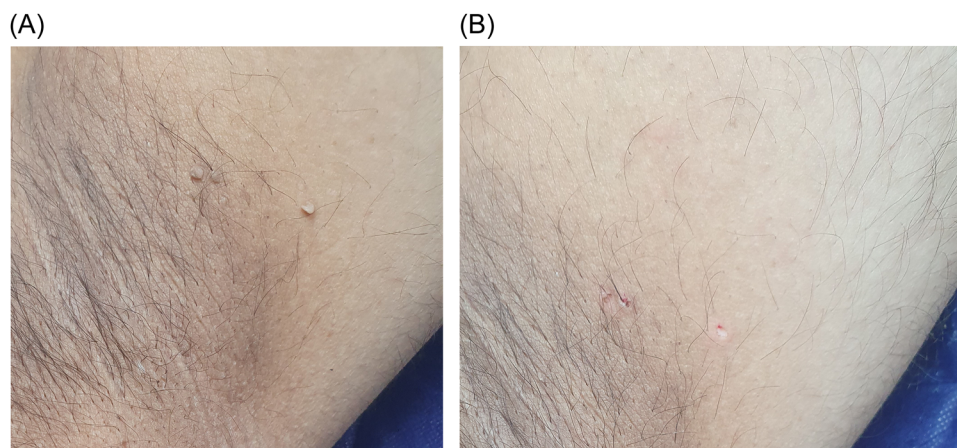


FIGURE 2 | (A, B) Axillary skin tag treatment with one session of electrocautery.

groups over time ($p: 0.001$). The level of patient satisfaction level in electrocautery methods in different follow-up sessions was significantly higher than in the cryotherapy method. Considering the lesion type, the satisfaction level in patients with seborrheic keratosis in cryotherapy and patients with skin tags in the electrocautery group, was significantly higher than other subgroups in different treatment sessions. Based on the mentioned results, it can be concluded that the effectiveness of different treatment methods can be different depending on the type of lesion. According to our results, the physician's satisfaction level increased significantly in cryotherapy and electrocautery groups, but the level of physician satisfaction level in electrocautery methods in different follow-up sessions was significantly higher than the cryotherapy method. According to the above results, and having more satisfaction with the electrocautery method from patients and doctors, it seems that the treatment results of this method were better than cryotherapy.

Regarding the side effects in different sessions after the treatment, our results showed that at the end of the second session, 58 (90.6%) and 60 (93.8%) patients in the cryotherapy and electrocautery methods were without complication. Also, 4 (6.30%) of patients in cryotherapy had depigmentation ($p: 0.10$). At the end of the third session, 58 (90.6%) and 59 (92.2%) of patients in the cryotherapy and electrocautery methods were without complication. Also, 4 (6.3%) of patients in cryotherapy had depigmentation. In this session, the 2 (3.1%) cases in electrocautery methods experienced atrophic scar ($p: 0.12$). And finally, at the end of the fourth session, 59 (92.2%) and 60 (93.8%) of patients in the cryotherapy and electrocautery methods were without adverse effects. Also, 4 (6.3%) of patients in cryotherapy had depigmentation. In this session 2(3.1%) of cases in electrocautery methods had atrophic scar ($p: 0.07$). Considering the mentioned results, it seems the side effects of electrocautery were less than cryotherapy.

Based on the search conducted by the authors, no similar study was found to accurately compare the results. Different researchers have investigated different methods to treat skin lesions [18–23]. In a study by Maryam Noorbakhsh which compared plasma exeresis and cryotherapy for the treatment of seborrheic keratosis, both methods were effective but after the second treatment sessions, plasma exeresis was more

effective compared to cryotherapy [24]. In the study by Divya Agrawal et al. which compared hydrogen peroxide and trichloroacetic acid in treatment of seborrheic keratosis, the results showed that the hydrogen peroxide was more effective compared to trichloroacetic acid in the treatment of seborrheic keratosis [25]. In another study by Sandra Tagliolatto et al., which evaluated the therapeutic effect of isotretinoin in the treatment of sebaceous hyperplasia, the results showed that decreasing trend in the number of sebaceous hyperplasia lesions after the treatment [9].

In the study by Edalat Khah et al., which compared cryotherapy and electrocautery in the treatment of pyogenic granuloma, the results showed that electrocautery is a more effective method with more efficiency in the treatment of pyogenic granuloma compared to cryotherapy, but cryotherapy treatment can be used as a beneficial method in children, and pregnant women, with large lesions [26]. Another study compared the effectiveness of cryotherapy and electrocautery in the treatment of cherry angioma, the results showed that cryotherapy and electrocautery had the same efficacy and safety in the treatment of small cherry angiomas [3]. A study by Singh et al., about the effectiveness of electrocautery by electrodesiccation and cryotherapy by liquid nitrogen spray in the treatment of plantar warts, the results showed that cryotherapy and electrocautery are safe methods with few complications in the treatment of plantar warts [27]. Faheema Afsar Khan et al., compared cryotherapy and mitomycin microneedling in the treatment of plantar warts, the efficacy of mitomycin microneedling in the treatment of warts was more effective compared to cryotherapy [28]. Based on the results of the current study and other research, it seems that all used methods in the treatment of skin lesions have acceptable effectiveness in the treatment of skin lesions, and the method that has fewer complications and greater satisfaction of patients and physicians will have priority.

Based on the results of the current study, limited side effects were observed in different sessions of treatment methods. In general, many side effects have been reported in different treatment methods. In a study that dealt with isotretinoin treatment in sebaceous hyperplasia dry skin and mucus were observed as side effects [9]. In a study that was performed to compare cryotherapy and curettage for the treatment of

TABLE 4 | The physician satisfaction according to the lesion type in two groups.

Physician Satisfaction	Cryotherapy n (%)						Electrosurgery n (%)					
	Lesion type						Lesion type					
	Sebaceous hyperplasia (N:16)	Seborrheic keratosis (N:16)	Cherry angioma (N:16)	Skin tag (N:16)	Sebaceous hyperplasia (N:16)	Seborrheic keratosis (N:16)	Cherry angioma (N:16)	Skin tag (N:16)	Sebaceous hyperplasia (N:16)	Seborrheic keratosis (N:16)	Cherry angioma (N:16)	Skin tag (N:16)
Second visit												
No response	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Little	12 (75.0)	0 (20.0)	7 (43.7)	3 (18.8)	2 (12.5)	2 (12.5)	3 (18.8)	2 (12.5)	2 (12.5)	3 (18.8)	0 (0.0)	0 (0.0)
Somewhat	2 (12.50)	9 (56.3)	9 (56.3)	10 (62.5)	2 (12.5)	2 (12.5)	2 (12.5)	2 (12.5)	2 (12.5)	2 (12.5)	2 (12.50)	2 (12.50)
Good	2 (12.50)	5 (31.3)	0 (0.00)	1 (6.3)	12 (75.0)	12 (75.0)	1 (6.3)	12 (75.0)	12 (75.0)	8 (50.0)	9 (56.30)	9 (56.30)
Excellent	0 (0.00)	2 (12.5)	0 (0.00)	2 (12.5)	0 (0.00)	0 (0.00)	2 (12.5)	0 (0.00)	0 (0.00)	3 (18.8)	5 (31.30)	5 (31.30)
P-Value						0.001					0.13	
Third Visit												
Somewhat	11 (68.8)	0 (0.00)	7 (43.8)	5 (31.3)	3 (18.8)	2 (12.5)	5 (31.3)	3 (18.8)	2 (12.5)	2 (12.5)	0 (0.00)	0 (0.00)
Good	3 (18.8)	9 (56.3)	9 (56.3)	6 (37.5)	1 (6.3)	7 (43.8)	6 (37.5)	1 (6.3)	7 (43.8)	3 (18.8)	5 (31.3)	5 (31.3)
Excellent	2 (12.5)	7 (43.8)	0 (0.00)	5 (31.3)	12 (75.0)	7 (43.8)	5 (31.3)	12 (75.0)	7 (43.8)	11 (68.8)	11 (68.8)	11 (68.8)
P-Value						0.001					0.12	
Fourth Visit												
Somewhat	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	2 (12.5)	0 (0.00)	0 (0.00)	2 (12.5)	0 (0.00)	0 (0.00)	0 (0.00)
Good	16 (100.0)	2 (12.5)	9 (56.3)	6 (37.5)	8 (50.00)	2 (12.5)	6 (37.5)	8 (50.00)	2 (12.5)	2 (12.5)	2 (12.5)	2 (12.5)
Excellent	0 (0.00)	14 (87.5)	7 (43.8)	10 (62.5)	8 (50.00)	14 (87.5)	10 (62.5)	8 (50.00)	12 (75.0)	14 (87.5)	14 (87.5)	14 (87.5)
P-Value						0.001					0.02	

TABLE 5 | The observed side effects over time in two groups.

Side effect	Subgroups	Cryotherapy <i>n</i> (%)	Electrosurgery <i>n</i> (%)	<i>p</i> -value
Second session	Without adverse effect	58 (90.6)	60 (93.8)	0.10
	Hypopigmentation	2 (3.1)	4 (6.3)	
	Depigmentation	4 (6.3)	0 (0.0)	
Third session	Without adverse effect	58 (90.6)	59 (92.2)	0.12
	Hypopigmentation	2 (3.1)	3 (4.7)	
	Depigmentation	4 (6.3)	0 (0.0)	
	Atrophic scar	0 (0.0)	2 (3.1)	
Fourth session	Without adverse effect	59 (92.2)	60 (93.8)	0.07
	Hypopigmentation	1 (1.6)	2 (3.1)	
	Depigmentation	4 (6.3)	0 (0.0)	
	Atrophic scar	0 (0.0)	2 (3.1)	

pyogenic granuloma, the most important reported complication was cosmetic problems, also some patients in the cryotherapy group had no scar or pigmentation abnormality [29]. Another study showed that the most common complication related to cryotherapy seborrheic keratosis was hypo pigmentation [24]. Also complications such as pain, scarring, post inflammatory depigmentation. in electro-surgery [30]. According to the mentioned points, it seems that the complications caused by the cryotherapy method are a bit more than other treatment methods, but considering the therapeutic benefits, it seems that using this treatment method is inevitable. Finally, the current study showed the satisfaction of patients and physicians and the low complications of electrosurgery and cryotherapy methods in the treatment of skin lesions. However, according to the obtained results, it seems that the electrosurgery method is most effective in the treatment of these lesions. But, this is not a reason to delay the use of the cryotherapy method because each of the methods used may be highly effective depending on the different conditions of the disease as well as patients. Multiple treatment sessions and long-term follow-up were one of the limitations of the current study. Also, the comparison of results in different subgroups of lesions is affected by the sample size, so a small sample size can lead to an underestimation of results in subgroups of the lesions. Finally, treatment outcomes and complications are affected by lesion size, which was not measured in this study.

5 | Conclusion

The study found that both cryotherapy and electrosurgery are effective treatments for sebaceous hyperplasia, seborrheic keratosis, cherry angioma, and skin tags. While both methods had some minor complications, the results suggest that electrosurgery is more effective in treating these lesions. However, both methods can be considered as alternatives to other treatment options for these skin lesions.

Author Contributions

Afsaneh Sadeghzadeh-Bazargan: conceptualization; data curation; methodology; project administration; supervision; writing-review &

editing. **Mojtaba Shafiei:** data curation; investigation; methodology; writing-original draft. **Najmolsadat Atefi:** investigation; methodology; supervision; visualization. **Abbas Dehghani:** visualization; writing-original draft. **Arezoo Pashaei:** writing-original draft. **Mehraneh Karimzadeh:** data curation; investigation; methodology. **Azadeh Goodarzi:** data curation; investigation; project administration; writing-review & editing.

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Disclosure

The lead author Azadeh Goodarzi affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

Consent

Informed consent was obtained from the patients for publication of the images and the rights of the subjects were protected. The authors have received permission to publish.

Conflicts of Interest

All authors have read and approved the final version of the manuscript had full access to all of the data in this study and takes complete responsibility for the integrity of the data and the accuracy of the data analysis. All authors declare no conflict of interest for this project.

Data Availability Statement

The data supporting the results of this study are available from the corresponding author.

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