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SYSTEMATIC REVIEW

Use of radiofrequency in the treatment of acne: a systematic review

Uso da radiofrequência no tratamento da acne: uma revisão sistemática

Uso de la radiofrecuencia en el tratamiento del acné: una revisión sistemática

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ABSTRACT | Acne, of great prevalence and impact, presents many forms that can be treated by hygiene, topical medications, and manual alternative interventions such as skin cleansing and electrotherapy. The use of radiofrequency in the treatment of acne aims to increase the temperature in the cutaneous tissue, causing several metabolic and structural reactions, such as stimulating neocollagenesis. This study aimed to investigate the use of high-frequency current as an adjunctive treatment for acne. This is a non-systematic review of indexed databases (MEDLINE, SciELO, LILACS). A total of 18 studies were included in this review and most of them related different treatment for acne associated with radiofrequency. Radiofrequency presents few complications and good results, besides having as an additional advantage the possibility of the patient returning to the routine immediately after application.

Keywords | Acne; Radiofrequency; Scar.

RESUMO | De grande prevalência e impacto, a acne apresenta muitas formas, que podem ser tratadas por meio de medidas de higienização, medicamentos tópicos e intervenções alternativas manuais, como limpeza de pele e uso de eletroterapia. A radiofrequência no tratamento da condição tem por objetivo produzir o aumento da temperatura no tecido cutâneo, ocasionando diversas reações metabólicas e estruturais, como o estímulo à neocolagênese. Este trabalho buscou investigar o uso da corrente de alta frequência como coadjuvante no tratamento da acne. Trata-se de uma revisão não sistemática de bases de dados indexadas (MEDLINE, SciELO, LILACS). Foram incluídos 18 estudos nesta revisão, a maioria deles relaciona diferentes recursos de tratamento para acne associados ao uso da radiofrequência. Verificou-se que a radiofrequência apresenta poucas complicações e bons resultados, além de ter como vantagem adicional a possibilidade de o paciente retornar à rotina imediatamente após a aplicação.

Descritores | Acne; Radiofrequência; Cicatriz.

RESUMEN | Con gran prevalencia e impacto, el acné puede tener muchas formas, las cuales pueden ser tratadas por medio de medidas de higiene, medicamentos tópicos e intervenciones manuales alternativas, como la limpieza de la piel y el uso de electroterapia. La radiofrecuencia en el tratamiento de esta afección tiene como objetivo aumentar la temperatura en el tejido de la piel, provocando diversas reacciones metabólicas y estructurales, como la estimulación de la neocolagénesis. Este trabajo pretendió investigar el uso de corriente de alta frecuencia como coadyuvante en el tratamiento del acné. Esta es una revisión no sistemática en las bases de datos indexadas (MEDLINE, SciELO, LILACS). En esta revisión se incluyeron 18 estudios, la mayoría de ellos abordaban diferentes recursos para el tratamiento del acné asociados al uso de la radiofrecuencia. Se encontró que la radiofrecuencia tiene pocas complicaciones y buenos resultados, además de la ventaja adicional de permitir al paciente volver a la rutina inmediatamente después de su aplicación.

Palabras clave | Acné; Radiofrecuencia; Cicatriz.

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INTRODUCTION

Acne is one of the most prevalent skin diseases, especially in the young population, peaking from 14 to 17 years in girls, and from 16 to 19 years in boys, but may also manifest in adulthood. About 80% of the adolescent population suffers from some type of acne during life[1].

The pathophysiology of acne is characterized by changes in sebaceous hyperplasia and keratinocytic activity of the hair follicle due to hormonal influences commonly present in adolescence. These alterations promote follicle colonization by *Propionibacterium acnes* and *Staphylococcus albus*[2] bacteria, responsible for the formation of free fatty acids with pro-inflammatory properties, culminating in the inflammatory/immune response that originate comedones and pustules, which can evolve to atrophic scars[3].

As consequence, acne can lead to a psychosocial impact, influencing daily activities and social relationships. Significant levels of anxiety and depression have already been observed in patients with this disease[4].

Despite the high prevalence and impact of acne, there are many forms of treatment available that vary according to the degree of involvement and may involve hygiene measures, topical (benzoyl peroxide) and oral (isotretinoin and tetracycline) medications, and manual alternative interventions such as skin cleansing and the use of electrotherapy[5,6].

In electrotherapy, radiofrequency aims to increase skin temperature, causing several metabolic and structural reactions, stimulation of neocollagenesis, skin retraction, and increased blood and lymphatic circulation (improving skin nutrition)[7]. Among other benefits, bactericidal, decongestant, regenerating, and healing effects can be highlighted.

Considering the number of studies on this theme in the literature, a systematic review is necessary to answer whether radiofrequency treatment is effective in the treatment of acne. As radiotherapy is a resource widely used in dermatological treatments, and can be associated with different techniques—including the treatment of other diseases—this systematic review aims to investigate the use of high-frequency/radiofrequency current as an adjuvant in the treatment of acne.

METHODOLOGY

This research is a systematic review. The papers used were obtained by searching indexed databases (MEDLINE, SciELO, LILACS). The review was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)[8]protocol. A review protocol was published in the International Prospective Register of Systematic Reviews (PROSPERO CDR42021244409).

Search strategy

The search for articles was performed by the keywords obtained in the Medical Subject Headings (MeSH) and other search terms. In the search, the following keywords were used: "Acne" and "Radiofrequency" for titles and/or abstracts.

The search and selection of the studies were completed using the PICOS strategy: Population (P), Intervention (I), Comparison (C), Outcome (O), and Study Design (S). The search strategy was defined with the help of MeSH and the terms were allocated in each category according to their search characteristic: P – Adults, I – Radiofrequency, C – Laser, O – Scar treatment, S – Randomized and non-randomized clinical trials.

Selection criteria and study eligibility

The search filters used were: articles published in the last 10 years; in Portuguese or English, and that were available in the full version online. Initially, 34 articles were found. As inclusion criteria, articles should be clinical trials and the theme should be related to the research objective, that is, articles addressing the use of radiofrequency in the treatment of acne. The eligibility criteria for the studies are presented below.

Population

Healthy patients who did not present any dermatological or other disorders, except acne scars, were included. The following patients were excluded: patients with diabetes; pregnant or breastfeeding; with active acne keloids; cancer lesions; warts or skin infections in the area to be treated; viral herpes infections in the previous six months; those who have had topical exfoliation treatments in the past two

months; who have taken photosensitizing medications or oral retinoids in the past eight months; who have undergone surgical treatments or orthotherapy; who have received local injections in the previous eight months; who have had photorejuvenation treatments with other sources or photodynamic therapy with aminolevulinic acid (ALA) one year before; who have undergone acne scar treatment during the previous six months; and who have collagen disease or autoimmune disease.

Intervention/exposure

The use of bipolar radiofrequency, fractional micro-plasma, micro-plasma, or micro-needling devices was required. Some studies have also used fractional CO_2 lasers, fractional 1,550nm lasers (erbium glass), ablative fractional lasers, or non-ablative fractional lasers.

Comparison/control

Studies that used radiofrequency and laser of different models, but did not use a placebo as a control, were included.

Outcomes

Outcomes were presented after one to five treatment sessions and follow-up visits were made one to six months after the end of treatment. The effects of radiofrequency therapy evaluated were the regeneration and healing of acne sequelae. In one study, improvement in acne scars was observed in different regions of the body (face, shoulders, and back).

Study design

Randomized and non-randomized clinical trials were selected, including crossover, single, or double-blind studies.

Data analysis

The data were used to analyze improvements in acne scarring via photographs taken before and after treatment and were quantified using the ECCA (*echelle d'evaluation clinique des cicatrices d'acné*) grading system. Months after the treatment, patients were asked to characterize their overall level of satisfaction as very satisfied, satisfied, slightly satisfied, or dissatisfied, separately evaluating each treated region.

Analysis of the quality of articles

The quality of the selected articles was evaluated via the questionnaire produced by Downs and Black[9], which consists of 27 items divided into five domains: "Reporting" assesses whether the information provided is sufficient; "External validity" verifies the extent to which the study can be generalized to the population studied; "Bias" analyzes the bias in the intervention and results; "Confounding" evaluates the bias in the subjects selection; and "Power" verifies if the results were by chance. The answers are: "Yes" (value 1), "Partially" (value 1), "No" (value 0), and "Unable to determine" (value 0), and the higher the value, the better the quality of the paper. The studies were classified as: poor (<14), regular (15-19), good (20-25), or excellent (>26), according to their score.

The quality of the papers, determined via the Questionnaire of Downs and Black[9], resulted in one article being classified as poor, five articles as regular, and 12 articles as good. Each article was studied in duplicate by two members of the research team.

RESULTS

Based on the specifiers and terms used for the search, 34 articles were found for this review. These articles were analyzed and three duplicate articles were found; five articles that were related to other diseases, despite addressing the use of radiofrequency; and eight others that were not original articles (systematic reviews and pilot study) (Figure 1). At the end of this analysis, 18 articles met the inclusion criteria (Chart 1). Chart 2 shows the classification of the quality of the studies.

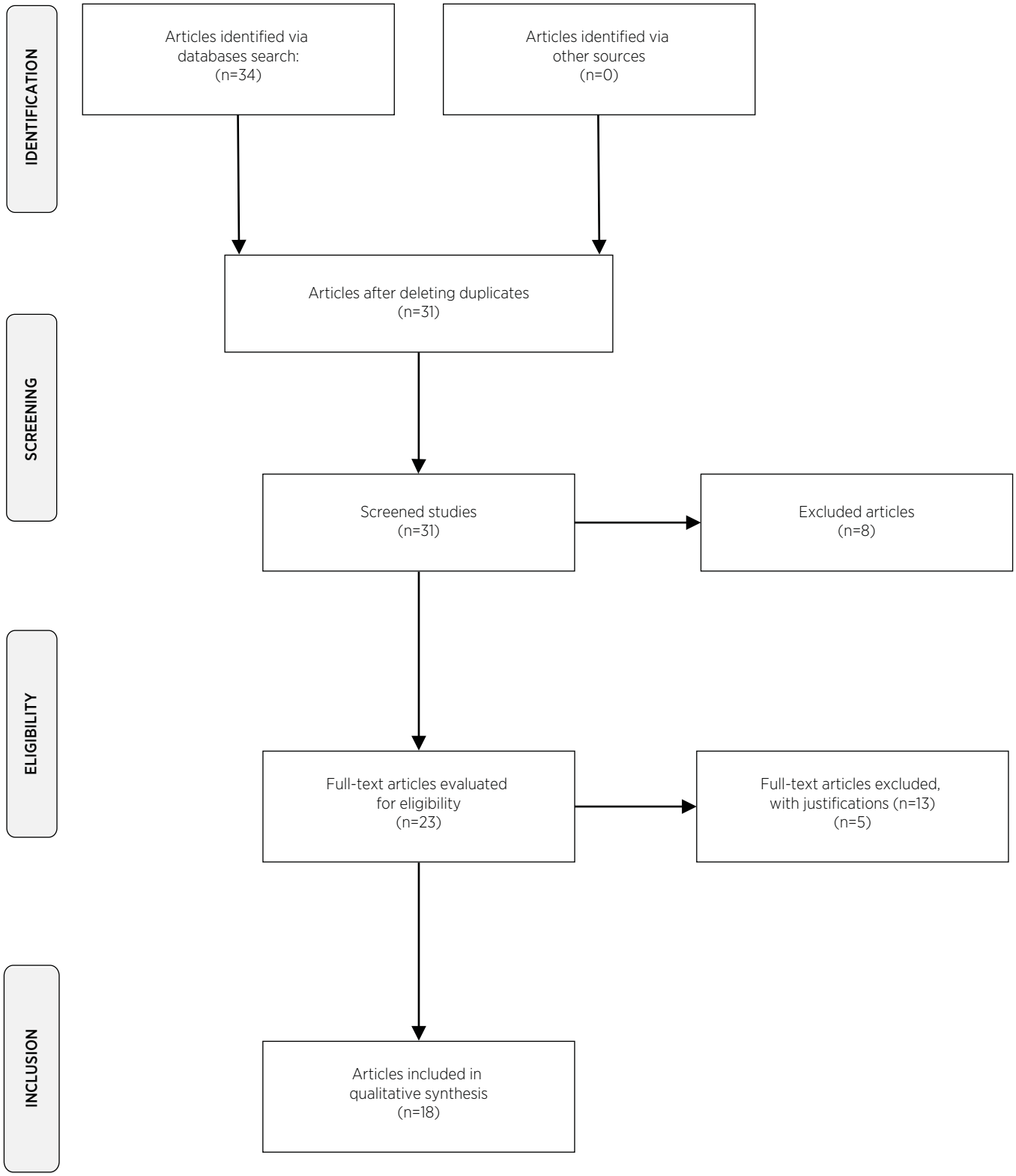

Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses flowchart showing the articles selection process

Chart 1. Main selected studies and their main results and conclusions

Authors/Year	Sample	Age (years)	Clinical symptoms	Treated area	Fitzpatrick scale	Antiviral prophylaxis
Cameli et al. (2014)[10]	10 patients (7 women and 3 men)	Average age: 39.2 (28 to 55)	Photoaging (wrinkles and sagging skin); acne scars (of the superficial boxcar and rolling type)	Periocular, periorbital, and cheek	Phototypes II and III	Yes (in case of erythema or severe edema)
Cannarozzo et al. (2014)[11]	9 patients (6 women and 3 men)	30 to 66	Acne scars (rolling, closed boxcar, and icepick); different degrees of photoaging in sun-exposed areas	Periocular, periorbital, forehead, chin, and cheeks	Phototypes II and III	Yes
Chae et al. (2015)[12]	Group A – 20 (13 men and 7 women) Group B – 20 (16 men and 4 women)	Group A – 25.5±3.76 Group B – 28.3±5.39	Atrophic acne scars	The whole face	Phototypes III, IV, and V	No
Zhang et al. (2013)[13]	33 patients (19 men and 14 women)	26.4±3.7	Atrophic acne scars	Both sides of the face	Phototypes III and IV	Yes (patients with a history of herpes virus infection)
Kaminaka, Furukawa and Yamamoto (2016)[14]	8 patients (6 men and 2 women)	Median age: 29.9	Atrophic scars of acne and acne vulgaris; horny plugging of hair follicles	Both cheeks	Phototypes III and IV	No
Kaminaka et al. (2014)[15]	6 patients (3 women and 3 men)	32.2±4.3	Atrophic acne scars and active acne vulgaris	Both cheeks	Phototypes III and IV	-
Kim et al. (2014)[16]	25 patients (17 women and 8 men)	23.08±3.13	Wrinkles, atrophic and hypertrophic scars, acne vulgaris	-	Phototypes III, IV, and V	No
Kim et al. (2014)[17]	23 patients (12 women and 11 men)	Average age: 28.9	Acne scars and dilated pores	Forehead, cheeks, and oral commissure	Phototypes III and IV	-
Kwon et al. (2017)[18]	28 patients (15 men and 13 women)	21 to 38	Wrinkles, atrophic and hypertrophic scars, acne vulgaris	Both sides of the face	Phototypes III and IV	-
Lan et al. (2018)[19]	86 patients (53 men and 33 women)	23.2±3.6	Atrophic facial acne scars, wrinkles	Face	Phototypes III and IV	-
Lee et al. (2013)[20]	20 patients (10 women and 10 men)	Average age: 26.5 (21 to 34)	Acne vulgaris	Forehead, right and left cheek	Phototypes III and IV	No
Min et al. (2015)[21]	20 patients (11 men and 9 women)	Average age: 22.8	Acne scars	Both cheeks	Phototypes III and IV	-
Park et al. (2016)[22]	20 patients (11 men and 9 women)	23.65±2.94	Atrophic facial acne scars, wrinkles	Face	Phototypes III and IV	No
Pudukadan (2017)[23]	19 patients (14 men and 5 women)	34.16±6.44	Atrophic facial acne scars, wrinkles	Both cheeks	Phototypes III, IV, and V	-
Qin et al. (2015)[24]	26 patients (16 women and 10 men)	22.6±6.8	Acne scars	Face	Phototypes III, IV, and V	No
Rongsaard and Rummaneethorn (2014)[25]	20 patients (12 men and 8 women)	18 to 55	Atrophic acne scars	Both cheeks	Phototypes III, IV, and V	-
Trelles and Martínez-Carpio (2014)[26]	19 patients (14 women and 5 men) Group I: 6 patients Group II: 13 patients	35.2	Wrinkles, atrophic and hypertrophic scars, acne vulgaris	Group 1: face Group 2: back or shoulders	Phototypes II and III	Yes
Verner et al. (2015)[27]	12 healthy patients (8 women and 4 men)	Average age: 36 (20 to 62)	Acne scars	Face	Phototypes I to III	-

Chart 2. Classification of the quality of studies

Authors/Year	Laser	Radiofrequency	Period of analysis	Objectives	Main conclusions	Downs and Black score
Cameli et al. (2014)[10]	Fractional carbon dioxide laser (CO_2 FS)	Bipolar radiofrequency (BR): 500MHz; 30mJ per microterm zone; 500lm spacing; 20W for two seconds	One week and three months after treatment	To compare the results obtained with the use of CO_2 FS with those obtained with the use of CO_2 FS associated with radiofrequency (RF) for the treatment of acne scars.	The combination of CO_2 FS and RF showed high efficacy, producing better results with fewer sessions, lower risks, and fewer side effects.	18
Cannarozzo et al. (2014)[11]	CO_2 FS	BR: 12W; 700lm spacing; 1.2ms time; 30W for three seconds	Three treatment sessions with an interval of two months	To evaluate the safety and efficacy of radio frequency associated with CO_2 FS technology for the treatment of acne scars.	All patients had good results in terms of improvement of skin texture, with mild and transient side effects.	19
Chae et al. (2015)[12]	Fractional 1,550nm laser (erbium glass – Er:Glass)	40-60W; 0.1ms driving time; continuous wave mode *not bipolar	Twenty weeks from treatment (four-week interval during the 12-week treatment period and an eight-week interval after the final session)	To evaluate the clinical efficacy and safety of fractional laser Er:Glass and fractional microneedling radiofrequency (FMR).	Both treatments are safe and effective methods for treating acne scars. However, the laser was more effective for acne scars without showing significant side effects. But FMR showed to be a relatively good option for pain-sensitive patients, and treatment has a shorter downtime.	24
Zhang et al. (2013)[13]	CO_2 FS	Fractional microplasma RF *not bipolar	Three treatment sessions at intervals of 6 to 12 (8 average) weeks and one follow-up visit after six months	To compare the fractional microplasma RF technology with the CO_2 FS system in the treatment of atrophic acne scars.	No statistically significant difference between the two therapies was found. Twelve individuals (36.4%) presented post-inflammatory symptoms of hyperpigmentation after 30 of 99 treatment sessions (30.3%) in the CO_2 FS group, which was not observed with the use of microplasma RF.	24
Kaminaka, Furukawa and Yamamoto (2016)[14]	Fractional laser	Coverage rate: 10%; peak energy: 62mJ/pin; two passes	Five treatment sessions at an interval of one month and follow-up for at least one year after the end of the treatment	To examine the usefulness and safety of BR in the treatment for atrophic acne and acne vulgaris scars in Japanese patients.	The importance of the physical therapist acting interdisciplinary with other professionals, primary care.	19
Kaminaka et al. (2014)[15]	-	Fractional BR. Coverage rate: 10%; peak energy: 25J	One session and 30 minutes later for histological evaluation	To histologically analyze the treatment performed with a bipolar radiofrequency system, taking into consideration the number of passes.	By increasing the number of passages, better results were observed in the treatment of deep acne atrophic scars. Moreover, although the most ablative mode was selected, the treatment did not produce serious adverse effects.	14
Kim et al. (2014)[16]	-	1MHz, 1.5mm depth, 10mm point size, level 3 (12.5W power, 80ms RF display time) *not bipolar	Three procedures with one-month intervals, with follow-up performed each month, from before treatment to three months after the last procedure	To investigate the safety and efficacy of FMR in the treatment of acne vulgaris.	The number of acne lesions (inflammatory and non-inflammatory) were reduced. Sebum excretion and subjective satisfaction were more favorable at all times compared to baseline values ($P<0.05$). Inflammatory lesions showed better results than non-inflammatory lesions ($P<0.05$). Adverse effects, such as occasional bleeding, pain, and erythema, were noted, but they were transient and mild enough not to have to stop the treatment.	21

(continues)

Chart 2. Continuation

Authors/Year	Laser	Radiofrequency	Period of analysis	Objectives	Main conclusions	Downs and Black score
Kim et al. (2014)[17]	Ablative fractional lasers	BR: 50 to 62mJ per pin, can be supplied with 5% to 7% ablation coverage, 16% to 22% coagulation coverage, and 27% to 35% heating coverage	Four treatment sessions at three-week intervals	To evaluate the efficacy of a new fractional device based on BR to treat acne scars and dilated pores in Asians, with objective measurements and histological evaluations.	The patients showed clinical improvement. Patients' self-assessments corresponded with physicians' evaluations. Histological analyses showed significant improvements in elasticity and melanin/erythema index, along with increases in procollagen levels types I and III, as well as elastin levels. There were no cases of hyperpigmentation, and adverse events were only mild.	22
Kwon et al. (2017)[18]	Nonablative fractional laser	Micro-needle penetration depth of 1.5 to 2.5mm, intensity from 20 to 50 and duration from 50 to 100ms, with two or three passes in FMR device and 25 to 35J/cm^2 at level 6 and with four passes of fractional 1,550nm laser (erbium glass)	Three consecutive sessions at four-week intervals, with a follow-up visit eight weeks after the end of treatment	Compare the clinical course of the treatment of acne between non-ablative 1,450nm laser diode (LD) and FMR.	The subjective evaluations of patients regarding the improvement of seborrhea were similar between the two devices, while those of acne, skin texture, and acne scars were more satisfactory with the use of MRF. For the safety profile, no significant difference was observed between the two regimens, while mild post-inflammatory hyperpigmentation was observed only on the LD side.	23
Lan et al. (2018)[19]	-	Microplasma radiofrequency *not bipolar	Three sessions at two-month intervals. Patients were seen one week after each treatment and one, three, and six months after the end of treatment	To evaluate the clinical effectiveness and safety of microplasma RF for the treatment of facial acne scars in Chinese patients.	There was a significant improvement in acne scars after three treatments. Mean score of the ECCA classification scale was reduced from 107.21 to 42.27 (P<0.05). Hyperpigmentation, hypopigmentation, infections, and worsening of scars were not observed. All patients were "very satisfied" or "satisfied" with the treatment results.	23
Lee et al. (2013)[20]	-	1MHz. Power: 50W; levels 1-20 with multiple exposure times: 10-1,000ms	Two sessions, initial evaluation of the study and two, four, and eight weeks after treatment	To evaluate the efficacy of the FMR device for acne vulgaris in Asians and its effect on sebum production.	After a single FMR treatment, the casual sebum level and sebum secretion rate showed 30-60% and 70-80% reduction, respectively (P<0.01), and remained below the basal level until the eighth week. Physician's overall improvement scores for acne severity and acne lesion count also showed improvement with maximum effectiveness by week two, but returned to baseline in most patients by week eight.	21
Min et al. (2015)[21]	-	BR: 100Hz; 100mJ/cm^2	Three treatment sessions with an interval of two months	To compare the efficacy and safety of FMR with RB in the treatment of acne scars.	FMR showed superior efficacy in acne and acne scar compared to RB. Increased expression of TGFb and collagen I and decreased expression of NF-kB suggest that IL-8 is involved in the improvement of acne scarring and acne lesion by FMR.	22

(continues)

Chart 2. Continuation

Authors/Year	Laser	Radiofrequency	Period of analysis	Objectives	Main conclusions	Downs and Black score
Park et al. (2016)[22]	-	FMR: 1.5mm needle depth; level 7; 50ms exposure time superficial fractional radio frequency (SFR): level 16-17; 70-80ms exposure	Three consecutive treatment sessions for four weeks over 12 weeks	To evaluate the efficacy and safety of FMR in the treatment of acne scars on Asian skin.	All 20 participants were evaluated by physicians for clinical improvement of grade 2 or more. Subjects' scores also showed a good agreement indicated by the 0.695 kappa index.	24
Pudukadan (2017)[23]	-	Micro-needling RF: power 15 to 25W (mean 20.19±2.22); pulse duration 110 to 140ms; and 2-3mm needle depth (mean: 2.47±0.20	Three sessions at monthly intervals and two other follow-up visits were held one and three months after the sessions	Evaluation of the efficacy and safety of the non-isolated, electronically controlled radiofrequency microneedling system on acne scars in patients with dark skin.	Improvement of at least one degree of acne scar was observed in 11 of 19 patients (57.9%) after one month and in 9 of 9 patients (100%) after three months.	19
Qin et al. (2015)[24]	-	Fractional BR. Energy: 85 to 95mj/pin; two or three passes were performed with a maximum of 5-10% overlap	Four sessions at one-month intervals and follow-up visits of 4 and 12 weeks after the end of treatment	To evaluate the efficacy and safety of FMR in the treatment of acne scars on Asian skin, with high energy strategy.	Patients' overall improvement and satisfaction assessment increased at the 12th week compared to baseline. Side effects were limited to transient pain, erythema, dryness, and low risk of hyperpigmentation.	22
Rongsaard and Rummaneethorn (2014)[25]	Fractional 1,550nm laser (erbium glass – Er:Glass)	Fractional BR: 53-59mJ/pin for two passes	Three treatment sessions were performed at four-week intervals. Follow-up four weeks after the end of treatment	To compare the clinical effectiveness and side effects of fractional BR with 1,550nm erbium glass laser in the treatment of atrophic acne scars.	The side effects of both devices were pain, transient facial erythema, and crust formation. The pain score was higher in laser treatment, but the duration of skin flaking was shorter. One case had post-inflammatory hyperpigmentation on the laser treated side only. Fractional BR and laser have similar efficacy for the treatment of atrophic acne scars.	20
Trelles e Martínez-Carpio (2014)[26]	Ablative fractional laser	Fractional ablative microplasma RF: 27.5kHz, with variables from 10 to 100Hz	Four treatment sessions at three-week intervals Follow-up two and six months after the final session	To determine the efficacy and safety of high-potency unipolar radiofrequency in the treatment of acne scars over a short-term period of two months and a long-term period of six months.	The bimodal procedure is safe and effective in reducing acne scars. Significant improvement was observed in the scars, both on the face (P<0.0001) and on the back and shoulders (P<0.0001).	22
Verner et al. (2015)[27]	-	Fractional RB: one low energy pass (15-20mJ/pin) over the whole face, as well as with two or three high energy passes at scar level (50-80mJ/pin)	Three to five treatment sessions at one-month intervals. Patients were followed up at each session and three months after the end of treatment	To evaluate the efficacy, safety, and tolerability of BR and the eTwo™ system (Syneron Candela Ltd., Yokneam, Israel) for the treatment of acne scars	All patients showed improvement after the second session and very good improvement (of at least one scale) after five sessions.	16

CO_2 FS Fractional carbon dioxide laser; ECCA: clinical assessment scale for acne scars; Er:Glass: Erbium glass lasers; FMR: fractional microneedling radiofrequency; IL-8: interleukin-8; LD: laser diode; NF-kB: Nuclear factor kappa B; BR: bipolar radiofrequency; RF: radiofrequency; SFR: surface fractional radiofrequency; TGFb: transforming growth factor beta.

DISCUSSION

Generally, out of the 18 studies included in this review, most employ different resources in the treatment of acne associated with the use of radiofrequency. Radiofrequency, in turn, consists of high-frequency currents that generate heat by conversion when they come into contact with tissues, ranging from 30KHz to 300MHz, with the most commonly used frequency ranging from 0.5MHz to 1.5MHz.

In dermatology, radiofrequency is used due to its physiological effects, namely: stimulation of vasodilation and local blood circulation; improvement of tissue nutrition; increased metabolism; decreased viscosity; alteration of collagenous tissue; and nerve stimulation.

These effects assist the regeneration and healing of acne sequelae, as demonstrated in the studies by Kaminaka et al.[14], who found a 57.5% reduction in scar volume and fewer lesions; by Kim et al.[17], who histologically evaluated the benefits of bipolar radiofrequency, finding an increase in the levels of procollagen types I and III, as well as elastin; and by Trelles and Martínez-Carpio[26], who observed improvements in acne scars in different regions of the body, such as the face, shoulders, and back.

In Verner's study[27], patients treated with radiofrequency showed improvement in skin appearance at the completion of five treatment sessions. The patient satisfaction survey by the global aesthetic improvement scale showed that half of the patients reported being satisfied with the treatment results, while the other half reported being very satisfied.

We found in the literature reports of the use of methods combining radiofrequency with other technologies, such as laser and microneedling in the treatment of acne, demonstrating that it can be significantly and safely reduced.

In the study by Camelli et al.[10], the concomitant use of laser and radiofrequency showed better results compared only to the use of radiofrequency, with an improvement of skin texture and mild and transient side effects. The study by Cannarozzo et al.[11] found an increase in skin elasticity due to fibroblastic activation and neocollagenesis by using radiofrequency associated with CO_2 laser.

Another technique also found in this study is the association of radiofrequency with microneedling, which consists of perforating the stratum corneum, thus stimulating the release of growth factors and the production of collagen and elastin in the papillary dermis. In the studies by Kim et al.[16] and Park et al.[22] the effects of this treatment were investigated, finding a reduction in the number of non-inflammatory lesions and an improvement in sebum excretion.

Kwon et al.[18] compared the use of a non-ablative laser diode (1,450nm) with radiofrequency associated with microneedling and found improvements in seborrhea with both treatments. However, the radiofrequency treatment proved to be better regarding skin texture and scarring.

The decrease in sebum secretion rate was found in the study by Lee et al.[20], being reduced by up to 80%, besides improving the severity of acne and reducing the number of lesions. Studies by Padukadan[23] and Qin et al.[24] also reported improvements in skin healing after three months of treatment.

Regarding the side effects of radiofrequency, they were mostly transient pain, erythema, dryness, and low risk of hyperpigmentation. As reported in the study by Kim et al.[17], the side effects were noticed but were not severe enough to cease treatment.

CONCLUSION

Radiofrequency presents few complications and good results, besides having as an additional advantage the possibility of the patient returning to the routine immediately after treatment session.

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