Review Article **AJODRR (2022) 5:48**

American Journal of Dermatological Research and Reviews
(ISSN:2638-1893)

The Effectiveness of Microneedling Therapy on The Severity of Acne Scars According to Goodman and Baron: A Systematic review and meta-analysis

Oktavianus Nugroho*, Diah Adriani Malik, Retno Indar Widayati, Suhartono, Asih Budiastuti, Puguh Riyanto, Muslimin

Departement of Dermatovenereology, Faculty of Medicine, Diponegoro University / Dr. Kariadi Hospital, Dr. Sutomo street No. 16 Semarang-Indonesia.

ABSTRACT

Background: The emergence of acne scars due to skin damage in the acne healing process and causes psychological effects. The management of acne scars can be done in several methods. Microneedling is a very simple, safe, effective, and minimally invasive therapeutic technique compared to other therapeutic modalities in acne scars. The resulting wound is micro-sized, and promotes the growth of growth factors and collagen production. We aimed to assess the effectiveness of using microneedling as an acne scar treatment option. A systematic review and meta-analysis were qualitatively and quantitatively conducted from RCTs, assessing the effectiveness of microneedling in reducing the severity of acne scars according to Goodman and Baron in the treatment of acne scars. **Methods:** Medline Pubmed, PMC, Scopus, Google Scholar, and JDC library, eligible search. Ten studies (n=514) were analyzed qualitatively with 2 studies (n=53 subjects) and quantitatively analyzed by 2 studies (n=90 subjects). Both analyzes were included in the meta-analysis. The mean age of the participants was 40.5 years. The application of microneedling intervention as monotherapy or a combination in patients with acne scarring was followed for at least 16 weeks, the results obtained were the mean reduction in the degree of acne scarring after microneedling. **Result:** The combination of microneedling treatment obtained a qualitative decrease in the degree of acne scars according to Goodman and Baron with a Z value (-4.299) and P=<0.001 lower than the control (PRP) with a significant difference. The quantitative decrease in the degree

***Correspondence to Author:**
Oktavianus Nugroho
Departement of Dermatovenereology, Faculty of Medicine, Diponegoro University / Dr. Kariadi Hospital, Dr. Sutomo street No. 16 Semarang-Indonesia.

How to cite this article:
Oktavianus Nugroho, Diah Adriani Malik, Retno Indar Widayati, Suhartono, Asih Budiastuti, Puguh Riyanto, Muslimin.The Effectiveness of Microneedling Therapy on The Severity of Acne Scars According to Goodman and Baron: A Systematic review and meta-analysis.American Journal of Dermatological Research and Reviews, 2022, 5:48

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Website: https://escipub.com/

of acne scars according to Goodman and Baron obtained a Z value (-4.681) and P=<0.001 lower than the control (PRP) with a significant difference. Quantitative reduction in the degree of acne scars according to Goodman and Baron on single therapy between treatment and control with a value of Z (-3.536) and P=<0.001 lower than control (fractional CO2) with a significant difference. The results of the degree of acne scars in the group treated with microneedling alone or in combination were lower than the control group. The mean before and after therapy compared to the control there was a significant difference.

Conclusion. The results of a systematic review, concluded that the group treated with microneedling had a decrease in the degree of acne scarring according to Goodman and Baron with P=<0.001 compared to before treatment. The decrease was shown in the difference in Z values, which was significantly greater than the control given other therapies. Microneedling therapy can be an alternative therapy option for acne scar patients who are unresponsive to previous therapy or in conditions where there are contraindications to other therapies.

Keywords: microneedling, acne scar

Abbreviations: PMC: PubMed Central; JDC: Journal of Dermatology & Cosmetology; RCT: randomized clinical trials

Introductions

Acne scars are an increase in the formation of fibrous tissue to replace normal tissue, or local tissue damage occurs due to complications of acne vulgaris (AV).[1,2] Most cases of acne arise with a pleomorphic lesion arrangement consisting of comedones, papules, pustules, nodules and cysts.[2] Acne scars are an increase in the formation of fibrous tissue to replace normal tissue, or local tissue damage occurs due to complications of acne vulgaris (AV).[1,2] Acne scars are often the result of nodulocystic inflammatory acne and cause considerable psychological effects.[3-6] In 2010, East Asia, South Asia, and Western Europe were the regions with the highest prevalence of acne vulgaris in the world in the 15-19 year age group (men: 49%; women: 51%) almost the same.[7,8]

The management of acne scars is carried out by several methods such as topical preparations, dermabrasion, laser, excision (punch and elevation), subcutaneous incision, chemical peeling, dermal graft, filler, and microneedling (automated and dermaroller).[1,2,9-11] Grade assessment acne scar severity using the Goodman and Baron subjective method.

Microneedling is a very simple, safe, effective, and minimally invasive therapeutic technique compared to other therapeutic modalities for acne scars.[1,2,12] Microneedling has the advantages of mild side effects, minimal downtime, and easy application.[8,13-16] Fabbrocini's study (2009) found that microneedling provided an improvement in the degree of acne scars with P<0.05. The wound results are micro-sized (microound), and stimulates the release of growth factors and collagen production.[12]

The effectiveness of microneedling therapy to reduce the degree of acne scars according to Goodman and Baron in the treatment of acne scars in this study was carried out by a systematic review and meta-analysis in the journal microneedling.

Methods

Literature Search

Information sources and strategies for searching electronic databases include database Medline Pubmed, PMC, Scopus, Google Scholar, and JDC. Pencarian *Medical Subject Headings* (*MeSH*) menggunakan subkelompok "*Microneedling*" AND "Skar akne *Goodman and Baron*". The search for research articles was carried out based on the 2009 PRISMA flow. Differences in results were determined by discussion of all reviews to reach a consensus.

Study Selection

Three reviewers conducted study selection independently. Duplicate articles have been removed. Title and abstract review, full text review were assessed for eligibility using predefined inclusion and exclusion criteria. Disagreements were resolved between all reviewers to reach a consensus.

Data extraction

Data extraction was carried out independently by three reviewers using the data collection form The Cochrane Collaboration data collection form for RCTs only.[17] Differences of opinion during data extraction were resolved between all reviewers and a consensus was reached.

Assessment of risk of bias

Assessment of the risk of bias from studies included in the meta-analysis using The Cochrane Collecting data - form for RCTs only and The Cochrane Collaboration's tool for assessing risk of bias in randomized trials.[17,18]

Data synthesis

Mean difference meta-analysis was performed using the Comprehensive Meta-Analysis A Computer Program meta-analysis Version 3.3. Unavailability of data to be collected and put together, then it is done by descriptive synthesis.

Results

Initial database searches identified 76 non duplicate records. Thirthy were excluded during title/abstract review, 16 were excluded during full-text review. Ten studies were included in this review, of which 3 studies were included for meta-analysis. Figure 1 gives details of the study selection process.

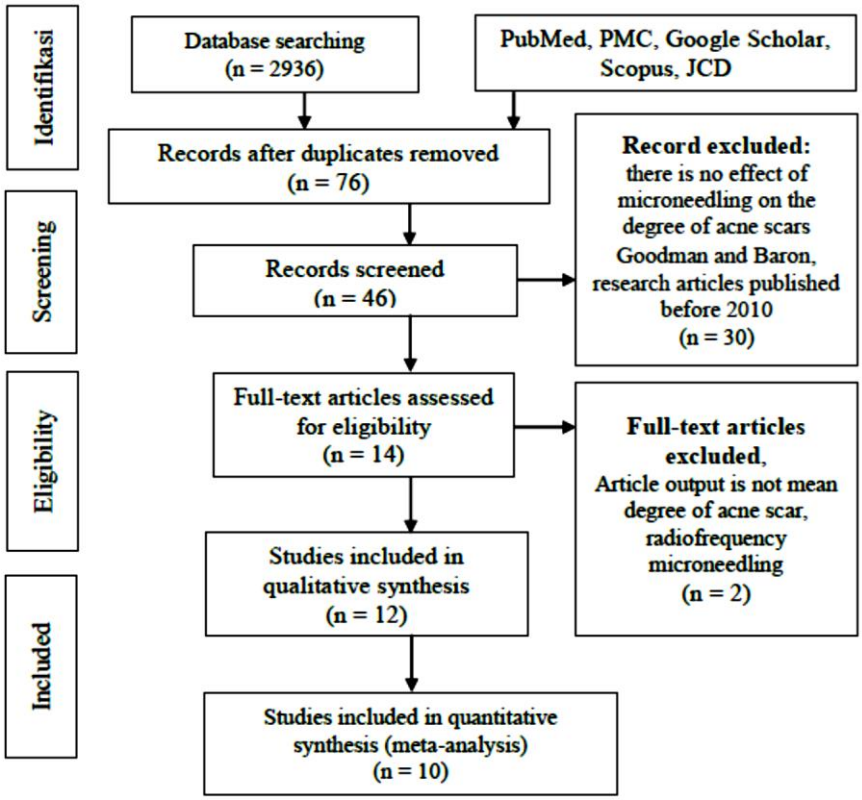


Figure 1. PRISMA flow diagram

Study Characteristics

The characteristics studies are given in table 1

Table 1. Characteritics studies

Study	Mean age	Degree acne scars	N recruite	Intervention Group	Comparison Group	Duration of Intervention	Outcome
Ibrahim MK, et all, 2018	18-34 years, mean 24.7± 6.8	II-IV	35/35	Combination of Microneedling (Dermaroller) and Platelet Rich Plasma (PRP)	Microneedling (Dermaroller 1.5mm needle length, 24 circular array with 8 needles (192 needles total)	4 times therapy with an interval of 3 weeks	Mean GB qualitative degrees. Degree of satisfaction with therapy (poor. moderate, good, excellent).
Asif M, et all, 2016	17-32 years, Mean 25.72	II-IV	50/50	Combination of Microneedling(Derm aroller) & intradermal injection of 2mL (0.1mL/cm^2) PRP	Combination microneedling (Dermaroller) and intradermal injection of 0.1mL/cm2) distilled water	3 times therapy with an interval of 4 weeks	Mean GB qualitative degree (poor, good, excellent). quantitative degrees. Degree of visual analogue & clinical improvement (excellent, good, fair, poor)
Elfar NN, et all, 2020	19-37 years, mean: I.26.70 ± 5.03 II.26.90 ± 5.65 III.27.70± 4.69	I-IV	60/60	Kombinasi Microneedling (Dermaroller) and topikal PRP	I. Microneedling(Der maroller) II. PRP injection (intradermal & subcutaneous)	4 times therapy with an interval of 4 weeks	Mean GB qualitative & quantitative (poor, good, very good, excellent)
Alam M, et all, 2014	20-65 years, mean: 33.7	II-IV	20/15 5 drops are treated first	Microneedling(Derm aroller)	Placebo	12 times therapy with an interval of 2 weeks	Mean GB quantitative Degree of pain (1-10)
Osman MAR, et all, 2016	21-41 years, mean: 27 ± 3.75	I-IV	30/30	Laser fractional Er:YAG: 2.940- nm (Fotona Xs Dynamics, Slovenia)	Microneedling (Dermapen – Derma stamp electronic pen, Auto-Stamp Motorized Meso Machine)	5 times in 4 week interval	Mean Degree of improvement in scars & satisfaction qualitative therapy (poor,good, fair,excellent). Collagen Image analyzer.
Ibrahim ZA, et all, 2017	Mean: 26.33 ± 6.08	II-IV	90/90	Combination: Microneedling(Derm apen) and PRP	I.*Microneedling* (Dermapen) II.PRP	6 times I and II at 4 week intervals. Combinations in 2 week intervals	Mean GB qualitative (mild, moderate, marked, very significant). Degree of pain & erythema (no, mild, moderate, severe). Degree of satisfaction (not satisfied, slightly satisfied, satisfied, very satisfied).
Saadawi AN, et all, 2018	19-45 years mean: 32	II-IV	30/30	Combination Microneedling (Dermapen) (Bomtech Electronics, Seoul, Seocho-Gu, Korea (34, Hyoryeong-ro 49-gil, Seocho-gu, Seoul, JX-120DR) & Glycolic acid peeling 35%	I.Microneedling (Dermapen) (Bomtech Electronics, Seoul,Seocho-Gu, Korea (34, Hyoryeong-ro 49-gil, Seocho-gu, Seoul, JX-120DR). II.Glycolic acid peeling 35%	6 times in 2 week interval	Mean Degree of qualitative GB & Degree of therapy satisfaction (no, mild, good, very good).

Afra TP, et all, 2018	18-30 years mean: 24	II-IV	36/34	Topical Tazaroten Gel 0.1%	Microneedling	Topical applied every night during the therapy period Microneedling 8 times in interval 4 weeks	Mean GB qualitative (excellent, good, poor) PGA Degrees (0 -10) Degree of satisfaction (0-3) unsatisfactory, (4-7) satisfactory, (8-10) highly satisfactory.
Gadkari R, et all, 2014	20-40 years, mean: 27.17	II-IV	37/30 7 drop out	Subcision and Microneedling(Derm aroller)	Subcision and Cryoroller	3 times in 4 week interval	Mean GB qualitative & quantitative
Monisha BM, et all, 2021	18-35 years, mean: 26.5	II-IV	140/140	Laser fraksional CO2 Fluence 15-25J/cm^2 Densities 100-150 MTZ/cm^2 Energy 40-45mJ	Microneedling(Der maroller)	4 times in 4 week interval	Mean GB qualitative

*GB = Goodman and Baron

Tabel 2. Bias Risk Assessment of the risk of research bias in the meta-analysis

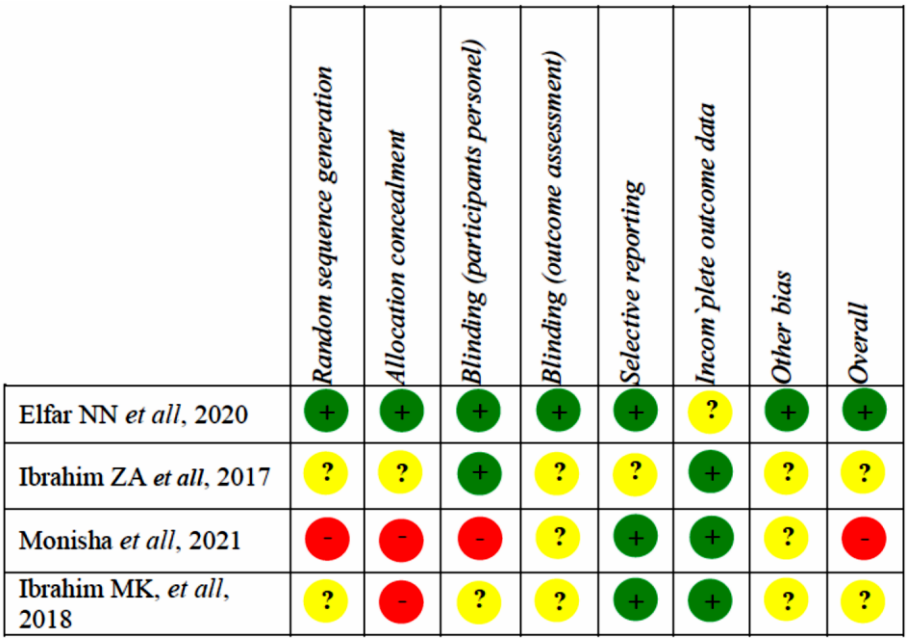
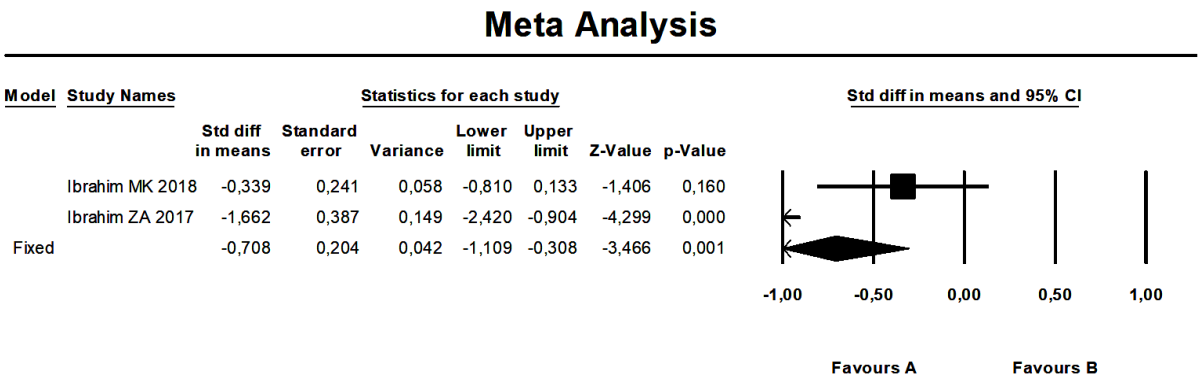
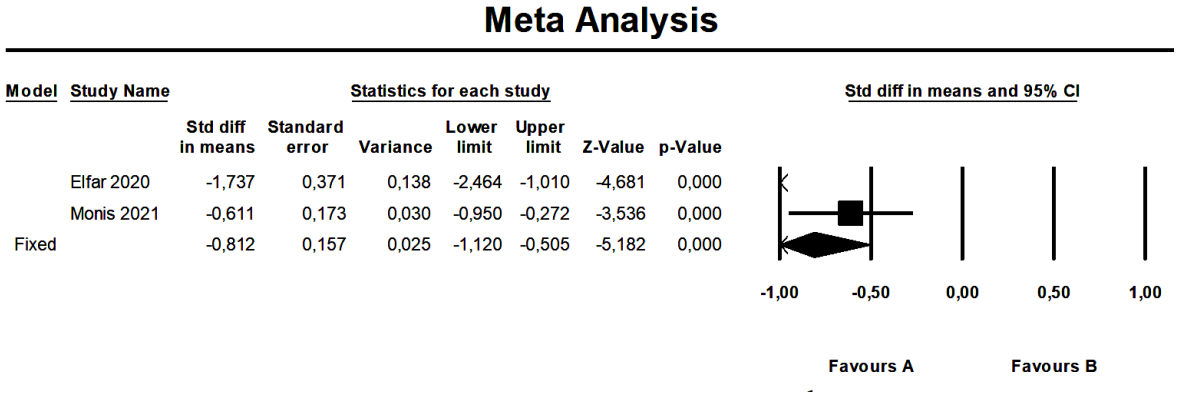


Table 3. The results of the meta-analysis of the effectiveness of microneedling therapy on the qualitative degree of acne scars according to Goodman and Baron



Z value: -3.466, P = 0.001

Table 4. Results of the meta-analysis of the effectiveness of microneedling therapy on the quantitative degree of acne scars according to Goodman and Baron



Z value: -5.182, P = 0.000

1. Ibrahim (2018) a split-face study on 35 subjects with acne scars. The facial treatment group K1 (n=35) received 4 sessions of microneedling therapy (dermaroller) combined with topical PRP on side of the face and the control group K2 (n=35) received 4 sessions of microneedling therapy on the other side of the face. Subjects were followed up every 3 weeks, for 12 weeks. Outcomes were analyzed before and after treatment (in the mean). A 1 to 2 degree reduction in Goodman and Baron's qualitative score was achieved. Two dermatologists concluded a significant increase in the severity of acne scars before and after treatment on both sides. The mean value decreased from 3.2 + 0.7 to 1.8 + 0.6 on the side of the face treated with microneedling combined with PRP (P<0.001) and 2.1 + 1.1 on the side of the face treated with microneedling (P<0.001) . The difference was not significant on both sides of the face because both treatment modalities gave similar good results.[19]

2. Asif (2016) a split-face study on 50 subjects with acne scars. The facial treatment group K1 (n=50) was treated with 3 sessions of microneedling (dermaroller) combined with 2 mL intradermal injection (0.1 mL/cm2) of PRP on acne scars and the control group K2 (n=50) was treated with 3 sessions of microneedling combined with injection. intradermal 0.1 mL/cm2 on the other side of the face. Subjects were followed up every 4 weeks, for 12 weeks. Outcomes were analyzed before and after treatment (mean) on the evaluation of Goodman's qualitative and quantitative degrees. The right-sided of the face showed a reduction of 2 degrees in 20 (40%) patients and a reduction of 1 degree in 30 (60%) patients. The left of the face showed a reduction of two degrees in 5 (10%) patients, a reduction of 1 degree in 42 (84%) patients and no reduction in the degree of scarring in 3 (6%) patients. Goodman's quantitative score on the right and left sides of the face had the same mean score of 19.24 before treatment.[20]

The degree of acne scars according to Goodman and Baron before treatment on the left and right sides of the face had the same average value of 19.24. The mean post-therapy score on the right side of the face was 7.08 with an increase of 62.50% in the acne scar area. The left side of the face had a mean score of 10.42 with an increase of 45.84% in the area of acne scars. Paired t-test showed significant improvement of acne scars on both sides, right (t-13.783933, P<0.00001) and left (t-12.195866, P<0.00001). The unpaired t-test showed a significant difference on both sides (t 4.729529, P<0.00001).[20]

3. Elfar (2020) a study of giving single and combination therapy to 60 subjects with acne scars divided into 3 groups, namely; 1) the PRP injection-treated group (K1), 2) the micro-needling (dermaroller) group (K2) and 3) the

microneedling and PRP combination therapy group (K3). The study group facial treatment K1 (n=20) was treated with 4 sessions of microneedling combined with topical PRP. The control group K2 (n=20) received 4 sessions of microneedling therapy and the other control group K3 (n=20) received 4 sessions of intradermal or subcutaneous PRP injection therapy. Subjects were followed up every 4 weeks, for 16 weeks. Outcomes were analyzed before and after treatment (in the mean). The K1 group had a significant difference in the degree of acne scarring before and 4 weeks after the last session (P=0.027). There was no statistically significant difference in the degree of acne scars before and 3 months after the last session (P=0.204). Group K2 did not find statistically significant differences in the degree of acne scarring before and at baseline 4 weeks and 3 months after the last session (P=0.121, and P=0.086). The K3 group had statistically significant differences before and at the beginning of 4 weeks and 3 months after the last session in the degree of acne scarring (P=0.041*, P=0.016*).[21]

The results showed a statistically significant difference in the comparison of quantitative acne scars scores between K1 and K2 before and 4 weeks after the last session (P1=0.008*). The K1 group showed better effectiveness in treating acne scars than the K2 group and there was a significant difference. A statistically significant difference was found at 3 months after the last session of K1 and K3 therapy (P2=0.009*). Group K3 obtained better results than K1 in the treatment of acne scars. Comparison of statistical clinical improvement between groups 4 weeks after the last treatment session. The difference was statistically significant between K1 and K2 (P1=0.027*), not significant between groups K1 and K3 (P2=0.564) and groups K2 and K3 (P3=0.230). Group K1 showed better improvement than K2 in acne scar therapy and there was a significant difference 3 months after the last session between K1 and K3 (P2=0.040*), and not significant between K1 and K2 (P1=0.837), also K2 and K3 (P3=0.121). The K3 group had more improvement than K1 in the treatment of acne scars statistically (P=0.035*).[21]

4. Alam (2014) split-face study on 20 subjects with acne scars and 5 drop-out subjects after the first therapy. Research with facial treatment group K1 treated with microneedling (dermaroller) and control K2 treated with placebo. Both groups were treated for 12 sessions for 24 weeks. Outcomes were analyzed based on quantitative Godman and Baron at 3 and 6 months of therapy. The control group from baseline to 3 months of therapy had no significant variation (mean, 1.0, 95% CI, -1.4 to 3.4; P=0.96) and 6 months of therapy (mean, 0.4, 95% CI, -2.8 to 3.5; P>0.99). In the microneedling group, the score of acne scars significantly decreased at 6 months of therapy (mean, 3.4, 95% CI, 0.2-6.5; P=0.03). The reduction in the degree of acne scars treated with microneedling was not significant at 3 months of therapy (mean, 2.4, 95% CI, -0.01 to 4.8; P=0.052).[22]

5. Osman (2016), split-face study on 30 subjects with acne scars. The study group K1 was treated with 5 sessions of Er:YAG 2,940 nm fractional laser (Photona Xs Dynamics, Slovenia) on side of the face and control group K2 received 5 sessions of microneedling (dermapen) therapy on the other side of the face. Subjects were followed up every 4 weeks for 20 weeks. Outcomes were analyzed before and after treatment (in the mean). Assessment of both sides of the face treated with 2,940 nm Er:YAG fractional laser and micro-needling on each side of the face 3 months to the last session, both modalities found significant improvement in the degree of acne scars. The side of the face treated with Er:YAG laser showed significantly better results (P<0.001) than microneedling. Another assessment via quantification of the collagen image showed an increase in the dermis after Er:YAG laser treatment compared to microneedling (P<0.001). The mean quantity of collagen fibers in each area increased from

23.3 to 42.2 sites treated with microneedling and 22.9 to 55.1 sites treated with Er:YAG laser.[23]

6. Ibrahim (2017) study of single and combination therapy on 90 subjects with acne scars. The study group K1 (n=18) was treated with 6 sessions of microneedling (dermapen) every 4 weeks. Group K2 (n=18) was treated with PRP intradermal injection every 2 weeks. The K3 group (n=18) were treated with a combination of microneedling (dermapen) with PRP, every 2 weeks between sessions. The whole group was carried out for 6 sessions. Outcomes were analyzed before and after treatment (in the mean) based on the degree of scars according to Goodman and Baron.

The K1 group had four patients with mild improvement, 20 patients (71.4%) with moderate improvement, and four patients (14.3%) with much improvement. The mean score improvement is 39.71+13.06. K2 group eight patients (23.5%) mild improvement, 14 patients (41.1%) moderate improvement, 6 patients (17.7%) much improvement, and 6 patients (17.7%) significant improvement. Mean score improvement (48.82 + 23.74). K3 group, two patients (7.1%) moderate improvement, 18 patients (16.3%) a lot of improvement, and 8 patients (28.6%) very significant improvement. The mean score of improvement (70.43 + 13.32). Significant difference from high response in K3 followed by K2 and finally K1 (P<0.001*).[24]

There were 4 (22.2%) grade 3 and 14 (77.8%) grade 4 cases before treatment at K1. After treatment, four (22.2%) cases were grade 2 and 14 (77.8). %) cases were grade 3 (P<0.003*). Group K2 before treatment 12 (66.7%) cases were grade 3 and 18 (33.3%) cases were grade 4. Post-therapy results, 10 (55.6%) cases became grade 2 and 8 (44.4%). cases were grade 3 (P<0.005*). K3 group before treatment, four (22.2%) grade 2 cases, six (33.3%) grade 3 cases, and 8 (44.5%) grade 4 cases. Post-therapy results, 10 (55.6%) cases were grade 1, eight (44.4%) cases were grade 2 (P<0.008*). The results obtained were significant with the understanding that there was an increase of 1 degree in each case of acne scar after microneedling (dermapen) single therapy and PRP, microneedling (dermapen) combination therapy with PRP.[24]

7. Saadawi (2018) study of single and combination therapy on 30 subjects with acne scars. The study group K1 (n=10) was treated with microneedling (dermapen). Group K2 (n=10) was treated with Glycolic acid 35% (GA) peeling. The K3 group (n=10) was treated with a combination of microneedling (dermapen) with 35% GA peeling. Overall therapy every 2 weeks for 6 sessions. The outcome of therapy was assessed qualitatively by the Global Scar grading system according to Goodman and Baron before and after therapy. The three groups showed a statistically significant increase in the improvement of the degree of acne scars from before treatment with all three treatment modalities (P<0.05). There was a statistically significant difference in the improvement in the degree of acne scars from the three groups in the increase (P=0.04).[25]

The improvement appears to be rated as good and very good in K3 compared to K1 and K2. Another increase was noted in K1 compared to K2 (P=0.04). Statistically, it was found that there was an increase in the improvement of rolling scars compared to icepick in all groups and boxcar scars compared to icepick (P=0.03, P=0.04, P=0.04) in all three groups. The difference in patient satisfaction responses in the three groups was statistically significant (P=0.04).[25]

8. Afra (2018) study of split-face therapy in 34 acne scar patients (grade 3 or 4) completed up to the last follow-up. Research on facial treatment K1 was treated with 0.1% tazarotene gel topical on side of the face, applied every night during the therapy period, and the control group K2 was treated with 4 microneedling (dermaroller) sessions on the other side of the face. Subjects were followed up every 4 weeks for 24 weeks. Outcomes were analyzed before and after treatment (in the median). Assessment of both sides of the face treated with topical

tazaroten gel 0.1%, the other side of the face with microneedling (dermaroller) in 3 months and 6 months until the last session based on Goodman and Baron's classification qualitatively and quantitatively. Both modalities obtained quantitative scar improvement. Significant quantitative and qualitative differences in the degree of acne scarring of the treated group. An increase in score from the beginning of therapy to the end of 31 (91.2%) participants in the treatment group had an improvement, three (8.8%) participants did not experience an improvement in their score (P<0.001). The overall difference in the analysis of improvement from the start of therapy to the end between the two treatment groups. Ten (29.4%) participants improved better on the microneedling side, six (17.6%) participants improved better on the tazarotene side (P=0.40), and 18 (52.9%) participants had similar improvements in both face side. Significant difference in the comparison of scores.[26]

9. Gadkari (2013) split-face study on 30 subjects with acne scars. The left side K1 (n=30) face group was treated with 3 subcision sessions combined with microneedling (dermaroller) and the right side K2 (n=30) face was treated with 3 subcision sessions combined with a cryoroller. Subjects were followed up every 4 weeks, for 12 weeks. Outcomes before and after treatment (in the mean) on the evaluation of the qualitative and quantitative degrees of Goodman and Baron. Qualitative assessment of the right sided facial showed a reduction in the degree of acne scarring from 4 to grade 2 in 61% of subjects (mean SD-0.14). The section of the left side of the face showed a reduction in the degree of acne scarring in 45% of subjects (mean SD-0.09). Quantitative assessment of the right side of the face showed 57% improvement in the degree of acne scarring (SD-0.18) and the left half of the face showed 40% improvement in the degree of acne scarring (SD-0.17). The mean-difference of acne scar degrees qualitatively from the two combinations of modalities was not significant (Z-0.99, t-8.786 E+37). The comparison of the reduction in the degree of acne scarring from the two combinations of modalities was not significant, almost all subjects gave similar results.[27]

10. Monisha (2021) single-therapy study on 140 subjects with acne scars. Group K1 (n=70) was treated with CO2 fractional laser (fluence 15-25 J/cm2, density 100-150 MTZ/cm2, energy 40-45 mJ). Group K2 (n=70) received microneedling (dermaroller) therapy. Overall therapy every 4 weeks for 4 sessions. Treatment outcomes were assessed qualitatively by the Global Scar grading system according to Goodman and Baron before and after therapy. Both groups showed a statistically significant improvement in the degree of acne scarring before treatment. The K2 group treated with microneedling (dermaroller) found a greater reduction in the degree of acne scars (mean SD 23.43 + 6.32 13.23 + 3.65) compared to the K1 group treated with CO2 fractional laser (mean SD 23.95 + 6.85 16.34 + 4.75). The value of the difference is statistically very significant with P<0.0001.[28]

Risk of bias in research

Based on the study characteristics data, the research articles included in the meta-analysis were 4 studies, namely Elfar (2020), Ibrahim (2017), Ibrahim (2018) and Monisha (2021), reporting data on the mean degrees of pre and post acne scars in the control and treatment.

The risk assessment of bias in the meta-analysis used The Cochrane Collecting data - form for RCTs only and Comprehensive Meta Analysis version 3.0 data - form for RCTs only.[29,30] (**table 2**)

Low risk of bias namely the Eflar study (2020). Provide a complete explanation of the randomization process, allocation concealment and blinding of drugs and research groups during outcome evaluation.

Meta-analysis

The results of the qualitative and quantitative meta-analysis of the effectiveness of microneedling therapy on the degree of acne

scars according to Goodman and Baron are shown in tables 3 and 4.

The results of a qualitative meta-analysis on the effectiveness of microneedling therapy on the degree of acne scars according to Goodman and Baron showed that in the study of Ibrahim ZA (2017), there was a qualitative difference in the degree of acne scars according to Goodman and Baron, which was significant after therapy between the treatment group and the control group. The mean difference was -1.662 (95% CI= -2.420 to -0.904), the Z value was -4.299 and P=0.001. The value of the mean difference was negative, indicating that the qualitative decrease in the degree of scars according to Goodman and Baron after combination therapy (microneedling and PRP) was lower than the control group (PRP) with a significant difference.

The results of a quantitative meta-analysis on treatments differed between the results of the Elfar study (2020) of combined administration (microneedling with PRP) versus single therapy (PRP) and the Monisha study (2021) of single administration (microneedling) versus single therapy (CO2 fractional laser). The results of the effectiveness of microneedling therapy on the quantitative degree of acne scars according to Goodman and Baron showed that the Elfar (2020) study found significant differences between the treatment group and the control group. The mean difference was -1.737 (95% CI=-2.464 to -1.010), the Z value was -4.681 and P=0.000. Monisha's study (2021) found a quantitative difference in the degree of acne scars according to Goodman and Baron, which was significant after single therapy between the treatment group and the control group. The mean difference was -0.611 (95% CI= -0.950 to -0.272), the Z value was -3.536 and P=0.000.

The mean difference value was negative, indicating that the quantitative reduction in the degree of acne scars according to Goodman and Baron after microneedling combination therapy was lower than the control group in the Elfar study (2020). Combination therapy (micro-needling and PRP) was lower than the control group (PRP), with meaningful difference. The mean difference value was negative in the single microneedling treatment, which was lower than the control group in the Monisha study (2021) using a CO2 fractional laser with a significant difference.

Discussion

A meta-analytic observational study, a systematic review and a meta-analysis to determine the effectiveness of microneedling therapy in reducing the degree of acne scars according to Goodman and Baron qualitatively and quantitatively.

The study included 10 studies included in the systematic review and meta-analysis, spanning 2010-2021. A total of 514 subjects with acne scars included both men and women. The study included a sample with an age range of 16-65 years, with a mean age of 40.5 years out of 10 studies, with a peak age range of 20 to 40 years. A research study from Chuah (2015) related to the impact of acne scars on the quality of life of adolescents, and it was seen that up to 80% of people aged between 11 and 30 years had experienced acne vulgaris.[31] The questionnaire from Chuah's (2015) study included many of the subjects studied (48 %, n=48) delayed their treatment for 1 year after the onset of acne vulgaris and 12 patients (12%) did not give any treatment.[31,32]

The prevalence of individual adult acne scars in 10 studies was reported to be 220 men and 267 women. Reports of studies related to sex differences related to the incidence of acne scars show higher levels of skin hydration in women, men produce higher sebum levels, and a higher risk of skin disorders in men. Men are at higher risk and are more prone to acne scarring. This still needs to be investigated further with a sebumeter measuring instrument and the sample size is enlarged so that the effect is accurate and significant between gender and the risk of acne scarring.[33]

The study involved subjects with Fitzpatric skin types I to V. Two studies did not show the skin types in the subjects. The Fabbrocini study

(2010) in the study of acne scars treated with microneedling.[34] The most significant post-procedure side effect on Fitzpatric skin types I and II was post-procedure erythema.[34] Hassan's (2015) study compared microneedling and the combination of micro-needling with subcision. in patients with atrophic acne scars.[35] Seventy patients were reported to be Asian with "dark skin". Comparison of image analysis was shown in 77% of patients who were microneeded, compared with 100% of patients treated with a combination of microneedling and subcision. The most severe side effects are temporary in the form of postoperative erythema, edema, and crusting. Microneedling can be performed safely on all colors, skin types, and has a lower risk of hyperpigmentation than other procedures (dermabrasion, chemical peels, and laser resurfacing).[11,13,34]

Researchers involved subjects with macular scarring to severe (n=2) and mild to severe (n=8). Microneedling is a relatively inexpensive and minimally invasive technique for cosmetic and dermatological treatment.[8,36] Trauma caused by needle penetration in the skin induces dermal regeneration.[37,38]

The first hypothesis states that micro-needling therapy is effective in reducing the degree of acne scars according to Goodman and Baron. The results of the analysis of 2 studies showed that there was a significant qualitative decrease in the degree of acne scars according to Goodman and Baron by Ibrahim ZA (2017) who was treated with a combination of PRP with the addition of microneedling compared to controls with PRP therapy modalities. Goodman and Baron by Elfar (2020) and Monisha (2021).[21,28] Both studies gave significant results in quantitative reduction in the degree of acne scars (macular, mild, moderate, and severe) with microneedling therapy combined with PRP that could be given as a single therapy, compared to controls given PRP therapy or CO2 fractional laser. The Elfar study (2020) which resulted from the combination of PRP with microneedling obtained a quantitative improvement in the degree of scars according to Goodman and Baron which was much lower than the Monisha study (2021). Microneedling plays a role in the post-stab wound healing process by releasing various platelet-derived growth factors (PDGF), transforming growth factors alpha and beta (TGF-α and TGF-β), connective tissue protein activation, connective tissue growth factor, and fibroblast growth factor. (FGH).[11,37,39-41] Trauma inflicted by needle penetration in the skin induces regeneration of the dermis.[38,42] Various studies have emphasized the effectiveness of microneedling monotherapy in the treatment of acne scars and have shown improvement of at least 1 degree increase in more than 1 degree 90 percent of acne scar patients.[43-46]

The second hypothesis states that micro-needling is effective in reducing the degree of acne scars according to Goodman and Baron in the treatment of acne scars compared to CO2 fractional lasers. The results of the analysis of Monisha's study (2021) showed that Goodman and Baron's acne scars were significantly reduced in microneedling treatment compared to controls treated with CO2 fractional laser. Monisha's study (2020) decreased the degree of acne scars (mild, moderate, severe) after 16 weeks of therapy compared to before treatment. Statistically, microneedling reduced the degree of acne scars significantly compared to CO2 laser therapy. Microneedling and CO2 fractional lasers, have a similar role in reducing the degree of acne scars. Saeed's study (2018) the role of CO2 fractional laser is a new modality in acne scars, especially the severe degree of acne scars. The CO2 fractional laser plays a role in lifting tissue, shrinking collagen, and forming skin dermal collagen.[47] Abel's (2020) study of boxcar and rolling acne scars has been shown to respond better to CO2 fractional laser therapy modalities. Another case had moderate-grade acne scars, a higher percentage of improvement was achieved using dermaroller therapy than CO2 fractional lasers, but the difference was not statistically significant.[48] This still needs to be investigated further with an enlarged sample

size so that the effect is accurate and significant between treatment modalities other.

Another hypothesis is that microneedling is effective in reducing the degree of acne scars according to Goodman and Baron in the treatment of acne scars compared to PRP. The study of Ibrahim MK (2018) and Ibrahim ZA (2017) showed a qualitative improvement in the degree of acne scars according to Goodman and Baron which was significant in the treatment group treated with a combination of PRP with microneedling (12 weeks duration). Compared to the control group treated alone with PRP and microneedling (duration takes 12 to 20 weeks longer). The Elfar study (2020) showed that the quantitative improvement in the degree of acne scars according to Goodman and Baron was significant in the treatment group treated with a combination of PRP with microneedling compared to the control group treated alone with PRP and microneedling. Both groups took 16 weeks. All three studies found a quantitative decrease in the degree of acne scarring (mild, moderate, severe) after 12 to 16 weeks of therapy compared to before treatment. Platelet Rich Plasma contains platelets in plasma that release various cytokines and growth factors (vascular endothelial growth factors, PDGF, epidermal growth factor, FGF, TGF-β, insulin-like growth factor, interleukin-8 supporting angiogenesis, remodeling, and wound healing). only acne scars Platelet Rich Plasma as monotherapy in acne scar research is used in several studies The results are satisfactory when PRP is used in combination with other modalities, one of which is microneedling.[49] The Pooja study (2020) modality of PRP therapy in acne scars when monotherapy is used (single therapy) is not recommended because the results are unsatisfactory.[50] Ibrahim's study (2017) combined therapy in the treatment of acne scars showed satisfactory results when PRP was used in combination with other modalities such as microneedling and CO2 laser.[51] Faghihi study (2016) acne scar therapy using a combination of PRP with CO2 laser, gave insignificant results, a synergistic effect with uncomfortable side effects and took longer.[52] This still needs to be investigated further. again with an enlarged sample size so that the effect is accurate and significant between other therapeutic modalities.

Conclusion

The results of a systematic review and meta-analysis conducted, it can be concluded that in the group given microneedling therapy (single or in combination) there was a qualitative and quantitative reduction in the severity of acne scars according to Goodman and Baron compared to other therapeutic modalities, but on average before and after therapy. Compared to the control there was no significant difference.

Acknowledgement

The author thanks to all reviewers (Dermatovenereolgy residents Diponegoro University/Dr. Kariadi Hospital, Semarang-Indonesia) for their help in collecting and analyzing data.

Funding

Nil.

Conflict of Interest

There is no conflict of interest

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