

ORIGINAL ARTICLE

Microbotox injection versus its topical application following microneedling in the treatment of wide facial pores: A split face comparative study

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Abstract

Background: Enlarged facial pores and seborrhea are common cosmetic problems. Mesobotox has been proved to be effective safe therapeutic option.

Objective: To compare the efficacy and longevity of intradermal mesobotox injection versus its topical application with microneedling for treatment of wide facial pores and seborrhea.

Materials and Methods: This split face study was conducted on 20 patients with enlarged facial pores and seborrhea. One side of the face was treated with intradermal injection of botulinum toxin, the other was treated with its topical application following microneedling. Patient evaluation was performed after 1 month then after 4 months.

Conclusion: Microbotox can effectively and safely minimize enlarged facial pores with no downtime. Intradermal injection showed more patient satisfaction on the basis of greater efficacy, longevity of treatment than its topical application following microneedling.

KEYWORDS

mesobotox, seborrhea, wide pores

1 | INTRODUCTION

Enlarged facial pores are common cosmetic concerns that are attributed to multiple factors. Excess sebum production, decreased skin elasticity, and increased hair follicle volume are the three main causes of enlarged pores. Other factors include sex, aging, excessive sun exposure and improper use of cosmetic products.¹ Due to great psychological impact, people have been trying to find treatment for this problem. Many treatment options are available including isotretinoin, chemical peeling, and laser therapy.²

Microbotox has been proved to be effective in improving the sheen and texture of the skin, as well as decreasing sweat and sebum production and enlarged pores as it causes atrophy of sebaceous glands, which subsequently causes tightening of the skin envelope.³

Microneedles (MNs) can create hundreds of reversible microchannels in non-invasive manner to enhance transdermal drug delivery and promote collagen production.⁴

Depending on the previously mentioned data, this study aimed to compare the efficacy and longevity of intradermal microbotox

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injection against topical application of microbotox with microneedling in the treatment of wide facial pores in a split face designed study.

2 | PATIENTS AND METHODS

2.1 | Study population

This study was designed as a split face study that involved 20 patients of both sexes and different age who were complaining of wide facial pores and seborrhea. Patients were recruited from the outpatient clinic of Dermatology and Andrology Department of Benha University hospitals in the period from January 2021 to January 2022.

2.2 | Ethical considerations

The study was approved by the local ethics committee on research involving human subjects of Benha Faculty of Medicine (MS: 19-1-2021). Informed consent was obtained from each individual before enrolment in the study.

Patients with pre-existing medical conditions that cause muscle weakness as myasthenia gravis, pregnant or lactating mothers, those with previous allergic or [hypersensitive reactions](#) to botulinum-A toxin were excluded. Those who received treatment for enlarged pores in the past 6 months prior to participation in the study were also excluded.

2.3 | Before treatment

All patients were subjected to detailed history taking to document the age and gender of the patients, duration of wide pores, occupation whether indoor or outdoor and smoking. The degree of seborrhea and the pores size on both facial sides were evaluated using sebum and pore scores⁵ before the treatment session. The sebum score graded the degree of seborrhea from 0 (dry skin) to 3 (severe oiliness), while the scores 1 and 2 referred to mild and moderate oiliness, respectively. According to the used pore score, patients with visible pores took the score "1," and those with enlarged pores took "2." When black heads were embedded on facial pores the score was "3." In this score, "0" referred to absence of visible pores. Both scores were assessed by 2 investigators who were blinded to the treatment used on each side.

Dermoscopic examination was also performed using Dermalite 4 Gen Pro II Dermoscopy at a fixed point (point of intersection between a line from ala of the nose to tragus with another line from the lateral canthus to angle of the mouth) on both sides of the face; and dermoscopic images were taken. Photographic images of both

treatment sides were also taken using a Sony digital camera (DSC-W530, 14 mega pixel resolutions).

2.4 | The treatment protocol

A numbing cream was applied topically for 40min before the procedure. Then, the treated area was disinfected and cleaned with a sterile saline.

Saline (5 ml of 0.9% NaCl) was added to a bottle of 100 units of botulinum toxin (Refinex® KC Pharmaceuticals). A single session was done. The patient's face was divided into two sides:

(i) The right side of the face

In this side, 1 ml syringe of microbotox solution contains 20 units of botulinum toxin A was injected via multiple intradermal injections using a 30-gauge needle. The injection was done all over the affected areas.

(ii) The left side of the face

The technique involved dropping 1 ml of the prepared mesobotox solution on the left side of the face following microneedling using the dermapen (DermaPen Ultima A6) for 3 s (24-needle head with a depth of 0.5mm, the vibrating frequency 8000 r/minute). A moderate pressure was applied by the device on the skin. This procedure was repeated throughout the outlined area.

2.5 | Patients evaluation

Patients were photographed and re-evaluated again by both scores, and by dermoscopic examination 1 month after the treatment session, then after the 4th month of follow up. Two-blinded dermatologists assessed the degree of clinical improvement according to the Pore score and sebum score. Every evaluator reported the scores of the patients in a separate sealed envelope; then the average of the scores of both of them was calculated for every patient and documented as the final score.

Adverse effects were also recorded following the treatment session and at every visit such as pain, ecchymosis, erythema or edema.

2.6 | Patients satisfaction

Patient satisfaction was evaluated by Likert satisfaction scale (1–5 scale)⁶ (1 = Very dissatisfied, 2 = Dissatisfied, 3 = neither satisfied nor dissatisfied, 4 = Satisfied, 5 = Very satisfied) at the 1st and the 4th month after the procedure.

Patients were also asked whether they recommend the intradermal injection method or the microneedling technique for their relatives or friends who have the same problem.

2.7 | Data management and analysis

The SPSS (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. IBM Corp) was used to analyze the results and determine its levels of significance. The significance of data was considered if p value < 0.05 .

3 | RESULTS

The present study was conducted on 20 cases with wide facial pores and seborrhea. Their mean age was (33.8 ± 7.2) years. They were six males (30%) and 14 females (70%).

3.1 | Baseline data

Among all studied cases, 15 patients (75%) had outdoors occupations and 16 patients (80%) were smokers. The mean duration of the condition was 7.8 ± 2.2 years.

The mean pore score was (2.6 ± 0.7) . Patients were classified according to pore visibility into: two patients (10%) with visible pores (score 1), five patients (25%) with enlarged pores (score 2) and 13 patients (65%) with blackhead embedded pores (score 3). The mean sebum score was (2.7 ± 0.5) . Seven patients (35%) had moderate oiliness (score 2) and 13 patients (65%) had severe oiliness (score 3).

3.2 | The safety profile

Regarding side effects, 100% of patients reported pain in the right side & edema as well as erythema in the left side (Table 1). No late side effects (scars or dyspigmentation) were reported in any patient.

3.3 | The efficacy of both lines

Both used treatment lines in this study were effective in improving facial pores and seborrhea (Figures 1 and 2). This was confirmed by

TABLE 1 Side effects in right and left sides.

| | Right | Left | |
|---------------------|-----------|-----------|-----------|
| | N (%) | N (%) | <i>p</i> |
| Pain | 20 (100%) | 2 (10%) | < 0.001 |
| Edema | 12 (60%) | 20 (100%) | 0.003 |
| Erythema | 10 (50%) | 20 (100%) | < 0.001 |
| Secondary infection | 0 | 0 | - |

the significant reduction of both pore and sebum scores in both sides. Moreover, the visibility of the pores and the degree of the treated skin oiliness were significantly improved in both sides (Table 2).

3.4 | Comparison between efficacies of both lines

The percentage of pore and sebum scores improvement were significantly higher in the right side than in the left side denoting that injecting mesobotox was significantly more effective than applying it topically following microneedling. The treated patients were significantly more satisfied with the results of the treatment option used on the right side of the face (mesobotox injection) when compared to the left side ($p = 0.001$). Fifteen patients (75%) would recommend mesobotox injection for treating similar cases (Table 3).

3.5 | Factors affecting response to treatment

Higher percentage of improvement was reported in females, non-smokers and those who have indoor occupation concerning both pore and sebum scores (Table 4). Better results were also reported in younger patients and with shorter duration of the problem (Table 5).

3.6 | After Follow up

Four months after treatment, all patients were re-evaluated again to check for the stability of the results and the occurrence of any late side effects. The effects were preserved in the right sides, while the left sides lost the effect completely regarding both pore and sebum scores. The patients satisfaction about the results in the left sides regressed significantly (2.5 ± 0.5 , $p < 0.001$) following the loss of the effect, while their satisfaction about mesobotox injection was not changed and the number of patients who reported that they would recommend this line for similar cases was increased to 19 (95%) of the 20 treated patients.

4 | DISCUSSION

Oily skin is a frequent dermatological complaint. Patients may suffer from oily skin, acne, enlarged pore when sebum secretion rates exceed $1.5 \text{ mg}/10 \text{ cm}^2$ every 3 hours. Moreover, it has a negative impact on self-perception.⁷

The therapeutic approaches used to treat this problem include topical retinoids, chemical peeling, intense pulsed light and systemic treatments, such as isotretinoin and oral contraceptives; however, their effects in different cases are variable.⁸ Moreover, certain therapies may lead to pronounced adverse effects, such as the teratogenic effect of oral isotretinoin as well as the hypercoagulability and breast tenderness caused by oral contraceptives.⁹

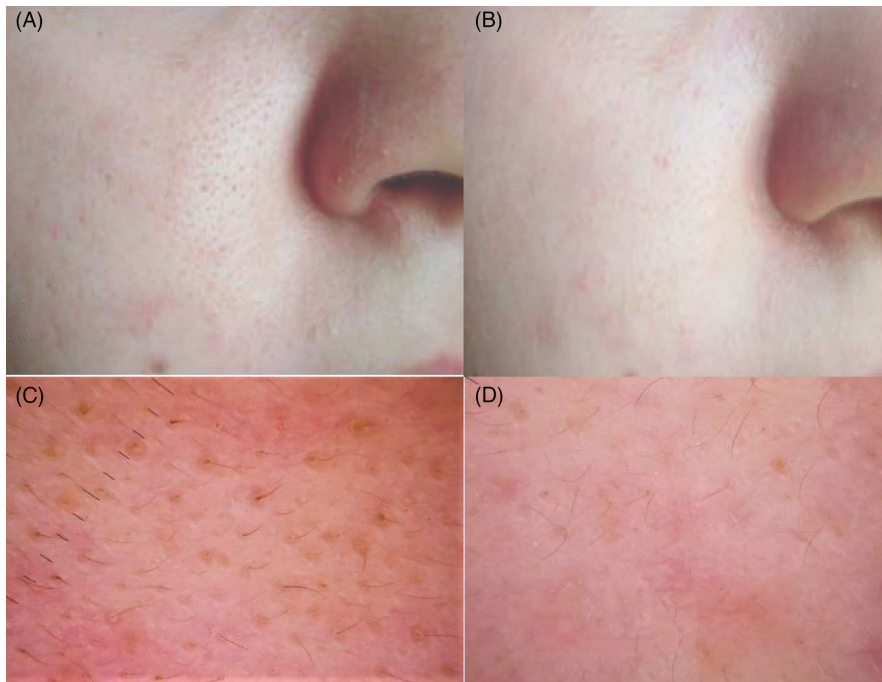


FIGURE 1 Right side of the face of a 20-year-old female patient with wide facial pores. (A) Before microbotox injection (B) after 1 month (C) Dermoscopic image at baseline (D) Dermoscopic image 1 month after treatment.

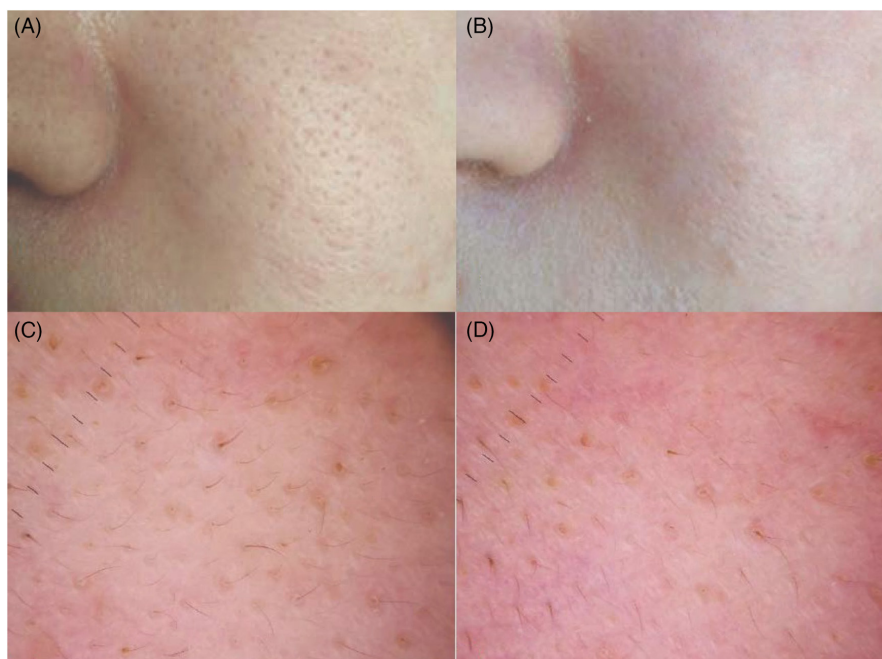


FIGURE 2 Left side of the face of the same patient (A) Before topical microbotox application with microneedling (B) after 1 month (C) Dermoscopic image at baseline (D) Dermoscopic image 1 month after treatment.

Owing to the efficacy and high safety profile of botulinum toxin type A (BoNT-A) in different dermatological indications, it was tried to shrink large facial pores, decrease sebum production, and improve the skin texture. To achieve these therapeutic effects, patients may need one session only with no downtime required following the session.¹⁰

Botulinum toxin A (BoNT/A) reduces the sebaceous gland activity with the subsequent improvement of seborrhea and shrinkage of the pores. Sebaceous glands express cholinergic receptors and release acetylcholine, which may alter the sebocytes activity. Botulinum toxin inhibits sebum secretion through cholinergic signaling blockage.¹¹

Topical microbotox with microneedling has been used in the treatment of skin aging symptoms, atrophic scars, stretch marks by stimulation of new collagen synthesis of epidermal thickening.¹² So, the aim of this study was to compare between the safety and efficacy of intradermal microbotox injection and topical application of microbotox following microneedling in the treatment of wide facial pores in a split face designed study.

The used treatment options were generally safe and well tolerated in all cases. The main side effect reported after intradermal injection of BONT/A was pain. This comes in line with previous studies.^{5,10,12-16} Whereas the main side effects after microneedling were

TABLE 2 The efficacy of both treatment lines.

| The assessment parameters | | Microbotox injection (Right side) | | | Topical microbotox with microneedling (Left side) | | |
|--------------------------------------|--------------|-----------------------------------|---------------|-----------|---|---------------|-----------|
| | | Before | After 1 month | <i>p</i> | Before | After 1 month | <i>p</i> |
| | | Pore score | Mean ± SD | 2.6 ± 0.7 | 1.3 ± 0.4 | <0.001 | 2.6 ± 0.7 |
| No visible pores | <i>N</i> (%) | 0 (0%) | 3 (15%) | <0.001 | 0 (0) | 0 (0) | <0.001 |
| Visible pores | <i>N</i> (%) | 2 (10%) | 8 (40%) | | 2 (10) | 7 (35) | |
| Enlarged pores | <i>N</i> (%) | 5 (25%) | 9 (45%) | | 5 (25) | 13 (65) | |
| Black heads embedded on facial pores | <i>N</i> (%) | 13 (65%) | 0 (0%) | | 13 (65) | 0 (0) | |
| Sebum score | Mean ± SD | 2.7 ± 0.5 | 1.1 ± 0.2 | <0.001 | 2.7 ± 0.5 | 1.7 ± 0.5 | <0.001 |
| Dry skin | <i>N</i> (%) | 0 (0) | 3 (15) | <0.001 | 0 (0) | 0 (0) | <0.001 |
| Mild oiliness | <i>N</i> (%) | 0 (0) | 12 (60) | | 0 (0) | 7 (35) | |
| Moderate oiliness | <i>N</i> (%) | 7 (35) | 5 (25) | | 7 (35) | 13 (65) | |
| Severe oiliness | <i>N</i> (%) | 13 (65) | 0 (0) | | 13 (65) | 0 (0) | |

TABLE 3 Comparison between the efficacies of both treatment lines

| | | Microbotox injection (Right side) | Topical microbotox with microneedling (Left side) | <i>p</i> Value |
|---------------------------------------|--------------|-----------------------------------|---|----------------|
| Percentage of pore score improvement | Mean ± SD | 49 ± 29 | 35 ± 14 | 0.005 |
| Percentage of sebum score improvement | Mean ± SD | 58.5 ± 22 | 37.5 ± 8 | 0.045 |
| Likert score of patient satisfaction | Mean ± SD | 3.7 ± 0.05 | 3 ± 0.6 | 0.001 |
| Patients recommendation | <i>N</i> (%) | 15 (75) | 5 (25) | <0.00001 |

TABLE 4 The relation between percentage of improvement and different study variables.

| The variables | % of improvement in the right side | | | | % of improvement in the left side | | | |
|---------------|------------------------------------|----------|-------------|----------|-----------------------------------|----------|-------------|----------|
| | Pore score | | Sebum score | | Pore score | | Sebum score | |
| | Mean ± SD | <i>p</i> | Mean ± SD | <i>p</i> | Mean ± SD | <i>p</i> | Mean ± SD | <i>p</i> |
| Male | 61 ± 30 | 0.70 | 58 ± 23 | 0.77 | 31 ± 15 | 0.25 | 35 ± 7 | 0.10 |
| Female | 65 ± 37 | | 60 ± 21 | | 36 ± 12 | | 39 ± 8 | |
| Smoker | 50 ± 29 | 0.60 | 46 ± 14 | 0.0059 | 33 ± 14 | 0.16 | 38 ± 7 | 0.40 |
| Non Smoker | 55 ± 31 | | 63 ± 22 | | 38 ± 7 | | 40 ± 8 | |
| Outdoors | 43 ± 19 | 0.0083 | 56 ± 19 | 0.059 | 33 ± 22 | 0.55 | 36 ± 6 | <0.00001 |
| Indoors | 70 ± 39 | | 70 ± 26 | | 36 ± 6 | | 50 ± 6 | |

TABLE 5 The correlation between percentage of improvement and different study variables.

| The variables | % of improvement in the right side | | | | % of improvement in the left side | | | |
|---------------|------------------------------------|----------|-------------|----------|-----------------------------------|----------|-------------|----------|
| | Pore score | | Sebum score | | Pore score | | Sebum score | |
| | <i>r</i> | <i>p</i> | <i>r</i> | <i>p</i> | <i>r</i> | <i>p</i> | <i>r</i> | <i>p</i> |
| Age | -0.537 | 0.015 | -0.700 | 0.001 | -0.499 | 0.025 | -0.353 | 0.127 |
| Duration | -0.305 | 0.191 | -0.490 | 0.028 | -0.37 | 0.108 | -0.400 | 0.080 |

erythema and edema that lasted no more than 48 hours and this comes in agreement with Calvani et al., 2019.¹⁷

In this study, regarding microbotox injection (the right side), there was a significant reduction in pore and sebum scores 1 month after treatment ($p < 0.001$). This comes in agreement with the results of Shah, 2008¹⁸ who proposed the effectiveness of intradermal BONT/A injections in the treatment of wide pores and seborrhea for the first time. This effect was also confirmed by several subsequent studies.^{5,10,14,19,20}

On the other hand, Sapra et al.²¹ reported that intradermal injection of botulinum toxin improves the skin texture, but not the sebum production or the pores size. The small sample size (10 females only) and the overall older patients (50–65 years) in that study may explain the discrepancy between their results and the current ones.

To the best of our knowledge, topical application of microbotox following microneedling (the left side) has not been used before in treatment of wide facial pores. In this study, this technique induced a significant reduction in pore and sebum scores 1 month after treatment ($p < 0.001$). Microneedling is a technique consisting of cutaneous micro perforations to allow nutrients and drugs absorption into the deep skin layers.²² The micro injuries from the needles might help in improving facial pores. The percutaneous needle pricks create multiple dermal microbruises and commence a cascade of growth factors that ultimately result in multiplication of fibroblasts and increase in collagen and elastin production.^{17,23}

The percentage of improvement was superior in microbotox injected side than that in topical microbotox with microneedling side regarding both pore and sebum scores. In fact, single microneedling session may not be sufficient to express its full efficacy. Biweekly or at least three to five monthly microneedling sessions are recommended to achieve the desired results.²⁴ Moreover, the intradermal injection guarantees larger amount and deeper levels of the substance delivered.

As regards patients' satisfaction, patients were more satisfied with microbotox injection due to its better and more persistent effects. When patients were asked about which line would they recommend to other people suffering the same problem, microbotox injection was obviously more preferred due to the same reasons. This comes in line with previous studies where patients were also highly satisfied with the rapid and great improvement in pore size after a single session of microbotox injection.^{5,14} However, Sapra et al.²¹ patients were not satisfied due to the poor results.

In the follow up visit (4 months after the treatment session), the effects were preserved in the microbotox injected side (right side). This is in agreement with other studies.^{5,14,20,25} Plewig and Kligman²⁶ reported the return of sebum production to the initial levels at the 16th week after treatment.

Regarding topical microbotox with microneedling (left side), the effect of treatment was lost completely regarding both pore and sebum scores in the 4th month visit. Calvani et al.¹⁷ used microneedling with BONT/A in the treatment of skin folds of the neck and reported also a complete loss of the therapeutic results after 6 months and all patients needed to repeat the procedure.

Percentage of improvement of both pore and sebum scores showed a significant negative correlation with both patients' age and the problem duration. Since the elderly people are more likely to have thinner and less elastic skin, they are not expected to respond as well to BTX-A treatment as younger patients.²⁷ Aging and its associated collagen modifications reduce tissue remodeling by matrix metalloproteinases and decrease the structural and mechanical integrity of collagen fibers.²⁸ It was assumed that pores would be more noticeable with older age as they become larger and deeper.^{8,29} With age, collagen breaks down, causing skin to lose its elasticity. As the skin relaxes, pores dilate and get more visible.³⁰

As regards gender, significantly higher percentage of improvement was observed in females. Females show better results as estrogen enhances skin thickness by increasing collagen synthesis. Estrogen restores skin thickness by enhancing the morphology and synthesis of elastic fibers, collagen type III, and hyaluronic acids. It also improves cutaneous collagen remodeling and limits excessive collagen degradation.³¹

Regarding smoking, nonsmokers had significantly higher percentage of improvement. Smoking is significantly associated with signs of visible skin aging.^{32,33} Cigarette smoke contains many toxins that cause collagen and elastin breakdown. Smoking also causes premature aging because it narrows the blood vessels, which limits tissue oxygenation, decreases free radicals scavenging, and lowers vitamin A level in the skin. It was proposed that the skin aging effects of tobacco smoking is attributed to MMP-1, which has been found elevated in the skin of smokers compared to nonsmokers.³⁴ Moreover, the effects of tobacco smoke may be topical due to the drying or irritating effect of cigarette smoke on the skin.³⁵

Significantly higher percentage of improvement was associated with indoor occupations. Sun exposure expands pores as it leads to inflammation and skin cells damage. Scorched cells around pores' edges make them appear even larger. MMPs, which are induced by ultraviolet radiation may also induce photo aging.⁵

Microbotox can effectively and safely minimize enlarged facial pores with no downtime. Intradermal injection showed more patients satisfaction on the basis of greater efficacy, longevity of treatment after a single session. Microbotox application after microneedling seems to require multiple treatment sessions and larger amount of the applied toxin to achieve the desired effects; however, this consumes more time and carries a larger financial burden attributes to the repeated sessions and more required materials. Older age, male gender, heavy smoking and excessive sun exposure related skin changes could be considered as a poor prognostic predictors, which may limit the expectations.

CONFLICT OF INTEREST

No Conflict of interest to declare.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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