Original Article

A Comprehensive Evaluation of Biofillers for Infraorbital Rejuvenation

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Abstract

Background: The increased demand of non-surgical cosmetic procedures has led to the popularity of infraorbital rejuvenation with autologous Biofillers because of their minimally invasive and biocompatible nature and cost-effectiveness. Dark circles around the eyes and loss of volume due to aging are relevant to facial aesthetics. Unlike hyaluronic acid fillers, Biofillers, having the origins in platelet-rich plasma (PRP), provide a regenerative and safer choice, as it uses own biological material to enhance the treatment of areas under the eye.

Objective: To evaluate the effectiveness of undereye Biofillers for infraorbital rejuvenation and with side effect profile and follow up.

Methods: Biofiller treatment was performed in 30 participants, 25-55 years of age who had mild to moderate undereye concerns. Biofiller was obtained by withdrawing blood followed by centrifugation, plasma separation and its heating and cooling to an opaque color before injection. Patients received two injections, 4 weeks apart. Subjective and photographic evaluation of outcomes such as improvement in hollowness, reduction in peri orbital hyperpigmentation and side effects were measured with visual analog scales before treatment, immediately after treatment and at 4 weeks and 12 weeks from the treatment.

Results: Overall satisfaction and improvement in aesthetic appearance reflected by the mean scores of 8.0 and 7.5 respectively was high. The side effects were not severe and were transient, lasting for a period of 3 to 5 days and a mean pain score noted was 6.5. The data points to the satisfactory to good response with low side effect profile in infraorbital rejuvenation with Biofillers.

Conclusion: Biofillers for infraorbital rejuvenation is an economically viable method effectively showing improvement in appearance of under eyes, both in improvement of hollowness and reduction of pigmentation and is accompanied by mild side effects.

Keywords: Undereye Biofillers, platelet-rich plasma, infraorbital rejuvenation, minimally invasive treatment.

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Introduction

The trend of using minimal invasive treatments has increased in the past decade owing to developments in aesthetic devices and rising popularity of effective non-surgical procedures.[1,2] Of these, undereye fillers have become common in treating features related to aging such as loss of volume and dark circles in periorbital area that can considerably age or give a tired look to the patient.[3,4] The commercially available fillers, which usually contain hyaluronic acid, are relatively safe and highly effective method for correcting undereye imperfections by replenishing lost volume, as well as improving skin tone and texture and in reducing pigmentation; however they have drawbacks such as filler migration , swelling and Tyndall effect.[5,6]

Aging can cause dark circles and bags under the eyes which are both related to changes in skin and tissue structure. The skin and subcutaneous

tissue in this region is sensitive and the structural framework of this area is unsuitable for conventional treatment.[7] Among all available topical and surgical treatments, under eye Biofillers are a relatively limited invasive procedure offering instant and natural-looking effects without the need for a long recovery period.[8] Research has shown that patients who undergo undereye Biofillers achieve up to 75-85% satisfaction with the results and the common side effects of the treatment can be minimized through proper application of the technique by qualified practitioners.[9,10]

Besides the improvement of the under-eye area, Biofillers have also shown significant improvement psychologically. Subtle changes in the appearance around the eyes, contributes positively on the self-esteem, decreases appearance-related concern and boosts self-confidence in interpersonal relationship.[11] Recent research stress that psychological aspect of face lifting treatments including Biofillers is a significant component of patient's satisfaction since numerous patients expect such procedures not only for esthetic sake but also to enhance their self-perception.[12] This psychological aspect of cosmetic intervention has made undereye Biofillers a go-to treatment for those patients who seek meaningful though relatively minor enhancement of facial aesthetics that is also known to have a beneficial impact on the state of mind.[13]

Like any skin procedure, undereye are not without their drawbacks. The patient may experience mild oedema, ecchymosis and moderate pain that is more likely to be self-limiting and disappears within 2 – 3 days of the procedure.[14] Other areas of interest include pain control and client expectations and the length of stay in the hospital. Recent research has also looked at the concept of follow-up care and realistic goals setting with patients because they affect patient satisfaction and likelihood of recommending the procedure.[15,16] For that reason, it is essential to investigate the efficacy and safety of undereye Biofillers to meet the goals of clinicians who want to get the best results from biostimulator treatments.[17]

Despite the growing adoption of Biofillers, several gaps remain in the existing literature. Most studies have primarily focused on subjective outcomes or short-term effects, with limited emphasis on standardized evaluation criteria and long-term safety data. Variations in Biofiller preparation techniques, injection protocols and follow-up durations have led to inconsistent findings, making cross-study comparisons difficult. There is also a paucity of region-specific data where economic constraints and differences in patient demographics may influence both treatment outcomes and expectations. Little is known about the psychological impact of these procedures when evaluated through structured follow-ups beyond initial sessions. These gaps highlight the need for more uniform, cost-effective and regionally contextualized clinical assessments like the present study.

The aim of this study is to provide a full appraisal of the effects of undereye Biofillers for satisfaction in terms of the aesthetic result, perceived improvement as well as side effects and the duration of recovery. Through comparing the responses of patients before the procedure, after the treatment and during the follow up visits in 4 and 12 weeks, this study provides information for the short term and long-term impacts of undereye Biofillers. The results of the study will add to the growing scientific data on the least invasive cosmetic treatments, demonstrating evidence regarding the efficacy, safety and Cost effectiveness of undereye Biofillers as an aesthetic treatment method.[18]

Methods

This cross-sectional, multicentered prospective study was performed at Shaikh Zayed Hospital Lahore from Oct 2023 to Oct 2024 after obtaining the ethical approval (Ref No. 02-TERC/NHRC/SZH/SC-Int/ 759), intended to do infraorbital rejuvenation with undereye Biofillers for enhancement in appearance of under eye area addressing both hollowness and pigmentation. All the procedures were done following hospital standard operation procedures, as supervised by the clinical staff.

A total of 30 participants of both genders aged between 25 and 55 years were involved in the

study. Specific criteria for patient selection involved no contraindication to Biofillers, with overall good health and minimal to moderate degree of under eye issues such as volume depletion or dark circles with realistic expectations. The exclusion criteria include any current Infection, previous cosmetic treatment in the under-eye area within the past 6 months. Allergic to any medication, pregnancy or lactation and patient on blood thinners with history of Autoimmune disorders was also observed for this study.

An economical and effective Biofiller was prepared using an advanced platelet rich plasma (PRP) technique. After taking informed consent, pictures were taken with patient in sitting position with adequate light, looking straight. Pictures were taken both before and after procedure and on follow up.

Local anaesthesia was injected at entry point of cannula, i.e 2cm below the lateral canthus or lateral orbital rim. Topical 10.56% lidocaine anesthetic cream was applied around the patient's eyes on the areas to be treated for 45 min.

Biofiller preparation was done by drawing 10 cc of blood using a 10-cc syringe. Preservation of blood was made using anticoagulant from a PRP tube containing sodium citrate. The blood was then centrifuged at a speed of 3000-3200 rpm for a period of 7-8 minutes, in a normal commercial centrifuge; no expensive equipment was required. The plasma was then slowly aspirated into a 3cc syringe such that the whole portion of plasma was collected. The Plasma solution was again centrifuged at 1000 Rpm for 5 min. The upper part of plasma i.e. Platelet Poor Plasma (PPP) was withdrawn in a 3ml syringe.

Calcium gluconate was added in PPP in proportion of 0.01 ml/1 ml of PPP. The plasma was then put in hot water, at 100°C for few minutes with the plasma changing into an opaque form. The Viscous gel approx. 3ml in volume was ready for use, after cooling to room temperature.

After application of an ice pack to the lower lid and cheek, a local anesthetic consisting of 0.5% lidocaine was injected into the orbicularis within the boundaries of tear trough. Finger pressure was applied to flatten the area of injection. Biofiller was then injected by connecting a 25 G cannula to the syringe, at the most lateral extent of the tear trough, advancing fully and potentially indenting the skin with the hub for full reach. The Biofiller was injected deep into the dermis as the needle was withdrawn, injecting small amount in a layering manner.

This process was repeated above and below the original site of injection. The area was then inspected and additional filler was injected as needed to yield a smooth contour. Last the area is massaged lightly, compressed with finger pressure and rolled with the cotton applicator. Care should be taken not to forcefully compress the product during massage as this can displace the product into the cheek and exaggerate the tear trough.

Post injection care involves applying ice to the area in case of pain or redness for 1 day and refraining from massaging the area.

Participants were given two injections of Biofiller under the eyes. One injection was given at baseline (Week 0) and the second injection at the Week 4 visit. Photographs were taken before, immediately after and at 4 and 12 weeks respectively on follow up visits.

Data were collected at four intervals. At baseline, Patients completed a baseline assessment to document initial aesthetic concerns and expectations. For Post treatment at 0 weeks, immediately after the first injection, patients reported initial impressions, pain levels (1-10 scale) and satisfaction with the initial results. At the 4-week mark, patients returned for the second injection and completed assessments on satisfaction, aesthetic improvement and any ongoing side effects. At 12 weeks, patients completed final assessments evaluating sustained effects on satisfaction, aesthetic improvement and overall experience with the treatment.

Based on the survey used in this study as primary outcomes, patient satisfaction, cosmetic benefit and side effect experience were evaluated. The level of satisfaction with the results was measured on a scale from 1 to 10, where 1 – is low satis-

faction, 10 – is high satisfaction. Aesthetic improvement was also measured through a visual analogue scale, in which 1 = poor and 10 = significant improvement in under-eye appearance. Side effects and recovery were assessed in each follow-up in which patients described the duration and severity of any side effects they had. At 12 weeks' follow-up, patients were asked to self-report the likelihood that they would recommend the treatment to others (on the 1-10 scale) to measure overall satisfaction and treatment endorsement.

Frequency, mean and standard deviation were used as descriptive analysis for the demographic data and each of the outcome variables. A comparison of the alterations in satisfaction, esthetic changes over different time points was used to assess the presence of any trends. A chi-square test of association was also performed for the study. The analysis was done using SPSS version 26.

The study was granted ethical approval from the relevant hospital's ethical committee. Informed consent was sought from all participants and data anonymity was preserved. The participants were told of the possible risks involved and could pull out at any time.

Results

The success of undereye Biofiller treatment was assessed by satisfaction, perceived appearance improvement and procedural satisfaction in this study. 30 participants were surveyed at four key points: a preliminary consultation before the operation, the first session (week 0) and two post-operative therapy sessions at 4 and 12 weeks, respectively. The participant was given two injections, separated by a period of 4 weeks and immediate and progressive changes were measured at the follow-up. The following tables present the findings gathered in the present study in terms of patients' experiences and subsequent outcomes.

Table 1 gives the demographic characteristics of the participants. The target sample comprised more female patients than males (56.7%) and the participants were within the age of 25 – 55 years. As for the medical history, participants' responses divided exactly evenly: 50.0% of participants had no medical conditions, while the rest had allergies, skin sensitivity or previous surgeries.

Table 1: *Participant Demographics.*

Characteristic	Frequency (n)	Percentage (%)
Gender		
Male	13	43.3
Female	17	56.7
Age Group		
Under 25	4	13.3
25-35	8	26.7
36-45	7	23.3
46-55	5	16.7
Over 55	6	20.0
Medical Conditions		
Yes	15	50.0
No	15	50.0
Specify Condition		
Allergy	4	13.3
Skin Sensitivity	5	16.7
Previous Surgery	3	10.0
Other	3	10.0

As presented in *Table 2*, 60% of participants had not previously received aesthetic treatments. Among respondents, 43.3% attended 2-3 Biofiller sessions and 20% of respondents got the last session more than six months ago. These outcomes

Table 2: *Treatment History.*

Treatment Characteristics	Frequency (n)	Percentage (%)
Previous Cosmetic Procedures		
Yes	12	40.0
No	18	60.0
Biofiller Sessions Received		
1 session	5	16.7
2-3 sessions	13	43.3
4 or more sessions	12	40.0
Time Since Last Treatment		
Less than 1 month ago	6	20.0
1-3 months ago,	10	33.3
4-6 months ago,	8	26.7
Over 6 months	6	20.0

reveal participants' divergent experiences and past concerning cosmetic procedures.

Looking at the patient satisfaction/appearance improvement scores in *Table 3*, the mean satisfaction and improvement scores received were 8.0 and 7.5 respectively. A majority number of patients; 33.3% of them, reported that the darkness of circles substantially decreased; satisfaction scores demonstrated that patients were generally happy with the results of their treatment.

Table 3: *Perceived Treatment Impact and Satisfaction.*

Outcome Measure	Scale	Frequency (n)
Appearance Improvement	1-10 scale	-
Mean Improvement Score	-	7.5
Dark Circle Reduction		
Significantly	10	33.3
Moderately	8	26.7
Slightly	7	23.3
No noticeable difference	5	16.7
Satisfaction with Results	1-10 scale	-
Mean Satisfaction Score	-	8.0

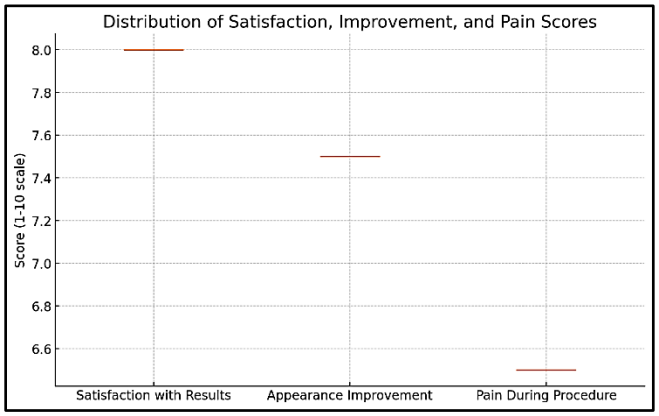

Figure 1: *Distribution of Satisfaction, Appearance Improvement and Pain Scores.*

The following images complete the quantitative data and illustrate the visual improvements observed in patients following undereye Biofiller treatment. The 'after' images were obtained at 12 week follow up, while the 'before' images were taken at baseline.

The specific satisfaction and appearance improvement statistics are shown in *Table 4*, which also provides the standard deviation, suggesting variability in patient response. Such scores have taken strong support in the effectiveness of the treatment.

Figure 2: *Before and after comparison showing reduced dark circles and improved volume under the eyes.*

Figure 3: *Patient outcome demonstrating significant reduction in periorbital hollowness and hyperpigmentation.*

The effect of Biofillers on infraorbital rejuvenation is also clear according to the results in *Table 5*. The large majority of participants presented an improvement score ranging between 7 and 9. In addition, majority of the participants pointed at high propensity to recommend the treatment to

other people, supporting the perceived advantages.

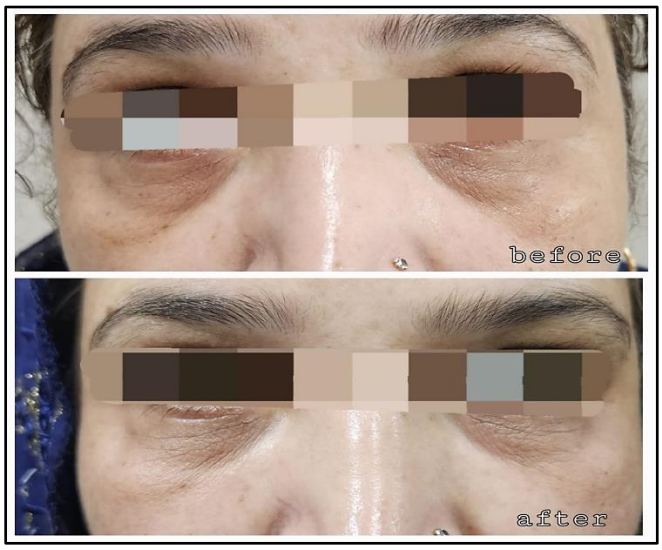

Figure 4: *Results highlighting the smoother skin texture and rejuvenated appearance.*

Table 4: *Satisfaction and Appearance Improvement Scores.*

Variable	Mean Score (1-10)	Standard Deviation
Satisfaction with Results	8.0	1.5
Appearance Improvement	7.5	1.8
Pain During Procedure	6.5	2.1

***Note**: Higher scores indicate greater satisfaction and per-ceived improvement, while a lower pain score reflects a more comfortable procedure experience.*

Table 5: *Perceived Impact on Recommendation Likelihood.*

Variable	Frequency (n)	Percentage (%)
Recommendation Likelihood (1-10)		
1-3	5	16.7
4-6	4	13.3
7-9	13	43.3
10	8	26.7

Concerning the analysis of side effects and the time required for the recovery, immediate side effects like pain, bruising and swelling were reported by 60% of participants as presented in *Table 6*, the effects were minor and of short duration. The majority of side effects were mild to moderate and lasted for 3-5 days, with 26.7% reporting this duration; 20.0% of respondents had side effects that lasted for 1 – 2 days, 13.3% side effects which lasted for 6 – 7 days.

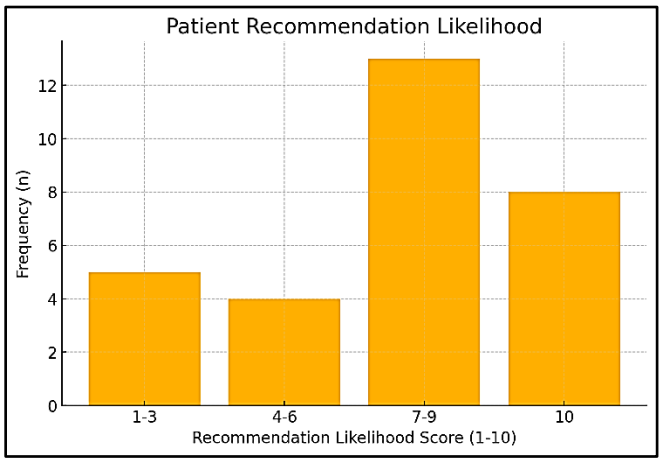

***Figure 5:** Patient Recommendation Likelihood.*

Table 6: *Side Effects and Recovery.*

Side Effect Characteristics	Frequency (n)	Percentage (%)
Immediate Side Effects		
Yes	18	60.0
No	12	40.0
Duration of Side Effects (Days)		
1-2 days	6	20.0
3-5 days	8	26.7
6-7 days	4	13.3
Pain Level During Procedure	1-10 scale	-
Mean Pain Score	-	6.5

The mean pain score during the procedure was 6.5 out of 10, the tested procedure may be considered moderately painful. Nevertheless, this level of pain did not seem to correlate with negatively affected satisfaction, as a majority of the participants stated that their perceived satisfaction and appearance enhancement were positive. These conclusions imply that non-serious distress and several forms of a mild adverse event are not a big issue as they are temporary and tolerable for a patient.

The duration of perceived Biofiller effects is presented in Table 7 and most of the participants reported maintained results within 3 to 9 months of its use. This outcome corroborates the effective-

ness of undereye Biofillers as a rejuvenation procedure with stable outcomes.

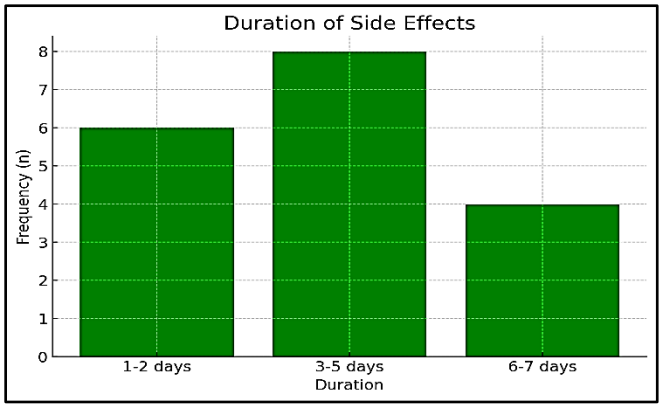

Figure 6: *Duration of Side Effects.*

Table 7: *Duration of Perceived Results.*

Result Duration	Frequency (n)	Percentage (%)
Less than 3 months	5	16.7
3-6 months	12	40.0
7-9 months	8	26.7
Over 9 months	5	16.7

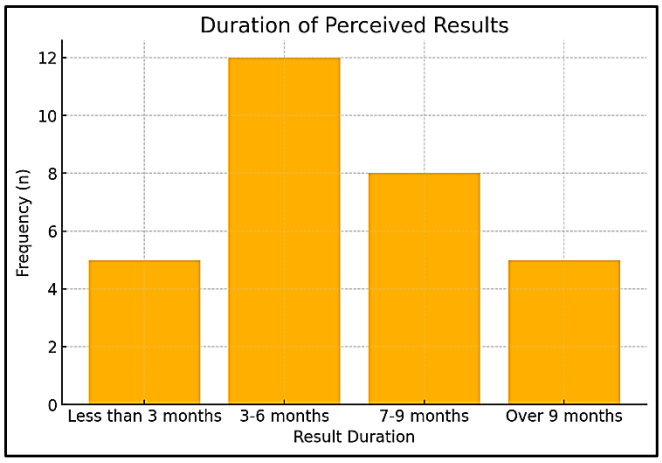

Figure 7: *Duration of Perceived Results.*

Discussion

The efficacy of undereye Biofillers to improve aesthetics and resolve aging complaints is reinforced in this study with favorable side effects and recovery periods. These results fall in line with currently available literature highlighting the benefit of non-surgical treatments for infraorbital rejuvenation, including correction of dark circles and volume loss.[1–3]

This study fits in with previous literature in that females tend to surpass the male percentage of patients seeking aesthetic procedures as a result of heightened societal and cultural expectations regarding facial appearance. The participants of this study were 25 to 55 years old, which is the age group most affected with concern such as volume depletion and pigmentation changes around the eyes.[4–6] These age-related changes confirm the reason they are so sought after as a minimally invasive treatment with Biofillers being able to see results quickly and having a quick recovery.[7,8]

The direct effect of Bio fillers in causing volume restoration is due to the denaturized gelled proteins and fibrin bundles through the degranulation of alpha granules that contain presynthesized growth factors. This leads to activation of neovascularization and neocollagenesis and synthesis of extracellular matrix components such as hyaluronic acid resulting in soft tissue augmentation and reduction of wrinkles.[19]

At follow up, 4 weeks later, significant reduction in dark circles and volume restoration were seen with average improvement and satisfaction scores of 7.5 and 8.0, respectively. These results are consistent with the results from other studies, for which an overall patient satisfaction of 75–85% for dermal fillers in infraorbital rejuvenation have been reported.[9,10] At 12 week followup, these improvements were maintained, as found in other studies showing long lasting benefits in periorbital treatments of 6 to 12 months.[13]

Side effects were mild to transient and were mainly swelling and bruising in 60% of participants with an average of 3–5 days duration. These finding are consistent with most previous research documenting minimal, if any, adverse effects of non-surgical cosmetic treatments [14,15]. The average pain level while having the procedure was moderate, at 6.5 on a 10-point scale, but it didn't impact overall patient satisfaction. This is consistent with other studies, which have reported that filler procedures usually cause only moderate discomfort and are well tolerated given that topical anesthesia and injection techniques are used.[16,17]

Despite promising outcomes, this study has

several limitations. The small sample size (n=30) offers a smaller sample size limits statistical power and the generalizability of the results. In future, larger and more diverse samples are recommended. Short- to medium-term effects were observed at 12 weeks, but long-term outcomes longer than 6 months are unknown. Follow up for the durability of Biofiller effects is needed. Participants included those with "realistic expectations," but those with autoimmune conditions or pregnancy were excluded. Some participants had undergone prior Biofiller treatment within six months, leading to potential overlap in effects. This may have influenced outcome measures, so the exclusion criteria were revised to require a minimum six-month interval since any previous under-eye procedure. Due to the lack of a control group, improvements cannot be attributed just to the Biofiller treatment. Due to ethical reasons, it was not possible to include a placebo or saline control group in this sensitive facial region. However, this was within subject design in which each subject was his own control. Further future trials with control groups or split face designs are encouraged for firmer comparisons. Biofillers were neither compared to other infraorbital rejuvenation methods. In future trials, the comparatively efficacy should be explored.

Conclusion

This study has established undereye Biofillers to be a promising modality in infraorbital rejuvenation since the participants expressed high satisfaction results and improvement in facial aesthetics. The limited side effects and a relatively short time needed for the low-cost recuperation also add to the treatment attractiveness. Results from these analyses are consistent with the overall benefits of Biofillers to fulfill the aesthetic concerns of patients.

Ethical Approval: The Intuitional Review Board, Shaikh Zayed Medical Complex, Lahore approved this study vide Ref No. 02-TERC/NHRC/SZH/SC-Int/ 759.

Conflict of Interest: There was no conflict of interest to be declared by any author.

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Author's Contribution

BM: Conception & design, acquisition of data, drafting of article, analysis & interpretation, final approval of the version to be published.

SA: Drafting of article, critical revision of the article, final approval of the version to be published

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