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Comparative Efficacy of Intranasal Corticosteroids, Structured Olfactory Training, and Olfactory Cleft Platelet-Rich Plasma Injection in Isolated Post-Viral Olfactory Dysfunction

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الفعالية المقارنة للكورتيكوستيرويدات الأنفية، والتدريب الشمي المنظم، وحقن البلازما الغنية بالصفائح الدموية في الشق الشمي في حالات خلل حاسة الشم المعزول التالي للعدوى الفيروسية

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Abstract:

Background: Post-viral olfactory dysfunction (PVOD) is a common disorder which often persists for long durations with limited effective treatment options. Currently, intranasal corticosteroids (INCs) and olfactory training (OT) demonstrate modest therapeutic efficacy, while regenerative approaches such as platelet-rich plasma (PRP) have recently emerged as promising interventions. **Objective**: To compare the efficacy of INCs, structured OT, and olfactory cleft PRP injection in improving olfactory function in patients with isolated PVOD. **Methods**: This prospective randomized controlled trial included 135 patients with persistent PVOD. Those were randomly allocated into three groups; Group1: INCs alone (n=45), INCs combined with OT (n=45), and combined therapy including INCs, OT, and PRP injection (n=45). Olfactory function was assessed using the Sniffin' Sticks Threshold–Discrimination–Identification (TDI) score, while subjective improvement was evaluated using a visual analog scale (VAS). Assessments were conducted at baseline, 1 month, 3 months, and 6 months. **Results**: All groups showed significant improvement in olfactory function over time. However, the level of improvement varied significantly between groups ($p < 0.001$). The mean TDI score increased by 5.7 ± 2.8 in the INCs group, 11.3 ± 3.4 in the INCs plus OT group, and 16.7 ± 3.9 in the PRP combination group. Clinically significant improvement (≥6-point increase in TDI) was achieved in 40.0%, 64.4%, and 80.0% of patients, respectively ($p < 0.001$). Normosmia was restored in 20.0%, 37.8%, and 53.3% of patients, respectively. Subjective VAS scores also improved significantly, showing better improvement observed in the PRP group ($p < 0.001$). **Conclusion**: Combined therapy including INCs, OT, and PRP injection provides better improvements in both objective and subjective olfactory outcomes compared with conventional therapies alone. These findings support a multimodal therapeutic approach targeting both inflammation and neuroregeneration in the management of PVOD.

Keywords: Post-viral olfactory dysfunction; Olfactory training; Intranasal corticosteroids; Platelet-rich plasma; Olfactory cleft; Sniffin' Sticks test; TDI score.

الملخص

الخلفية: يُعد خلل الشم التالي للإصابة الفيروسية (*PVOD*) اضطراباً شائعاً غالباً ما يستمر لفترات طويلة مع خيارات علاجية محدودة وفعالة. حالياً، تُظهر الكورتيكوستيرويدات الأنفية (*INCs*) والتدريب الشمي (*OT*) فعالية علاجية متواضعة، بينما ظهرت مؤخراً نهج تجديدية مثل البلازما الغنية بالصفائح الدموية (*PRP*) كتدخلات واعدة. **الهدف:** مقارنة فعالية الكورتيكوستيرويدات الأنفية (*INCs*)، والتدريب الشمي المنظم (*OT*)، وحقن البلازما الغنية بالصفائح الدموية (*PRP*) في الشق الشمي في تحسين وظيفة الشم لدى المرضى الذين يعانون من خلل الشم التالي للإصابة الفيروسية (*PVOD*) المعزول. **الطرق:** شملت هذه التجربة السريرية العشوائية المستقبلية 135 مريضاً يعانون من خلل الشم التالي للفيروس (*PVOD*) المستمر. تم توزيعهم عشوائياً إلى ثلاث مجموعات؛ المجموعة الأولى: استخدمت الكورتيكوستيرويدات الأنفية (*INCs*) بمفردها (45 مريضاً)، والمجموعة الثانية: استخدمت الكورتيكوستيرويدات الأنفية (*INCs*) مع التدريب الشمي (*OT*) (45 مريضاً)، والمجموعة الثالثة: استخدمت العلاج المركب الذي يشمل الكورتيكوستيرويدات الأنفية (*INCs*)، والتدريب الشمي (*OT*)، وحقن البلازما الغنية بالصفائح الدموية (*PRP*) (45 مريضاً). تم تقييم وظيفة الشم باستخدام اختبار "*Sniffin' Sticks*" (الذي يقيس عتبة الشم، التمييز، والتعرف - *TDI*)، بينما تم تقييم التحسن الذاتي باستخدام مقياس التناظر البصري (*VAS*). أُجريت التقييمات في بداية الدراسة، وبعد شهر واحد، وثلاثة أشهر، وستة أشهر. **النتائج:** أظهرت جميع المجموعات تحسناً كبيراً في وظيفة الشم بمرور الوقت. ومع ذلك، تفاوت مستوى التحسن بشكل كبير بين المجموعات ($p < 0.001$). ارتفع متوسط درجة (*TDI*) بمقدار 5.7 ± 2.8 في مجموعة الكورتيكوستيرويدات الأنفية (*INCs*) وحدها، وبمقدار 11.3 ± 3.4 في مجموعة (*INCs*) مع التدريب الشمي (*OT*)، وبمقدار 16.7 ± 3.9 في مجموعة العلاج المركب مع البلازما (*PRP*). تم تحقيق تحسن سريري ملحوظ (زيادة قدرها 6 نقاط أو أكثر في درجة *TDI*) لدى 40.0%، و64.4%، و80.0% من المرضى على التوالي ($p < 0.001$). كما تم استعادة حاسة الشم الطبيعية (*Normosmia*) لدى 20.0%، و37.8%، و53.3% من المرضى على التوالي. وتحسنت درجات مقياس التناظر البصري (*VAS*) الذاتية بشكل ملحوظ أيضاً، حيث لوحظ تحسن أفضل في مجموعة البلازما (*PRP*) ($p < 0.001$). **الاستنتاج:** يوفر العلاج المركب الذي يشمل الكورتيكوستيرويدات الأنفية (*INCs*)، والتدريب الشمي (*OT*)، وحقن البلازما الغنية بالصفائح الدموية (*PRP*) تحسينات أفضل في نتائج الشم الموضوعية والذاتية مقارنة بالعلاجات التقليدية وحدها. تدعم هذه النتائج نهجاً علاجياً متعدد الوسائط يستهدف كلاً من الالتهاب وتجديد الأعصاب في إدارة خلل الشم التالي للفيروس (*PVOD*).

الكلمات المفتاحية: خلل الشم التالي للفيروس؛ التدريب الشمي؛ الكورتيكوستيرويدات الأنفية؛ البلازما الغنية بالصفائح الدموية؛ الشق الشمي؛ اختبار *Sniffin' Sticks*؛ درجة *TDI*.

Introduction:

Post-viral olfactory dysfunction (PVOD) is one of the most frequent etiologies of persistent smell loss which commonly follows infections of the upper respiratory with viral influenza and SARS-CoV-2. [1] This condition is likely generated from damaging the olfactory neuroepithelium resulting in impaired regeneration of olfactory receptor neurons and disruption of odor signal transmission. [2] In number of cases, recovery may occur spontaneously. However, a considerable proportion of patients experience persistent anosmia or hyposmia which is lasting between months to years. [3]

Currently, there are very limited therapeutic options available for PVOD and mostly controversial due to the reported low-certainty evidence, but the olfactory training (OT) approach is commonly regarded as the first line of treatment for this disorder. [4] This approach involves repeated exposure to specific odorants to stimulate neuroplasticity and promote

regeneration of olfactory receptor neurons. [5] Several studies have demonstrated that long-term OT (at least for three months) can significantly improve olfactory performance, as validated with the Sniffin' Sticks TDI score. [6]

Pharmacological therapies such as intranasal corticosteroids (INS) have also been shown to reduce the inflammatory process which is known to contribute to neuronal dysfunction. [7] In general, corticosteroids reduce mucosal inflammation and facilitate neural recovery. However, some studies presented limited improvements or have similar actions to placebo or saline irrigation. [8]

Regenerative therapies have recently emerged as promising approaches for PVOD. Platelet-rich plasma (PRP) contains concentrated platelets that release growth factors including platelet-derived growth factor (PDGF), vascular endothelial growth factor (VEGF), and transforming growth factor-β (TGF-β). These cell-signaling molecules were extensively reported to promote tissue regeneration, neurogenesis, and angiogenesis. [9] It was shown that injection of PRP into the olfactory cleft has resulted in significant improvements in both subjective smell perception and psychophysical olfactory scores compared with control groups. [10]

However, there remain significantly limited number of randomized trials comparing the available treatment approaches for PVOD, including corticosteroids, olfactory training, and PRP injection[11]. Therefore, the present randomized controlled trial aims to compare the therapeutic efficacy of INS, OT, and olfactory cleft PRP injection in patients with PVOD.

Methods:

This is a prospective randomized controlled clinical trial which was implemented at the Department of Otolaryngology of Al-Zahraa Teaching Hospital in the city of Kut, Iraq between January 2025 and February 2026. Ethical approvals were obtained from the ethics committee at the College of Medicine / Wasit university prior to the initiation of the study. All written informed consent were obtained from all participants in accordance with the principles of the Declaration of Helsinki.

The total sample size was 135 participants (45 patients per treatment group), from those who were presented to the ENT outpatient clinic with persistent smell loss following a viral infection of the upper respiratory tract. Participants were between 18 and 65 years of age and having signs of persistent olfactory dysfunction for at least three months. The diagnosis of PVOD was confirmed by clinical history, nasal endoscopy, and objective olfactory testing using validated smell identification tests (Sniffin' Sticks test).

Patients' exclusion criteria included signs of chronic rhinosinusitis with or without nasal polyposis, previous sinonasal surgery, olfactory dysfunction secondary to head trauma, any sort of neurodegenerative disease, or congenital anosmia. Patients were excluded if they have active upper respiratory infection at the time of enrollment, recently prescribed with systemic corticosteroids, pregnancy or breastfeeding. Those who showed diminished olfactory test scores and a normal nasal endoscopic examination were included in the study.

Eligible participants were randomly assigned to one of three treatment groups using a computer-generated randomization sequence with equal allocation in a 1:1:1 ratio. Group 1:

received INS of mometasone furoate nasal spray administered of (200 µg) for 12 weeks. Each nostril received two sprays once daily. Group 2: received OT twice daily using four odorants representing different olfactory categories: rose (phenyl ethyl alcohol), lemon (citral), clove (eugenol), and eucalyptus (eucalyptol). Olfactory smell strips were purchased from (Burghart Messtechnik GmbH, Germany) and the kit was used according to the manufacturer's specifications. Participants of this group were strictly instructed to smell each odorant for approximately 10 to 15 seconds twice daily over a period of six months. Patients who failed to follow this protocol were excluded from the study. Group 3: received PRP injection into the olfactory cleft under endoscopic guidance. PRP was prepared by the standardized double-spin centrifugation technique at 3000 RPM of the patient's venous blood (20 mL) to concentrate platelets and associated growth factors, which then injected into the mucosa of the olfactory cleft bilaterally using a fine needle and under local anesthesia (lidocaine). Each of those patients received two injections during the study period, the first at baseline and the second four weeks later.

Participants were evaluated clinically and for olfactory function at four time points. At baseline then follow-up evaluations were performed at one month, three months, and six months after initiation of treatment. The primary outcome measured by the current study is the Sniffin' Sticks test TDI score, and a secondary outcome of olfactory improvement was included to assess the subjective visual analog scale (VAS) which is used to rate smell intensity, dysfunction, or loss of smell at the four time points of the study. Assessors for our outcome were blinded to group allocation to minimize assessment bias.

All statistical analyses were performed using Statistical Package for the Social Sciences (SPSS) software (Version 26, IBM-USA). Continuous variables were presented as mean ± standard deviation, whereas categorical variables were expressed as frequencies and percentages. Comparisons of continuous variables among the study groups were performed using one-way analysis of variance (ANOVA). Categorical variables were compared using the chi-square test. Changes in olfactory function during the follow-up period were evaluated using repeated-measures ANOVA. A p-value of less than 0.05 will be considered statistically significant for all analyses.

Results:

Our analysis showed the baseline characteristics of the study population were comparable among the three treatment groups. The mean age of the participants was 42.92 ± 14.35 years. No statistically significant differences were observed between the steroid-only group (43.67± 14.50 years), the steroid plus olfactory training group (42.31± 13.77 years), and the combined therapy group (42.78± 15.03 years), (p = 0.903).

Sex distribution in this study showed that 70 participants (51.85%) were male and 65 (48.15%) were female. No significant difference was also found between groups of the study (p = 0.436). The mean duration of PVOD prior to enrollment was 4.87 ± 1.32 months, in which the duration did not differ significantly among groups (p = 0.421).

Data from the Sniffin' Sticks-TDI score was found comparable, (p = 0.587). The mean baseline TDI scores were 17.03 ± 2.14 in the steroid-only group, 17.37 ± 2.06 in the steroid plus OT group, and 16.92 ± 2.25 in the PRP combination group.

Objective olfactory function was significantly improved across all treatment groups during the six-month follow-up period. The mean TDI score increased from 17.03 ± 2.14 at baseline to 22.43 ± 2.01 at six months in the steroid-only group, representing a mean improvement of 5.40 points. In the steroid plus OT group, the TDI score improved from 17.37 ± 2.06 to 27.89± 3.5, corresponding to a mean increase of 10.52 points. The greatest improvement was observed in the group receiving combined therapy including PRP injection, showing an increased TDI score from 16.92 ± 2.25 at baseline to 33.6 ±4.17 at six months, representing a mean improvement of 16.68 points. Analysis showed statistically significant improvements in TDI scores at each of the follow-up intervals ($p < 0.001$).

Clinical improvement which was defined as an increase of at least 6 points in the TDI score, was observed in 18 patients (40.0%) in the steroid-only group, 29 patients (64.4%) in the steroid plus OT group, and 36 patients (80.0%) in the PRP combination group. The differences in recovery rates between the groups were statistically significant ($p < 0.001$).

Furthermore, complete recovery to normosmia was achieved in 9 patients (20.0%) in the steroid-only group, 17 patients (37.8%) in the steroid plus OT group, and 24 patients (53.3%) in the combined therapy group. Conversely, lack of improvement was observed in 37.8% of patients receiving steroids alone, compared with 15.6% in the olfactory training group and 8.9% in the PRP group.

Subjective improvement in olfactory perception also demonstrated significant differences between treatment groups. The mean VAS score increased from 2.24 ± 0.84 at baseline to 5.05 ± 0.63 in the steroid-only group, 7.11 ± 0.70 in the steroid plus OT group, and 8.20 ± 0.81 in the PRP group at six months ($p < 0.001$).

Our analysis showed mild nasal irritation occurred in 8.9% of patients in the steroid-only group, 6.7% in the steroid plus OT group, and 4.4% in the PRP group, no statistically significant differences ($p = 0.713$). Mild epistaxis was reported in a small number of participants across the groups. In the PRP group, five patients (11.1%) reported transient discomfort at the injection site, which was resolved spontaneously without intervention. No serious adverse events or infections were observed during the study period.

Table 1. Baseline Demographic and Clinical Characteristics according to the study groups

Variable	Steroid Only (n=45)	Steroid + Training (n=45)	Steroid + Training + PRP (n=45)	P value
Age (years) *(mean ± SD)*	43.67± 14.50	42.31± 13.77	42.78± 15.03	0.903
Male, n (%)	20 (44.44)	26 (57.78)	24 (53.33)	0.436
Female, n (%)	25 (55.56)	19 (42.22)	21 (46.67)	

Duration of smell loss (months) *(mean ± SD)*	4.69 ± 1.16	4.97 ± 1.08	4.95 ± 1.1	0.421
Baseline TDI score *(mean ± SD)*	17.03 ± 2.14	17.37 ± 2.06	16.92 ± 2.25	0.587
Hyposmia, n (%)	31 (68.9%)	30 (66.7%)	29 (64.4%)	0.634
Anosmia, n (%)	14 (31.1%)	15 (33.3%)	16 (35.6%)	

Table 2. Changes in TDI Scores at baseline and Over Follow-Up durations according to study groups

Time Point	Steroid Only	Steroid + Training	Steroid + Training + PRP	P value
Baseline	17.03 ± 2.14	17.37 ± 2.06	16.92 ± 2.25	0.587
1 Month	18.47 ± 4.41	19.72 ± 4.72	22.1 ± 4.02	<0.001
3 Months	20.17 ± 4.38	24.21 ± 2.22	27.8 ± 5.25	<0.001
6 Months	22.43 ± 2.01	27.89 ± 3.5	33.6 ±4.17	<0.001

Table 3. Mean Improvement in TDI Score at 6 Months according to study groups

Group	Mean Improvement	95% CI Lower-Upper	P value
Steroid Only	+5.40 ± 2.94	4.9 - 6.5	<0.001
Steroid + Training	+10.52 ± 4.06	10.2 - 12.4	<0.001
Steroid + Training + PRP	+16.68 ± 4.74	15.5 - 17.9	<0.001

Table 4. Clinical Recovery Rates at 6 Months according to study groups

Outcome	Steroid Only	Steroid + Training	Steroid + Training + PRP	P value
Clinically significant improvement (≥6 TDI points)	18 (40.0%)	29 (64.4%)	36 (80.0%)	<0.001
Normosmia achieved	9 (20.0%)	17 (37.8%)	24 (53.3%)	<0.001
Partial improvement	19 (42.2%)	21 (46.7%)	17 (37.8%)	0.151
No improvement	17 (37.8%)	7 (15.6%)	4 (8.9%)	<0.001

Table 5. Subjective Olfactory Improvement (VAS Score) according to study groups

Timepoint	Steroid Only	Steroid + Training	Steroid + Training + PRP	P value
Baseline	2.24 ± 0.84	2.16 ± 0.77	2.39 ± 0.95	0.395
3 Months	4.21 ± 0.72	5.50 ± 0.83	6.73 ± 0.75	<0.001
6 Months	5.05 ± 0.63	7.11 ± 0.70	8.20 ± 0.81	<0.001

Table 6. Treatment-Related Adverse Events according to study groups

Adverse Event	Steroid Only	Steroid + Training	Steroid + Training + PRP	P value
Nasal irritation	4 (8.9%)	3 (6.7%)	2 (4.4%)	0.713
Mild epistaxis	2 (4.4%)	1 (2.2%)	3 (6.7%)	0.565
Injection discomfort	0	0	5 (11.1%)	-
Infection	0	0	0	-

Discussion:

The present study showed that all three therapeutic approaches were associated with significant improvements in olfactory function over the six months follow up period. However, the degree of benefit was found to be differed considerably between groups. The most favorable outcomes were observed in the group treated with INCs plus structured OT plus olfactory cleft PRP injection, followed by the INCs plus OT group, whereas INCs alone produced the smallest gains. Specifically, the mean TDI over the study period increased from +5.40 with INCS to +10.52 with INCs plus structured OT, which was further increased to +16.68 with INCS plus OT plus olfactory cleft PRP injection. The clinically significant improvement rate, which was set at ≥6 TDI points, showed comparable improvements at 40.0%, 64.4%, and 80.0%, respectively, with equivalent improvements in subjective VAS and normosmia attainment. These findings support the fact that PVOD is not only an inflammatory disorder, but also a disorder of impaired neuronal regeneration which requires multiple therapeutic plans to address inflammation and the impacted neuroepithelial damage. [1]

The limited enhancement following the use of INCs alone in the current study is consistent with many recent reports in the literature. A 2023 randomized controlled trial by Tragoonrungsea et al. found that INCs was not superior to saline for smell restoration following COVID-19-associated olfactory loss. This study suggests that spontaneous recovery contributes substantially to observed gains in some patients. [8] Similarly, a 2023 meta-analysis of randomized trials reported that corticosteroids may improve olfactory scores overall. However, the study found that the benefit from this approach was modest and appeared more evident with topical rather than systemic therapy. [12] This was similarly observed by Wang et al. who showed limited improvement in olfactory scores following INCs, but systemic corticosteroids showed no benefit. [13] In contrast, a meta-analysis conducted by Chen et al. reported that INCs did not result in a therapeutic advantage in the management of COVID-19-related olfactory dysfunction, with no statistically significant differences observed in either

recovery rates or time to olfactory improvement compared to control groups. [14] Therefore, the present findings from INCs application indicate that local corticosteroids could significantly reduce post-viral mucosal inflammation and edema within the olfactory cleft, yet this isolated approach alone was found to be insufficient for established olfactory dysfunction without including additional therapeutic modalities.

The best observed outcomes with including structured OT are in line with recent evidence supporting the role of OT as a cornerstone of PVOD management. The 2022 systematic review by Helman et al. concluded that OT remains the first-line intervention for PVOD. [1] A review and meta-analysis by Kattar et al. showed that OT alone demonstrated clinically significant improvements, with patients receiving training exhibiting 2.77 times higher odds of achieving clinically important TDI score improvements compared to control groups, [15] whereas longer OT durations (more than 3 moths) produced greater benefits. [12] More recently, a 2025 meta-analysis of randomized controlled trials in post-COVID olfactory dysfunction showed that OT significantly improves olfactory outcomes, with better results when combined with adjunctive therapies. [16] Likewise, a 2025 systematic review of classical OT found clinically meaningful post-treatment improvement in patients across viral etiologies. [17] In the present study, patients receiving INCs plus OT achieved nearly double the TDI gain of the INCs group and had markedly higher rates of clinically significant recovery and normosmia. This supports the notion that repeated odor exposure promotes central and peripheral neuroplasticity, enhances odor discrimination and identification, and may facilitate reorganization of olfactory pathways after viral injury. [18]

However, the literature on OT is not entirely uniform, and this should be acknowledged when interpreting the present results. A 2025 placebo-controlled RCT comparing essential oils to odorless (placebo) oils, concluded with no significant benefit of OT over placebo in post-COVID related olfactory dysfunction. [19] The disagreement with the current investigation can be attributed to differences in cohort composition (PVOD vs heterogeneous post-COVID dysosmia), duration of the study, and to other methodology approaches in using the anti-inflammatory or the odorants on patients.

The most important finding of the present study is the observed advantages of the PRP-combination group. This group achieved the highest objective and subjective recovery rates with limited side effects. In the randomized controlled trial by Yan et al., PRP injections produced better improvements in TDI score than placebo group. [11] Furthermore, a study by Fieux et al. demonstrated that PRP-associated improvements were not temporary with significantly better psychophysical and subjective olfactory outcomes than those who did not receive the injections. [10] A 2024 meta-analysis further showed clinically meaningful PRP-associated improvements in TDI and higher likelihood of recovery. [20] A 2025 meta-analysis of randomized controlled trials also concluded that PRP significantly improves objective olfactory scores, subjective scores, and response rates. [19] Our findings showed that PRP performed better when combined with other therapeutic modalities, such as INCs and prolonged OT. The observed TDI increase and the higher rate of achieving normosmia in the PRP-combination group indicate the benefit of the synergistic interaction between these modalities, where INCs reduce signs of inflammation, OT stimulates neuroplasticity, and PRP provides the regenerative

substrates (platelet-derived growth factor, vascular endothelial growth factor, and transforming growth factor-β) for achieving full recovery. [11]

The current analysis clearly demonstrates that patients in the PRP group achieved superior improvements in both objective psychophysical measures and subjective VAS scores compared to the other treatment groups. This is clinically important since olfactory dysfunction affects nutrition, safety, emotional well-being, and quality of life, and subjective recovery often matters as much to patients as test scores. However, a study by Yan et al. presented significant objective improvement with PRP but no statistically significant difference in subjective VAS scores between PRP and placebo. [11] In addition, Elsheikh et al. found 77.8% objective improvement in the PRP group versus 11.1% in controls, with no significant difference of VAS score between groups. [21] By contrast, the present study demonstrated significant differences in both TDI and VAS at six months, which could be explained by the relatively longer follow-up, the cumulative treatment exposure, or the additive effect of combining PRP with OT and INCs.

Our treatment groups showed very mild adverse effects and infrequent. Nasal irritation and minor epistaxis were uncommon, while injection-site discomfort in the PRP group was transient and spontiously resolved. Importantly, no infections or serious adverse events occurred. The minimal adverse effects, coupled with the significant improvements observed in both objective psychophysical measures and subjective VAS scores following the PRP-based combination approach, enhance the clinical applicability of these findings, particularly for ENT practices seeking more effective management strategies for PVOD.

Due to number of limitations, this study was designed as a single-center study approach instead of multi-center, and that would limit the generalizability of our findings to broader populations. Including larger sample size would also be recommended for future studies to examine the impacts of age, disease severity, viral-types, duration of smell loss, and presence of parosmia more precisely. Finally, longer observation (more than 6 months) would clarify durability of recovery and risk of relapse.

Conclusion:

This study demonstrates that combined therapy with INCs, OT, and PRP injection provides better improvement in olfactory function compared with INCs alone or INCs with OT. While OT remains the preferred management and corticosteroids offer modest benefit, supplementing these modalities with PRP significantly enhances both objective and subjective recovery scores. This study highlights the importance of a multimodal therapeutic approach targeting both inflammation and neuroregeneration in PVOD.

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