Statistical Analysis Plan (SAP)

Official Title: Effectiveness of Platelet Rich Plasma, Conditioned Medium From Umbilical Cord Mesenchymal Stem Cell (MSCs) Secretome and Hyaluronic Acid for the Treatment of Knee Osteoarthritis

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1. Objectives

Primary Objective: To compare the effectiveness of PRP, UC-MSCs Secretome, and HA in improving pain and function in patients with knee OA as measured by VAS and WOMAC over 6 months.

Secondary Objective: To assess changes in serum COMP levels at baseline, 3 months, and 6 months.

2. Endpoints

Primary Endpoints:

1. Change in VAS score from baseline to 3 and 6 months.
2. Change in WOMAC total and subscale scores from baseline to 3 and 6 months.

Secondary Endpoints:

1. Change in COMP concentration from baseline to 3 and 6 months.

3. Study Design Summary

Randomized, parallel-group, open-label clinical trial with 3 groups (PRP, UC-MSCs Secretome, HA), 15 participants each, total n=45. Simple randomization. Full Analysis Set (FAS) includes all randomized patients who received ≥1 treatment and had ≥1 post-baseline assessment.

4. Sample Size Justification

Exploratory trial; sample size of 45 chosen based on feasibility and effect sizes from similar studies.

5. Statistical Hypotheses

H0: No difference between groups in mean change of VAS, WOMAC, or COMP scores.

H1: At least one group differs.

6. Statistical Methods

General Principles: Two-sided α=0.05, continuous data as mean±SD or median[IQR], categorical as n(%). Intention-to-treat (ITT) primary; per-protocol (PP) sensitivity.

Baseline Comparisons: ANOVA/Kruskal–Wallis for continuous; Chi-square/Fisher for categorical.

Primary Analysis: MMRM for VAS & WOMAC with group, time, group×time as fixed effects; Bonferroni post-hoc; Friedman test if non-normal.

Secondary Analysis: Same MMRM framework for COMP, log-transform if skewed.

Missing Data: Multiple Imputation (MAR); sensitivity with LOCF and complete-case.

Subgroup Analyses: Baseline OA severity, age group.

7. Interim Analysis

No interim analysis planned.

8. Safety Analysis

AEs and SAEs summarized descriptively; Fisher's exact for AE rates.

9. Software

Analyses in SPSS v28, R 4.3+, or equivalent.

10. Reporting

Final report will include CONSORT diagram, baseline table, primary & secondary analyses, safety results, and protocol deviation discussion.