Statistical Analysis Plan

Clinical Trial Protocol No.:	ChiCTR2600122083
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Revision History

Version Number	Version date	Author	Remarks

Statistical Analysis Plan

Statistical Analysis Organization Signature Page

Study Title: A Single-Center Clinical Study to Evaluate the Efficacy and Safety of Suture-Free Ocular Hydrogel Adhesion for Ocular Surface Tissue Adhesion Therapy

Clinical Trial Protocol: Refer to the Study Protocol for details

The Affiliated Eye Hospital of Shandong First Medical University　　2026 Year 1 Month 1 Day

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Table of Contents

1. Introduction

This Statistical Analysis Plan (SAP) has been developed for the study entitled “A Single-Center Clinical Study to Evaluate the Efficacy and Safety of Suture-Free Ocular Hydrogel for Ocular Surface Tissue Adhesion Therapy” and specifies the statistical analysis methods, data handling principles, and presentation of study results.

2.Study Objectives and Endpoints

2.1 Study Objectives

Primary Objective: To evaluate the safety of suture-free ocular hydrogel for adhesion of ocular surface tissues.

Secondary Objective: To evaluate the efficacy and conduct an exploratory investigation.

2.2 Endpoints

2.2.1 Efficacy Endpoints

1）Primary Efficacy Endpoint: Conjunctival flap adhesion effect postoperatively.

2）Secondary Efficacy Endpoints:

1. Ocular surface repair status postoperatively；
2. Visual function recovery status postoperatively;
3. Surgical efficiency, i.e., surgical operation time.

3.Study Design

3.1 Overall Study Design

This is a single-center clinical study designed to preliminarily evaluate the safety and efficacy of suture-free ocular hydrogel for ocular surface adhesion surgery. The study population consists of 20 patients aged 18–85 years with ocular surface diseases requiring conjunctival flap adhesion, amniotic membrane transplantation or corneal transplantation. The study will be conducted from January 2026 to January 2027. Eligible subjects must provide written informed consent and meet the corresponding inclusion and exclusion criteria. The primary assessments include ocular surface irritation symptoms, conjunctival hyperemia, conjunctival flap adhesion effect, ocular surface repair status and visual function recovery status at each postoperative follow-up visit.

3.2 Study Method

After signing the informed consent form, patients undergo screening examinations to confirm eligibility. Surgery is performed under topical anesthesia or peribulbar block anesthesia. Lesion tissue is resected according to the pathological condition, and a conjunctival flap of appropriate size is prepared. Four sutures are placed to align the graft with the surrounding conjunctiva to ensure no active bleeding. Blood around and beneath the graft is thoroughly irrigated, and moisture on the surface and fornix is dried with absorbent spears to maintain dryness; no irrigation is allowed before curing. The hydrogel is liquefied in a 37°C water bath in advance. The hydrogel is injected under the graft and surrounding conjunctiva and spread evenly. Excess hydrogel overflowing the periphery is aspirated, and redundant hydrogel beneath the graft and conjunctiva is squeezed out and removed. Care should be taken to avoid residual hydrogel on the surface and under the conjunctiva. The cornea is protected with a wet cotton patch. The graft is irradiated with a 465 nm UV lamp at an energy of 18 mW/cm^2 for 60 seconds at a distance of 15 cm. After hydrogel curing, sutures can be removed without forceful pulling of the conjunctiva. A bandage contact lens may be applied upon completion of surgery. At each postoperative follow-up visit, slit-lamp biomicroscopy is performed to confirm conjunctival flap position and thickness, as well as ocular surface inflammatory response.

4. Statitical Analysis Methods

4.1 Statistical Analysis Software

All statistical analyses will be performed using statistical analysis software such as GraphPad Prism and SPSS.

4.2 Analysis of General Data

This study will employ descriptive statistical analyses only. Continuous variables will be summarized using the number of observations, mean, standard deviation, median, minimum, and maximum values. Categorical variables will be summarized using counts and percentages, with the denominator defined as the total number of subjects in the relevant analysis population.

No formal statistical hypothesis testing will be conducted in this study. If any statistical inference is referenced, a two-sided test will be applied, and a P value < 0.05 will be considered statistically significant.

4.3 Handling of Missing and Outlier Data

Unless otherwise specified, no imputation will be performed for missing data.

Handling of Missing AE Dates or Missing Assessment of Relationship to Study Drug

a) Missing AE Start Date

- If the year and month are known and precede the year and month of the first administration of the study drug, the AE start date will be imputed as the last day of the known month.
- If the year and month are known and are the same as the year and month of the first administration of the study drug, the AE start date will be set as the date of the first administration of the study drug.
- If the year and month are known and follow the year and month of the first administration of the study drug, the AE start date will be imputed as the first day of the known month.
- If only the year is known and the year precedes the year of the first administration of the study drug, the AE start date will be imputed as December 31 of that year.
- If only the year is known and the year is the same as the year of the first administration of the study drug, the AE start date will be set as the date of the first administration of the study drug.
- If only the year is known and the year follows the year of the first administration of the study drug, the AE start date will be imputed as January 1 of that year.
- If the year, month, and day are all missing, the date of the first administration of the study drug will be used as the AE start date. If the imputed start date occurs after the AE end date, the AE end date will be used as the start date.

b) Missing AE End Date

- If the year and month are known, the AE end date will be imputed as the last day of the known month.
- If only the year is known, the AE end date will be imputed as December 31 of that year.
- In all other cases, the AE end date will be considered missing.

c) Missing Assessment of Relationship to Study Drug

- If the assessment of the relationship between an AE and the study drug is missing, the AE will be summarized as a drug-related adverse event.

4.4 Definitions

4.4.1 Study Procedure

Ocular Surface Adhesion Surgery

4.4.2 Reference Start Date

Unless otherwise specified, the reference start date is the date of surgery.

4.4.3 Study Day

Study Day is defined as the number of days between the date of a specific event or assessment (e.g., AE onset date, date of examination completion, visit date) and the reference start date. The calculation is performed as follows:

（1） If the event date occurs on or after the reference start date：

Study Day = Event date (e.g., visit date, event onset date, assessment date) − Reference start date + 1

（2） If the event date occurs before the reference start date:

Study Day = Event date (e.g., visit date, event onset date, assessment date) − Reference start date

Study Day will be presented in the data listings. If the event begins prior to the reference start date, the Study Day will be displayed as a negative value.

4.4.4 Baseline

The baseline value is defined as the last valid measurement (scheduled or unscheduled) obtained prior to administration of the study surgery. If measurements cannot be distinguished due to insufficient time precision, the baseline value will be defined as the last valid measurement obtained at the last scheduled visit prior to surgery.

4.4.5 Definition of Study Periods

The overall study consists of three main periods: the screening period, the surgical period, and the treatment observation period.

4.5 Analysis Populations

Screened Set (SCN): All subjects who have signed the informed consent form.

Randomized Set (RND): All subjects who have been assigned a randomization code.

Full Analysis Set (FAS): All randomized subjects who have received at least one dose of the study drug.

Per Protocol Set (PPS): All randomized subjects who have received the study drug, completed treatment, and had no major protocol deviations.

Safety Set (SS): All subjects who have received at least one dose of the study drug.

5. Subject Disposition

5.1Subject Distribution

The conduct of the clinical trial and the status of the analysis populations will be described with respect to the following aspects:

- Number of subjects screened
- Number of screening failures
- Number and percentage of subjects who completed the clinical trial
- Number and percentage of subjects who discontinued the trial prematurely, categorized by reason

5.2 Protocol Deviations

Protocol deviations for all subjects will be summarized by type and severity of deviation, and presented as counts and percentages for each group and overall.

6. Demographic and Other Baseline Characteristics

6.1 Demographic Characteristics

The summary of demographic characteristics will include the following:

- Age (years)
- Sex (male/female)
- Ethnicity (Han Chinese/Other)

6.2 Baseline Characteristics

6.2.1 Medical History, Surgical History, and Other Relevant History

Medical history, surgical history, and other relevant history will be summarized using counts and percentages.

7. Efficacy Analysis

7.1 Analysis of the Primary Efficacy Endpoint

The primary efficacy endpoint of this clinical trial is the conjunctival flap adhesion effect postoperatively. Descriptive statistical analysis will be performed for the primary efficacy outcome.

7.2 Analysis of the Secondary Efficacy Endpoints

The secondary efficacy endpoints include:

1. Ocular surface repair status postoperatively;
2. Visual function recovery status postoperatively;
3. Surgical efficiency, i.e., surgical operation time.

8. Safety Analysis

8.1 Adverse Events (AE)

An adverse event (Adverse Event, AE) is defined as any untoward medical occurrence in a subject following ocular surface adhesion surgery, which may present as symptoms, signs, diseases or abnormal laboratory findings, but is not necessarily causally related to the investigational product.

In this study, the relationship between AEs and the study drug will be categorized into five levels: definitely related, probably related, possibly related, possibly unrelated, and definitely unrelated. AEs assessed as definitely related, probably related, or possibly related will be summarized as drug-related adverse events.

A serious adverse event (Serious Adverse Event, SAE) is defined as any adverse medical event that results in death, is life-threatening, results in permanent or severe disability or loss of function, requires inpatient hospitalization or prolongation of existing hospitalization, or results in a congenital anomaly or birth defect.

8.2 Laboratory Tests

8.3 Other Safety Data

8.3.1 Vital Signs

8.3.2 12-Lead Electrocardiogram (ECG)

8.4 Ophthalmic Examinations

9. Deviations Between the Statistical Analysis Plan and the Clinical Trial Protocol

None.