

# INPLASY PROTOCOL

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None reported.

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**Review Stage at time of this submission:** The review has not yet started.

**Conflicts of interest:**  
None declared.

## Effects of far infrared therapy in Hemodialysis Arterio-Venous Fistula Maturation: A Meta-analysis and Systematic Review

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**Review question / Objective:** Participant Type: Only for any ESRD patient diagnosed with CKD and established AVF and requiring regular HD treatment with AVF. Intervention type: Studies using FIR therapy versus non- FIR therapy. Outcome Measure Types: Fistula maturation, patency, access blood flow, AVF I.D.; fistula occlusion. P: Patients under hemodialysis.

**Condition being studied:** Far infrared is an invisible electromagnetic wave. Far infrared therapy (FIR) uses low-power electromagnetic waves emitted by FIR with wavelengths of 3-100  $\mu\text{m}$  to improve human physiological functions. Previous studies have shown that FIR can effectively suppress inflammation, and in recent years it has also been widely used in the clinical treatment of various diseases, such as cardiovascular diseases. The use of FIR allows the improvement of AVF blood flow and patency not only through local vasodilation induced by thermal effects, but more importantly, through non-thermal effects that improve endothelial function.

**INPLASY registration number:** This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 07 April 2023 and was last updated on 07 April 2023 (registration number INPLASY202340020).

### INTRODUCTION

**Review question / Objective:** Participant Type: Only for any ESRD patient diagnosed with CKD and established AVF and requiring regular HD treatment with AVF. Intervention type: Studies using FIR therapy versus non- FIR therapy. Outcome Measure Types: Fistula maturation,

patency, access blood flow, AVF I.D.; fistula occlusion. P: Patients under hemodialysis.

**Rationale:** FIR has been used in recent decades to promote AVF maturation with the goal of increasing vascular access blood flow and increasing patency rates. For example, in 2014, Bashar et al conducted a statistical analysis of the

effect of FIR therapy on improving the patency rate of primary and secondary AVF. In 2017, Wan et al also conducted a meta-analysis on the effect of FIR therapy on the patency rate of AVF, but the results of this literature were too heterogeneous and most of the studies used were not available in full text, which reduced the reliability of their results. Therefore, we conducted a systematic review and meta-analysis to evaluate the impact of FIR on the maturity and fluency of AVF.

**Condition being studied:** Far infrared is an invisible electromagnetic wave. Far infrared therapy (FIR) uses low-power electromagnetic waves emitted by FIR with wavelengths of 3-100  $\mu\text{m}$  to improve human physiological functions. Previous studies have shown that FIR can effectively suppress inflammation, and in recent years it has also been widely used in the clinical treatment of various diseases, such as cardiovascular diseases. The use of FIR allows the improvement of AVF blood flow and patency not only through local vasodilation induced by thermal effects, but more importantly, through non-thermal effects that improve endothelial function.

## METHODS

**Search strategy:** A search of Pubmed, EMBASE, Cochrane Library, Web of Science, and other databases (as of February 2023) was conducted to identify eligible studies. The following keywords were used and searched using Brin's logic: "chronic kidney disease or dialysis, hemodialysis, end-stage renal disease, renal failure, fistula, arterial fistula, graft, far-infrared therapy, far-infrared. We also searched the bibliographies of included studies to find more studies.

**Participant or population:** ESRD patient diagnosed with CKD and established AVF and requiring regular HD treatment with AVF.

**Intervention:** Patients underwent FIR therapy.

**Comparator:** Patients underwent standard care.

**Study designs to be included:** Published reports of randomized controlled trials (RCTs) in patients with ESRD or HD.

**Eligibility criteria:** Non-RCTs and case reports were excluded.

**Information sources:** A search of Pubmed, EMBASE, Cochrane Library, Web of Science, and other databases (as of February 2023) was conducted to identify eligible studies. The following keywords were used and searched using Brin's logic: "chronic kidney disease or dialysis, hemodialysis, end-stage renal disease, renal failure, fistula, arterial fistula, graft, far-infrared therapy, far-infrared. We also searched the bibliographies of included studies to find more studies.

**Main outcome(s):** Fistula maturation.

**Additional outcome(s):** Fistula patency, access blood flow, AVF I.D.; fistula occlusion.

**Quality assessment / Risk of bias analysis:** The evaluation items contain: (1) Selection bias: Are the assignments sufficiently hidden? Are the methods used to perform random sequence generation, allocation concealment, and blinding described? (2) Detection bias: Is the knowledge of allocation interventions adequately prevented? ; (3) loss bias: Are missing value data adequately resolved? (4) reporting bias; (5) other biases[16].

**Strategy of data synthesis:** Statistical analysis of comparable data was performed using Review Manager 5.4 software. Continuous results were evaluated using mean differences (MD) or standardized mean differences (SMD). Results were expressed as risk ratios (RR) and 95% confidence intervals (CI) for dichotomous variables. The  $\chi^2$  and I<sup>2</sup> tests (I<sup>2</sup> > 50% is considered significant heterogeneity) are used to assess data heterogeneity. When heterogeneity was low, fixed-effects models were applied to

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the meta-analysis. Otherwise, random effects models were used to reduce the effect of statistical heterogeneity. The pooled effects were determined by z-tests and p-values < 0.05 were considered statistically significant. For some comparisons, sensitivity analysis was used.

**Subgroup analysis:** Nil.

**Sensitivity analysis:** Nil.

**Language restriction:** There is no language restriction in this study.

**Country(ies) involved:** Taiwan.

**Other relevant information:** Nil.

**Keywords:** End stage renal disease, far infrared therapy, Arterio-venous fistula, maturation.

**Dissemination plans:** Nil.

**Contributions of each author:**

**Author 1 - Chiu-Feng Wu - Author 1 drafted the manuscript.**

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**Author 2 - Tzu-Pei Yeh - Author 2 planned and carried out the statistical model and provided statistical expertise.**

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**Author 3 - Tzu-Chen Lin - Author 3 contributed to the development of the selection criteria, and the risk of bias assessment strategy.**

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**Author 4 - Po-Hsiang Huang - Author 4 provided critical feedback and helped shape the research.**

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**Author 5 - Pin-Jui Huang - Author 5 contributed to the interpretation of the results.**

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