# INPLASY PROTOCOL

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**Conflicts of interest:**
**None declared.**

# Lower limb biomechanics in patients with hallux valgus: a systematic review and meta-analysis

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**Review question / Objective:** **Identify the differences in the gait of the patient with hallux valgus compared with controls.**
**Condition being studied:** **Hallux valgus (HV) is a symptom in which the bunion deviates from the midline of the foot with an abnormally large outward deflection displacement. The hallux valgus angle (HVA) is often associated with clinical manifestations such as subluxation of the first metatarsophalangeal joint, bunions and lowering or even collapse of the transverse arch of the forefoot. It has been shown that the prevalence is 23% in women aged 18-65 years and 35% in women over 65 years. Magnetic resonance imaging in bunion patients often shows structural changes such as bony redundancy of the first metatarsophalangeal joint, bone marrow edema, bony redundancy of the peroneal seed.he musculoskeletal structure of the foot in bunion patients causes abnormal movements of the foot segments as well as the ankle, knee, and hip joints during walking. However, abnormal gait has not been systematically evaluated for bunion patients. Therefore, the aim of the systematic review and meta-analysis is to investigate the differences between lower limb biomechanics in walking in bunion patients and non-bunion normal gait.**

**INPLASY registration number:** This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 10 July 2022 and was last updated on 10 July 2022 (registration number INPLASY202270054).

## INTRODUCTION

**Review question / Objective:** **Identify the differences in the gait of the patient with hallux valgus compared with controls.**

**Rationale:** **Studies that investigated the lower limb biomechanics during walking in patients with hallux valgus compared with the control group. Biomechanical data must have been collected in the gait with**

devices. Reporting quality was assessed using the Newcastle-Ottwa Scale (NOS).

**Condition being studied:** Hallux valgus (HV) is a symptom in which the bunion deviates from the midline of the foot with an abnormally large outward deflection displacement. The hallux valgus angle (HVA) is often associated with clinical manifestations such as subluxation of the first metatarsophalangeal joint, bunions and lowering or even collapse of the transverse arch of the forefoot. It has been shown that the prevalence is 23% in women aged 18-65 years and 35% in women over 65 years. Magnetic resonance imaging in bunion patients often shows structural changes such as bony redundancy of the first metatarso-phalangeal joint, bone marrow edema, bony redundancy of the peroneal seed.he musculoskeletal structure of the foot in bunion patients causes abnormal movements of the foot segments as well as the ankle, knee, and hip joints during walking.However, abnormal gait has not been systematically evaluated for bunion patients. Therefore, the aim of the systematic review and meta-analysis is to investigate the differences between lower limb biomechanics in walking in bunion patients and non-bunion normal gait.

## METHODS

**Search strategy:** The keywords include bunion or hallux valgus or hallux abductovalgus and the subject terms include gait analysis or biomechanics or kinesiology or kinetics in English and Chinese.

**Participant or population:** Patients with hallux valgus.

**Intervention:** None.

**Comparator:** gait analysis.

**Study designs to be included:** Characteristic study of two samples.

**Eligibility criteria:** Duplicate literature and conference literature were eliminated by Note express software; the titles, as well as article abstracts, were read to exclude duplicate published articles as well as articles that did not meet the purpose of the study, and literature that met the criteria was extracted. The literature included in this study was reviewed, evaluated and recorded, and literature information was extracted: (i) basic information of the article, including title, first author and publication time; (ii) basic characteristics of the study, including sample size, inclusion criteria, age and weight of the study subjects; (iii) quality evaluation and study methods: type of study design, data analysis and study results, etc.

**Information sources:** Search China Knowledge Network (CNKI), Wanfang database, Ebsco Medline, Web of Science (SCI), Pubmed, Cochrane, Embase, with the year of publication from 2000 to 2022.

**Main outcome(s):** A total of 20 articles with a sample of 1533 cases were included in the study, with NOS scores ranging from 4 to 7. The studies showed that the motion of the foot segments during walking was abnormal in bunion patients. In the meta-analysis, the bunion group had a statistically significant difference in reduced: external foot deflection angle (SMD-1.02, 95% CI -1.90 to -0.15), stride speed (-0.77, 95% CI -1.06 to -0.47), stride length (-0.32, 95% CI - 0.62 to -0.01. Patients with HV walked with a higher: stride time: (0.38, 95% CI 0.05 to 0.71), double support phase (0.39, 95% CI 0.09 to 0.69), support phase (0.60, 95% CI 0.05 to 1.16).

**Data management:** Excel was used to extract the data from the test results included in the study with specific numerical observations; the data of the main study results with statistical differences were recorded if the study results were described only in graphs and text.

**Quality assessment / Risk of bias analysis:** The Newcastle-Ottwa Scale (NOS) was used to assess the quality of the included

studies, including: (i) identification of study subjects; (ii) representativeness of study subjects; (iii) selection of control groups; (iv) definition of control groups; (v) comparability of cases and controls; (vi) identification of exposure factors; (vii) consistency of methods for determining case and control groups; and (viii) shedding rate.

**Strategy of data synthesis:** Meta-analysis of specific values in the study was performed using RevMan 5.4 software. All observations were measures, expressed as standardized mean squared deviations and 95% confidence intervals (95% CI). Heterogeneity between studies was assessed using chi-square tests; if $I^2 < 50\%$, the studies included in the observation were less heterogeneous and a fixed-effects model was used; otherwise, a random-effects model was selected.

**Subgroup analysis:** None.

**Sensitivity analysis:** None.

**Language:** None restriction.

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

**Keywords:** gait analysis, hallux valgus, review, meta-analysis.

**Contributions of each author:**

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