

Efficacy and safety of postural intervention on prevention of deep venous thrombosis of lower extremity in postpartum women with pregnancy-induced hypertension

A protocol for systematic review and meta-analysis

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Abstract

Background: Deep venous thrombosis (DVT) is a relatively serious complication commonly seen in pregnant women, especially parturients with pregnancy-induced hypertension (PIH), whose incidence of DVT is higher. Because it can lead to pulmonary embolism (PE) and endanger the lives of patients, it has been paid much attention in clinic. Nursing plays an important role in the prevention and treatment of DVT. Early posture intervention can prevent postpartum DVT in hypertensive pregnant women, which has certain clinical value, but there is no evidence of evidence-based medicine. This study aims to systematically study the effectiveness and safety of postural intervention on prevention of deep venous thrombosis of lower extremity in postpartum women with PIH.

Methods: Use the computer to retrieve the English databases (PubMed, Embase, Web of Science, the Cochrane Library) and the Chinese databases (China Knowledge Network, Wanfang, Weipu, China Biomedical Database), in addition to the manual retrieval of Baidu academic, Google academic, from the construction of database to December 2020, for randomized controlled clinical studies of postural intervention on prevention of deep venous thrombosis of lower extremity in postpartum women with PIH. Two researchers independently extracted the data and evaluated the quality of the included research, and used RevMan5.3 software to do meta-analyze of the included literature.

Results: This study assessed the efficacy and safety of potential intervention on prevention of deep venous thrombosis of lower extremities with lower extremity hypertension by mean velocity of femoral venous flow in the lower extremities, lower extremity skin status, swelling level, and pain condition, lower extremity deep venous thrombosis rate, and incidence of pulmonary embolism.

Conclusion: This study will provide reliable evidence-based evidence for the clinical application of postural intervention on prevention of deep venous of lower extremity in Postpartum women with PIH.

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Abbreviations: DVT = deep venous thrombosis, PE = pulmonary embolism, PIH = pregnancy-induced hypertension, RCTs = randomized controlled trials, VTE = venous thromboembolism.

Keywords: deep venous thrombosis, meta-analysis, postural intervention, pregnancy-induced hypertension, protocol, systematic review

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The results may be published in a peer-reviewed journal or disseminated at relevant conferences.

The authors have no conflicts of interest to disclose.

Data sharing not applicable to this article as no datasets were generated or analyzed during the current study.

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1. Introduction

Venous thromboembolism (VTE) is widely recognized as important complications of pregnancy. Indeed, VTE remains one of the leading causes of maternal mortality in developed countries.^[1–2] Pregnant and postpartum patients have a fourfold increased risk of VTE compared to the general population, and VTE accounts for 9% of maternal deaths in the United States.^[3–5] VTE includes deep venous thrombosis (DVT) and pulmonary embolism (PE), and DVT is becoming more and more common in clinical practice, which attracts much attention because of its tendency to endanger the life safety of patients with PE. Parturients with pregnancy-induced hypertension (PIH) have a higher chance of developing lower extremity DVT due to their abnormally increased blood pressure, increased resistance to blood flow, and increased blood viscosity, combined with the postpartum maternal need for bed rest and decreased limb movement,^[6] which are detrimental to postpartum recovery. Nursing plays an important role in the prevention and treatment of DVT,^[7–8] among them, early posture intervention is of great significance to prevent lower limb DVT in pregnant women with PIH.

At present, there are several randomized controlled findings^[9–11] that suggest that postural intervention on prevention of deep venous thrombosis of lower extremity in postpartum women with PIH can effectively prevent the occurrence of postpartum lower extremity swelling and deep venous thrombosis in pregnant women with PIH, which is helpful for promoting the postpartum recovery of pregnant women, has important practical significance, and deserves to be promoted in the clinical range. However, various clinical trials have differences in the research protocols and efficacy, and so on, leading to mixed findings, which to some extent affects the promotion of this therapy. Therefore, this research is to systematically evaluate the effectiveness and safety of postural intervention on prevention of deep venous of lower extremity in postpartum women with PIH. This paper provides reliable reference for postural intervention on prevention of deep venous of lower extremity in postpartum women with PIH.

2. Methods

2.1. Protocol register

This protocol of systematic review and meta-analysis has been drafted under the guidance of the preferred reporting items for systematic reviews and meta-analyses protocols.^[12] Moreover, it has been registered on open science framework (OSF) (Registration number: DOI 10.17605/OSF.IO/4NPKW).

2.2. Ethics

We have no patient recruitment and collection of personal information for this protocol, so the approval of the ethics committee is not required.

2.3. Eligibility criteria

2.3.1. Types of studies. We collected all available randomized controlled trails (RCTs) on postural intervention on prevention of deep venous thrombosis of lower extremity in postpartum women with PIH. Whether or not blind method was used; language was limited to Chinese and English; publication status was unlimited.

2.3.2. Study subjects.

1. Pregnant women diagnosed with PIH, meeting the diagnostic criteria of PIH in the Guidelines for the diagnosis and treatment of PIH (2015)^[13];
2. The blood pressure lowering medication regimen was consistent in the 2 groups;
3. Limb movement was not restricted;
4. The nationality, race, age, gestational week, delivery time, delivery mode, and so on of pregnant women are not limited.

2.3.3. Interventions. The control group received routine care (including preaching, holter monitoring, oxygen inhalation therapy, hypertension control, diet care, activity care, etc.), and specific care modalities were not limited; the observation group, on the basis of the same routine care as the control group, plus early postural interventions (recumbent position with head low and feet high and with the head biased to 1 side, massage of the lower extremities, early passive, and active activity instruction, etc.).

2.3.4. Outcome indicators. Lower extremity femoral venous flow mean velocity; lower extremity skin status, swelling level, pain condition; lower extremity deep venous thrombosis rate; and incidence of PE.

2.4. Exclusion criteria

1. Duplicate published papers;
2. Literature published as an abstract or with incomplete data, and articles for which complete data could not be obtained after contacting the authors;
3. Literature without relevant outcome indicators;
4. Literature in which patients with gestational diabetes mellitus and other pregnancy complications;
5. Literature in which patients with a previous history of DVT;

2.5. Search strategy

Taking “ti wei gan yu” (postural intervention), “ren shen qi gao xue ya” (“gestational hypertension”), ren gao zheng (“PIH”), shen jing mai xue shuan” (deep venous thrombosis), and so on as Chinese search terms, the Chinese databases were searched, including China Knowledge Network, Wanfang data knowledge service platform, Weipu Information Chinese Journal Service platform (VIP), China Biomedical Database; Taking “postural intervention,” “deep venous thrombosis,” “deep vein thrombosis,” “pregnancy,” “pregnant,” “postpartum,” “hypertension,” and so on as English search terms, the English databases were searched, including PubMed, Embase, Web of Science, the Cochrane Library, in addition manual retrieval was conducted in Baidu academic, Google academic. Search time was from the establishment of the database to December 2020, for all the domestic and foreign literatures about postural intervention on prevention of deep venous thrombosis of lower extremity in postpartum women with PIH. For example, PubMed retrieval strategy is shown in Table 1.

2.6. Data screening and extraction

Referring to the method of research selection in version 5.0 of the Cochrane collaboration Network system Evaluator Manual,

Table 1
Search strategy in PubMed database.

Number	Search terms
#1	deep vein thrombosis [Title/Abstract]
#2	deep venous thrombosis [Title/Abstract]
#3	#1 OR #2
#4	postural intervention [Title/Abstract]
#5	pregnant [Title/Abstract]
#6	pregnancy [Title/Abstract]
#7	postpartum [Title/Abstract]
#8	#4 OR #5 OR #6 OR #7
#9	hypertension [Title/Abstract]
#10	#3 AND #8 AND #9

according to the PRISMA flow chart, the 2 researchers used the EndNote X9 document management software to independently screen and check the literature according to the above inclusion and exclusion criteria, and check each other, if there were different opinions, negotiate with a third party to resolve the differences. At the same time, Excel 2013 was used to extract relevant information, including:

1. Clinical studies (title, first author, month of publication, sample size, mean age, mean gestational week, mode of delivery, mean number of births);
2. Interventions (medication, dosage, frequency, and course of hypertension in the control and observation groups; other usual care modalities in the control and observation groups; implementation plans of early postural intervention in the observation group);
3. Elements of risk bias assessment in RCTs;
4. Outcome indicators.

The literature screening process is shown in Figure 1.

2.7. Literature quality assessment

Use the Cochrane collaboration's tool for assessing risk of bias to do the risk of bias assessment of included studies. According to the performance of the included literatures in the above evaluation items, 2 researchers will give judgments like low risk, unclear, or high risk judgments 1 by 1, and cross-check after completion respectively. In case of any disagreement, discussion will be carried out. If no agreement can be reached between the 2, discussion will be made with the researchers in the third party.

2.8. Statistical analysis

2.8.1. Data analysis and processing. The RevMan 5.3 software provided by the Cochrane Collaboration will be used for statistical analysis. We assumed that the results of different studies depend on the sample variables, covariables, and other factors studied. Fixed effects analysis allows only inferences similar to those contained in the meta-analysis, and random effects analysis allows a wider range of inferences. The overall rate was estimated to be a 95% confidence interval as well as the effect sizes on the meta-regression model. When this interval contained the value of 1, and the effect had a *P* value greater than 5%, we considered it to have no effect, *I*² index was used to measure the heterogeneity of different study results. The index can vary between negative values (assuming 0%) to 100%. It is suggested that up to 25% is a small degree of heterogeneity, up to 50% is a medium degree, and 75% and above are high degree.

2.8.2. Dealing with missing data. If data was missing from this article, please email the author for more information. If the author cannot be reached, or if the author has lost relevant data, descriptive analysis, rather than meta-analysis, will be performed.

2.8.3. Subgroup analysis. Subgroup analyses were performed according to the mode of delivery, which can be divided into 2 types: normal delivery and cesarean section; subgroup analyses were performed according to the number of births, which can be divided into 2 types: primipara and pluripara; subgroup analyses were performed according to hypertension grade; subgroup analyses were performed according to gestational weeks.

2.8.4. Sensitivity analysis. Because we noticed significant heterogeneity of the data, we performed a sensitivity analysis by stepwise exclusion of each study.

2.8.5. Assessment of reporting biases. Publication bias was evaluated using the funnel plot and analyses were performed. Moreover, Egger and Begg test were used for the evaluation of potential publication bias.

2.8.6. Evidence quality evaluation. We will choose to assess the quality of evidence by using the Grading of Recommendations Assessment, Development, and Evaluation, which contains 5 domains, including bias risk, consistency, directness, precision, and publication bias. We would rate the quality of evidence as high, moderate, low, and very low.

3. Discussion

Studies have shown that certain conditions have been associated with the high risk of pregnancy related DVT. These include inherited or acquired thrombophilias, a previous history of thrombosis, antiphospholipid syndrome, lupus, heart disease, sickle cell disease, etc.^[14] Other independent risk factors are age 35 and older, null parity, multiple gestations, obesity, and immobility, these increase the risk 1.5 to 2 fold.^[15-17] DVT of the lower extremities is mainly due to the abnormal clotting of blood in the deep venous lumen to form a thrombus, which leads to venous reflux disorders caused by venous vascular obstruction, and easily leads to sensory and motor nerve disorders in the lower extremities of patients, manifested by altered skin status of the lower extremities, swelling, pain, itching, etc., and in severe cases, it even triggers PE, threatening the life safety of patients. According to 3 major factors of lower extremity deep venous thrombosis proposed by Virchow, including slow venous flow velocity and stasis, vessel wall damage, and blood hypercoagulation,^[18-19] various coagulation factors, such as II, V, VII, VIII, etc., are significantly increased in the maternal blood during the third trimester, and the pregnant women with PIH have a high erythrocyte aggregation index and weak deformability, all of which can make their blood stagnant and increase the resistance to blood flow, and make their blood chronically hypercoagulable. And because of multiple options for cesarean section in the pregnant women with PIH, surgical trauma, or intravenous fluids can injure the venous vascular wall. And to enable a successful delivery of pregnant women with PIH, continuous epidural anesthesia is required to dilate the peripheral veins with progressively slow blood flow and the muscles of the lower extremities in a relaxed state, resulting in slow blood flow and venous thrombosis. Besides, long-term bed rest in the process of labor and puerperium makes lower extremity activity decreasing,

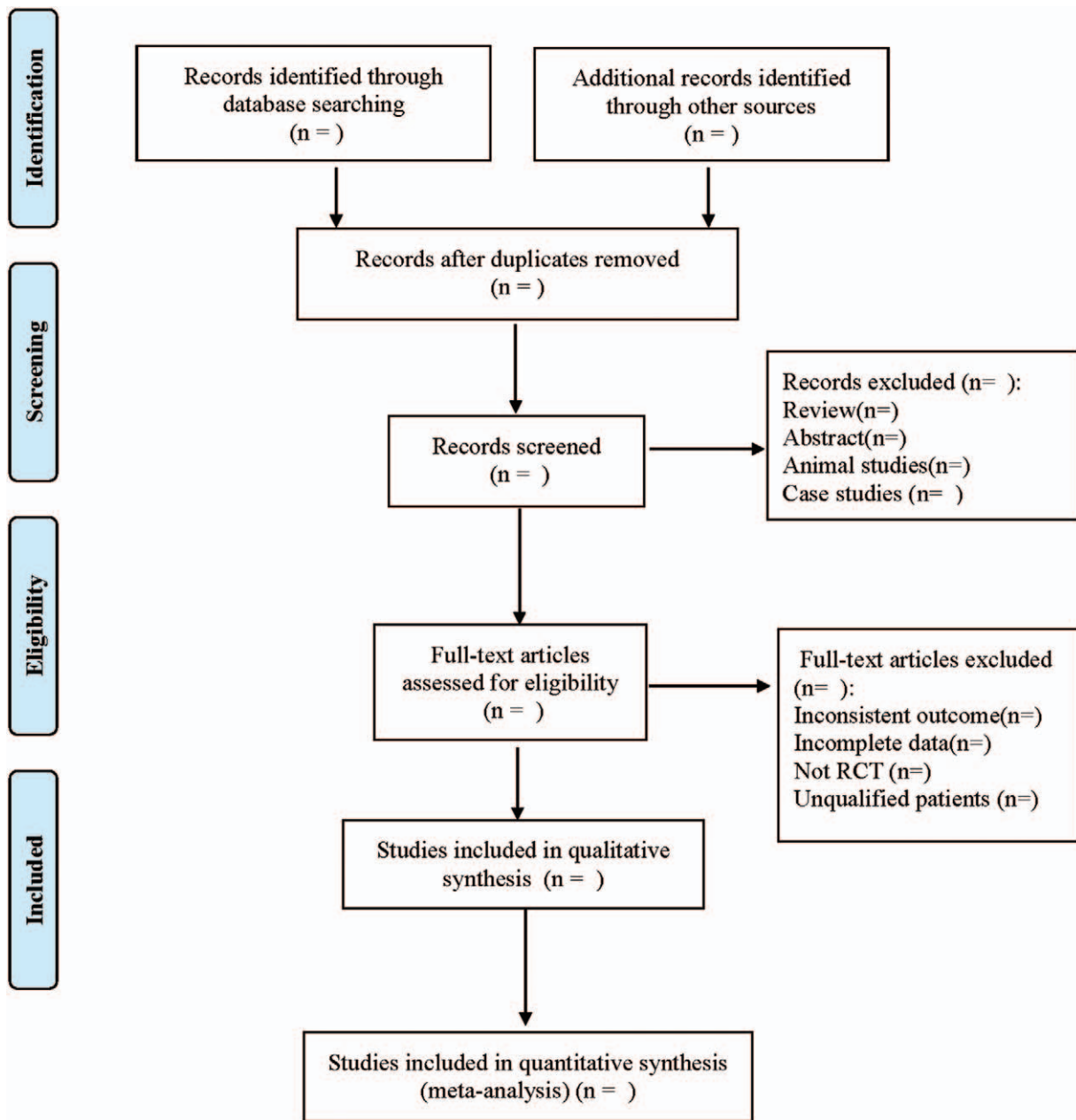


Figure 1. Flow diagram.

leading to slow speed of lower extremity blood flow, the patient's blood stasis in blood vessel wall, thus causing thrombosis. In addition, improper healing or care of lower extremity DVT can compromise postnatal recovery and result in lipid sclerosis and pigmentation in the affected limb, which may also lead to partial or complete functional loss of the affected limb, at the same time, lower extremity venous thrombosis detached to form emboli with blood flow obstructing systemic important organs, most likely causing PE, causing life-threatening, so clinically, postpartum lower extremity DVT in pregnant women with PIH should be treated and prevented aggressively. Anticoagulant therapy is a common prevention method, such as heparin, vitamin K antagonists, and so on.^[20–22] Besides medication, it is of great significance to cooperate with certain medical care.

The usual care model often ignores the venous flow characteristics of the lower extremities, and it is able to promote blood reflow after taking early postural intervention, effectively preventing the formation of lower extremity deep venous thrombosis in postpartum women with PIH. This is because after giving birth, the heel of the pregnant woman is raised, the lower leg is suspended, which is conducive to the lower limb venous blood reflux, thus preventing blood stasis in the lower limb veins; the calf muscle massage can promote the micro-vein dilation, improve the lower limb blood circulation, and relieve the lower limb muscle pain; by doing exercise and getting out of bed in early stage, the lower extremity blood flow can be further increased, and the purpose of preventing the lower extremity deep venous thrombosis can be achieved finally.

Clinically, it has been confirmed that postural intervention on prevention of deep venous thrombosis of lower extremity in postpartum women with PIH can help reduce the pressure on iliac veins and other iliac veins, promote blood reflux of postpartum lower limbs, and reduce the deep venous thrombosis of postpartum lower extremity in pregnant women with PIH. The clinical effect is reliable. However, the evidence from RCTs is not consistent. With the increasing number of clinical trials, it is extremely urgent to carry out systematic evaluation on postural intervention on prevention of deep venous thrombosis of lower extremity in postpartum women with PIH. In this study, we will summarize the latest evidence of postural intervention on prevention of deep venous thrombosis of lower extremity in postpartum women with PIH. This work also provides beneficial evidence for determining whether postural intervention on prevention of deep venous thrombosis of lower extremity in postpartum women with PIH is effective and safe, which is beneficial to both clinical practice and health-related decision makers.

However, this systematic review has some limitations. The included women had different modes of delivery, times of birth and gestational age, degree of hypertension and antihypertensive drugs used by the patients differed, routine care methods differed, and there may be some clinical heterogeneity. The course of the disease of the patients also varies, which may affect the results to some extent. Due to the limitation of language ability, we only search literature in English and Chinese, and may ignore research or reports in other languages.

Author contributions

Data collection: Jie Chen and Lijuan Guo

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Literature retrieval: Jie Chen and Lijuan Guo

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Writing – review & editing: Jie Chen and Lijuan Guo and Yuqin Shi

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