INPLASY PROTOCOL

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None declared.

Diagnostic accuracy of ultrasound for nutcracker syndrome: A protocol for systematic review and meta-analysis

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Review question / Objective: Are the sensitivity and accuracy of ultrasound examination for nutcracker syndrome satisfactory? Compared with other imaging examinations, what's the advantages of Doppler ultrasound?

Condition being studied: Doppler ultrasound is a kind of non-invasive, cheap, and reproducible imaging diagnostic technique, which is widely used in clinical work, but it is highly dependent on the skills of the operator, especially for the examination of retroperitoneal small blood vessels, which is often required The operator has rich experience and good knowledge of anatomy. Therefore, the conclusions drawn by different research groups are often controversial. Doppler ultrasound transmits, reflects, receives pulse waves, and detects the frequency shift signal of the target area to determine the blood flow direction and blood flow speed. Doppler ultrasound uses the spectrum shape to judge the fluid dynamics and infer whether there is a stenosis factor. The rational use of Doppler technology can theoretically clearly diagnose the factors of vascular stenosis, especially for the diagnosis of arterial stenosis with high sensitivity and specificity. For venous compression stenosis, in addition to changes in flow rate, morphological changes "beak-like" have diagnostic value, which is confirmed by the gold standard angiography. This study aims to make an objective assessment of the accuracy of Doppler ultrasound in the diagnosis of compression of left renal vein.

INTRODUCTION

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Rationale: The left renal vein usually runs between the angle formed by abdominal aorta and superior mesenteric artery. A small number of slender and weak patients will experience compression of the left renal vein, named "nutcracker phenomenon". Doppler ultrasound can non-invasively detect blood flow in blood vessels, which has certain significance for distinguishing the nutcracker. However, because the left renal vein is located behind the peritoneum, with gastrointestinal gas interference in the front, it is usually difficult to display. The conclusions drawn by different research groups have much difference. The patient's posture and breathing state have a non-negligible influence on the examination results. Therefore, the purpose of our research is to determine the ability of Doppler ultrasound to diagnose the nutcracker phenomenon and provide clinicians with a reliable reference.

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METHODS

Search strategy: Embase, Cochrane library、Web of science and PubMed(Medline) databases will be used for retrieval, and the retrieval time range is set from the beginning of the database establishment to December 31, 2020. Use "ultrasound, Doppler ultrasound, ultrasonography, left renal vein, posterior left renal vein, nutcracker phenomenon" as search terms. The type of literature include cohort study, case comparative study and randomized controlled study.

Participant or population: This study does not restrict the patient's gender, weight, height, race, nationality, or education level. Adult the patients older than 18 years with suspected compressed left renal vein who have received at least Doppler ultrasound and computed tomography angiography (CTA) or Magnetic resonance angiography (MRA) or Digital subtraction angiography (DSA) at the same time were included in this study.

Intervention: Color Doppler flow imaging.

Comparator: CTA or MRA or DSA examination.

Study designs to be included: We conducted the meta-analysis following the Preferred Reporting Items for systematic review and meta-analyses of diagnostic test accuracy studies (PRISMA-DTA). cohort study, case comparative study and randomized controlled study are enrolled. All the patients should have accept ultrasound and at least one of CTA, MRA or DSA examination. Any one of CTA, MRA or DSA is regarded as the gold standard for diagnosis.

Eligibility criteria: 1) In the included studies, patients can cooperate to complete the Doppler ultrasound examination, and at

least complete one of CTA, MRA and angiography. 2) The patient's left renal vein did not have serious developmental malformations, and the annular left renal vein, retro-aortic left renal vein and renal vein of ectopic origin were excluded. 3) The included research data are expressed in the form of a four grid table, TP, TN, FP, FN 4) At least two authors screened abstracts and selected studies for inclusion independently.

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Main outcome(s): The main outcome indicators include: sensitivity, specificity, positive likelihood ratio, negative likelihood ratio, diagnostic odds ratio, area under the SROC curve.

Quality assessment / Risk of bias analysis: Two investigators respectively evaluated the methodology of the included studies and adopted the quality assessment of diagnostic Accuracy studies assessment tool (QUADAS-2). If the opinions of the two investigators are not uniform, we will negotiate or seek a third researcher's opinion and make the final decision. We will also seek detailed information from the author of the original article in order to assess the methodological quality of the included studies accurately.

Strategy of data synthesis: We use STATA 14.0 version software for data analysis. We calculated pooled summary statistics, including sensitivity, specificity, positive likelihood ratio, negative likelihood ratio, diagnostic odds ratio, and calculated 95% confidence intervals respectively. Plot the SROC curve and get the area under the curve. For potential heterogeneity, we use cochrane's Q-statistic and I2 test to test. 1)

I2>0.50 means highly heterogeneity, we will use descriptive analysis. 2) 0.25< I2<0.50 Means relatively moderate heterogeneity, we will use random effects model analysis, and if conditions permit, analyze the source of heterogeneity. 3) I2<0.25 means low degree of heterogeneity, we will use fixed effects model analysis.

Subgroup analysis: If the necessary data are available, subgroup analyses will be done.

Sensitivity analysis: In order to verify the robustness of the conclusions, we use the single-experiment elimination method to verify, each time one study is excluded, and the results after the elimination are compared with the results before the elimination. If it is found that the conclusion has changed significantly, the reasons for the heterogeneity should be explored from multiple aspects, such as the characteristics of the research object and the degree of variation of intervention measures. If necessary, a subgroup analysis is required to explain the heterogeneity.

Language: English.

Country(ies) involved: China.

Other relevant information: Patients with ectopic origin of the left renal vein were not included in this study. Dysplasia of the double inferior vena cava was not included in this study. Patients with poor renal function and unable to undergo any one of CTA , MRA or angiography examination are not included in this study.

Keywords: Ultrasound; color Doppler flow imaging(CDFI); posterior; nutcracker phenomenon; diagnostic; Renal Veins; Renal Nutcracker Syndrome.

Contributions of each author:
Author 1 - Yang Bai is responsible for project design , article writing and communicate with editor.
Author 2 - Ying Xu is responsible for the writing of the first draft of the article and

the selection of the article, data extraction and analysis.

Author 3 - Guanghong Han is responsible for article retrieval, article screening and data extraction.

Author 4 - Xiadong Du is responsible for article retrieval, article screening and data extraction.

Author 5 - Lili Yu is responsible for data extraction and software analysis.