INPLASY

Comparison of ultrasound-guided microwave ablation, laser ablation, and radiofrequency ablation in treating benign thyroid nodules: A meta-analysis

INPLASY202410025
doi: 10.37766/inplasy2024.1.0025
Received: 07 January 2024
Published: 08 January 2024

Qian, Y[1]; Zheng, L[2]; Fan, CY[3]; Huang, Y[4].

Corresponding author:
Yong Huang

dysrmyyhy@163.com

Author Affiliation:
Department of Endocrinology, The People's Hospital of Danyang, Danyang Hospital of Nantong University, Danyang, Jiangsu 212300, China.

ADMINISTRATIVE INFORMATION

Support - N/A.

Review Stage at time of this submission - Completed but not published.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202410025

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 07 January 2024 and was last updated on 07 January 2024.

INTRODUCTION

Review question / Objective This analysis was carried out to comprehensively evaluate and compare the efficacy and safety of LA, RFA, and MWA in treating BTNs to provide more robust evidence for the rational selection of ablation methods for treating benign thyroid nodules.

Condition being studied As a new minimally invasive technique, ultrasound-guided thermal ablation has become one of the treatment methods for benign thyroid nodules. This study aims to evaluate the efficacy and safety of laser ablation (LA), radiofrequency ablation (RFA), and microwave ablation (MWA) in treating benign thyroid nodules (BTNs).

METHODS

Search strategy (Ultrasonography OR Echotomography), (Microwave Ablation OR Ablation Techniques), (Laser Ablation OR Ablation, Laser), (Radiofrequency Ablation OR Ablation, Radiofrequency OR Radio Frequency Ablation) AND (Benign Thyroid Nodules OR Benign, Nodule, Thyroid), Randomized controlled trial (RCTs).

Participant or population The meta-analysis included seven articles with 840 participants.The treatment group was treated with any of the following three ablation methods: LA, RFA and MWA.

Intervention N/A.

Comparator The treatment group was treated with any of the following three ablation methods: LA, RFA and MWA.

Study designs to be included PubMed, Web of Science, and Cochrane Library were searched for qualified randomized controlled studies (RCTs) issued from establishing databases to March 2022. After screening and evaluating the article quality, the data on nodular volume reduction rate (VRR) and the incidence of complications after thermal ablation were extracted and analyzed by RevMan 5.3 and Stata l4.0.

Eligibility criteria The inclusion criteria were as follows: (1) The retrospective study or RCTs of LA, RFA and MWA in treating BTNs; (2) Patients with BTNs diagnosed by fine needle aspiration cytology before treatment; (3) The treatment group was treated with any of the following three ablation methods: LA, RFA and MWA; (4) The outcome indicator includes at least one kind of efficacy evaluation indicator and one safety evaluation indicator. Therapeutic indicators include nodule reduction rate; safety indicators include the incidence of complications. (5) The articles are issued in English. We excluded studies: (1) There are duplicate patient or nodule data in the study; (2) Literature without precise data; (3) Study on the combination of ablation technique and other therapeutic techniques at the same time.

Information sources PubMed, Web of Science, and Cochrane Library.

Main outcome(s) LA, RFA, and MWA can markedly lessen the volume of BTNs, and they can safely treat BTNs.

Quality assessment / Risk of bias analysis We employed RevMan version 5.1 (Review Manager) to conduct this meta-analysis. Quality assessment was carried out by the Newcastle–Ottawa Scale (NOS) for RCTs and Cochrane's risk of bias (RoB) tool for randomized trials. The $\chi 2$ test was conducted for homogeneity analysis, and I-squared (I2) and Q statistics were assessed. The forest plot was created to visualize each effect variable's random effects meta-analysis model. We estimated the standardized mean difference (SMD) and 95% confidence interval (CI) for statistics. The source of heterogeneity was explored when heterogeneity $P \leq 0.05$ or $I2 \geq 50\%$. All statistical analyses were performed using Stata l4.0.

Strategy of data synthesis Bias risk assessment was conducted by the Cochrane risk of bias (RoB) tool for included articles.

Subgroup analysis Comparison of the efficacy of LA vs. RFA in treating BTNs; Comparison of the efficacy of MWA vs. RFA in treating BTNs; Comparison of the efficacy of MWA vs. LA in the treatment of benign thyroid nodules; Comparison of the occurrence of major complications between RFA and LA; Comparison of the incidence of major complications between RFA and MWA; Comparison of the incidence of major complications between LA and MWA; Comparison of the incidence of secondary complications between RFA and LA; Comparison of the incidence of secondary complications between RFA and MWA; Comparison of the incidence of secondary complications between LA vs. MWA.

Sensitivity analysis Due to this study's different intervention methods and thermal ablation techniques, operating unthinkingly in the population is challenging, so the bias risk could not be assessed through the blind method.

Country(ies) involved China.

Keywords Benign thyroid nodules; Laser ablation; Microwave ablation; Radiofrequency ablation.

Contributions of each author

Author 1 - Ying Qian - Methodology, Investigation, Data curation, original draft.
Email: dysrmyyqy@126.com
Author 2 - Zheng Li - Writing, review & editing.
Email: 165001113@qq.com
Author 3 - Chunyun Fan - Review & editing.
Email: dysrmyyfcy@163.com
Author 4 - Yong Huang - Idea, Supervision, review & editing.
Email: dysrmyyhy@163.com