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Safety of Bone Marrow Biopsy in Patients Receiving Anticoagulation Therapy

A Systematic Review and Meta-Analysis

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BACKGROUND

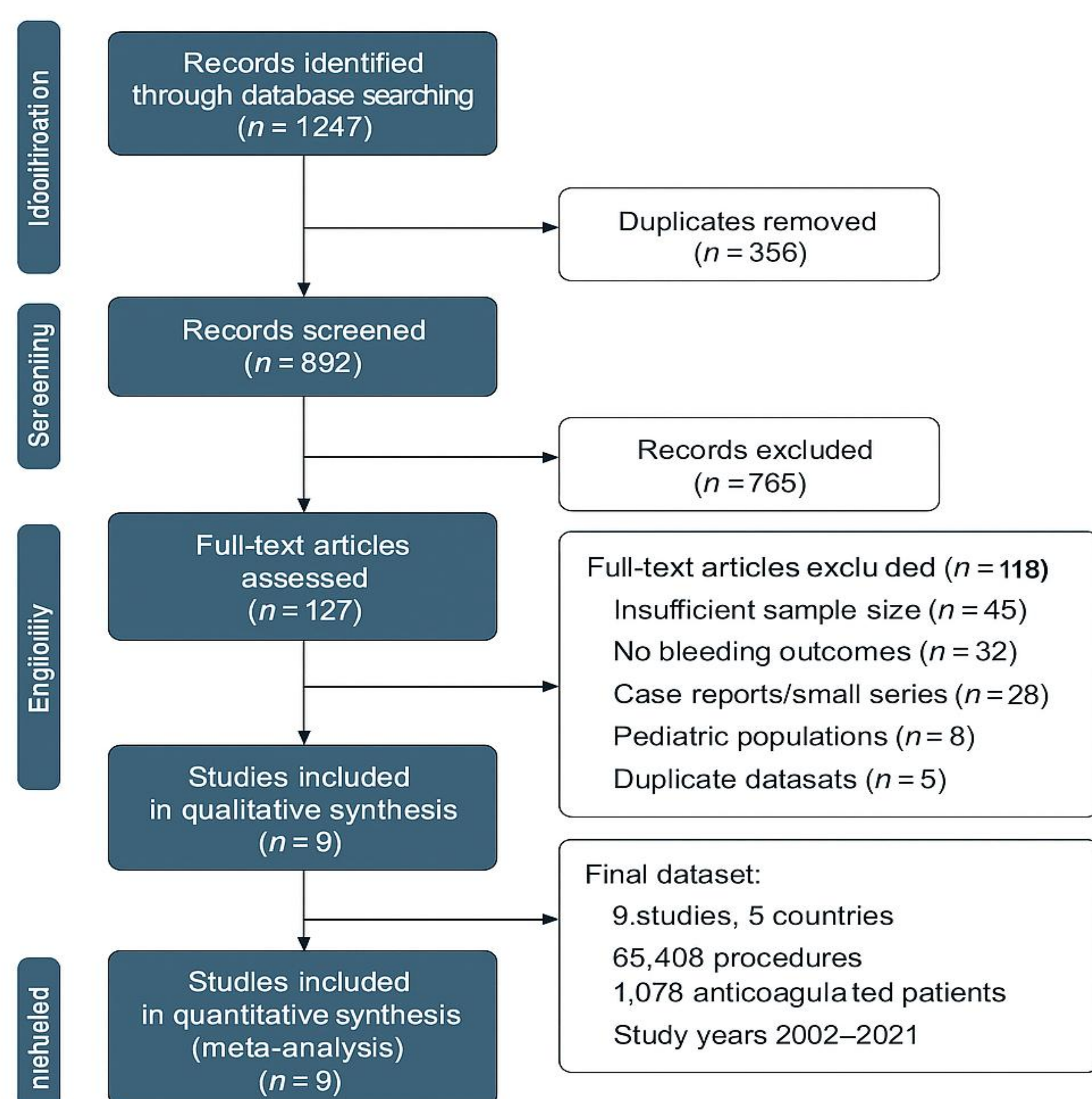
Bone marrow biopsy is a fundamental diagnostic procedure in hematology, yet the safety profile in patients receiving anticoagulation therapy remains poorly defined. Current practice varies widely regarding anticoagulation management, with some clinicians routinely interrupting therapy while others proceed without modification.

OBJECTIVE

To systematically evaluate the safety of bone marrow biopsy in anticoagulated patients and identify risk factors for bleeding complications.

METHODS

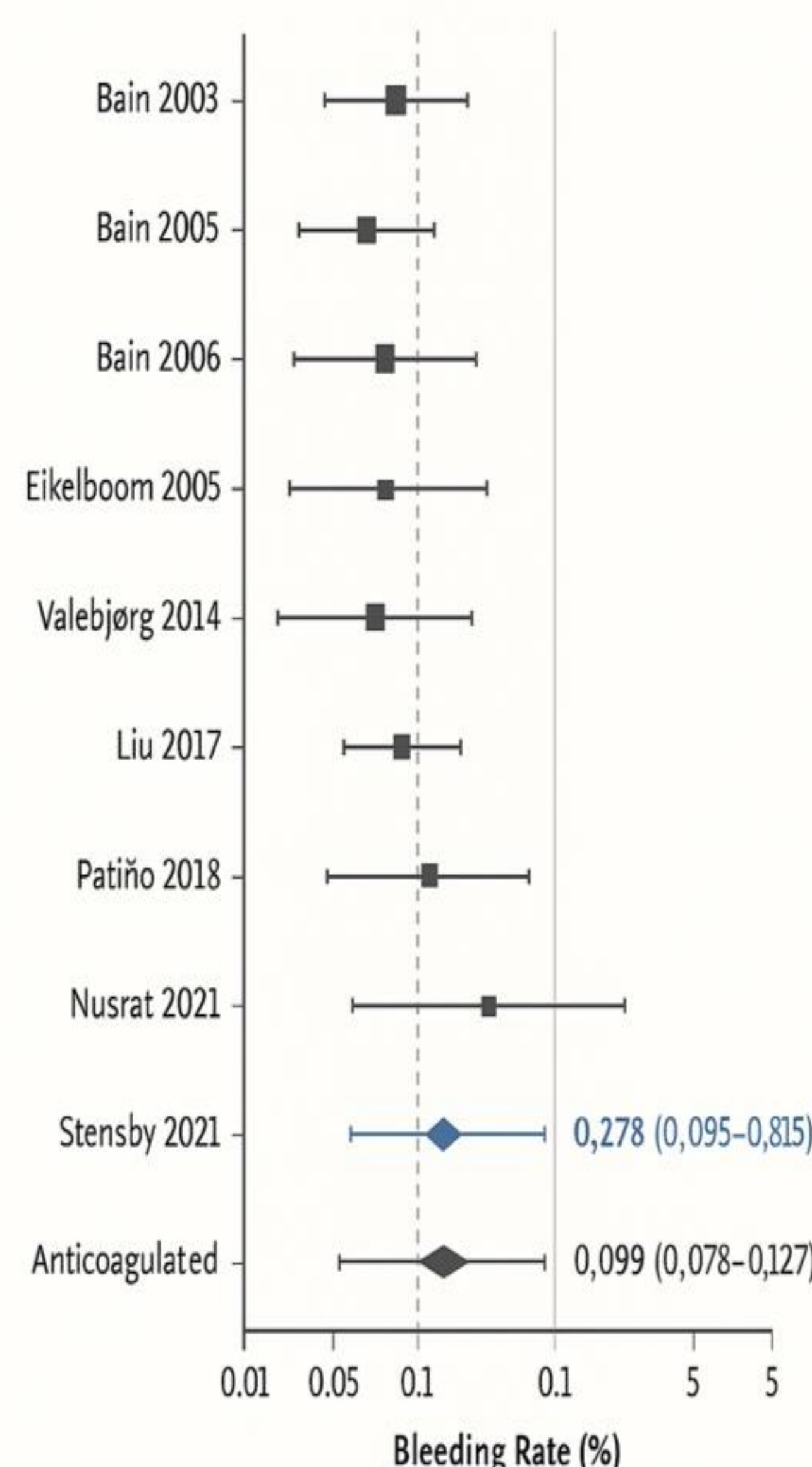
We conducted a systematic review following PRISMA guidelines, searching PubMed, Embase, and Cochrane databases from inception to 2023. Studies reporting bleeding outcomes after bone marrow biopsy with clear methodology were included. Data extraction focused on bleeding rates, patient characteristics, and anticoagulation status. Meta-analysis was performed using random-effects models with 95% confidence intervals.



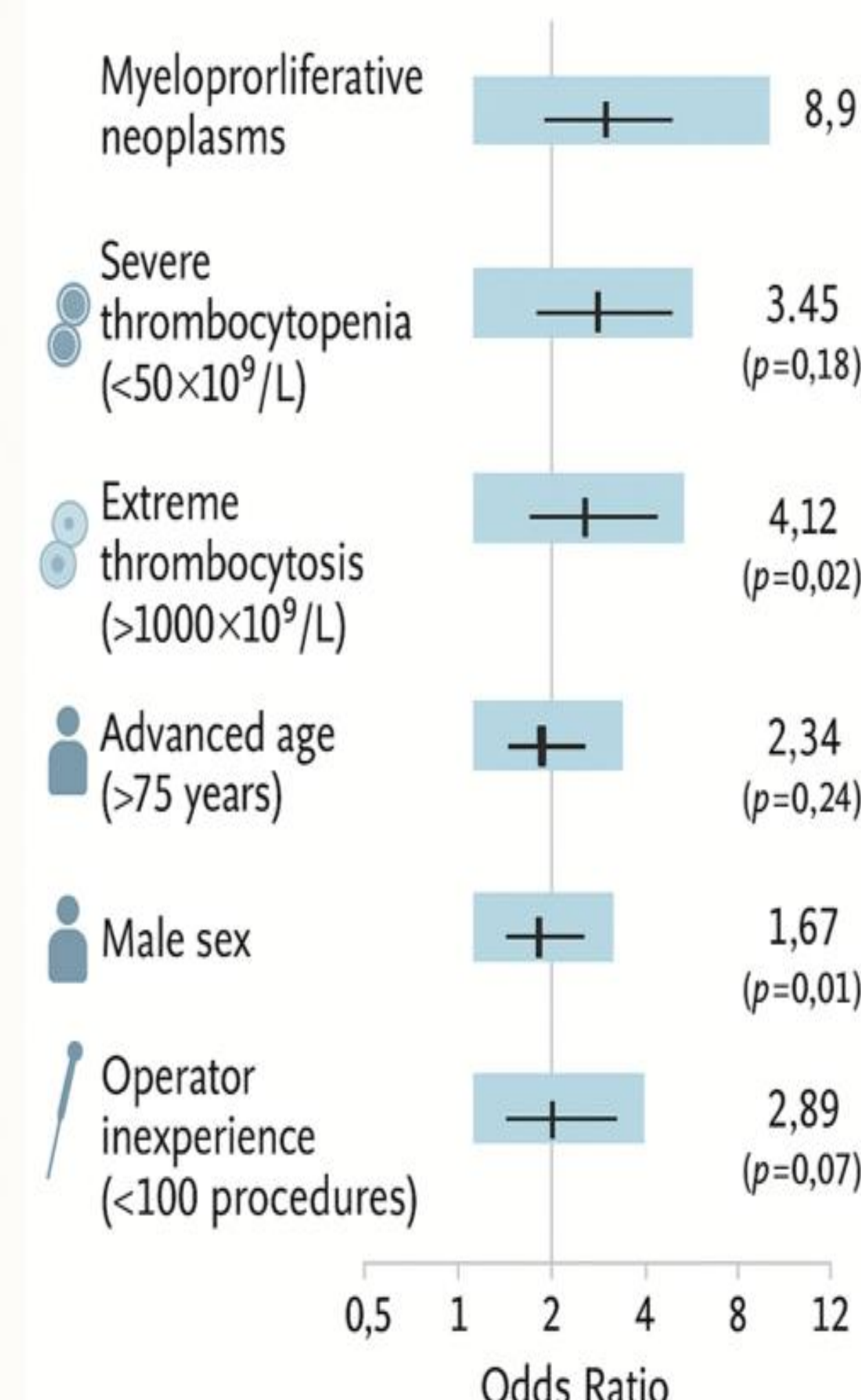
RESULTS

Nine studies encompassing 65,408 bone marrow biopsy procedures were included, with 1,078 patients receiving anticoagulation therapy. The overall major bleeding rate was 0.099% (95% CI: 0.078–0.127%), representing fewer than 1 in 1,000 procedures. Among anticoagulated patients, the bleeding rate was 0.278% (95% CI: 0.095–0.815%), corresponding to approximately 1 in 360 patients. Myeloproliferative neoplasms emerged as the strongest bleeding risk factor (OR 8.9, $p=0.006$), while severe thrombocytopenia ($<50 \times 10^9/L$) and extreme thrombocytosis ($>1000 \times 10^9/L$) also conferred increased risk. Anticoagulation status alone was not significantly associated with bleeding complications.

Forest Plot of Major Bleeding Risk After Bone Marrow Biopsy in Anticoagulated vs. Non-Anticoagulated Patients



Risk Factors for Bleeding After Bone Marrow Biopsy



CONCLUSION

Bone marrow biopsy demonstrates an excellent safety profile with very low bleeding rates, even in anticoagulated patients. Patient-specific risk factors, particularly underlying hematologic conditions, appear more predictive of bleeding risk than anticoagulation status. These findings support individualized risk assessment rather than routine anticoagulation interruption.

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