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Effect of Standard vs Intensive Blood Pressure Control on the Risk of Recurrent Stroke

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ABSTRACT

Background: The literature surrounding blood pressure management in patients with a history of stroke has evolved significantly over the past few years, reflecting an increasing understanding of the complexities involved in optimizing treatment strategies for secondary stroke prevention. **Literature Review:** The literature reviewed illustrates the intricate relationship between blood pressure management and recurrent stroke risk, emphasizing the need for individualized treatment strategies. (Wang et al., 2016) provide a foundational overview of the effectiveness of various antihypertensive medications, highlighting angiotensin-converting enzyme inhibitors (ACEIs) and diuretics as key players in secondary stroke prevention. **Conclusion:** In conclusion, the literature presents a complex landscape of blood pressure management strategies for stroke patients, highlighting the importance of individualized approaches based on patient characteristics and specific clinical contexts. The evidence suggests that while intensive blood pressure control may offer certain protective benefits, it must be balanced with potential risks and tailored to the unique needs of each patient. Continued research is essential to refine these strategies and optimize outcomes for individuals at risk of recurrent strokes.

Keyword: Effect, Standard , Intensive, Blood Pressure Control, Risk of Recurrent Stroke

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INTRODUCTION

The literature surrounding blood pressure management in patients with a history of stroke has evolved significantly over the past few years, reflecting an increasing understanding of the complexities involved in optimizing treatment strategies for secondary stroke prevention. The article by (Wang et al., 2016) underscores the critical role of hypertension as a primary risk factor for both initial and recurrent strokes. Their systematic review and meta-analysis of randomized controlled trials revealed that angiotensin-converting enzyme inhibitors (ACEIs) and diuretics are the most effective classes of blood pressure-lowering medications for reducing the risk of recurrent stroke in this population. This foundational work sets the stage for subsequent discussions regarding blood pressure management in various contexts.

Building on this foundation, (Charlotte Sandset et al., 2018) initiated a prospective collaborative systematic review aimed at evaluating the effects of vasoactive drugs in acute stroke scenarios. Their focus on individual patient data represents a methodological advancement in understanding blood pressure management during acute ischemic strokes. They note the widespread occurrence of high blood pressure in acute stroke settings and highlight the ongoing debate regarding the appropriateness of intensive blood pressure management, particularly in ischemic stroke patients. This article emphasizes the need for tailored approaches to blood pressure control, particularly during critical interventions such as thrombolysis.

In a more nuanced exploration, (Sobieraj et al., 2019) examined the relationship between low diastolic blood pressure and the risk of stroke in high-risk populations. Their findings suggest that low diastolic blood pressure may not universally correlate with increased stroke risk, particularly among individuals with a prior stroke history. This analysis calls for further investigation into the implications of varying blood

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pressure thresholds and the necessity of personalized treatment strategies.

(Camafort et al., 2020) provided a comprehensive review of the effects of intensive blood pressure lowering, particularly in patients with type 2 diabetes and chronic kidney disease. Their meta-analysis revealed that while intensive blood pressure management can yield benefits in certain populations, it also raises concerns regarding potential adverse outcomes, such as increased risks of renal injury and cardiovascular events. This article contributes to the ongoing discourse regarding the balance between aggressive blood pressure control and patient safety.

The ENCHANTED trial, discussed by (Hsu et al., 2023), adds another layer of complexity to this dialogue. Their findings indicate that while intensive blood pressure lowering did not improve functional recovery in acute ischemic stroke patients, it was associated with a reduced incidence of intracranial hemorrhage. This highlights the potential benefits of intensive management in preventing complications, despite the lack of improvement in primary clinical outcomes. The subsequent trials, including BP-TARGET, further examined the safety of intensive blood pressure control, although they similarly failed to demonstrate significant improvements in clinical outcomes.

Finally, (Hsu et al., 2023) conducted a meta-analysis focusing on the relationship between the magnitude of differential blood pressure reduction and secondary stroke prevention. Their rigorous criteria for inclusion ensure that the findings are robust, emphasizing the importance of understanding the nuances of blood pressure-lowering therapy in recurrent stroke prevention. This article synthesizes the evidence surrounding the effectiveness of intensive versus standard blood pressure management, reinforcing the need for continued research in this vital area of stroke care.

Together, these studies provide a comprehensive overview of the evolving landscape of blood pressure management in patients with a history of stroke, highlighting the ongoing

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challenges and the need for individualized treatment approaches.

LITERATURE REVIEW

The article "Comparative Effectiveness of Blood Pressure-lowering Drugs in Patients who have Already Suffered From Stroke: Traditional and Bayesian Network Meta-analysis of Randomized Trials" by Wang et al. (Wang et al., 2016) provides a comprehensive analysis of the impact of various blood pressure (BP)-lowering medications on the recurrence of stroke in patients with a prior stroke history. The study is particularly significant as it addresses a critical gap in understanding which classes of antihypertensive drugs are most effective in preventing subsequent strokes, a major concern in stroke management.

The authors conducted a systematic review and meta-analysis of 15 randomized controlled trials (RCTs) involving a substantial cohort of 39,329 participants. This large sample size enhances the reliability of the findings and allows for a robust comparison across different BP-lowering strategies. The analysis revealed that angiotensin-converting enzyme inhibitors (ACEIs) and diuretics emerged as the most effective classes of medications for reducing the risk of recurrent stroke and coronary heart disease (CHD).

One of the key insights from the article is the emphasis on the combination of diuretics with ACEIs. The authors argue that this combination therapy is particularly beneficial for secondary prevention in patients with a history of stroke. This finding is crucial as it not only informs clinical practice but also guides future research directions in hypertension management post-stroke.

The methodology employed in the study, including both traditional and Bayesian network meta-analysis, is commendable as it allows for a nuanced understanding of the comparative effectiveness of various antihypertensive agents. The use of Bayesian methods, in particular, provides a probabilistic framework that can offer additional insights into the relative benefits of each treatment option.

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However, while the study presents compelling evidence for the efficacy of ACEIs and diuretics, it is essential to consider the heterogeneity of the included trials. Variations in study design, participant characteristics, and BP-lowering targets may influence the generalizability of the results. Furthermore, the article does not delve deeply into potential side effects or contraindications associated with the recommended medications, which are crucial factors in clinical decision-making.

The article "Protocol for a prospective collaborative systematic review and meta-analysis of individual patient data from randomised controlled trials of vasoactive drugs in acute stroke: the Blood pressure in Acute Stroke Collaboration, stage-3 (BASC-3)" by Sandset et al. (Charlotte Sandset et al., 2018) outlines a comprehensive framework aimed at assessing the impact of blood pressure management in acute stroke scenarios. The authors emphasize the critical role of blood pressure control in influencing functional outcomes, as measured by the modified Rankin Scale, which is a widely accepted metric for assessing disability.

One of the key insights from the article is the recognition of the prevalence of high blood pressure in both acute ischemic stroke and primary intracerebral hemorrhage, which is associated with adverse short- and long-term outcomes. The authors note that there is a consensus in the medical community regarding the intensive management of elevated blood pressure in cases of intracerebral hemorrhage, as highlighted by international guidelines stemming from the INTERACT-2 trial. However, the authors also point out the ongoing debate concerning the management of blood pressure in ischemic stroke patients, particularly in light of the neutral findings from the ATACH-2 trial. This indicates a significant gap in clinical practice, as equipoise persists about whether to initiate blood pressure treatment in these patients.

The article further elaborates on the methodological rigor of their proposed systematic review and

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meta-analysis by advocating for the use of individual patient data, which is deemed the gold standard for such analyses. This approach allows for a more nuanced understanding of the effects of blood pressure management, as it can account for various clinical, hemodynamic, and neuroradiological variables, as well as safety outcomes like mortality and serious adverse events.

Moreover, the authors highlight the need for additional research to address critical questions regarding blood pressure management before, during, and after reperfusion therapies, such as intravenous thrombolysis and mechanical thrombectomy. This aspect is particularly relevant given the evolving landscape of acute stroke treatment and the implications that blood pressure control may have on the success of these interventions.

The article titled "Low Diastolic Blood Pressure is Not Related to Risk of First Episode of Stroke in a High-Risk Population: A Secondary Analysis of SPRINT," authored by Sobieraj et al. (Sobieraj et al., 2019), presents a critical examination of the relationship between low diastolic blood pressure (DBP) and the incidence of stroke, particularly in a high-risk population. The authors conducted a secondary analysis of the SPRINT trial, which primarily aimed to evaluate the effects of intensive versus standard blood pressure control on cardiovascular outcomes.

The main finding of the study indicates that low DBP does not correlate with an increased risk of the first episode of stroke in the examined cohort. This conclusion challenges some existing assumptions in the literature regarding the role of low DBP as a potential risk factor for stroke. The authors highlight that while low DBP has been associated with various cardiovascular events in different populations, its relationship with stroke risk remains ambiguous, particularly in individuals who have previously experienced a stroke.

The authors argue for the necessity of further research to clarify the association between low DBP and stroke risk, especially in subpopulations with a history of stroke. They suggest that ongoing

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studies could provide new insights and potentially lead to more nuanced clinical recommendations regarding blood pressure management in these high-risk groups. This call for additional research underscores the complexity of blood pressure dynamics and their implications for stroke prevention strategies.

The evaluation of the article reveals a thoughtful approach to a significant clinical question, yet it also raises important considerations regarding study limitations and the need for broader investigations. The authors do not fully address potential confounding factors that could influence the relationship between DBP and stroke risk, nor do they explore the implications of their findings for clinical practice in detail. Additionally, the article could benefit from a more comprehensive discussion of the pathophysiological mechanisms that might underlie the observed outcomes.

The article "Intensive blood pressure lowering: a practical review" by Camafort et al. (Camafort et al., 2020) provides a comprehensive examination of the implications of intensive blood pressure control in the context of secondary stroke prevention. The authors synthesize findings from various significant studies, notably including the SPS3 trial and the SPRINT trial, which have contributed to the understanding of how blood pressure management strategies affect the risk of recurrent strokes.

A central theme in the article is the nuanced relationship between baseline kidney function and the effectiveness of intensive blood pressure control in patients with a history of lacunar strokes. The authors reference Agarwal et al. (2019), who conducted a post hoc analysis revealing that patients with compromised kidney function may experience different outcomes when subjected to intensive blood pressure management. This insight is pivotal as it suggests that personalized treatment plans should consider renal status to optimize secondary prevention strategies.

Moreover, the review highlights the contrasting approaches of intensive versus standard blood pressure control as evidenced by the

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SPRINT trial. The SPRINT trial's findings, which advocate for lower blood pressure targets, are juxtaposed with the results from the SPS3 trial, which focused on patients with recent lacunar strokes. The authors critically evaluate the implications of these studies, noting that while intensive management may reduce the incidence of recurrent strokes, it also raises concerns regarding potential adverse effects, particularly in vulnerable populations.

Additionally, the systematic review and meta-regression analysis conducted by Katsanos et al. (2017) is discussed, providing a broader context for understanding how blood pressure reduction correlates with secondary stroke prevention. The article underscores the importance of a balanced approach to blood pressure management, suggesting that while aggressive control may be beneficial, it is essential to weigh the risks and benefits on a case-by-case basis.

The article "Effects of intensive blood pressure lowering on cerebral ischaemia in thrombolysed patients: insights from the ENCHANTED trial" by Chen et al. (Hsu et al., 2023) provides a comprehensive examination of the implications of intensive blood pressure management in patients experiencing acute ischaemic stroke. The authors address a critical area of ongoing debate within the clinical community regarding the effectiveness of intensive versus standard blood pressure control in promoting functional recovery and minimizing complications such as intracranial haemorrhage.

The findings from the ENCHANTED trial are particularly noteworthy, as they reveal that while intensive blood pressure lowering did not yield significant benefits in terms of functional recovery compared to standard management, it did correlate with a marked reduction in the incidence of all forms of intracranial haemorrhage. This suggests that while aggressive blood pressure control may not enhance recovery outcomes, it could play a pivotal role in mitigating the risk of secondary complications that can arise post-stroke.

Furthermore, the article highlights the broader context of

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blood pressure management in conjunction with endovascular thrombectomy, a procedure increasingly employed for large-vessel occlusions. The authors reference the BP-TARGET trial, which established that more intensive systolic blood pressure control was safe but failed to improve clinical outcomes post-thrombectomy. This is echoed in findings from the Enhanced Control of Hypertension and Thrombectomy Stroke Study, which indicated that maintaining systolic blood pressure below 120 mm Hg could actually lead to poorer functional recovery in patients following the procedure.

The critical evaluation of the material presented in this article underscores the complexity of managing blood pressure in acute ischaemic stroke cases. The authors effectively articulate the nuanced relationship between blood pressure control and recovery outcomes, suggesting that while intensive management may reduce the risk of intracranial bleeding, it does not necessarily translate into improved functional recovery. This insight is essential for clinicians as it emphasizes the need for a balanced approach to blood pressure management that considers both the potential benefits and the risks associated with intensive control.

The article titled "Association Between Magnitude of Differential Blood Pressure Reduction and Secondary Stroke Prevention: A Meta-analysis and Meta-Regression" by Hsu et al. (Hsu et al., 2023) provides a comprehensive examination of the impact of varying intensities of blood pressure control on the recurrence of strokes. The authors rigorously define their inclusion and exclusion criteria, ensuring that the selected studies are relevant and methodologically sound, which strengthens the validity of their findings.

The inclusion criteria focused on randomized clinical trials that specifically involved participants with a history of stroke or transient ischemic attack (TIA), which is critical for understanding the effects of blood pressure management in this high-risk population. By emphasizing studies that evaluated more intensive

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versus less intensive blood pressure-lowering therapies, the authors effectively isolate the variable of interest—blood pressure reduction magnitude—allowing for a clearer analysis of its association with recurrent stroke risk.

Moreover, the authors meticulously extracted data on various trial characteristics, including patient demographics, baseline blood pressure levels, and the duration of follow-up. This detailed approach is commendable as it provides a nuanced understanding of the factors that may influence outcomes in secondary stroke prevention. The focus on the magnitude of systolic blood pressure (SBP) reduction is particularly relevant, as it aligns with current clinical interests in optimizing blood pressure management to mitigate stroke risk.

The article's methodology also addresses potential biases by excluding studies with significant limitations, such as those published before 1980 or those that adopted non-pharmaceutical approaches. This attention to the quality of included studies enhances the reliability of the meta-analysis and meta-regression results.

However, while the article presents a robust analysis, it would benefit from a more detailed discussion regarding the clinical implications of the findings. For instance, the authors could elaborate on how the identified differential in blood pressure reduction translates to specific clinical recommendations for practitioners managing patients with a history of stroke. Additionally, a broader exploration of the potential adverse effects associated with more intensive blood pressure control could provide a more balanced view of the benefits versus risks in this population.

CONCLUSION

The literature reviewed illustrates the intricate relationship between blood pressure management and recurrent stroke risk, emphasizing the need for individualized treatment strategies. (Wang et al., 2016) provide a foundational overview of the effectiveness of various antihypertensive medications, highlighting angiotensin-converting

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enzyme inhibitors (ACEIs) and diuretics as key players in secondary stroke prevention. This systematic review and meta-analysis of randomized controlled trials establishes a critical understanding of how specific drug classes can mitigate the risk of recurrent strokes in patients with a history of stroke.

The work by (Charlotte Sandset et al., 2018) expands on this by examining the role of blood pressure management in acute stroke scenarios, particularly stressing the need for individualized approaches during critical interventions like thrombolysis. Their prospective collaborative systematic review highlights the prevalence of high blood pressure during acute ischemic strokes and calls for further research to clarify optimal management strategies.

(Sobieraj et al., 2019) contribute to the discussion by challenging existing assumptions regarding low diastolic blood pressure (DBP) as a risk factor for stroke. Their findings suggest that low DBP does not correlate with increased stroke risk in high-risk populations, indicating a need for more nuanced clinical recommendations.

(Camafort et al., 2020) provide a practical review of intensive blood pressure management, focusing on the balance between benefits and potential adverse outcomes in patients with a history of stroke. Their analysis underscores the importance of considering baseline kidney function when implementing aggressive blood pressure control strategies.

The ENCHANTED trial, discussed by (Chen et al., 2023), reveals that while intensive blood pressure lowering does not improve functional recovery in acute ischemic stroke patients, it is associated with reduced incidence of intracranial hemorrhage, suggesting that intensive management may prevent complications despite not enhancing recovery outcomes. This is further supported by findings from (Hsu et al., 2023), which emphasize the significance of the magnitude of blood pressure reduction in secondary stroke prevention, advocating for careful consideration of treatment intensity.

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In conclusion, the literature presents a complex landscape of blood pressure management strategies for stroke patients, highlighting the importance of individualized approaches based on patient characteristics and specific clinical contexts. The evidence suggests that while intensive blood pressure control may offer certain protective benefits, it must be balanced with potential risks and tailored to the unique needs of each patient. Continued research is essential to refine these strategies and optimize outcomes for individuals at risk of recurrent strokes.

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