Blood Pressure Management after Mechanical Thrombectomy for Acute Ischemic Stroke: A Survey of the StrokeNet Sites

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Background: It is unclear what factors providers take into account to determine the target blood pressure (BP) after mechanical thrombectomy (MT) in patients who had acute ischemic stroke. We aimed to understand practice patterns of post-MT BP management across institutions in the United States. *Methods:* We surveyed StrokeNet institutions providing MT and post-MT care with an online questionnaire, designed to understand institutional post-MT BP management practices. *Results:* Of 131 potential institutions, 58 completed the survey. The majority of institutions target systolic BP (SBP, n = 53, 91%) during the first 24 hours post-MT (n = 32, 55%) using nicardipine as a first-line agent (n = 43, 74%). At most institutions, BP management is determined by a team of physicians in a collaborative fashion (n = 30, 52%) and individualized on a case-by-case basis (n = 39, 67%) after taking the reperfusion status into account (n = 42, 72%). In patients with successful reperfusion, 36% (n = 21) of the institutions target SBP in the range of 120-139 mm Hg, 21% (n = 12) target 140-159 mm Hg, and 28% (n = 16) would accept any value less than or equal to 180 mm Hg. In patients with unsuccessful reperfusion, 43% (n = 25) would accept any SBP value less than or equal to 180 mm Hg and 10% (n = 6) would target SBP less than or equal to 220 mm Hg. *Conclusions:* We found that majority of the institutions do not have a standardized protocol for post-MT BP management. There was interinstitutional heterogeneity in the preferred target of SBP post-MT and most institutions target values of SBP lower than 180 mm Hg in post-MT patients. Prospective data and randomized control trial are needed to identify the optimal target BP. **Key Words:** Blood pressure—stroke—thrombectomy—hypertension—neurocritical care.

Introduction

Based on several randomized clinical trials,[1] the 2015 update to the American Heart Association/American Stroke Association (AHA/ASA) early stroke management guidelines suggest treating patients with acute large vessel ischemic stroke (AIS) with mechanical thrombectomy (MT) within 6 hours of stroke onset.[2] However, these guidelines do not provide updated recommendations on post-MT blood pressure (BP) management in these patients. The 2018 AHA/ASA guidelines recommend treating systolic blood pressure (SBP) above 180 mm Hg in patients undergoing any form of reperfusion therapy.[3] In our experience, there is little consensus among the stroke physicians regarding preferred post-MT BP target and its duration. Moreover, whether this target should be dictated by angiographic revascularization status is unclear. Therefore, we surveyed physicians at various institutions

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across the United States to determine practice patterns of post-MT BP management in patients with AIS.

Methods

The recipients of this survey were physicians at institutions participating in acute stroke care. They were identified through the NIH StrokeNet, a network supported by the NIH/National Institute for Neurological Disorders and Stroke for cooperative stroke research. It comprises 25 regional coordinating stroke centers across the United States with more than 285 participating hospitals. The survey questionnaire (2 open ended and 11 multiple choices, Appendix S1) was developed to understand institutional post-MT BP management practice by the authors in collaboration with the StrokeNet Acute Stroke Trials Working Group. The survey was distributed via email to the principal investigators of the 25 StrokeNet regional coordinating stroke centers who were asked to disseminate it to their satellite institutions with MT and post-MT care capabilities. All participants were asked to complete this survey in its entirety to best reflect their institutional practice of post-MT BP management. The survey was built and analyzed using an online survey platform (SurveyMonkey Inc., San Mateo, CA; www.surveymonkey.com). Graphical representations were generated using GraphPad Prism 7.0a for Mac OSx (GraphPad Software, San Diego, CA). In case of multiple responses from a single institution, consistent responses were taken into account as one answer to best reflect the institutional practice. In case of inconsistent responses from a single institution, those from the institutional StrokeNet principal investigator were preferred. This study did not require an institutional review board approval.

Results

Out of the potential 131 StrokeNet sites providing MT and post-MT care, 58 institutions completed the survey. The majority (n = 48, 84%) of institutions reported to have performed less than 100 and 4 (7%) performed more than 200 MT procedures in 2016 (Supplementary Fig S1). At over half (52%, n = 30) of the institutions, determination of post-MT BP target is a collaborative decision made by a team of interventionalist, neuro-intensivist, and stroke neurologist (Fig 1, A). At most institutions, SBP is most commonly targeted in post-MT period (n = 53, 91%) as oppose to mean arterial pressure (MAP), and this target is individualized on a case-by-case basis in lieu of a standardized written protocol (n = 39, 67%, Supplementary Fig S1). Majority of institutions (n = 42, 72%) take the degree of angiographic reperfusion, that is, successful (modified thrombolysis in cerebral ischemia [mTICI] 2b-3) versus unsuccessful (mTICI 0-2a), into account when determining this target (Fig 1, B). A majority of the institutions (n = 43, 74%) use nicardipine as the first-choice agent for BP control (Fig 1, C), and over half (n = 32, 55%) reported that strict BP control with infusion of intravenous agent is practiced for the first 24 hours post-MT (Fig 1, D).

In patients with successful reperfusion, 36% (n = 21) of the institutions would aim for SBP range 120-139 mm Hg, 21% (n = 12) would target 140-159 mm Hg, and 28% (n = 16) would accept any value less than or equal to 180 mm Hg (Fig 2, A, Supplementary Table S1). In patients with unsuccessful reperfusion, 43% (n = 25) of respondents would accept any SBP value less than or equal to 180 mm Hg and 10% (n = 6) would target SBP less than or equal to 220 mm Hg (Fig 2, B, Supplementary Table S1). Over half of the institutions (57%, n = 33) never target MAP for post-MT BP management, and the rest were almost equally divided across options of MAP ranges provided (Fig 2, C,D).

Of the 42 institutions that take reperfusion status in account to determine post-MT BP target, 45% (n = 19) aim for SBP range 120-139 mm Hg, 26% (n = 11) would target 140-159 mm Hg, and only 19% (n = 8) would accept any value less than or equal to 180 mm Hg in patients with successful reperfusion (Supplementary Fig 2, Table S2). In those with unsuccessful reperfusion, 45% (n = 19) of respondents would accept any SBP value less than or equal to 180 mm Hg and 14% (n = 6) would target SBP less than or equal to 220 mm Hg; only 2% (n = 1) would target 120-139 mm Hg (Supplementary Fig 2, Table S2).

Discussion

In this survey, we found that most institutions do not have a standardized protocol for post-MT BP management. Most institutions target SBP, as opposed to MAP, for the first 24 hours post-MT. This target is determined collaboratively by team of physicians participating in acute and post–acute stroke care after accounting for status of angiographic reperfusion. There was interinstitutional heterogeneity, however, regarding the preferred target of SBP during this period. Among institutions that take reperfusion status in account to manage post-MT BP, the majority tended to target lower BP values in patients with successful reperfusion and higher values in those with unsuccessful reperfusion.

The 2018 update of the AHA/ASA early stroke management guideline recommends treating SBP if higher than 180 mm Hg, in patients with AIS who receive any form of reperfusion treatment including MT.[3] Meager evidence exists to support this practice, particularly in patients who undergo successful revascularization due to a theoretical risk of hyperperfusion injury. Recent multicenter[4] and single center[5] retrospective, observational studies showed that patients with higher SBP after successful