Annual Meeting of the
AANS/CNS Cerebrovascular Section
Programming in Conjunction with SNIS
February 9-10, 2015
Nashville, Tennessee

Comparison of First and Second Generation Mechanical Thrombectomy Devices for the Endovascular Treatment of Acute Ischemic Stroke

Kate A Hentschel; Nohra Chalouhi MD; Robert M. Starke MD MSc; Ashish Gandhe; Stavropoula I. Tjoumakaris MD; Shannon W. Hann MD; Pascal Jabbour MD; Robert H. Rosenwasser MD, FACS, FAHA

Department of Neurosurgery, Thomas Jefferson University and Jefferson Hospital for Neuroscience

Introduction

Over the past decade, mechanical thrombectomy has become popular for the treatment of acute ischemic stroke. However, limited data is available assessing outcomes of the four FDA-approved devices. This study aims to compare clinical outcomes, efficacy, and safety of first and second generation thrombectomy devices.

Methods

A single-center retrospective review was conducted on 166 patients with identifiable arterial thrombi and no pre-intervention arterial dissections treated for acute ischemic stroke with thrombectomy using Merci, Penumbra, Solitaire, or Trevo from January 2008 to June 2014 at Jefferson Hospital for Neuroscience. Primary outcomes included modified Rankin Scale (mRS) at 90 days, recanalization rate (Thrombolysis in Cerebral Infarction - TICI), and incidence of symptomatic intracranial hemorrhages (ICH). Secondary outcomes included 90-day NIHSS, radiographic analysis of percentage area salvaged, discharge location, and 90-day mortality. Univariate analysis and multivariate logistic regression were performed to determine predictors of TICI 3 and mortality.

Results

Our first generation (FG) cohort included 99 patients (30 Merci, 69 Penumbra), while the second generation (SG) cohort had 67 (62 Solitaire, 5 Trevo). Compared to first generation devices, second generation devices yielded higher rates of 90-day mRS < or = 2 (61.67% SG vs. 22.54% FG, $p = 0.000$), lower 90-day NIHSS (2.49 vs. 4.71, $p = 0.008$), higher TICI 2-3 recanalization rates (97.01% vs. 79.80%, $p = 0.002$), and greater percentage of parenchyma salvaged (62.3% vs. 28.23%, $p = 0.002$). The SG cohort had greater discharge rates to home or rehabilitation (80.60% vs. 61.62%; $p = 0.009$). There was no significant difference in the incidence of symptomatic ICH (1.49% SG vs. 7.07% FG, $p = 0.145$), but the overall incidence of ICH was significantly lower in the SG group (13.43% vs. 40.40%, $p = 0.002$) with a trend toward lower 90-day mortality (20.90% vs. 34.34%, $p = 0.067$). The use of second generation devices was an independent predictor of TICI 3 (OR = 6.08, 95% CI 2.973-12.420, $p = 0.000$). When controlling for increasing age (OR = 1.03, 95% CI 1.005-1.058, $p = 0.020$) and a history of diabetes (OR = 2.59, 95% CI 1.251-5.347, $p = 0.010$), the independent predictors of mortality, there was a trend towards decreased mortality with second generation devices (OR = 0.49, 95% CI 0.225-1.058, $p = 0.069$).

Conclusions

Our study suggests that second generation mechanical thrombectomy devices have a higher recanalization rate in acute ischemic stroke with improved safety, and clinical and radiographic outcomes as compared to first generation devices.

Learning Objectives

By the conclusion of this session, participants should be able to:

1) Compare, in small groups, clinical outcome (mRS, NIHSS, discharge disposition, 90 day mortality) of first and second generation devices in the endovascular treatment of acute ischemic stroke.

2) Discuss, in small groups, the efficacy (recanalization, percentage of brain salvaged) of both generations.

3) Evaluate the safety, in terms of incidence of post-intervention intra-cranial hemorrhages, of the mechanical thrombectomy devices.

4) Identify predictors of TICI 3 and mortality in acute ischemic stroke found to be significant in this study.