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Impact of routine manual aspiration thrombectomy on outcomes of patients undergoing primary percutaneous coronary intervention for acute myocardial infarction: A meta-analysis

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ABSTRACT

Background: The efficacy and safety of thrombectomy as an adjunct to primary percutaneous intervention (PCI) in the management of acute myocardial infarction (AMI) are debated. We performed a meta-analysis of randomized trials comparing primary PCI performed with versus without routine aspiration thrombectomy (AT).
Methods: A meta-analysis of randomized AT trials reporting clinical outcomes was done in accordance with the PRISMA guidelines. Trials reporting only non-clinical endpoints and those of technologies other than manual devices were excluded. The primary endpoint of this meta-analysis was mortality (either all-cause or cardiovascular). Secondary endpoints were reinfarction, stent thrombosis, and stroke.
Results: Seventeen randomized trials, involving 20,853 patients were included. Weighted mean follow-up was 9.3 ± 3.3 months. The rates of all-cause mortality (reported in 14 trials, n = 10,430) and cardiovascular mortality (reported in 6 trials, n = 11,810) did not differ significantly between patients treated with or without AT (4.6% vs. 5.3%, RR = 0.88 [95%CI = 0.75–1.04]; and, 3.0% vs. 3.7%, RR = 0.83 [95%CI = 0.68–1.01]; respectively). The rates of reinfarction and stent thrombosis were also similar in patients treated with versus those treated without AT (2.1% vs. 2.2%; RR = 0.96 [95%CI = 0.80–1.15]; and, 1.2% vs. 1.4%; RR = 0.84 [95%CI = 0.65–1.07], respectively). However, stroke rates were increased with AT (0.84% vs. 0.52%, RR = 1.56 [95%CI = 1.09–2.25]).
Conclusions: Routine AT as an adjunct to primary PCI does not reduce the rates of death, reinfarction, or stent thrombosis, but is associated with increased stroke risk.

1. Introduction

Primary percutaneous coronary intervention (PCI) is accepted as the standard of care for patients with acute myocardial infarction (AMI) presenting with electrocardiographic ST-segment elevation. Nevertheless, impaired myocardial perfusion at the microvasculature level despite effective relief of epicardial vessel occlusion remains an important limitation of primary PCI since it is not infrequent and is associated with increased mortality [1]. It was in this context that the beneficial impact of manual aspiration thrombectomy (AT) on mortality reported in a single-canter randomized trial [2] led to unanimous recommendations for routine implementation of this procedure in primary PCI procedures [3,4]. However, later (and much larger) trials did not demonstrate a survival advantage for AT [5,6], so that in the most recent practice guidelines the role of routine AT is less clear [7]. Moreover, the safety of routine AT has been called into question [6].

Meta-analyses of AT preceding [8–12] or following [13,14] the publication of the largest randomized trial to date [6] have varied in methodology and have reported discordant results concerning the efficacy and safety of this intervention. We therefore sought to perform an updated meta-analysis of randomized controlled trials of routine manual AT as an adjunct to primary PCI, focusing on individual efficacy and safety outcomes.

2. Methods

2.1. Literature search and trial selection

A computerized literature search of the MEDLINE and Cochrane databases (culminating May 2015) was conducted to identify randomized controlled trials of AT as an adjunct to standard primary PCI. The following keyword and Medical Subject Headings were used: “aspiration”, “aspiration thrombectomy”, “infarction”, “infarct”,

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Table 1
Features of selected trials.

First author[citation]/acronym	Year	n	Duration of follow-up (days)	Reported endpoints			
				Mortality endpoint	Reinfarction	Stent thrombosis	Stroke
Burzotta et al. [19]/REMEDIA	2005	99	30	AC	+	−	+
Chao et al. [20]	2008	74	180	AC	−	−	−
Chevalier et al./Exoprt [21]	2008	249	30	CV	+	−	−
Ciszewski et al. [22]	2011	137	In-hospital	AC	−	−	−
De Luca et al. [23]	2006	76	180	AC	+	−	−
Dudek et al./PIHRATE [24]	2010	196	180	AC	+	−	−
Ikari et al./VAMPIRE [25]	2008	355	240	AC	+	+	−
Jolly et al. [6]/TOTAL	2015	10,063	180	CV	+	+	+
Kaltoft et al. [26]	2006	215	30	AC	+	−	+
Lagerqvist et al./TASTE [5]	2014	7244	365	AC	+	+	+
Liistro et al. [27]	2009	111	180	CV	+	+	−
Liu et al./ITTI [28]	2012	47	180	AC	+	−	+
Onuma et al./TROFI [29]	2013	141	In-hospital	AC, CV	−	+	+
Sardella et al./EXPIRA [30]	2010	175	730	AC, CV	+	+	−
Silva-Orrega et al./DEAR-MI [31]	2006	148	30	AC	+	−	−
Stone et al./INFUSE-AMI [32]	2013	452	365	AC	+	+	+
Vlaar et al./TAPAS [2]	2008	1071	365	AC, CV	+	+	−

AC, all-cause; CV, cardiovascular.

"myocardial infarct", "myocardial infarction", "ST segment elevation", "thromboaspiration", and "thrombectomy".

All selected trials had randomized AMI patients presenting with ST-segment elevation within 12-h of symptom onset. Only trials reporting clinical outcomes including mortality were selected for the present analysis. Excluded were trials in which the exact duration of follow-up could not be ascertained. Also excluded were trials reported in languages other than English, trials of mechanical thrombectomy devices based on technologies other than manual aspiration (e.g., Angiojet®, X-sizer®), trials reported only in the abstract form, and trials reporting only non-clinical endpoints (e.g., surrogate markers of myocardial perfusion).

2.2. Endpoints and statistical analysis

The primary endpoint for the present meta-analysis was mortality. Of the trials included in the present meta-analysis, 3 reported the rates of both all-cause mortality and cardiovascular mortality, 11 trials reported only all-cause mortality rates, whereas cardiovascular mortality rates alone were reported in 3 trials. Therefore, the mortality outcome was examined using specific analyses conducted separately for each of these endpoints. In keeping with the methodology used in some previous meta-analyses [8,9,11,13], an additional analysis was also performed in which cardiovascular mortality was considered a surrogate for all-cause mortality in the case of trials in which only the

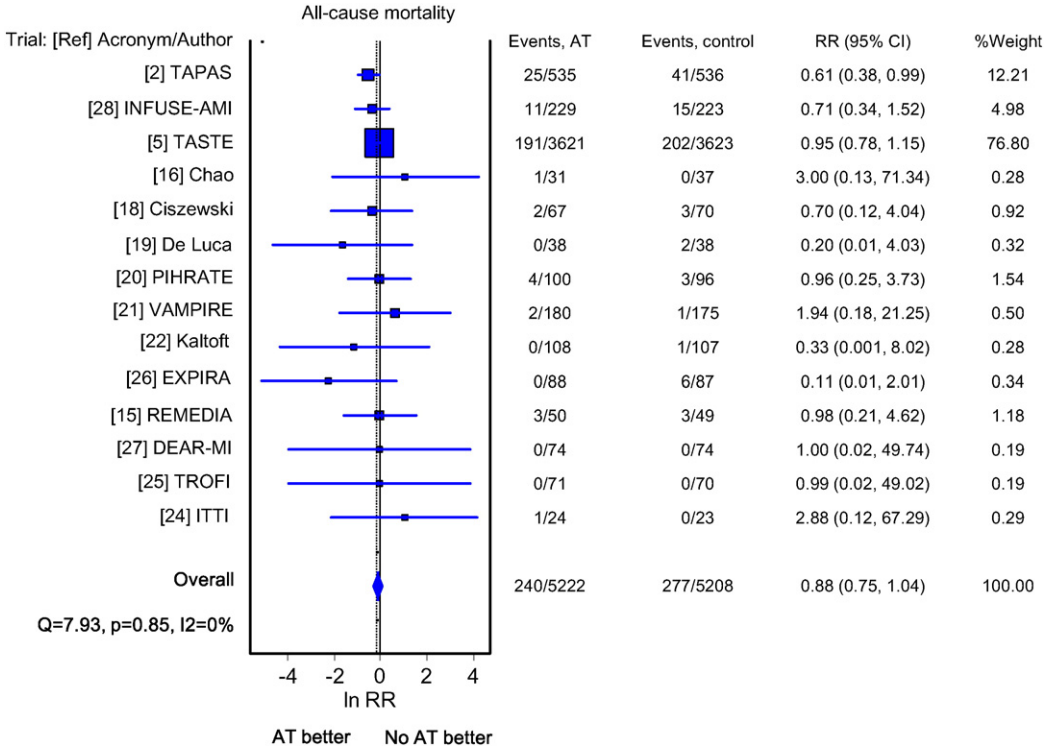

Fig. 1. Risk of all-cause mortality comparing primary PCI with versus without routine AT: Square markers represent risk ratios (logarithmically transformed using the natural log function). The relative size of each marker reflects the weight of each trial's sample size corresponding to the figures in the left column. The diamond marker represents the overall risk. Horizontal lines represent the 95% confidence intervals.