

## ***Comparison of Drug-Eluting Stents and Bare-Metal Stents in Reinfarction on ST-Elevation Myocardial Infarction Patients***

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### ***Abstract***

*STEMI is part of the acute coronary syndromes world which is one of the most common causes of death in the world. One of STEMI treatment is percutaneous coronary intervention (PCI) using stents, such as drug-eluting and bare-metal stents. These stents can reduce the recurrence of a subsequent heart attack. Three articles were found from the online databases then critical appraisal was performed. The three articles have ARR range of 0.3% -3.6%, RRR 5%-44,3% and NNT 29-333 patients. The three articles stated that drug-eluting stents compared to bare-metal stents did not have significant difference in the occurrence of reinfarction in STEMI patients.*

**Keywords:** STEMI, drug eluting stent, bare metal stent, recurrence, myocardial infarction

## **Perbandingan Penggunaan *Drug-Eluting Stents* dan *Bare-Metal Stents* dalam Rekurensi ST Elevasi Miokard Infark**

### ***Abstrak***

*STEMI adalah bagian dari sindrom koroner akut yang merupakan salah satu penyebab kematian tersering di dunia. Salah satu terapi STEMI adalah percutaneous coronary intervention (PCI) menggunakan stent seperti drug-eluting stents serta bare-metal stents yang dapat menurunkan rekurensi serangan jantung berikutnya. Dari pencarian didapatkan 3 artikel yang kemudian ditelaah kritis. Ketiga artikel memiliki rentang ARR 0,3%-3,6%, RRR 5%-44,3% dan NNT 29-333 pasien. Ketiga artikel menyatakan tidak ada perbedaan bermakna antara penggunaan drug-eluting stents dan bare-metal stents dalam menurunkan rekurensi serangan infark miokard.*

**Kata kunci:** STEMI, drug eluting stents, bare metal stents, rekurensi, infark miokard

## Clinical Scenario

Male, 58 years old came to the Emergency Department with chest pain. His chest pain started 3 hours before admission. The pain was dull, in the center of the chest, and radiates to the left arm. The ECG shows ST segment elevation in leads I, avL, V1-V6; and LBBB. The laboratory tests showed increasing CK-MB and Troponin T. Patient was diagnosed with acute ST-elevation myocardial infarction. Doctors advise patients to undergo percutaneous coronary intervention (PCI) with Drug Eluting Stent (DES). Patient's family then asked whether PCI with DES may reduce the recurrence of heart attacks.

## Introduction

Despite the widespread use of ECG changes to characterize patients presenting with acute myocardial infarction, little is known about recent trends in the incidence rates, treatment, and outcomes of patients admitted for acute myocardial infarction further classified according to the presence of ST-segment elevation. The acute coronary syndrome model espoused by the American College of Cardiology places unstable angina, non ST-segment elevation myocardial infarction (NSTEMI), and ST-segment elevation myocardial infarction (STEMI) at increasingly severe points along a disease continuum.<sup>1,2</sup> Clinical trial and registry data have supported this conceptual model by showing that individuals with NSTEMI and STEMI have differing short term prognoses and responses to therapies.<sup>3,4</sup>

STEMI represents one end of a spectrum of related conditions called acute coronary syndromes. The underlying common pathophysiology involves the sudden rupture of an atheromatous plaque (cholesterol-rich material) within the wall of a coronary artery. This ruptured plaque then stimulates blood clotting (thrombosis) within the affected coronary artery. Complete obstruction to blood flow is usually associated with the appearance of ST segment elevation on the electrocardiogram the defining feature of STEMI. Occlusion of blood flow leads to heart muscle (myocardium) cell death, which becomes complete over the subsequent 12 to 24 hours. Although the incidence of STEMI has been declining over the last 20 years, it varies

between regions of the UK and still averages around 750 cases per million people each year. Over the last 30 years in-hospital mortality following STEMI has fallen from around 20% to less than 5%, a change that has been attributed to various factors, including improved drug therapy and speed of access to effective treatments.

Coronary artery bypass grafting (CABG) has long been considered the standard procedure for revascularization of unprotected left main coronary artery (LMCA) stenosis.<sup>5</sup> DES have been shown to dramatically reduce the rate of restenosis and target lesion revascularization (TLR) compared with bare-metal stents (BMS).<sup>6,7</sup> As the indications for DES have expanded, LMCA stenting has been performed more frequently. Recent studies have reported positive short- and long-term outcomes for PCI with DES implantation for unprotected LMCA disease.<sup>8</sup> The purpose study is to compare the clinical outcomes after implantation of DES and BMS in STEMI patients.

## Clinical Question

In patient with STEMI, does treatment with DES compared to the BMS lead to recurrence reduction of myocardial infarction?

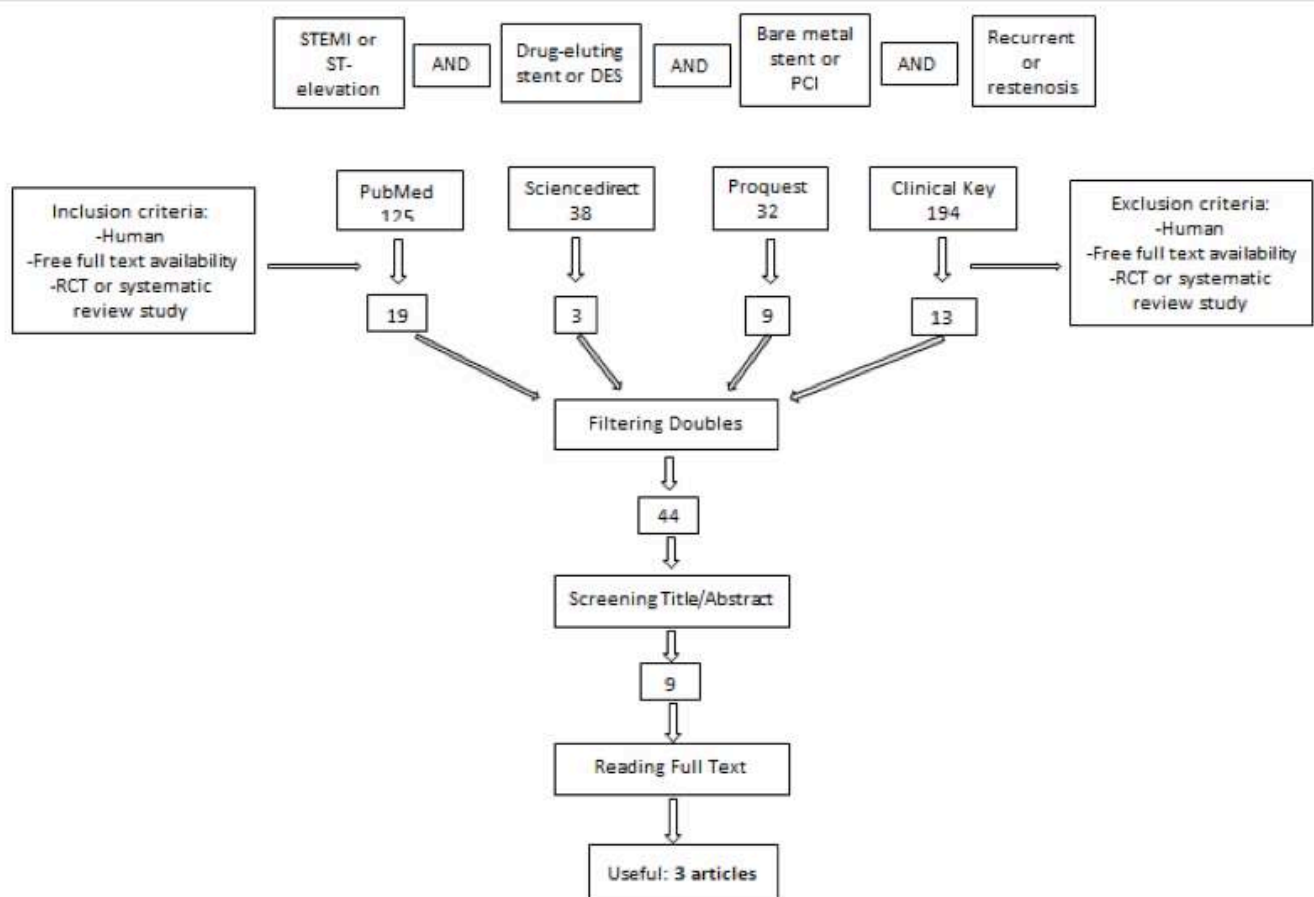
## Method

The search method was using the online databases to search relevant articles. The search was conducted in Pubmed®, Scisearch®, Clinical Key®, and Proquest®. From these online databases, we were searching the relevant articles using the search queries (Table 1). The keywords that were used in the searching were STEMI, drug-eluting stents, bare-metal stents, and recurrent, these keywords and/or other related terms were conducted in the search queries. From these databases, we found some articles that relevant to our clinical scenario with specific inclusion and exclusion criteria to find the specific articles. The search flowchart including the inclusion and exclusion criteria are shown in Figure 1.

The articles that have found in online literature database were appraised in validity, importance, and applicability. The articles also have their relevance to the clinical case. The appraisal checklist was available from [www.cebm.net](http://www.cebm.net).

**Table 1. Search Queries from Online Databases**

Online Databases	Search Queries
<b>PubMed</b>	(((((PCI[Title/Abstract]) OR bare metal stent[Title/Abstract]) OR stent[Title/Abstract])) AND ((drug-eluting[Title/Abstract]) OR DES[Title/Abstract])) AND (((ST-segment[Title/Abstract]) OR ST elevation[Title/Abstract]) OR STEMI[Title/Abstract]))
<b>Science direct</b>	TITLE-ABSTR-KEY((STEMI or ST elevation or ST segment elevation) AND (drug-eluting stent or DES)) and TITLE-ABSTR-KEY((PCI or stent or bare metal stent) AND (recurrent or restenosis))
<b>Proquest</b>	ab(STEMI or ST elevation) AND ab((DES OR drug eluting stent)) AND ab((PCI OR bare metal stent)) AND ab((recurrent OR restenosis))
<b>Clinical Key</b>	ab(STEMI or ST elevation) AND ab((DES OR drug eluting stent)) AND ab((PCI OR bare metal stent)) AND ab((recurrent OR restenosis))



Search date: 26th June 2013

All the decisions were made by consensus at least 3 authors

**Figure 1. Flowcharts of the Articles Searching**

Table 2. Critical Appraisal of the Articles

Article	Study Design	Validity					Relevance			
		Number of patients	Randomization	Similarity treatment and control	Blinding	Comparable treatment	Intention to treat	Domain	Measurement of outcome	Level of evidence
Kaltoft <i>et al</i> <sup>9</sup>	RCT	626	+	+	+	+	+	+	+	2b
Stone <i>et al</i> <sup>10</sup>	RCT	3006	+	-	+	+	+	+	+	2b
Palmieri <i>et al</i> <sup>11</sup>	RCT	453	+	-	N/A	+	+	+	+	2b

Note: (+) : + stated clearly in the article, - not stated clearly in the article, N/A not available

Level of evidence didapatkan dari Centre for Evidence Based Medicine, University of Oxford (downloaded from <http://www.cebm.net/index.aspx?o=1025>)

## Results

From the online databases, we found nine articles after filtering and screening the relevant articles. This search were conducted in 26th June 2013. After reading the full text from those nine articles, we only found three articles that were useful. These three articles were appraised from its validity and relevance. Those three articles were Kaltoft A *et al*<sup>9</sup>, Stone GW *et al*<sup>10</sup>, and Palmieri C *et al*<sup>11</sup>.

In the first article (Kaltoft *et al*<sup>9</sup>), a total of 626 STEMI patients in randomized so that there were 313 patients in DES group and 313 patients in BMS group. Then after 3 years of follow-up is done then there were 9 patients in the DES group had a myocardial infarction (4.2%) and there were 15 patients in the BMS group had a myocardial infarction (5.4%) with  $p = 0.58$ .<sup>9</sup>

In the second article (Stone *et al*<sup>10</sup>), a total of 3006 STEMI patients, 749 patients in the BMS group and 2257 patients in PES group. After follow-up of 24 months 43 patients in BMS group had a myocardial infarction (6%) and 123 patients had myocardial infarction PES group (5.7%) with a value of  $p = 0.73$ .<sup>10</sup>

In the third article (Palmieri *et al*<sup>11</sup>), a total of 453 STEMI patients were randomized so that there were 176 patients in the BMS groups and 277 patients in DES group. After follow-up of 26 months there were 14 patients in the BMS group had a myocardial infarction (7.9%) and 12 patients in the DES group had a myocardial infarction (4.3%) with  $p = 0.09$ .<sup>11</sup>

## Discussion

In the first article (Kaltoft *et al*), the number of patients large enough, long enough follow-up is done and complete. From the results of the statistical calculations it can be seen that the Absolute Risk Reduction (ARR) in this article is only 1.9% which means that the risk of myocardial infarction was reduced only 1.9% in the DES group compared to the BMS group. The Relative Risk Reduction (RRR) is 40% means that using DES is 40% better than BMS in reducing the recurrency of myocardial infarction. The results of Number Needed to Treat (NNT) is 53 pts, which means to prevent one myocardial infarction patients required intervention/ treatment at 53 patients. And on the calculation of 95% Confidence Interval (CI) -0.0124 showed up to 0.054, in the range of 95% CI past zero so that the use of DES does not have a significant difference / significant compared with BMS.

In the second article (Stone *et al*), the number of patients large enough and long enough follow-up is done and complete. From the results of the statistical calculations showed ARR 0.3% which means that the risk of myocardial infarction in patients with DES group only decreased 0.3% compared to the BMS group. RRR is 5% means DES is 5% better than BMS. NNT in this article is 333 pts, which means to prevent one myocardial infarction patients required intervention/ treatment at 333 patients. The yield on the 95% CI is -0.018 to 0.019, the result is zero through the use of DES

does not have a significant difference/significant compared with BMS.

In the third article (Palmieri *et al*), the number of patients who use large enough, follow up sufficiently long and complete. After calculating statistics showed a 3.6% ARR, which means the use of DES is only 3.6% reduces the occurrence of myocardial infarction compared with BMS. RRR is 44,3% means that using DES is 44,3% better than BMS. Calculation results of NNT is 29 pts which means to prevent one myocardial infarction patients required intervention / treatment at 29 patients. 95% CI results obtained figures -0.011 to 0.081, the results of this past zero so that the use of DES has no significant difference/significant compared with BMS.

## Conclusion

From three articles, there's no significant difference of using drug-eluting stents compared to the bare-metal stents in reducing recurrency of heart attack or myocardial infarction in patients with ST-elevation myocardial infarction. From this result, the drug-eluting stents have slight reduction in recurrent of myocardial infarction. Despite of this, the bare-metal stents would have be the choice in treatment of ST-elevation myocardial infarction than drug-eluting stents because the cost was more expensive in the use of drug-eluting stents compared to the bare-metal stents and it didn't have the significant difference.

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