



## Rate of Urgent Coronary Artery Bypass Grafting in Elective Percutaneous Coronary Intervention (PCI)

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### Abstract

**Background:** Latest research shows that about 0.5% of percutaneous coronary intervention (PCI) patients will need urgent coronary artery bypass grafting (CABG) because of coronary accidents. The ACC/AHA guidelines regard on-site cardiac surgery back-up obligatory for PCI centers. It seems the need for urgent CABG in some Iranian PCI centers is less than 0.5%, which may affect decision-making for performing PCI without on-site surgical back-up in the same condition in Iran.

**Methods:** This retrospective study reviewed all elective PCI documents in two large educational centers with on-site cardiac surgery back-up in Tehran from April 2005 to April 2006. CABG immediately after PCI or until 24 hours after PCI was considered urgent.

**Results:** There were 1533 PCI patients (71% male) and 1936 PCI vessels in our study. The patients' mean age was 56 (95% CI 46-66) years. The prevalence of hypertensives, smokers, and diabetics was 42%, 44%, and 24%, respectively. The mean stenotic lesion length was 20.5 mm (95% CI 19.5-21), and the mean lesion diameter was 3.02 mm (95% CI 2.58-3.52). There were 98 (5.8%) unsuccessful PCI procedures. The relative frequency of PCI on different vessels was 1070 (55%) on the left anterior descending artery (LAD), 591 (30.5%) on the proximal part of LAD, 286 (14.5%) on left circumflex artery (LCX), 438 (22%) on the right coronary artery (RCA), and 142 (8.5%) on other arteries such as the obtuse marginal (OM) or diagonal arteries. There was only one case of urgent CABG in these patients.

**Conclusion:** The recent widespread use of coronary stenting, new antiplatelet drugs, and increased skills of operators has ushered in a considerable reduction in urgent CABG after PCI.

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### Introduction

Some experts believe that cardiac surgery service is obligatory for centers where percutaneous coronary intervention (PCI) is performed.<sup>1</sup> This recommendation is borne out by the fact that between 0.3% and 0.8% of PCI patients will require urgent coronary artery bypass grafting (CABG), without which they may develop serious and

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sometimes irreversible complications.

On the other hand, other experts cite increasing evidence that the common use of coronary stenting and new antiplatelet drugs such as thienopyridine agents, especially for elective PCI patients, has brought about a significant decrease in the need for urgent CABG.

The two rather opposing views are embodied in the existing PCI guidelines: whereas the ACC/AHA guidelines (2005) endorse obligatory on-site cardiac surgery back-up for PCI centers, the latest European PCI guidelines (2005) clearly do not seem to deem it a requirement.<sup>2</sup>

There is little doubt, however, that the non-availability of cardiac surgery services in developing countries for a variety of reasons ranging from a paucity of funds to a dearth of technical know-how could hamper the widespread use of PCI.

We sought to assess the rate of urgent CABG after elective PCI in two large educational hospitals affiliated with Tehran University.

## Methods

In this descriptive, retrospective study, we collected data on all elective PCI procedures carried out from March 2005 to March 2006 in two large hospitals in Tehran, Iran.

All cases scheduled for PCI were recruited into this study, and patients who had unplanned PCI (PCI on acute coronary syndrome) were excluded. Data were obtained from hospital medical notes and PCI report sheets, as well as the computerized data bank in one of the two hospitals. Any CABG procedure performed up to 24 hours following PCI was considered urgent CABG. All the patients received 450 mg clopidogrel as loading dose and 325 mg aspirin before PCI; none received IIb/IIIa inhibitors. Also, all the patients were administered at least 10000 IU heparin during the procedures, but there was no routine control of ACT during the procedures. Bifurcation stenosis was defined as Medina classification "1-1-1" if the side branch diameter was  $\geq 2$  mm. Data analysis was performed by SPSS software, and the mean value was expressed by 95% confidence interval.

## Results

In total, 1533 patients, comprising 1084 males and 449 females at a mean age of 56.47 years (95% CI from 46 - 66 years), were included in our study.

The mean ejection fraction was 53% (95% CI from 43-63%). The prevalence of cigarette smoke, hypertension, and diabetes was 44.4%, 42.2%, and 24%, respectively.

Overall, 1936 vessels underwent PCI, and the multi-vessel PCI rate was 26.2%. The relative frequency of PCI on

different vessels was 1070 (55%) on the left anterior descending artery (LAD), 591 (30.5%) on the proximal part of LAD, 286 (14.5%) on the left circumflex artery (LCX), 438 (22%) on the right coronary artery (RCA), and 142 (8.5%) on other vessels such as the obtuse marginal (OM) or diagonals.

The prevalence of chronic total occlusion was 98 (6%). Unsuccessful PCI was seen in 5.8% of the patients. Stenting was used in 93% of all PCI procedures, and in 43% the stents were drug eluted. The PCI rate of bifurcation lesions was 3.8%. The mean stent length was 20 mm (95% CI 15-25 mm), and the mean stent diameter was 3.02 mm (95% CI 2.58-3.52 mm). The relative frequency of PCI on stent restenosis was 4%.

In all these cases, there was only one urgent case of CABG. The case was PCI on RCA, and the patient was discharged from hospital after surgery.

## Discussion

Klinke et al., having studied 846 cases of PCI from 1981 to 1991 in the United States,<sup>3</sup> encountered 12 (1.6%) cases of urgent CABG. This high rate of urgent CABG was due to the fact that stents and dihydropyridine antiplatelets were not used at the time. In addition, some of the PCI procedures in their study were carried out on acute coronary syndrome, which is different from our study.

In Italy in 1995, Dellavalle et al.<sup>4</sup> at a center far from cardiac surgery centers and without any back-up programs carried out a study on 199 selective patients that showed no need for urgent CABG. There was no mortality, and only 2 patients who suffered myocardial infarction were managed medically.

In a study of France registry in 1996<sup>5</sup> on 27497 cases of PCI performed in hospitals with or without on-site surgical back-up, researchers found 0.32% urgent CABG, which was the same rate between hospitals with and without on-site surgical back-up. The stenting rate was 64% in this study.

In 1997, a study by Brown<sup>6</sup> in the United States on low-volume (<200 cases/year), medium-volume (between 200-400 cases/year), and high-volume (>400 cases/year) PCI centers showed 1.1%, 1.2%, and 0.08% need for urgent CABG, respectively. It was concluded that high-volume centers had lesser need for urgent CABG.

An article published by Shubrooks et al.<sup>7</sup> in 2001 showed a decrease in urgent CABG from 2.2% in 1992 to 0.6% in 1997. The stenting rate, however, increased over the same period up to 79%. Interestingly enough, 95% of the urgent CABG cases had PCI during acute coronary syndromes.

The Zavala-Alarcon et al.<sup>8</sup> study in 2004 on 1000 patient with 1756 non-selective but elective PCI procedures carried out in a center without on-site surgical back-up showed that there was no need for urgent CABG. In this study, IIb/IIIa was used for all the patients.



In another study in 2005 on 562 elective and non-selective patients, Paraschos et al.<sup>9</sup> found only 4 cases (0.8%) of urgent CABG, which was similar to our results with respect to dihydropyridine and stent use rates.

It seems that in performing PCI there is a small possibility of coronary complications giving rise to a wide range of complications from sudden death to myocardial infarction to asymptomatic rise in cardiac markers. Some of these complications can be treated via urgent heart surgery. It is worthy of note, however, that the rate of such complications has decreased in recent years and currently stands at about 0-1.2%.

In our study, there was a lesser need for urgent CABG by comparison with many other similar studies. Of probable reasons for this can be our patient selection system or a stronger trend to manage complications medically or to avoid rotabators and cutting balloons.

## Conclusion

The widespread use of new and potent antiplatelet drugs and coronary stenting has almost obviated the need for urgent CABG after PCI.

There is a small but real risk in referring patients who need PCI either electively or urgently, especially over long distances, because of procedural delays and insufficiency of medical care during transportation. Our findings were indicative of the fact that on-site cardiac surgery has only a very small benefit to PCI patients. We need a randomized clinical trial for more appropriate decisions on the necessity of on-site surgical back-up for PCI center.

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