Table 10. Studies Reporting the Clinical Outcome of Patients Undergoing Noncardiac Surgery After a Percutaneous Coronary Intervention

Study Author	Year Published	No. of Patients who Underwent PCI	Time From PCI to Surgery	Perioperative Mortality, %	Perioperative Infarction Rate, %	Comments
Huber et al (179)	1992	50	9 days (mean)	1.9	5.6	CABG needed after balloon angioplasty in 10% of pts. No control group for comparison.
Elmore et al (180)	1993	14	10 days (mean)	0	0	Very small study. Event rate in pts. treated with CABG or balloon angioplasty less than in control group. Angioplasty pts. had fewer risk factors than pts. undergoing CABG.
Allen et al (181)	1991	148	338 days (mean)	2.7	0.7	No increase in events if surgery performed within 90 days of PTCA.
Gottleib et al (296)	1998	194	11 days (median)	0.5	0.5	Only vascular surgeries included.
Possner et al (298)	1999	686	1 year (median)	2.6	2.2	Pts. who had undergone PCI had a similar frequency of death and MI but half the angina and HF of matched pts. with CAD who had not undergone PCI. Event rates were much higher if PCI had been performed within 90 days.
Kaluza et al (301)	2000	40	13 days (mean)	20	16.8	The only study in which stents were used. Mortality was 32% among pts. operated on less than 12 days after stent placement vs. 0 in pts. operated on 12 to 30 days after PCI.
Hassan et al (303)	2001	251	29 months (median)	0.8	0.8	Among pts. who received PCI in BARI, outcome after noncardiac surgery was equivalent to that of BARI pts. who had received CABG.

BARI indicates Bypass Angioplasty Revascularization Investigation; CABG, coronary artery bypass surgery; CAD, coronary artery disease; HF, heart failure, MI, myocardial infarction; PCI, percutaneous coronary intervention; PTCA, percutaneous transluminal coronary angioplasty; Pts, patients.

tality rate 1.9%. Whether this result differs from what might have occurred without PTCA is uncertain.

Elmore et al (180) compared the results of preoperative coronary angioplasty and coronary bypass surgery in patients identified for elective abdominal aortic aneursymorrhaphy. This study retrospectively analyzed the records of 2452 patients who underwent abdominal aortic surgery between 1980 and 1990. Only 100 (4.1%) had revascularization before aortic surgery, and 95% of these had symptomatic CAD. Eighty-six had coronary bypass surgery and 14 had angioplasty. There were no perioperative deaths in this group at the time of aortic surgery, compared with 2.9% perioperative mortality for the entire group (n=2452). The patients having angioplasty had significantly more 1- and 2-vessel disease and less 3-vessel disease than did the bypass group. Late cardiac events were more frequent in the angioplasty group. The small numbers in the angioplasty group and the retrospective analysis over a long period of time make interpretation of the results of this study difficult. It appears, however, that candidates for elective abdominal aortic aneurysmorrhaphy with symptomatic disease (CAD) have a low operative mortality when revascularization is performed before surgery by either angioplasty or bypass surgery.

Allen et al (181) performed a retrospective analysis of 148 patients who underwent angioplasty before noncardiac surgery (abdominal 35%, vascular 33%, and orthopedic 13%). Surgery occurred within 90 days after angioplasty in 72. There were 4 operative deaths (1 cardiac), and 16 patients experienced cardiac complications during the noncardiac surgery. Cardiac complications were more common in patients older than 60 years. Little information can be gleaned from this small retrospective study except to note the low incidence of cardiac death in patients who had coronary angioplasty sometime before their noncardiac surgery.

Gottlieb et al studied 194 patients who underwent PTCA followed by aortic abdominal, carotid endarterectomy, or peripheral vascular surgery. The median interval between PTCA and surgery was 11 days (interquartile ranges 3 and 49 days) (296). Twenty-six (13.4%) of the patients had a cardiac complication, but only 1 patient died, and 1 had a nonfatal MI. The long time interval over which PTCA was performed before surgery and the inability to know whether the clinical outcome of these patients would have been different had a prior PTCA procedure not been performed limit the conclusions that can be drawn from this study. Massie et al performed a case-control study of 140 patients with abnormal dipyridamole thallium scans in 2 or more segments; 70 underwent coronary angiography (of whom 25 were referred for revascularization) and 70 (matched for age, gender, type of vascular surgery, and number of myocardial segments suggesting ischemia on thallium scanning) did not (297). A trend toward late benefit associated with preoperative revascularization was offset by a trend toward an early hazard from the risk of the preoperative invasive cardiac evaluation and treat-