

Cardiac Imaging

Pro-Arrhythmic Effects of Intracoronary Adenosine Administration

ARIF MAHMOOD, ARISTOTELIS C. PAPAYANNIS, EMMANOUIL S. BRILAKIS

VA North Texas Healthcare System and University of Texas Southwestern Medical Center, Dallas, Texas, USA

Key words:
**Arrhythmias,
 ventricular
 fibrillation, atrial
 fibrillation.**

Manuscript received:
 March 16, 2011;
 Accepted:
 May 24, 2011.

Address:
 Emmanouil S. Brilakis

Dallas VA Medical
 Center (111A)
 4500 South Lancaster
 Road
 Dallas, TX 75216
 USA
 e-mail:
esbrilakis@yahoo.com

A 61-year-old man presented with in-stent restenosis of the mid circumflex artery (Figure 1, panel A, arrow) and underwent bifurcation stenting. After stent implantation, he developed no-reflow that was treated with intracoronary administration of 100 µg of adenosine. Complete heart block lasting 4 seconds ensued, followed by ventricular escape beats and *torsades des pointes* due to the R-on-T phenomenon (Figure 1, panel B). Cardiac defibrillation resulted in sinus rhythm restoration (Figure 1, panel C). The patient had an excellent final angiographic result (Figure 1, panel D) and an uneventful recovery.

A 60-year-old man underwent fractional flow reserve assessment of a right coronary artery in-stent restenotic lesion (Figure 2, panel A). After administration of 40 µg of intracoronary adenosine, the patient developed 5 seconds of complete heart block (Figure 2, panel B), followed by atrial fibrillation (Figure 2, panel C), which was treated with cardioversion at the end of the procedure. The right coronary artery lesion was successfully treated with drug-eluting stent implantation (Figure 2, panel D).

Adenosine is a short-acting agent that inhibits conduction through the atrioventricular node and is commonly used in the cardiac catheterization laboratory for fractional flow reserve measurements and to treat no-reflow. Although intravenous or intracoronary adenosine administration is usually well tolerated (patients may devel-

op flushing or chest pain), adenosine may have a pro-arrhythmic effect, as highlighted in our two cases.¹ Atrial fibrillation is the most commonly documented adenosine-induced arrhythmia (2.7% after intravenous administration)¹ and is usually well-tolerated, except in patients with accessory pathways.² *Torsades des pointes* or ventricular fibrillation can also be triggered by adenosine administration, usually after a ventricular pause due to the R-on-T phenomenon (Figure 1B), but may also occur without a pause.³ Usually, lower doses of adenosine are administered through the right coronary artery (30-40 µg) than through the left main coronary artery (80-100 µg), as administration through the right coronary artery is more likely to cause heart block. Alertness to the potential pro-arrhythmic effects of adenosine and rapid access to defibrillation are important for the prompt recognition and treatment of adenosine-induced arrhythmias.

References

1. Pelleg A, Pennock RS, Kutalek SP. Proarrhythmic effects of adenosine: one decade of clinical data. *Am J Ther.* 2002; 9: 141-147.
2. Turley AJ, Murray S, Thambyrajah J. Pre-excited atrial fibrillation triggered by intravenous adenosine: a commonly used drug with potentially life-threatening adverse effects. *Emerg Med J.* 2008; 25: 46-48.
3. Smith JR, Goldberger JJ, Kadish AH. Adenosine induced polymorphic ventricular tachycardia in adults without structural heart disease. *Pacing Clin Electrophysiol.* 1997; 20: 743-745.

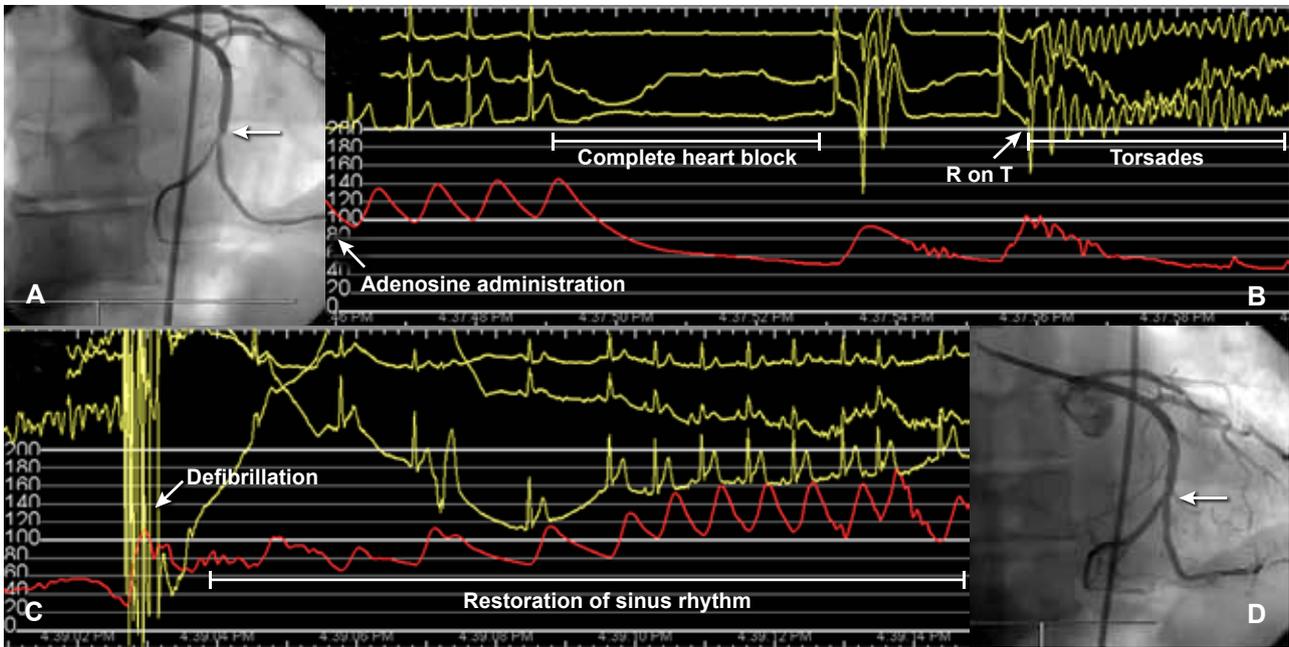


Figure 1. Coronary angiography demonstrating a bifurcation lesion in the mid circumflex artery (panel A, arrow). Administration of intracoronary adenosine to treat no-reflow in the circumflex coronary artery resulted in complete heart block, followed by *torsades de pointes* due to the R-on-T phenomenon (panel B). After defibrillation, sinus rhythm was restored (panel C). Bifurcation stenting using a “culotte” technique provided an excellent final angiographic result with TIMI 3 flow (panel D).

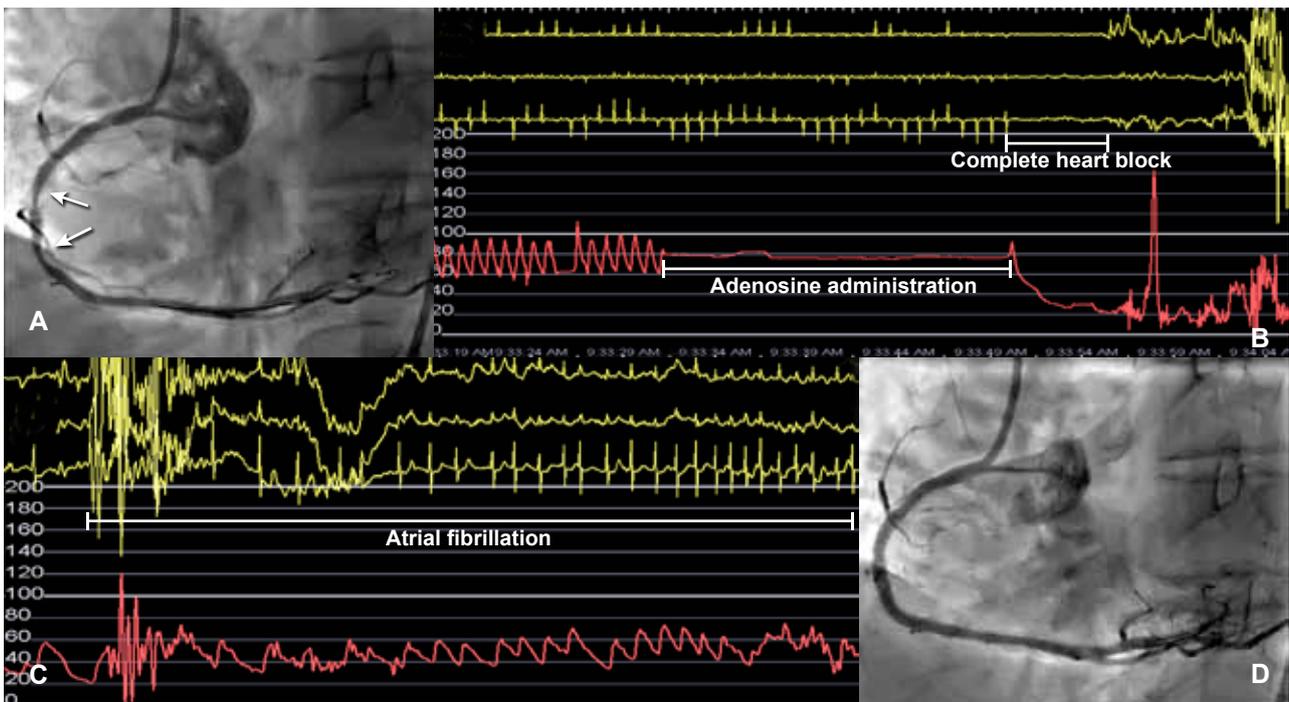


Figure 2. Coronary angiography demonstrating an in-stent restenotic lesion of the mid right coronary artery (panel A). Intracoronary adenosine administration through the right coronary artery (40 μ g) resulted in complete heart block (panel B), followed by development of atrial fibrillation (panel C). After stenting the right coronary artery lesion resolved. Sinus rhythm was restored after cardioversion was performed at the end of the procedure.