The Safety Of High Dose Adenosine For Induction Of Temporary Asystole For Stent-graft Deployment During Endovascular Abdominal Aortic Aneurysm Repair

R Kahn, D Moskowitz, L Hollier, M Marin

Citation

R Kahn, D Moskowitz, L Hollier, M Marin. *The Safety Of High Dose Adenosine For Induction Of Temporary Asystole For Stent-graft Deployment During Endovascular Abdominal Aortic Aneurysm Repair*. The Internet Journal of Anesthesiology. 1998 Volume 3 Number 3.

Abstract

INTRODUCTION

Endovascular stent-graft placement has recently become an alternative to conventional surgical treatment of abdominal aortic aneurysms (AAA).

{image:1}

Table 1: Advantages of endovascular aortic repair

Advantages

Endovascular Aortic Repair

- Remote access to aorta
- No retroperitoneal or aortic dissection
- Fluid shifts
- Hemodynamic stability (1)
- Early ambulation and discharge
- Cost
- Outcome (?)

{image:2}

{image:3}

One technique used for the deployment of the endovascular aortic device employs large balloon angioplasty catheters to expand and secure the proximal stent portion of the endovascular graft to the underlying vessel wall. (Figure 4) These balloons have a large cross sectional area, predisposing them to distal aortic migration as a result of the forward aortic blood flow. This device malposition may result in either occlusion of major arterial branches or incomplete aneurysm exclusion. Many techniques have been advocated to prevent this distal migration. (Table 3) One of these techniques is the administration of high dose adenosine, which results in temporary high degree AV block ($_2$). In this report, we present our experience with the use of high dose adenosine for induction of temporary asystole during endovascular aortic repair (EAR) in 100 patients.

{image:4}

Table 2: Pharmacology of Adenosine

Adenosine

Pharmacology

- Negative dromotropic and chronotropic effects at SA and AV nodes. No inotropic effects
- Systemic, pulmonary, & coronary vasodilatation
- Short half life (t1/2 □ 10 seconds)
- Prolonged effect with dipyridamole
- Shorted effect with methylxanthines

Table 3: Options for Prevention of Stent-Graft Migration During Deployment

Options for Prevention of Stent-Graft

Migration During Deployment

- Induced hypotension
- Anesthetics
- Vasodilators
- Beta Blockade
- Temporary asystole
- Adenosine (2)
- Ventricular fibrillation (3)

METHODS

Endovascular repair of AAA were carried out in accordance with investigator sponsored Investigational Device Evaluation protocol from the United States Food Federal Drug Administration, and approval of the Institutional Review Board.

Table 4: Anesthetic Preparation

Methods

Anesthetic Preparation

- Invasive arterial blood pressure monitoring
- Pulmonary artery catheterization
- External defibrillator
- Pacemaker (PM)
- External
- Temporary ventricular pacing lead
- Consideration of regional anesthesia

After placement of either a temporary transvenous ventricular lead or an external transthoracic pacing electrodes, adenosine was administered in an escalating dose fashion in order to induce at least 10 seconds of asystole during proximal stent-graft deployment.

Table 5: Induction of Asystole

Methods

Induction of Asystole

- Patient sedation
- Confirmation of ventricular PM capture
- Confirmation of defibrillator function
- Adenosine administration via central line
- Adenosine 24 mg given empirically
- Escalating doses administered in order to achieve approximately 10 seconds of asystole

RESULTS

The records of 100 patients undergoing EAR were reviewed. The dose range of adenosine administered was 12-90 mg with a median value of 24 mg. Two patients had transient episodes of myocardial ischemia (diagnosed by ST segment depression), which resolved within 30 seconds after return of the patient's baseline rhythm. Two patients developed atrial fibrillation after adenosine administration, which responded to synchronized direct current cardioversion, and one patient developed a transient bundle branch block, which did not adversely effect hemodynamics. Four patients required temporary activation of their indwelling temporary transvenous pacemakers for prolonged bradycardia or AV block after adenosine. No patients developed bronchospasm, required treatment for worsening obstructive pulmonary disease, or received inotropic support that was not required prior to adenosine administration.

Table 6: Results of the Study

Study

Results

- 100 Patients underwent endovascular procedures requiring adenosine induced asystole
- Median adenosine dose: 24 mg

(range 12-90 mg)

- Two patients required D/C cardioversion for atrial fibrillation
- Four patients required a short period of pacemaker activation and one patient developed self limited

bundle branch block

- Two patients with temporary myocardial ischemia without sequela
- One patient with self limited dyspnea
- No episodes of bronchospasm or worsening COPD
- No patients required additional inotropes

CONCLUSIONS

EAR is a viable alternative to conventional open surgical aortic reconstruction. The perioperative use of high dose adenosine to ensure precise stent-graft placement appears to be a safe method of inducing temporary asystole during endovascular aortic repair in this high risk surgical population.

Table 7: Conclusions of the Study

Study

Conclusions

- Endovascular aortic repair is a minimally invasive procedure which may offer many advantages over open aortic repair.
- This single center experience with the use of induced asystole appears appears to support the relative safety of this modality to induce temporary ventricular quiescence.

References

1. Kahn RA, Moskowitz DM, Manspeizer HA, et al.: Endovascular aortic reconstruction is associated with greater hemodynamic stability compared with open aortic reconstruction. Journal of Cardiothorac and Vascular Anesthesia 13: 42-46,1999.
2. Dorros G, Cohn JM: Adenosine-induced transient cardiac asystole enhances precise deployment of stent - grafts in the thoracic of abdominal aorta. J Endovasc Surg 1996; 3: 270-272.
3. Kahn R, Marin M, Hollier L, et al.: Induction of ventricular fibrillation to facilitate endovascular stent graft repair of thoracic aortic aneurysms. Anesthesiology 88: 534-536, 1998.

Author Information

R. A. Kahn, M.D.
Departments of Anesthesiology and Surgery, The Mount Sinai Medical Center

D. M. Moskowitz, M.D.
Departments of Anesthesiology and Surgery, The Mount Sinai Medical Center

L. H. Hollier, M.D.
Departments of Anesthesiology and Surgery, The Mount Sinai Medical Center

M. Marin, M.D.
Departments of Anesthesiology and Surgery, The Mount Sinai Medical Center