Monitoring for Cardiac Ischemia in the MRI Scanner
- Sometimes Less is More

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Introduction

Variant/Prinzmetal angina is an episode of angina caused by coronary vasospasm in association with ST elevations on EKG. These episodes typically occur at rest and are not necessarily associated with coronary artery stenosis. Acute coronary syndrome, associated with an allergic, anaphylactic or anaphylactoid insult is referred to as Kounis Syndrome. For these patients, monitoring for cardiac ischemia during anesthesia care is of utmost importance.

Case Report

A 10-year-old male with a history of asthma presented for a cardiac MRI after admission for recurrent acute chest pain, ST-elevations in the precordial leads (Fig. 1), and elevated troponins (10.9 ng/ml). There was no family history of cardiac disease or sudden cardiac death.

Two months earlier he was admitted with similar symptoms that were associated with an urticarial rash over his chest, abdomen and lower extremities. He developed an anaphylactoid reaction when given morphine for chest pain. The angina resolved with continuous IV nitroglycerin administration. His extensive cardiac work-up was negative, except for a medium sized, moderately severe, anteroseptal, reversible perfusion defect associated with mild hypokinesia detected on a myocardial perfusion exercise stress test (MIBI).

The patient was discharged with the presumptive diagnosis of Kounis syndrome on a steroid taper, antihistamines, amiodipine, and an epinephrine pen for severe allergic reactions.

Despite these medications, the patient continued to complain of chest pain on exertion and was readmitted.

Since there was no clear evidence of allergic symptoms concomitant with the recurrent chest pain, a cardiac MRI with anesthesia was ordered to rule out myocarditis and to further evaluate the perfusion defect.

The decision was made to perform the scan with monitored anesthesia care (MAC), since the available MRI-compatible EKG monitor (3-lead) permitted only rhythm monitoring.

The patient was extremely cooperative, receiving 1 mg of IV midazolam for the duration of the scan (140 minutes). He remained hemodynamically stable throughout the entire procedure and did not complain of any chest pain.

Figure 1: 12-lead EKG during episode of acute chest pain

Discussion

Considering the patient’s risk for repeated coronary vasospasm during general anesthesia, MAC appeared to be the safest way of providing anesthetic care for this 10-year-old’s cardiac MRI. As an MRI-compatible 12-lead EKG is not commercially available, the patient’s ability to complain of chest pain would be the best monitor for cardiac ischemia in this setting.

However, in order to safely administer MAC for a cardiac MRI in children, many prerequisites need to be met. The patient should be motivated and cooperative, as well as able to understand the importance of holding still and breathing when instructed, since the scan may require more than 40 breath-holds of 20 seconds in duration. Moreover, the patient should be able to communicate any discomfort or distress to the team. Patient anxiety and language barriers need to be addressed.

The constraint of maintaining the patient’s ability to follow commands or voice complaints limits the degree of sedation that can be provided. Non-pharmacological anxiolytic approaches, such as listening to music or watching a movie, along with parental presence, may be preferred.

12-lead EKG remains the gold-standard of monitoring cardiac ischemia. Despite the fact that MRI-compatible technology for 12-lead EKG exists, reliability (artifacts) and availability issues are barriers to its widespread application.

MAC with minimal sedation is a possible approach in selected children for cardiac MR.

References

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