

Management of Cold-Induced Urticaria During Cardiac Surgery

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ABSTRACT General body cooling and local hypothermia during cardiopulmonary bypass in theory could precipitate a severe systemic anaphylaxis in the case of cold-induced urticaria. We present a case of cold-induced urticaria and describe how preanesthetic single-dose steroid, H₂ antagonist, and antihistamine, normothermic retrograde, and antegrade cardioplegia administration were all employed with normothermic conditions in the prevention of life-threatening anaphylaxis during coronary artery bypass grafting. doi: 10.1111/j.1540-8191.2010.01176.x (*J Card Surg* 2011;***:***-***)

Although the exact pathogenesis of physical Urticaria is unknown, its symptoms of hives or wheals are induced by environmental stimuli, such as heat/cold or pressure and are not usually life-threatening symptoms to the patient. Found predominantly in young women, the diagnosis is based on careful history taking and ice cube testing. Patients with a negative ice cube test may have systemic cold urticaria (atypical acquired cold urticaria) induced by general body cooling. Mediated by the release of cutaneous mast cells such as Histamine, vasodilatation occurs at a local level. This condition, when exposed to the rigors of coronary artery bypass grafting and standard core cooling, could induce systemic hypotension and cardiovascular collapse, which could be fatal. We discuss the management of successful coronary artery bypass grafting in a patient with cold urticaria in which systemic cooling was avoided.

CASE REPORT

A 67-year-old female presented for coronary artery bypass grafting eight months following a STEMI and bare metal stent placement to the left anterior descending artery with a Canadian Cardiovascular Society symptomatology class II. Angiography showed triple vessel disease with 60% left main stem stenosis. Her past medical history was significant for cold-induced urticaria that responded well to antihistamine therapy. Coronary revascularization was planned using normothermic cardiopulmonary bypass and isothermic cardioplegia. Prior to induction of anesthesia she received a single dose of steroid (hydrocortisone), H₂ antagonist (ranitidine), and antihistamine (chlorphenamine). Her core temperature was maintained between 35.6°C and 37.3°C throughout surgery. Ambient

temperature in the operating room was carefully monitored, and a warming blanket was used for perioperative heat preservation. Temperature and minute flow of cardiopulmonary bypass were maintained at 37°C and 2.5 L/min/m².

Antegrade and retrograde warm blood cardioplegia was administered every 10 minutes. Any fluid was administered with fluid warming devices and the Bair Hugger was applied to the patient when the saphenous vein had been harvested. The patient came off bypass without any difficulty. Duration of cardiopulmonary bypass and the aortic cross clamp were 140 minutes and 101 minutes, respectively. The nasopharyngeal temperature of the patient during the procedure was above 36°C. The patient was extubated seven hours postprocedure and was discharged home on the fifth postoperative day.

DISCUSSION

Although cold-induced Urticaria could potentially have a benign course, the symptoms range from a localized picture to severe systemic responses, including hypotension, laryngeal edema, and even anaphylactic shock.¹ Most cases are idiopathic, without any association to a known disease. Less commonly, cold urticaria is associated with hematological disorders such as leukemia, cryoglobulins, cryofibrinogens, cold agglutinins, paroxysmal hemoglobinuria or viral infections (measles, hepatitis), and is termed secondary-acquired cold urticaria.^{1,2}

Diagnosis is with a provocation test of ice cubes on the patients forearm for five minutes, or an immersion test involving the placement of the hands in cold water (0°C) for 4 minutes, or taking the patient to a cold room at 4°C for 10 to 30 minutes.³ A positive test reveals erythema on removal of cold exposure, pruritis between 2 to 4 minutes, and a hive within 10 minutes.

The response associated with this disorder occurs as the result of mast cell activation and degranulation (possibly IgE-mediated reaction) and the release of

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inflammatory mediators in response to a cold stimulus. Mast cell products, including histamine, leukotrienes, platelet-activating factor, and prostaglandin D2, can be detected in these individuals. Of these, histamine appears to mediate most of the clinical manifestations, and its release is greatest on withdrawal of the cold stimulus, or while rewarming.^{3,4}

Treatment of cold urticaria-related symptoms involves nonsedating antihistamine. The use of epinephrine, and other conventional measures are reserved for angioedema and cardiovascular shock.³ Cyproheptadine was the first H1 antihistamine to be studied. Doxepin, an antihistamine with H1- and H2-receptor antagonist properties, also suppresses cold urticaria reactions. Other combinations of H1- and H2-receptor antagonists, such as cyproheptadine with cimetidine, hydroxyzine with cimetidine, and terfenadine with cimetidine, have also been used successfully. Other medications that have been beneficial include mizolastine (second-generation antihistamine), cetirizine with zafirlukast, and montelukast alone. Use of corticosteroids in the therapy of cold urticaria syndromes seems to be inappropriate unless there is evidence of a late-phase inflammatory cell response or if the patient is exposed to prolonged cold stimulation, such as during cardiopulmonary bypass surgery.⁴ Cold-induced urticaria in patients undergoing cardiac surgery has been previously described but is still an unusual entity.⁵⁻⁸

Avoidance of cold stimuli is the foundation of treatment for most patients. The options, in order to avoid cold stimuli during open heart surgery, include off-pump techniques with the avoidance of bypass or performing the procedure with normothermic cardiopulmonary bypass.

Previous authors have described successful attempts at coronary surgery using normothermia or with preventive regimes and warm cardioplegia avoiding core cooling. This case is the fourth report of coronary bypass grafting (previous reports by Bakay et al., Irani et al., and Malm et al.) with normothermic cardiopulmonary bypass at 37°C.^{5,6,9} The benefits and risks need to be assessed on an individual basis. The risk of core cooling with resultant systemic vasodilata-

tion during rewarming could have serious implications to the patient with cold induced urticaria. Cardiovascular collapse has been reported in a patient who received a muscle relaxant that had just been removed from the refrigerator.⁹ Prophylactic antiinflammatory regimes have been described with core cooling to 32°C but only in one case report and postoperative rhythm disturbance was noted.⁶

An alternative method to revascularize this patient with cold urticaria would have been to use off-pump CABG which avoids systemic cooling and the administration of cold cardioplegia. However, in those circumstances, such as our patient with significant left main and three vessel disease where on-pump CABG is preferred, normothermic bypass with isothermic cardioplegia is both safe and effective.

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