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Case Report

Initial Experience with Autopulse® in a Catheterisation Laboratory

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ABSTRACT

An initial experience using the AutoPulse® Non-Invasive Cardiac Support Pump in a catheterisation laboratory is reported. The device was used for a case of cardiopulmonary arrest in the catheterisation laboratory, allowing the percutaneous procedure to continue with simultaneous cardiopulmonary resuscitation. The device provided uninterrupted and effective chest compressions and allowed a team physician to perform other functions during the procedure. There were difficulties related to the setup of the device and to the radiopacity of the electronic components, which prevented some angiographic projections from being obtained. The use of mechanical devices for chest compressions during cardiopulmonary arrest is feasible; however, there is no proof of their benefits when compared to cardiopulmonary resuscitation using manual compressions.

DESCRIPTORS: Cardiopulmonary resuscitation. Cardiac arrest. Angioplasty. Equipment.

RESUMO

Experiência Inicial com o Uso do Autopulse® em Sala de Hemodinâmica

Os autores apresentam a experiência inicial do uso de dispositivo mecânico de reanimação AutoPulse®. O dispositivo foi utilizado em caso de parada cardiorrespiratória em sala de hemodinâmica, permitindo a continuidade do procedimento percutâneo concomitantemente à ressuscitação cardiopulmonar. O dispositivo proporcionou compressões torácicas ininterruptas e efetivas, bem como liberou um médico da equipe para outras funções durante o procedimento. Houve dificuldades quanto à rapidez na instalação do dispositivo no momento da emergência e em relação à radiopacidade dos componentes eletrônicos, que impediram algumas projeções angiográficas. O uso de dispositivos mecânicos de compressões torácicas durante parada cardiorrespiratória é factível, porém ainda não há comprovação de seus benefícios em relação à ressuscitação cardiopulmonar com compressões manuais.

DESCRITORES: Ressuscitação cardiopulmonar. Parada cardíaca. Angioplastia. Equipamentos.

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Cardiorespiratory arrest during procedures in the catheterisation laboratory is a catastrophic event and can greatly affect the outcome of the interventions, as manual chest compressions prevent the continuity of coronary angiography and coronary angioplasty, and they require the assistance of a staff trained in treating cardiorespiratory arrest quickly and effectively. Used in intra-hospital and pre-hospital care, the AutoPulse® (ZOLL Medical Corporation – Chelmsford, MA, USA) mechanical cardiopulmonary resuscitation (CPR) device consists of a pneumatic band coupled to a board placed against the patient's chest that enables effective and continuous pneumatic compressions, allowing CPR to be performed concurrently with angiography and coronary angioplasty.

CASE REPORT

This is a report of an initial experience with using the AutoPulse® on a 66-year-old non-white male patient who was admitted to the emergency room with anginal pain lasting for an hour and a half. The electrocardiogram showed ST-segment elevation in the inferior wall and an atrioventricular block. The patient was referred to the catheterisation laboratory for emergency intervention; he had a blood pressure of 100/60 mmHg, a heart rate of 40 bpm, a complete atrioventricular block upon examination, and he was receiving nitroglycerine 0.1 mcg/kg/min by continuous infusion pump. In the emergency room, 300 mg aspirin and 300 mg clopidogrel were administered.

A temporary pacemaker was implanted in the left femoral vein. Coronary angiography via the right femoral artery route showed that a dominant right coronary artery was occluded in its middle third; the left main coronary artery, left anterior descending artery, and circumflex artery were without significant obstructive lesions, but there was severe left ventricular hypokinesia in the inferior wall, and the mitral valve showed severe regurgitation.

Coronary artery angioplasty was performed immediately after the intravenous administration of 10,000 U heparin. A JR 3.5 6-F guide catheter, 0.014 inch BMW® guide wire (Abbott Vascular – Santa Clara, CA, USA) and 3.0 x 15 mm Maverick® balloon catheter (Boston Scientific – Natick, MA, USA), which was inflated to 16 atm, were used for pre-dilation, as was a 4 x 20 mm Liberté® stent (Boston Scientific – Natick, MA, USA), which was released at 12 atm in the middle third of the right coronary artery, successfully resulting in coronary thrombolysis in myocardial infarction (TIMI) 3 flow.

Ten minutes after the end of the procedure, while the patient was still in the catheterisation laboratory, he went into cardiac arrest in ventricular fibrillation, which was reversed with a biphasic shock of 200 J. He then suffered multiple cardiorespiratory arrests in ventricular fibrillation and was submitted to successive electric shocks. After tracheal intubation, he went into cardiorespiratory arrest with pulseless electrical activity. Manual compressions were initiated, and after 30 seconds, the AutoPulse® was installed

During cardiac compressions with the device, control angiography was started, which showed the right coronary artery with stent patency in the middle third and TIMI 3 flow. Left coronary angiography showed an occluded left anterior descending artery in the proximal third. Using a JL 4 6-F guide-catheter, a 0.014 inch BMW® guide wire was introduced, and aspiration thrombectomy was performed with a PRONTO® (Vascular Solutions, Inc. – Minneapolis, MN, USA) suction catheter to remove thrombi, followed by coronary angioplasty with a 2.5 x 15 mm Voyager® balloon catheter (Abbott Vascular – Santa Clara, CA, USA), with no success. After an unsuccessful angiographic procedure, the patient did not respond to CPR and died. These steps are shown in Figures 1 through 3.

DISCUSSION

An initial experience with the use of the AutoPulse® in the catheterisation laboratory showed that it was possible to continue the procedure with the device attached to the patient. There is insufficient scientific evidence to demonstrate the benefits of employing the AutoPulse® compared to CPR with manual compressions, but the feasibility of percutaneous coronary intervention during CPR was observed.

Series of cases in which the AutoPulse® was employed have shown improvement in haemodynamic pressures[1] during CPR and improvement in the restoration of spontaneous circulation.[2,3] However, there was no improvement in survival up to hospital discharge or improvement of neurological damage in survivors when compared to manual CPR.[4]

A prospective, multicentre, randomised trial, comparing the use of the AutoPulse® to manual CPR in the pre-hospital care of cardiac arrest has not demonstrated improved survival at 4 hours, and worse neurological outcomes have been reported when the device was used.[5] However, another larger, prospective, multicentre, international, randomised study, the Circulation Improving Resuscitation Care (CIRC) trial, compared survival rates after cardiorespiratory arrest outside of the hospital in patients undergoing CPR procedures with the use of the AutoPulse® or high-quality manual chest compressions. A total of 4,231 patients were included, and it was concluded that mechanical compressions were equivalent to manual compressions regarding survival to hospital discharge.[6] Therefore, there is sufficient evidence for the disseminated use of mechanical devices for CPR in cardiorespiratory arrest.[7]