Journal of Clinical Anesthesia (2016) **32**, 242–247

Journal of Clinical Anesthesia

Original contribution

A comparative study between propofol and dexmedetomidine as sedative agents during performing transcatheter aortic valve implantation ☆

Mohamed Khalil MD (Professor)[a,*], Ahmed Al-Agaty MD (Professor)[a], Osama Asaad MD (Assistant Professor)[a], Mohsen Mahmoud MD (Assistant Professor)[b], Amr S. Omar MD (Assistant Professor)[c], Ahmed Abdelrazik MD (Assistant Professor)[b], Mohamed Mostafa MD (Lecturer)[d]

[a]*Anesthesia Department, Cairo University, Giza, Egypt*
[b]*Critical Care Department, Cairo University, Giza, Egypt*
[c]*Critical Care Department, Cairo University (Beni-Suef division), Giza, Egypt*
[d]*Cardiology Department, Ain-Shams University, Giza, Egypt*

Received 30 June 2015; revised 7 August 2015; accepted 5 March 2016

Keywords:
TAVI;
Conscious sedation;
Dexmedetomidine;
Propofol

Abstract

Objective: The type of sedative drugs could play a major role in providing hemodynamic stability which is crucial during transcatheter aortic valve implantation (TAVI) procedure. The aim of this study is to compare propofol with dexmedetomidine for conscious sedation during TAVI.

Design: A prospective randomized pilot study.

Patients: Fifty patients with a mean age of 74 years, American Society of Anesthesiologists 3-4, complaining from severe aortic stenosis were enrolled in this study to undergo TAVI.

Interventions: The propofol group (group P; n = 25) received a bolus dose of 0.5 mg/kg propofol followed by a continuous intravenous infusion of propofol at a rate of 30 to 50 $\mu g\ kg^{-1}\ min^{-1}$, and the dexmedetomidine group (group D; n = 25) received dexmedetomidine at a loading dose of 1 μg/kg and then a continuous intravenous infusion of dexmedetomidine at a rate of 0.5 $\mu g\ kg^{-1}\ h^{-1}$.

Measurements: Heart rate, mean arterial blood pressure, number of phenylephrine boluses, oxygen saturation, sedation, and satisfaction scores were measured just after the start of infusion of the sedation drugs and at the end of the procedure. Postoperative complications were also recorded.

Results: There was a statistically significant reduction in the heart rate in group D in comparison to group P where it was 67.28 ± 6.9 beats/min in the first group in comparison to 78 ± 6.9 beats/min in the last one ($P < .001$). The mean arterial blood pressure was statistically significant lower in group D in comparison to group P (58.12 ± 5.4 mm Hg in group D vs 68.24 ± 11.4 mm Hg in group P; $P < .001$). Also, the number of phenylephrine boluses was higher in group D than in group P (36.5 ± 7.17 in group D vs 20.6 ± 2.07 in group p; $P < .001$). No difference between the 2 groups regarding oxygen saturation, sedation, pain, satisfaction scores, and postoperative complications.

☆ No disclosure or conflict of interest for this study.

* Corresponding author at: Saad Specilalist Hospital, Prince Faisal Bin Fahad Street, Al-Khobar 31952, Kingdom of Saudi Arabia. Tel.: +966 545965581; fax: +966 8011926.
E-mail address: mohamedkhalil404@hotmail.com (M. Khalil).

http://dx.doi.org/10.1016/j.jclinane.2016.03.014

Conclusion: During TAVI, dexmedetomidine may be associated with significant hypotension and bradycardia rather than propofol.

1. Introduction

The prognosis of medical treatment of symptomatic aortic stenosis is usually poor [1]. Many patients with severe aortic stenosis do not undergo surgery for many reasons [2–4]. This might be the result of the presence of many comorbidities, the advanced age which may increase the morbidity and mortality associated with the surgical technique [4,5]. Many experimental trials have been done to investigate the efficiency of percutaneous catheter–based systems to treat the valvular heart disease [6–8]. In 2002, Alain et al [7] introduced their new nonsurgical technique where the biological heart valve was mounted on a balloon-expandable stent. Recently, this technique (TAVI) has become more and more the treatment of choice as an alternative method to the conventional surgery of aortic stenosis. Conscious sedation is used widely for TAVI as an acceptable and safe method. However, the type of sedation drugs could play a major role to provide hemodynamic stability which is mandatory during the TAVI procedure as well as the intensive care unit (ICU) and hospital stays.

Transcatheter aortic valve implantation (TAVI) was performed under different anesthetic techniques. Local anesthesia alone was used in some studies [9]. General anesthesia was used at the start of TAVI where the need for transesophageal echocardiography (TEE) use was necessary [10]. Local anesthesia with sedation has become the standard anesthetic technique to perform TAVI in many cardiac centers in order to maintain hemodynamic stability [11–14]. Sedation anesthesia technique is used widely for TAVI as an acceptable and safe method. The necessity for hemodynamic stability as well as rapid recovery of the patients undergoing TAVI is a major goal. This goal could be achieved through the use of either propofol or dexmedetomidine as sedative agents during TAVI. The aim of this study is to compare 2 different conscious sedation techniques during performing TAVI.

2. Materials and methods

2.1. Patient population

The study was conducted for 18 months in duration from January 2013 to June 2014. After ethical committee approval (reference number 124-2012), 50 patients who presented with severe aortic stenosis, were scheduled to undergo TAVI, and had provided informed written consent were included in this study. Patients were enrolled into either 1 of 2 groups in a prospective randomized pilot study: group P (n = 25) received propofol and group D (n = 25) received dexmedetomidine. The administration of propofol or dexmedetomidine was randomized. Randomization was performed according to a computer-generated list, and the sequence of randomization was concealed using sequentially numbered envelopes (SPSS program; SPSS Inc, Chicago, IL). Patients included in our study were those with severe aortic stenosis and cardiac symptoms as chest pain, dyspnea, syncope, or heart failure with preserved systolic function. Severe aortic stenosis was considered if the aortic valve area is less than 0.8 cm^2, a mean aortic valve gradient of 50 mm Hg or more, or a peak aortic jet velocity of 4 m/s or more.

Excluded patients from were those with recent myocardial infarction, ejection fraction of less than 30%, noncalcified aortic valve, associated severe mitral or aortic regurgitation, coronary artery disease requiring revascularization, aortic annulus diameter less than 18 mm or more than 26 mm, or history of transient ischemic attack or stroke within 6 months period.

2.2. Anesthetic technique

An 18-gauge or 16-gauge peripheral venous cannula was inserted under local anesthesia. A 20-gauge radial arterial catheter was inserted after premedication with midazolam and fentanyl according to a standard protocol consisting of midazolam 0.05 mg/kg as well as fentanyl 1 μg/kg intravenous bolus. A triple-lumen central venous catheter was inserted in the right internal jugular vein through which a pacing wire was inserted into the right ventricular apex. Monitoring consisted of 5 lead electrocardiogram, pulse oximetry, capnography, and continuous invasive arterial pressure monitoring. All patients were put a simple face mask as a source of oxygen at a rate of 5 L/min as well as a CO_2 analyzer probe which is put near the patient's nostril for end-tidal carbon dioxide monitoring.

Before starting the procedure, patients were allocated into 1 of 2 groups consisting of 25 patients each. Group P received a bolus dose of 0.5 mg/kg propofol followed by a controlled infusion of propofol at a rate of 30 to 50 μg kg^{-1} min^{-1}. Group D received dexmedetomidine (Precedex; Hospira, Lake Forest, IL) at a loading dose of 1 μg/kg than a continuous intravenous infusion of dexmedetomidine at a rate of 0.5 μg kg^{-1} h^{-1}. Blood pressure and heart rate were recorded 3 times, first time before the start of the procedure (baseline reading), second time with the start of cardiologic intervention, and last one at the end of the procedure. All TAVI patients received their deficit needs only, in a trial to protect them against the development of fluid overload or pulmonary edema. Therefore, patients received almost 1 L of crystalloid normal saline solution. Infusion started just with the beginning of the