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Case Report Open Access

Transcatheter Aortic Valve Implantation by Retroperitoneal Access without General Anaesthesia

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Abstract

A patient is described having severe aortic stenosis and severe pulmonary disease contraindicating general anaesthesia for standard surgical aortic valve replacement as well as Transcatheter Aortic Valve Implantation (TAVI) using apical or direct aortic access. Dimensions of femoral and subclavian arteries were prohibitive for vascular access for TAVI. Therefore, the patient was treated by TAVI under full consciousness in spinal anaesthesia using a conduit to the common iliac artery. Thus, this case describes an alternative access route and anaesthesiological handling in otherwise untreatable TAVI candidates.

Keywords: TAVI; Spinal anaesthesia; Retroperitoneal access

Introduction

Since 2002 Transcatheter Aortic Valve Implantation (TAVI) has been used in patients, where frailty or concomitant diseases result in too high surgical risk for open heart surgery. With the currently available TAVI devices most patients can be treated from a technical standpoint using femoral, subclavian, apical or direct aortic access or rarely, carotid or iliac access [1-3]. In our first more than 200 cases, prohibitive access problems had not been an issue for denial of a TAVI procedure, but such a case was then encountered, and a solution with TAVI under full consciousness via a retroperitoneal access was finally used [4]. We found it relevant to present the case, since a treating a fully conscious patient using this access and anaestsiological handling has not previously been described.

Case Report

A 57 years old female developed heart failure due to severe aortic stenosis while undergoing intensive care admittance for severe pulmonary problems. She had been known with severe chronic obstructive lung disease, albeit with remarkable good physical function despite advanced disease. Furthermore, she attended with regular intervals a local hospital for previously estimated non severe aortic stenosis.

The patient was admitted to the Intensive Care Unit (ICU) of her local hospital with a severe case of *Pneumococcus pneumonia*, but 18 days later she was transferred to the regional university hospital due to recurrent pleural effusions. A total of 79 days under intensive care was needed due to several pleural drainages, tracheotomy and difficult weaning from respiratory therapy. Prior to discharge the patient was discussed at an interdisciplinary heart valve conference, due to the stenotic aortic valve, and its impact on the present situation. Her left ventricular ejection fraction (LVEF) had dropped from normal value >60%, at the last outpatient control 10 months prior to admittance, to 25% during the ICU stay. She had a bicuspid aortic valve with severe calcifications, grade 2^+ insufficiency and an estimated valve area of 0.5 cm^2. Despite the low LVEF the patient could produce a gradient of 72/42 mmHg (peak/mean). Pulmonary pressures were estimated to 55 mmHg.

Surgery was the preferred option, so it was decided to re-evaluate her 3 weeks after discharge from the ICU. Spirometry then showed forced vital capacity of 41% and forced expiratory volume of 21% of reference values, and still minor relapses of pneumonia. Full treatment for congestive heart failure could not be offered due to hypotension. Surgery was found too risky at this stage, and it was decided to perform valvuloplasty of the stenotic valve in local infiltration anaesthesia as a bridge to possible later surgery. Transesophageal echocardiography and cardiac 64 slice computerised tomography scan showed normal coronaries, aortic annulus of 25 mm by area evaluation. Femoral and subclavian vessels were straight without obstructions, but with diameters of only 4 x 4 mm. A balloon valvuloplasty was then performed in local anaesthesia using a 22 mm balloon. At follow-up 4 weeks later LVEF had risen to 35%-40%, but clinically she was still in New York Heart Association grade 3-4 heart failure. Pulmonary function was unchanged, and hence the risk of pulmonary complications too high for direct aortic or apical TAVI. Sheathless femoral access was considered, but found prohibited by the >50% oversizing of femoral arteries needed to accommodate an 18F delivery system. Proximal right common iliac artery was just 6 mm, and an iliac access under full consciousness was offered to the patient with informed consent that termination of the access procedure would be done, if combined spinal anaesthesia and intravenous opioids could not control the pain.

Hence, a spinal catheter was placed in L1-L2, initially using 8 mg Bupivacain. Later 5 mg more added and infusion of Remifentanil 0.07 µg/kg/min started for pain relief while stretching the peritoneum. Activated Coagulation Time was kept just above 250 sec using unfractionated heparin.

Retroperitoneal exposure of the right common iliac artery and an end-to-side anastomosis with 8 mm clamped Dacron® (Vascutek Ltd, Glasgow, UK) prosthesis was done.Except for advancing the delivery sheath through the unclamped conduit, a standard 29 mm Medtronic Corevalve™ TAVI procedure was then performed with initial redo valvuloplasty with a 25 mm balloon. The implant was complicated by a deep dive to the left ventricular outflow tract, probably due to the bicuspid valve. After a prolonged traction process with the valve still attached to the delivery catheter, an acceptable position was obtained with grade 1 paravalvular aortic insufficiency and the valve released. However, the valve dived again under release, resulting in a grade 3 insufficiencies. A second valve was implanted 4 mm higher, reducing the paravalvular leak to grade 0-1. The delivery system and wire were removed and the access Dacron tube shortened to approximate 10 mm from the anastomosis site and closed with sutures. Standard closure of abdominal wall, subcutis and skin was done. The patient was hemodynamically stable during the procedure and no vasopressors needed.

The patient was observed for 4 hours in postoperative intensive care unit before transfer to an ordinary ward. Two units of erythrocytes were given the second post procedural day, but otherwise the postoperative period was uneventful, and she was discharged on day 10. Echocardiography before discharge showed discrete paravalvular aortic insufficiency, a peak gradient of 24 mmHg and mean gradient of 14 mmHg. The aortic valve area was estimated to 1.6 cm^2. Three months after the procedure the patient was in NYHA 2b, lung function unchanged, but she managed her household herself and was without diuretic therapy. LVEF had normalised, and no paravalvular leak remained. Pulmonary pressure was slightly elevated at estimated 40 mmHg, judged due to her pulmonary insufficiency.

Discussion

Retroperitoneal access for TAVI has been described under general anaesthesia, but not in a wake patient, and this case illustrates, that in the rare patient with prohibitive access due to anatomic or physiological constraints, this is an option [5]. Tough the patient tolerance of the retroperitoneal manipulations in a conscious state even with spinal anaesthesia was uncertain, we saw this as her only option, and in this case turned out to be possible. If this experience can be extrapolated to other patients with similar problems remains to be seen, and as further downsizing of TAVI access vessel requirements seems to be ongoing, the described option will be relevant for a minority of patients in the future. For these patients, however, it is important that, instead of having to resort to the dismal prognosis of untreated significant aortic stenosis or repeated valvuloplasties, an option of retroperitoneal access is available that can be performed in a conscious state without intubation and artificial ventilation and highlights the need for multidisciplinary approach to the TAVI patient.

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