2020-2021

THÈSE

pour le

DIPLÔME D'ÉTAT DE DOCTEUR EN MÉDECINE

Qualification en ANESTHESIE-REANIMATION

Procédures TAVI sous analgo-sédation : Evaluation de l'intérêt du TAP block associé à l'anesthésie locale

Une étude rétrospective sur 191 patients

Chloé LIEPPE

Née le 29 Novembre 1992 à Laval (53)

Sous la direction de M. le Docteur Emmanuel RINEAU

Membres du jury

Monsieur le Professeur Sigismond LASOCKI	Président
Monsieur le Docteur Emmanuel RINEAU	Directeur
Monsieur le Professeur Bertrand ROZEC	Membre
Monsieur le Docteur Olivier FOUQUET	Membre
Madame le Docteur Laurence CHAUSSERET	Membre

Soutenue publiquement le :
15 Janvier 2021

FACULTÉ DE SANTÉ
UNIVERSITÉ D'ANGERS

ENGAGEMENT DE NON PLAGIAT

Je, soussignée LIEPPE Chloé .....
déclare être pleinement consciente que le plagiat de documents ou d'une partie d'un document publiée sur toutes formes de support, y compris l'internet, constitue une violation des droits d'auteur ainsi qu'une fraude caractérisée.
En conséquence, je m'engage à citer toutes les sources que j'ai utilisées pour écrire ce rapport ou mémoire.

signé par l'étudiante le **15**/**12**/**2020**

LISTE DES ENSEIGNANTS DE LA FACULTÉ DE SANTÉ D'ANGERS

Doyen de la Faculté : Pr Nicolas Lerolle
Vice-Doyen de la Faculté et directeur du département de pharmacie : Pr Frédéric Lagarce
Directeur du département de médecine : Pr Cédric Annweiler

PROFESSEURS DES UNIVERSITÉS

ABRAHAM Pierre	Physiologie	Médecine
ANNWEILER Cédric	Gériatrie et biologie du vieillissement	Médecine
ASFAR Pierre	Réanimation	Médecine
AUBE Christophe	Radiologie et imagerie médicale	Médecine
AUGUSTO Jean-François	Néphrologie	Médecine
AZZOUZI Abdel Rahmène	Urologie	Médecine
BAUFRETON Christophe	Chirurgie thoracique et cardiovasculaire	Médecine
BENOIT Jean-Pierre	Pharmacotechnie	Pharmacie
BEYDON Laurent	Anesthésiologie-réanimation	Médecine
BIGOT Pierre	Urologie	Médecine
BONNEAU Dominique	Génétique	Médecine
BOUCHARA Jean-Philippe	Parasitologie et mycologie	Médecine
BOUVARD Béatrice	Rhumatologie	Médecine
BOURSIER Jérôme	Gastroentérologie ; hépatologie	Médecine
BRIET Marie	Pharmacologie	Médecine
CAILLIEZ Eric	Médecine générale	Médecine
CALES Paul	Gastroentérologe ; hépatologie	Médecine
CAMPONE Mario	Cancérologie ; radiothérapie	Médecine
CAROLI-BOSC François-xavier	Gastroentérologie ; hépatologie	Médecine
CHAPPARD Daniel	Cytologie, embryologie et cytogénétique	Médecine
CONNAN Laurent	Médecine générale	Médecine
COUTANT Régis	Pédiatrie	Médecine
CUSTAUD Marc-Antoine	Physiologie	Médecine
DE CASABIANCA Catherine	Médecine Générale	Médecine
DESCAMPS Philippe	Gynécologie-obstétrique	Médecine
D'ESCATHA Alexis	Médecine et santé au Travail	Médecine
DINOMAIS Mickaël	Médecine physique et de réadaptation	Médecine
DIQUET Bertrand	Pharmacologie	Médecine
DUBEE Vincent	Maladies Infectieuses et Tropicales	Médecine
DUCANCELLE Alexandra	Bactériologie-virologie ; hygiène hospitalière	Médecine

DUVAL Olivier	Chimie thérapeutique	Pharmacie
DUVERGER Philippe	Pédopsychiatrie	Médecine
EVEILLARD Mathieu	Bactériologie-virologie	Pharmacie
FAURE Sébastien	Pharmacologie physiologie	Pharmacie
FOURNIER Henri-Dominique	Anatomie	Médecine
FURBER Alain	Cardiologie	Médecine
GAGNADOUX Frédéric	Pneumologie	Médecine
GARNIER François	Médecine générale	Médecine
GASCOIN Géraldine	Pédiatrie	Médecine
GOHIER Bénédicte	Psychiatrie d'adultes	Médecine
GUARDIOLA Philippe	Hématologie ; transfusion	Médecine
GUILET David	Chimie analytique	Pharmacie
HAMY Antoine	Chirurgie générale	Médecine
HENNI Samir	Chirurgie Vasculaire, médecine vasculaire	Médecine
HUNAULT-BERGER Mathilde	Hématologie ; transfusion	Médecine
IFRAH Norbert	Hématologie ; transfusion	Médecine
JEANNIN Pascale	Immunologie	Médecine
KEMPF Marie	Bactériologie-virologie ; hygiène hospitalière	Médecine
LACCOURREYE Laurent	Oto-rhino-laryngologie	Médecine
LAGARCE Frédéric	Biopharmacie	Pharmacie
LARCHER Gérald	Biochimie et biologie moléculaires	Pharmacie
LASOCKI Sigismond	Anesthésiologie-réanimation	Médecine
LEGENDRE Guillaume	Gynécologie-obstétrique	Médecine
LEGRAND Erick	Rhumatologie	Médecine
LERMITE Emilie	Chirurgie générale	Médecine
LEROLLE Nicolas	Médecine Intensive-Réanimation	Médecine
LUNEL-FABIANI Françoise	Bactériologie-virologie ; hygiène hospitalière	Médecine
MARCHAIS Véronique	Bactériologie-virologie	Pharmacie
MARTIN Ludovic	Dermato-vénéréologie	Médecine
MAY-PANLOUP Pascale	Biologie et médecine du développement et De la reproduction	Médecine
MENEI Philippe	Neurochirurgie	Médecine
MERCAT Alain	Réanimation	Médecine
MERCIER Philippe	Anatomie	Médecine
PAPON Nicolas	Parasitologie et mycologie médicale	Pharmacie
PASSIRANI Catherine	Chimie générale	Pharmacie
PELLIER Isabelle	Pédiatrie	Médecine
PETIT Audrey	Médecine et Santé au Travail	Médecine
PICQUET Jean	Chirurgie vasculaire ; médecine vasculaire	Médecine
PODEVIN Guillaume	Chirurgie infantile	Médecine
PROCACCIO Vincent	Génétique	Médecine
PRUNIER Delphine	Biochimie et Biologie Moléculaire	Médecine

PRUNIER Fabrice	Cardiologie	Médecine
REYNIER Pascal	Biochimie et biologie moléculaire	Médecine
RICHARD Isabelle	Médecine physique et de réadaptation	Médecine
RICHOMME Pascal	Pharmacognosie	Pharmacie
RODIEN Patrice	Endocrinologie, diabète et maladies métaboliques	Médecine
ROQUELAURE Yves	Médecine et santé au travail	Médecine
ROUGE-MAILLART Clotilde	Médecine légale et droit de la santé	Médecine
ROUSSEAU Audrey	Anatomie et cytologie pathologiques	Médecine
ROUSSEAU Pascal	Chirurgie plastique, reconstructrice et esthétique	Médecine
ROUSSELET Marie-Christine	Anatomie et cytologie pathologiques	Médecine
ROY Pierre-Marie	Thérapeutique	Médecine
SAULNIER Patrick	Biophysique et biostatistique	Pharmacie
SERAPHIN Denis	Chimie organique	Pharmacie
TRZEPIZUR Wojciech	Pneumologie	Médecine
UGO Valérie	Hématologie ; transfusion	Médecine
URBAN Thierry	Pneumologie	Médecine
VAN BOGAERT Patrick	Pédiatrie	Médecine
VENIER-JULIENNE Marie-Claire	Pharmacotechnie	Pharmacie
VERNY Christophe	Neurologie	Médecine
WILLOTEAUX Serge	Radiologie et imagerie médicale	Médecine

MAÎTRES DE CONFÉRENCES

ANGOULVANT Cécile	Médecine Générale	Médecine
BAGLIN Isabelle	Chimie thérapeutique	Pharmacie
BASTIAT Guillaume	Biophysique et biostatistique	Pharmacie
BEAUVILLAIN Céline	Immunologie	Médecine
BELIZNA Cristina	Médecine interne	Médecine
BELLANGER William	Médecine générale	Médecine
BELONCLE François	Réanimation	Médecine
BENOIT Jacqueline	Pharmacologie	Pharmacie
BIERE Loïc	Cardiologie	Médecine
BLANCHET Odile	Hématologie ; transfusion	Médecine
BOISARD Séverine	Chimie analytique	Pharmacie
CAPITAIN Olivier	Cancérologie ; radiothérapie	Médecine
CASSEREAU Julien	Neurologie	Médecine
CHAO DE LA BARCA	Juan-Manuel	Médecine

CHEVALIER Sylvie	Biologie cellulaire	Médecine
CLERE Nicolas	Pharmacologie / physiologie	Pharmacie
COLIN Estelle	Génétique	Médecine
DERBRE Séverine	Pharmacognosie	Pharmacie
DESHAYES Caroline	Bactériologie virologie	Pharmacie
FERRE Marc	Biologie moléculaire	Médecine
FORTRAT Jacques-Olivier	Physiologie	Médecine
HAMEL Jean-François	Biostatistiques, informatique médicale	Médicale
HELESBEUX Jean-Jacques	Chimie organique	Pharmacie
HINDRE François	Biophysique	Médecine
KHIATI Salim	Biochimie et biologie moléculaire	Médecine
JOUSSET-THULLIER Nathalie	Médecine légale et droit de la santé	Médecine
JUDALET-ILLAND Ghislaine	Médecine Générale	Médecine
KUN-DARBOIS Daniel	Chirurgie Maxillo-Faciale et Stomatologie	Médecine
LACOEUILLE Franck	Biophysique et médecine nucléaire	Médecine
LEBDAI Souhil	Urologie	Médecine
LANDREAU Anne	Botanique/ Mycologie	Pharmacie
LEBDAI Souhil	Urologie	Médecine
LEGEAY Samuel	Pharmacocinétique	Pharmacie
LE RAY-RICHOMME Anne-Marie	Pharmacognosie	Pharmacie
LEPELTIER Elise	Chimie générale	Pharmacie
LETOURNEL Franck	Biologie cellulaire	Médecine
LIBOUBAN Hélène	Histologie	Médecine
LUQUE PAZ Damien	Hématologie; Transfusion	Médecine
MABILLEAU Guillaume	Histologie, embryologie et cytogénétique	Médecine
MALLET Sabine	Chimie Analytique	Pharmacie
MAROT Agnès	Parasitologie et mycologie médicale	Pharmacie
MESLIER Nicole	Physiologie	Médecine
MOUILLIE Jean-Marc	Philosophie	Médecine
NAIL BILLAUD Sandrine	Immunologie	Pharmacie
PAILHORIES Hélène	Bactériologie-virologie	Médecine
PAPON Xavier	Anatomie	Médecine
PASCO-PAPON Anne	Radiologie et imagerie médicale	Médecine
PECH Brigitte	Pharmacotechnie	Pharmacie
PENCHAUD Anne-Laurence	Sociologie	Médecine
PIHET Marc	Parasitologie et mycologie	Médecine
PY Thibaut	Médecine Générale	Médecine
RAMOND-ROQUIN Aline	Médecine Générale	Médecine
RINEAU Emmanuel	Anesthésiologie réanimation	Médecine
RIOU Jérémie	Biostatistiques	Pharmacie
ROGER Emilie	Pharmacotechnie	Pharmacie
SAVARY Camille	Pharmacologie-Toxicologie	Pharmacie
SCHMITT Françoise	Chirurgie infantile	Médecine
SCHINKOWITZ Andréas	Pharmacognosie	Pharmacie

SPIESSER-ROBELET Laurence	Pharmacie Clinique et Education Thérapeutique	Pharmacie
TANGUY-SCHMIDT Aline	Hématologie ; transfusion	Médecine
TESSIER-CAZENEUVE Christine	Médecine Générale	Médecine
VENARA Aurélien	Chirurgie générale	Médecine
VIAULT Guillaume	Chimie organique	Pharmacie

PROFESSEURS EMERITES

Philippe MERCIER	Neurochirurgie	Médecine
Dominique CHABASSE	Parasitologie et Médecine Tropicale	Médecine
Jean-François SUBRA	Néphrologie	Médecine

AUTRES ENSEIGNANTS

AUTRET Erwan	Anglais	Médecine
BARBEROUSSE Michel	Informatique	Médecine
BRUNOIS-DEBU Isabelle	Anglais	Pharmacie
CHIKH Yamina	Économie-Gestion	Médecine
FISBACH Martine	Anglais	Médecine
O'SULLIVAN Kayleigh	Anglais	Médecine

REMERCIEMENTS

Mes remerciements vont

À Monsieur le Professeur Sigismond Lasocki
Qui me fait l'honneur de présider ce jury,
Pour ses conseils et sa disponibilité,
Et pour organiser notre formation de main de maître.

À Monsieur le Professeur Bertrand Rozec
Qui me fait l'honneur de juger ce travail,
Pour m'avoir accueillie et formée en stage de réanimation cardiaque,
Et pour la future collaboration qui je l'espère sera nôtre.

À Monsieur le Docteur Olivier Fouquet
Qui me fait l'honneur de juger ce travail,
Pour m'avoir permis de découvrir les TAVI,
Et pour votre soutien pour cette thèse et futur article.

À Madame le Docteur Laurence Chausseret
Qui me fait l'honneur de juger ce travail,
Pour toutes les journées au bloc opératoire de chirurgie cardiaque,
Et pour mon premier cathéter central sans échographie.

À Monsieur le Docteur Emmanuel Rineau
Qui est à l'origine de ce travail et me fait l'honneur de le juger,
Pour m'avoir guidée à travers toutes les étapes de cette thèse,
Pour m'avoir soutenue et aidée dans mon travail de mémoire,
Et pour la musique en médecine, c'est tellement mieux !

À Monsieur Pierre Leprovost
Pour toutes les journées et soirées à faire du recueil,
Pour PREMIER, et les ceintures thoraciques,
Et merci à Morgane et Côme de nous avoir soutenus dans ce projet.

À mes co-internes et amis
Anna ma chéwie merci pour toutes les soirées « N'oubliez pas les paroles » et ce qui va avec,
Charlotte merci d'avoir chanté avec moi pendant nos heures sombres,
Manu parce que tu es beaucoup trop « explosif »,
Elise ma piou-piou merci de m'avoir fait tant rire,
Alice pour tes avis tranchés et tes coaching musclés !
Fabien, Pierre-Edouard et Eugénie mes « papa et maman » de l'anesthésie,
Camille pour les fous-rires incessants à Laval,
Les Choletais pour m'avoir soutenue sur cette dernière ligne droite,
Cléor, Maeva, Jonathan, Victor, Aurélien et tous les autres !

REMERCIEMENTS

À mes chefs
Jean-Marc et Hussein pour ma première réanimation,
Manu et Benj pour les iPACK et les cafés,
Julien, Thierry, Nico, Camille, Arthur… Pour ces 7 mois de cœur… et de pique !
Johann et Anthony, pour votre confiance quand vous me laissez « votre réa »,
Audrey, Charlotte, Mathieu, Vincent, Guillaume… pour ces 5 années super de formation !

Aux équipes paramédicales au bloc et en réanimation, sans qui rien ne serait possible.

À mes amis
Emma après tant d'années et de ski nous voilà devenir Docteur ensemble,
Laura, Marie, Quentin, Alex, Pierre, Major, Hubert pour m'avoir supportée dès mon plus jeune âge (et ce n'est pas peu dire !),
Claire et Céline : vive le GO et ses merveilleux feuillets, longue amitié à eux !
Michel, Tonton, Dédé, Jojo, Camille, Valou, Tristan (le beauf'), Vinvin, Davidou, Lulu, HLDL, Marie, Jeanne, Louise, Charlotte, Manon, Adèle, AL, Lise et Chacha sans vous ces 6 ans de médecine n'auraient jamais été si merveilleux !
Benjam, Caro, Toinou, Blinou, Gaga pour continuer le sport… et les bières !
Les Bénéteau, Madiot, Termeau pour ces super vacances et JO !
Thom, Thom et Alex : promis, je ne prendrai plus le volant !

À ma famille
À mes grands-parents qui, je l'espère, sont fiers de moi,
À mes parents qui me soutiennent, m'aiment et me supportent depuis le début merci du fond du cœur,
À mes frères pour les bêtises, les bagarres, les rires mais aussi le travail, je suis fière de vous !
À Christine et Bernard, Valérie et Henri, Béa et Jacques, Janine et Jacques, Yves, Jess Matthieu Axel et Eline, Jéré Justine et Léandre, Jonathan, Benjamin, Justine, Paul et Gabriel merci d'être ou d'avoir été là pour moi.

À Vic
Un certain « bon ami » que je connais depuis « quelques mois »,
Merci pour ta patience et ta gentillesse,
« Léa, elle est parisienne, est est pas présentable elle est pas jolie… »,
Tu sais la suite.

Liste des abréviations

ACT	Activated Clotting Time
AVR	Aortic Valve Replacement
DVT	Deep Vein Thrombosis
GA	General Anesthesia
HF	Heart Frequency
LA	Local Anesthesia
MAP	Mean Arterial Pressure
NRS	Numerical Rating Scale of pain
NSAI	Non-Steroidal Anti-Inflammatory
PACU	Post-Anesthesia Care Unit
PE	Pulmonary Embolism
RA	Regional Anesthesia
SpO2	Pulsed Oxygen Saturation
TAP	Transversus Abdominis Plane-block
TAVI	Transcatheter Aortic Valve Implantation

Plan

INTRODUCTION

Les remplacements valvulaires aortiques par voie percutanée (TAVI) sont de plus en plus fréquents. On constate une augmentation de plus de 50% des procédures TAVI entre 2015 et 2017 avec 11 000 implantations en France pour cette dernière année, tandis que le nombre de remplacements valvulaires aortiques (RVA) par voie chirurgicale reste globalement stable (1).

Le vieillissement de la population et l'élargissement des indications expliquent en partie cette augmentation. En effet, si la TAVI est actuellement proposée aux patients ayant un risque modéré à sévère de mortalité périopératoire, deux essais randomisés multicentriques ont montré récemment son intérêt potentiel chez les patients à faible risque chirurgical (2–4). Ils ne retrouvaient pas de différence significative entre TAVI et RVA chirurgical, sur les accidents vasculaires cérébraux ischémiques et la mortalité à 12 et 24 mois ainsi que sur la réhospitalisation à 1 an.

L'abord par voie transfémorale est le plus fréquent pour les TAVI, et les pratiques anesthésiques sont variées (1,5). La sédation associée à une anesthésie locale ou loco-régionale est de plus en plus utilisée et est le mode privilégié dans un grand nombre de centres (5). En comparaison avec l'anesthésie générale, la sédation pourrait apporter un bénéfice sur le temps de procédure et la durée de séjour, et diminuer le recours aux amines, sans augmenter la mortalité intra-hospitalière et à 30 jours et 1 an (6–8). Ces résultats ont été confirmés dans trois méta-analyses récentes (9–11), et une étude retrouvait une diminution de la mortalité intra-hospitalière et à 30 jours en faveur du groupe sédation (12).

L'utilisation d'une anesthésie locorégionale pourrait permettre de diminuer la consommation d'hypnotiques et/ou morphiniques et est déjà pratiquée par certaines équipes (5). Elle a été

peu étudiée dans le cadre des procédures TAVI (13), et n'a pas été comparée avec l'anesthésie locale pour les TAVI sous sédation. L'objectif de notre étude était d'évaluer si l'ajout d'une anesthésie locorégionale par « Transverse Abdominal Plane-Block » (TAP), comparée à l'anesthésie locale, permettait de diminuer le recours peropératoire à une technique adjuvante analgésique et/ou sédative pour les procédures TAVI réalisées sous sédation.

ARTICLE

Transcatheter aortic valve implantations under sedation : evaluation of the value of adding a transversus abdominis plane block to local anesthesia.

A retrospective single-center study.

1. ABSTRACT

Introduction: With the increase in the number of TAVI procedures in recent years, anesthetic practices have evolved and sedation, associated with local or regional anesthesia, is now the preferred type of anesthesia by anesthesiologists in charge of these procedures. However, no study has evaluated the usefulness of regional anesthesia compared to local anesthesia (LA) with sedation alone. Our aim was to assess the value of performing a preoperative transverse abdominal plane block (TAP) during TAVI procedures under sedation.

Material and methods: In this single-center retrospective study at the University Hospital of Angers, all patients who had transfemoral TAVI under sedation from January to December 2018 were included. The group of patients who received a TAP was compared with those of patients who received local anesthesia (LA) only. The primary endpoint was insufficient intraoperative anesthesia defined by either the need to add propofol, the need for unplanned general anesthesia, or the need for a sedation with a remifentanil target > 3 ng / mL. Secondary outcomes were postoperative pain, duration of surgery, complications and length of hospital stay.

Results: 191 patients were included, 126 in the LA group, and 65 in the TAP group. Populations of both groups were comparable. A significantly greater number of patients required additional anesthesia in the LA group, 111 (89%) vs. 34 (55%) in the TAP group, p <0.01. In addition, patients in the LA group more often presented significant pain (EN> 4) postoperatively, 14 (11%) vs. 1 (1.6%) in the TAP group, p = 0.02. There was no significant difference in intraoperative vital parameters, in the use of amines or crystalloids, in the onset of complications, and in durations of the operation or lengths of hospital stay. However, nicardipine was used more frequently in the TAP group intraoperatively.

Conclusion: In this retrospective study, patients who received a TAP block required less additional intraprocedural anesthesia than patients who received local anesthesia only for TAVI

procedures under sedation. In addition, although levels of pain were low in both groups, patients with TAP presented less frequently a significant postoperative pain. Prospective studies are needed to confirm the value of regional anesthesia for TAVI procedures under sedation.

Keywords: Transcatheter Aortic Valve Implantation, Local Anesthesia, Regional Anesthesia, Transversus Abdominis Plane-block, sedation

2. INTRODUCTION

The number of trancatheter aortic valve implantations (TAVI) is constantly increasing, with a rise of more than 50% between 2015 and 2017, while the number of surgical aortic valve replacements (AVR) remains globally stable (1). Aging of the population and expansion of indications partly explain this increase, which is likely to continue in the years to come. Indeed, while TAVIs are currently offered to patients with a moderate to severe risk of perioperative mortality, two multicenter randomized trials have recently shown its potential benefit in patients at low surgical risk (2–4).

Transfemoral approach is now the most common approach for TAVIs, but anesthetic practices vary between physicians, centers, or countries (1,5). Intravenous sedation, associated with local or regional anesthesia, is increasingly used and is the preferred method in a large number of centers (5). Compared with general anesthesia, sedation may reduce procedural time, need for amines, and hospital length of stay, without difference on in-hospital mortality at 30 days and 1 year (6–8). These results were confirmed in three recent meta-analyzes (9–11), although one study even found a decrease in in-hospital and 30-day mortality in favor of the sedation (12).

However, the use of sedation may be associated with patient discomfort, that can sometimes lead to patient movements. These movements may interfere with the operator and compromise the smooth running of the procedure and the correct positioning of the aortic prosthesis. In some cases, additional anesthesia is therefore necessary, in the form of general anesthesia or increased sedation, which, if the dosage is too strong, may itself be responsible for complications, in particular respiratory or hemodynamic events.

The use of regional anesthesia could reduce the consumption of hypnotics and/or opioids, and avoid the use of unscheduled general anesthesia. Regional anesthesia is already performed by a few teams (5), but it has been little studied for TAVI procedures (13) and has not been compared with local anesthesia for TAVIs under sedation. Our aim was to assess whether adding a regional anesthesia using a transversus abdominis plane block (TAP), compared to local anesthesia with sedation, allowed for the reduction in the use of an adjuvant analgesic or sedative technique during TAVI procedures.

3. METHODS

3.1. Design and patients

This retrospective single-center observational study, carried out at Angers University Hospital, France, was approved by the local Ethics Committee (reference number: 2020/148). Data was extracted from computerized patient records using M-Bloc Dianesthesia software (Maincare Solutions - Bow Medical) for intraoperative data and M-Crossway (Maincare Solutions) for pre and postoperative data. Patients data was anonymized.

All adult patients who had transfemoral TAVI between January 2018 and December 2018 were included. Patients who received scheduled general anesthesia or for whom important data was missing were excluded.

3.2. Clinical management of TAVIs

All included TAVIs were performed via the femoral approach by a cardiologist and a cardiac surgeon. Patients were selected after a TAVI meeting with at least cardiac surgeons, cardiologists and an anesthesiologist. Procedures were performed in a hybrid operating room. Patients were in supine position. Surgeon or cardiologists inserted venous and arterial femoral lines as well as a right ventricular pacemaker wire. Anticoagulation was performed using unfractionated heparin adjusted for an activated clotting time (ACT) above than 250 s. Medtronic (Edwards) or Sapiens (Corevalve) aortic valves were placed via the arterial femoral route and were impacted during a rapid ventricular pacing. After the procedure, patients were transferred to the post-anesthesia care unit (PACU) and then to the cardiology unit.

An anesthesiologist and a nurse anesthetist were systematically present in the operating room for all procedures. Intravenous sedation was performed using remifentanil used with brain targets between 1 and 3 ng/mL. The unit protocol allowed for the addition of propofol if remifentanil was not sufficient, starting with a brain target of 1 μg/mL. Patients all had a facemask with an oxygen flow of between 4 and 10 L/min and an end-tidal carbon dioxide monitoring during the procedure. Arterial pressure (via the femoral arterial catheter), electrocardiogram and capillary oxygen saturation were continuously monitored.

The decision to perform a TAP block was made at the discretion of the anesthesiologist in charge of the patient. TAP blocks were performed by the anesthesiologist before the operation, under ultrasound guidance. A volume of 10 to 30 mL ropivacaïne 4,75 mg/mL (for a maximum of 2 mg/kg) was injected on the operated side, using an 80 mm 22G needle. There was no other type of regional anesthesia performed for these patients in our center. Local anesthesia was systematically performed by the cardiac surgeon or the cardiologist in charge at the beginning of the procedure, at puncture points of both sides, with a mixture of 20 mL lidocaine 10mg /mL and 10 mL ropivacaïne 7,5 mg/mL.

3.3. Data collection

The following variables were collected: age, sex, height and weight, medical history (including hypertension, diabetes, alcohol intake, smoking, dyslipidemia, mental disorders, dementia, peripheral artery disease, regular opioids or narcotics intake, respiratory or cardiac failure, hypertrophic cardiomyopathy, coronary artery disease, pulmonary embolism and deep vein thrombosis, atrial fibrillation or other arrhythmias, neurological disorders, abdominal aortic aneurysm, ischemic stroke, coagulation disorders, previous history of prosthetic aortic valve), usual treatments (including paracetamol, nonsteroidal anti-inflammatory drug, tramadol,

codeine, morphine, benzodiazepine, beta-blocker, calcium channel blocker, antiplatelet agent), the date and duration of the procedure, the type of valve, the total and maximum target doses of remifentanil or propofol, the need for general anesthesia with orotracheal intubation, postoperative complications, vital parameters (including intraoperative mean arterial pressure, heart rate and oxygen saturation (SpO2)), use of fluids, amines (ephedrine, neosynephrine, atropine and norepinephrine) or nicardipine, intra and postoperative analgesics (paracetamol, nefopam, ketoprofen, morphine), the numerical scale of maximum pain, and the length of hospital stay.

3.4. Outcomes

Two groups were compared, the group of patients who received only a local anesthesia with an intravenous sedation (LA group) and the group of patients who received a TAP block with a local anesthesia and an intravenous sedation (TAP group).

The main objective was to compare the effectiveness of the anesthesia to allow the procedure to be comfortable for the patient and the operators between the two groups. The primary endpoint was a composite endpoint, insufficient anesthesia, defined by: either the need to go for a remifentanil target above than 3 ng/mL, or the need to add propofol, or the need to perform an unplanned general anesthesia.

Secondary endpoints were to compare perioperative pain (assessed by the numerical rating scale of pain (NRS) and the use of analgesic medications), respiratory and hemodynamic parameters including the need for amines, crystalloids or nicardipine, duration of the procedure, the occurrence of severe complications (death, failed TAVI positioning, stroke,

femoral hematoma), the occurrence of rhythm disturbances or the need for pacemaker implantation, and length of hospital stay.

3.5. Statistical analysis

Data are expressed in numbers (%) or in means (standard deviation). Qualitative and quantitative variables were compared between the two groups by a Fisher's exact test or a Student's t test respectively. The comparisons were made bilaterally and the significance level set at 0.05. Statistical analyzes were performed using JMP software (SAS, USA).

4. RESULTS

4.1. Characteristics of the population

In 2018, 211 patients had a TAVI using the trans-femoral approach at the University Hospital of Angers. Among them, 191 (90%) patients were included in our study: 126 patients (66%) in the LA group and 65 (34%) in the TAP group (Figure 1). Populations of the two groups were similar, with however a significant difference in age and alcohol intake (Table I). There was no significant difference between the two groups regarding usual treatments.

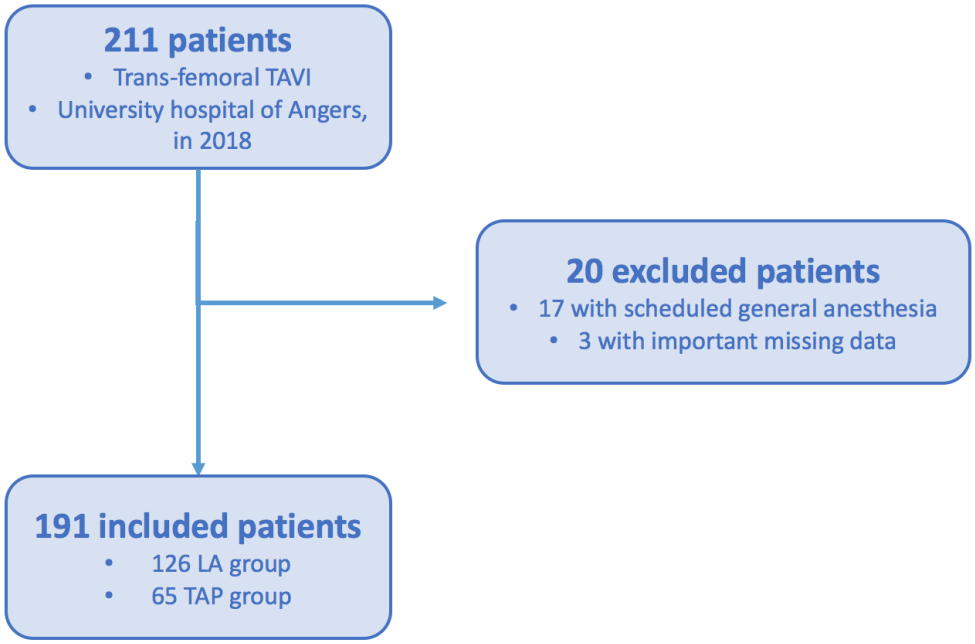


Figure 1. Flow chart.

Table I. Patients baseline characteristics

	Global (n = 191)	LA (n = 126)	TAP (n = 65)	p
Clinical parameters				
Age (years)	85 (7)	83 (7)	85 (6)	0,04
Female sex	98 (51%)	65 (52%)	33 (51%)	1,0
Height (cm)	162 (9)	162 (9)	162 (10)	0,94
Weight (kg)	69 (15)	71 (15)	68 (15)	0,16
Comorbidities				
Chronic hypertension	143 (75%)	95 (75%)	48 (74%)	0,86
Diabetes	33 (17%)	24 (19%)	9 (14%)	0,42
Current smoker	9 (5%)	6 (5%)	3 (5%)	1,0
Alcohol intake	18 (9%)	16 (13%)	2 (3%)	0,04
Dyslipidemia	79 (41%)	54 (43%)	25 (38%)	0,64
Psychiatric disorder	9 (5%)	6 (5%)	3 (5%)	1,0
Dementia	9 (5%)	8 (6%)	1 (2%)	0,17
Peripheral arterial disease	12 (6%)	8 (6%)	4 (6%)	1,0
Opioids use	3 (1,6%)	2 (1,6%)	1 (1,5%)	1,0
Chronic respiratory failure, sleep apnea syndrome	36 (19%)	29 (23%)	7 (11%)	0,05
Acute heart failure	31 (16%)	25 (20%)	6 (9%)	0,07
Hypertrophic cardiomyopathy	52 (27%)	35 (28%)	17 (26%)	0,86
Ischemic heart disease	69 (36%)	47 (37%)	22 (34%)	0,75
PE, DVT	14 (7%)	10 (8%)	4 (6%)	0,78
Atrial fibrillation, rhythm disturbances	63 (33%)	38 (30%)	25 (38%)	0,26
Neurologic disorder	14 (7%)	11 (9%)	3 (5%)	0,39
Abdominal aortic aneurysm	2 (1%)	2 (1,6%)	0	0,55
Ischemic stroke	21 (11%)	15 (12%)	6 (9%)	0,63
Coagulation disorder	2 (1%)	2 (1,6%)	0	0,55
Prosthetic aortic valve	14 (7%)	9 (7%)	5 (8%)	1,0
Usual treatments				
Paracetamol	45 (24%)	30 (24%)	15 (23%)	1,0
NSAI drugs	3 (1,6%)	2 (1,6%)	1 (1,5%)	1,0
Tramadol, codeine	5 (2,6%)	4 (3%)	1 (1,5%)	0,66
Morphinic drugs	4 (2%)	4 (3%)	0	0,30
Benzodiazepine	28 (15%)	18 (14%)	10 (15%)	0,83
Beta blockers	77 (40%)	51 (40%)	26 (40%)	1,0
Calcium channel blockers	53 (28%)	37 (29%)	16 (24%)	0,61
Other anti-hypertensive drugs	153 (80%)	97 (77%)	56 (86%)	0,18
Anti-platelet aggregation	82 (43%)	55 (44%)	27 (42%)	0,88

Data in mean (standard deviation) or numbers (%).
PE : pulmonary embolism, DVT : deep vein thrombosis, NSAI : non-steroidal anti-inflammatory.

4.2. Primary endpoint

There was a significant difference regarding our primary endpoint, with 111 (89%) patients having had an "insufficient anesthesia" in the LA group vs 34 (55%) patients in the TAP group, p <0.01 (Figure 2).

Concerning each parameter of this composite criterion, propofol was significantly more used in the LA group, but rates of general anesthesia or use of a remifentanil target > 3 ng/L were not significantly different between the two groups, although higher in the LA group (Figure 2). Maximum and average remifentanil targets were not significantly different between the groups, but the total average doses of propofol received were significantly higher in the LA group (Table II).

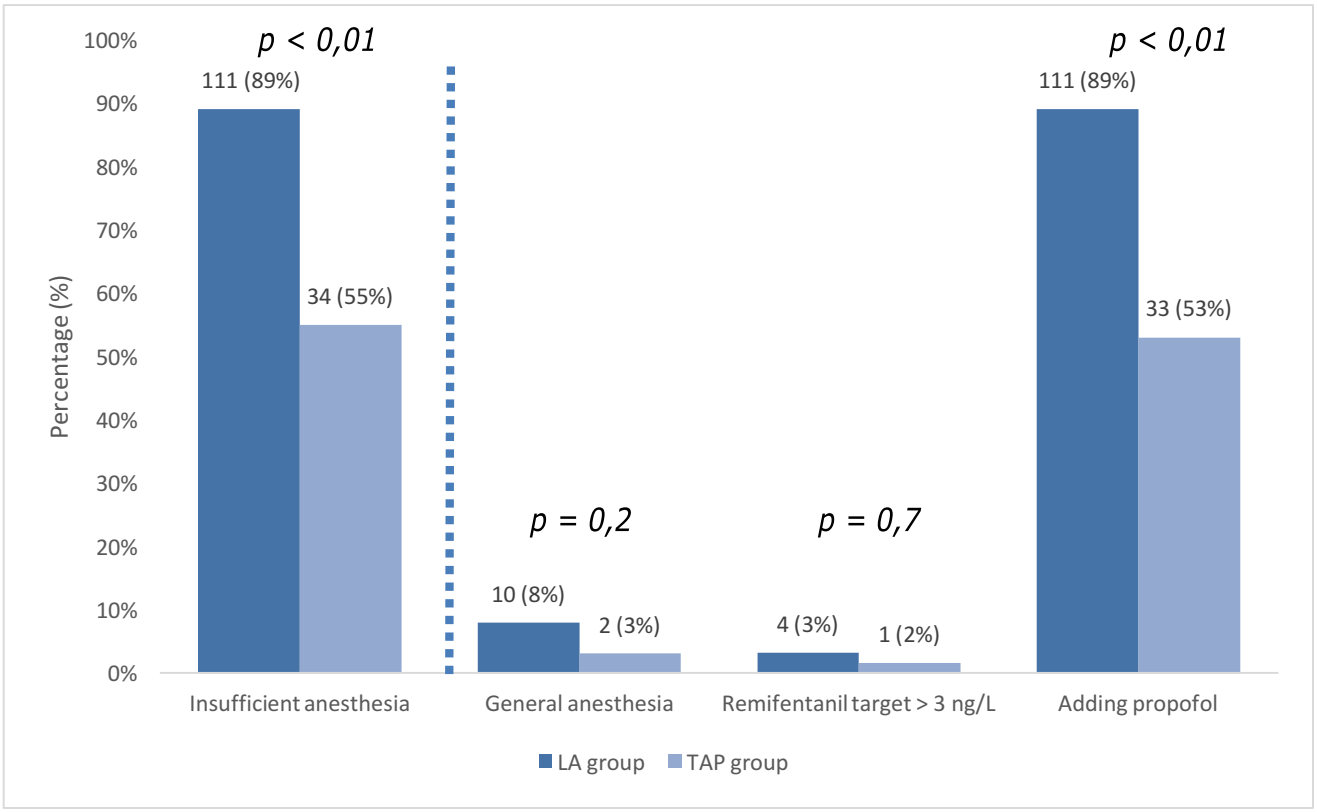


Figure 2. Primary endpoint.

Table II. Intraoperative data.

	LA (n = 126)	TAP (n = 65)	p
Intraoperative anesthetics			
Maximal remifentanil target (ng/L)	1,3 (0,8)	1,3 (0,6)	0,50
Total remifentanil dose (µg)	124 (112)	123 (170)	0,99
Total propofol dose (mg)	104 (87)	46 (58)	< 0,0001
Intraoperative analgesics			
Paracetamol	106 (84%)	57 (88%)	0,67
Morphine	2 (1,6%)	0	0,55
Nefopam	3 (2%)	9 (14%)	< 0,01
Vital parameters			
Maximal MAP (mmHg)	111 (20)	112 (19)	0,80
Minimal MAP (mmHg)	60 (14)	59 (14)	0,50
Maximal HF (by minute)	112 (27)	108 (23)	0,36
Minimal HF (by minute)	63 (12)	64 (14)	0,62
Minimal SpO2 (%)	94 (6)	94 (5)	0,86
SpO2 < 88%	9 (7%)	4 (6%)	1,0
Hemodynamic gestion			
Use of amines (%)	33 (26%)	15 (23%)	0,73
Fluids > 500 mL (%)	36 (29%)	17 (26%)	0,86
Nicardipine (%)	41 (33%)	31 (49%)	0,04
Duration of procedure (min)	101 (41)	95 (36)	0,30

Data in mean (standard deviation) or numbers (%).
MAP : Mean arterial pressure, HF : heart frequency, SpO2 : pulsed oxygen saturation

4.3. Perioperative pain

Apart from remifentanil, paracetamol was the analgesic the most frequently used, although nefopam and morphine were little used intraoperatively (Table II).

Postoperatively, pain was significantly higher in the LA group, with a higher proportion of patients having an NRS > 4 (Table III). The analgesics used postoperatively were paracetamol, tramadol and morphine, with no significant difference in use between the groups.

Table III. Postoperative data.

	LA (n = 124)	TAP (n = 64)	p
Pain			
Maximal NRS	1,4 (2)	0,8 (1)	0,02
NRS > 4	14 (11%)	1 (1,6%)	0,02
Analgesic drugs			
Paracetamol	68 (55%)	33 (52%)	0,76
Tramadol	6 (5%)	3 (5%)	1,0
Morphine	7 (6%)	1 (1,6%)	0,27
Complications			
Severe complications	19 (15%)	5 (8%)	0,17
Rhythm disturbances	60 (48%)	27 (42%)	0,44
Postoperative pace-maker implantation	23 (18%)	11 (17%)	1,0
Length of stay (days)	8 (8,7)	7 (5)	0,18

Data in mean (standard deviation) or numbers (%).
NRS : Numerical rating scale of pain

4.4. Other results

Intraoperative vital parameters, use of amines and volumes of fluids were not different between the two groups (Table II). In contrast, nicardipine was used more frequently in the TAP group (Table II).

There was no significant difference between the two groups in the occurrence of perioperative complications, with 24 (13%) severe complications, 87 (46%) rhythm disturbances, and 34 (18%) need of postoperative pace-maker implantation (Table III).

Finally, neither the duration of the procedure nor the length of hospital stay were statistically different between the groups (Tables II and III).

5. DISCUSSION

In this study, the use of a TAP block, together with local anesthesia and intravenous sedation, allowed less need for additional anesthesia during TAVI procedures, as well as better postoperative analgesia. To our knowledge, this is the first study, although retrospective, that compared TAP block with local anesthesia for TAVIs using the trans-femoral approach.

TAVI procedures have evolved towards less and less invasive approaches, made possible in particular with the major development of the trans-femoral approach (14–16). With these surgical evolutions, the improvement of techniques, the increase in the number of procedures and experience operators, anesthetic techniques have also been adapted and local anesthesia associated with sedation seems to be now the first anesthetic technique in a large number of centers (5). Several studies have thus compared general anesthesia to analgo-sedation for this procedure, with no benefit found for either anesthesia technique on perioperative mortality (7,12,17). In three recent meta-analyzes, however, sedation was associated with shorter lengths of procedure and hospital stay, and reduced use of vasopressors, without increased mortality or complications (9–11).

However, an insufficient anesthesia may lead to surgical complications, due in particular to the movements of the patient, or to medical hemodynamic or respiratory complications, due to the need for a stronger unplanned sedation (18,19). In our study, insufficient anesthesia was observed more frequently in patients in the LA group. The main difference observed was the need to add a propofol infusion. This may be due to a poorer tolerance of the procedure without an additional TAP block. However, the retrospective nature of our study does not allow us to precisely explain the choice to introduce propofol, which may have been influenced by different anesthetic practices depending on the anesthetists in charge.

To our knowledge, although the TAP block has shown its efficiency to reduce perioperative pain in numerous surgeries (20–22), it has not accurately been evaluated in TAVIs. Moreover, other types of regional are commonly used for TAVIs, such as iliofascial, ilioinguinal, femoral and genitofemoral blocks (5). Iliofascial and ilioinguinal blocks have been compared with general anesthesia for trans-femoral TAVIs (13,23,24). In these studies, the use of regional anesthesia allowed better hemodynamic stability, as well as shorter procedure and hospitalization times. As some teams are currently questioning the need for an anesthetist to be present for these procedures, our results are more in the direction of maintaining the presence of an anesthesiologist, for both patient comfort and safety (5,9). Indeed, recent studies observed that intraoperative pain and discomfort are risk factors for conversion of sedation to general anesthesia (19). The need for good intraoperative analgesia is therefore crucial, even if the value of a regional anesthesia still remains to be assessed.

Postoperative pain of TAVI procedures is poorly studied, but seems to be mild and to require little analgesics (25). In our study, patients of the TAP group were less painful although pain levels were not high and not associated with increased postoperative analgesics. However, this difference may allow a shorter hospital stay, even if this study was not powerful enough to prove it.

We did not find any differences in the doses of amines or the volumes fluids used. However, interestingly, less nicardipine was used in the LA group. This could be explained by the fact that propofol, which is hypotensive even at low doses, was more used in this group. Furthermore, 75% of the included patients had an history of hypertension with hypertensive medications, as already observed in previous studies (26). As required in the guidelines (27),

these patients did not take their antihypertensive treatment preoperatively. These data confirm that the use of sedation for TAVI procedures is associated with a very low use of amines, as previously observed (6,8,10).

Finally, duration of the entire procedure (including anesthesia) and length of hospital stays did not differ between the groups, and these times are similar to those found in literature (1). Indeed, performing a TAP block requires little time with ultrasound guidance, especially when physicians are used to do it. In addition, despite the use of heparin in the minutes following the block, no complications linked to the TAP block were found in our study.

This study has several limitations. Firstly, this is a single-center retrospective study, and patients with significant missing data were removed from the analysis. However, our population is similar to those seen in TAVI studies in terms of age, sex and presence of cardiovascular risk factors (1,28,29). Secondly, practices of the different anesthetists performing these procedures were not completely harmonized, with some of them probably using some drugs (propofol for example) earlier than others. Finally, our population was probably too small to show some differences in terms of pain or requirement of general anesthesia. However, it already allowed us to observe a larger requirement in alternative techniques to perform the procedures. Larger and randomized studies should therefore be considered to confirm these results.

6. CONCLUSION

In this retrospective study, patients who received a TAP block required less additional intra-procedural anesthesia than patients who had only local anesthesia and intravenous sedation during a TAVI. In addition, these patients had lower postoperative pain levels. Prospective, larger and randomized studies are now needed to evaluate the benefit of regional anesthesia during TAVIs under sedation on patient outcomes and perioperative pain, either for the TAP block or for lower nerve blocks such as the ilio-inguinal block.

BIBLIOGRAPHIE

1. Haute Autorité de Santé. Réévaluation des critères d'éligibilité des centres implantant des bioprothèses valvulaires aortiques par voie artérielle transcutanée ou par voie transapicale. Service d'Evaluation des Dispositifs. Saint-Denis La Plaine : HAS ; 2018.

2. Baumgartner H, Falk V, Bax JJ, De Bonis M, Hamm C, Holm PJ, et al. 2017 ESC/EACTS Guidelines for the management of valvular heart disease. Eur Heart J. 21 2017;38(36):2739‑91.

3. Popma JJ, Deeb GM, Yakubov SJ, Mumtaz M, Gada H, O'Hair D, et al. Transcatheter Aortic-Valve Replacement with a Self-Expanding Valve in Low-Risk Patients. N Engl J Med. 2 mai 2019;380(18):1706‑15.

4. Mack MJ, Leon MB, Thourani VH, Makkar R, Kodali SK, Russo M, et al. Transcatheter Aortic-Valve Replacement with a Balloon-Expandable Valve in Low-Risk Patients. N Engl J Med. 2 mai 2019;380(18):1695‑705.

5. Rineau E, Lieppe C, Chausseret L, Provenchere S, Mauriat P. Current French anaesthetic practices for Transcatheter Aortic Valve Replacement: a national survey. Anaesth Crit Care Pain Med. 14 févr 2020;

6. He W, Huang R, Shi Q, Liu X, Wang J, Yan M. Bispectral index-guided sedation in transfemoral transcatheter aortic valve implantation: a retrospective control study. J Zhejiang Univ Sci B. avr 2017;18(4):353‑9.

7. Eskandari M, Aldalati O, Dworakowski R, Byrne JA, Alcock E, Wendler O, et al. Comparison of general anaesthesia and non-general anaesthesia approach in transfemoral transcatheter aortic valve implantation. Heart Br Card Soc. 2018;104(19):1621‑8.

8. Stragier H, Dubois C, Verbrugghe P, Jacobs S, Adriaenssens T, Rex S. General Anesthesia Versus Monitored Anesthesia Care for Transfemoral Transcatheter Aortic Valve Implantation: A Retrospective Study in a Single Belgian Referral Center. J Cardiothorac Vasc Anesth. déc 2019;33(12):3283‑91.

9. Konigstein M, Ben-Shoshan J, Zahler D, Flint N, Margolis G, Granot Y, et al. Outcome of patients undergoing TAVR with and without the attendance of an anesthesiologist. Int J Cardiol. 15 août 2017;241:124‑7.

10. O' Sullivan KE, Bracken-Clarke D, Segurado R, Barry M, Sugrue D, Flood G, et al. Is local anesthesia the optimum strategy in retrograde transcatheter aortic valve implantation? A systematic review and meta-analysis. Thorac Cardiovasc Surg. sept 2014;62(6):489‑97.

11. Ehret C, Rossaint R, Foldenauer AC, Stoppe C, Stevanovic A, Dohms K, et al. Is local anaesthesia a favourable approach for transcatheter aortic valve implantation? A systematic review and meta-analysis comparing local and general anaesthesia. BMJ Open. sept 2017;7(9):e016321.

12. Hyman MC, Vemulapalli S, Szeto WY, Stebbins A, Patel PA, Matsouaka RA, et al. Conscious Sedation Versus General Anesthesia for Transcatheter Aortic Valve Replacement: Insights from the National Cardiovascular Data Registry Society of Thoracic Surgeons/American College of Cardiology Transcatheter Valve Therapy Registry. Circulation. 28 nov 2017;136(22):2132‑40.

13. Dehédin B, Guinot P-G, Ibrahim H, Allou N, Provenchère S, Dilly M-P, et al. Anesthesia and perioperative management of patients who undergo transfemoral transcatheter aortic valve implantation: an observational study of general versus local/regional anesthesia in 125 consecutive patients. J Cardiothorac Vasc Anesth. déc 2011;25(6):1036‑43.

14. Adams HSL, Ashokkumar S, Newcomb A, MacIsaac AI, Whitbourn RJ, Palmer S. Contemporary review of severe aortic stenosis. Intern Med J. mars 2019;49(3):297‑305.

15. Lareyre F, Raffort J, Dommerc C, Habib Y, Bourlon F, Mialhe C. A 7-Year Single-Center Experience of Transfemoral TAVI: Evolution of Surgical Activity and Impact on Vascular Outcome. Angiology. juill 2018;69(6):532‑9.

16. Blackstone EH, Suri RM, Rajeswaran J, Babaliaros V, Douglas PS, Fearon WF, et al. Propensity-matched comparisons of clinical outcomes after transapical or transfemoral transcatheter aortic valve replacement: a placement of aortic transcatheter valves (PARTNER)-I trial substudy. Circulation. 2 juin 2015;131(22):1989‑2000.

17. Husser O, Fujita B, Hengstenberg C, Frerker C, Beckmann A, Möllmann H, et al. Conscious Sedation Versus General Anesthesia in Transcatheter Aortic Valve Replacement: The German Aortic Valve Registry. JACC Cardiovasc Interv. 26 mars 2018;11(6):567‑78.

18. Brecker SJD, Bleiziffer S, Bosmans J, Gerckens U, Tamburino C, Wenaweser P, et al. Impact of Anesthesia Type on Outcomes of Transcatheter Aortic Valve Implantation (from the Multicenter ADVANCE Study). Am J Cardiol. 15 avr 2016;117(8):1332‑8.

19. Mayr NP, Wiesner G, Husser O, Joner M, Michel J, Knorr J, et al. Critical adverse events during transfemoral

TAVR in conscious sedation. Is an anesthesiologic support mandatory? Cardiovasc Revascularization Med Mol Interv. 2018;19(6S):41‑6.

20. Jakobsson J, Wickerts L, Forsberg S, Ledin G. Transversus abdominal plane (TAP) block for postoperative pain management: a review. F1000Research. 2015;4.

21. Johns N, O'Neill S, Ventham NT, Barron F, Brady RR, Daniel T. Clinical effectiveness of transversus abdominis plane (TAP) block in abdominal surgery: a systematic review and meta-analysis. Colorectal Dis Off J Assoc Coloproctology G B Irel. oct 2012;14(10):e635-642.

22. Abdallah FW, Halpern SH, Margarido CB. Transversus abdominis plane block for postoperative analgesia after Caesarean delivery performed under spinal anaesthesia? A systematic review and meta-analysis. Br J Anaesth. nov 2012;109(5):679‑87.

23. Maas EHA, Pieters BMA, Van de Velde M, Rex S. General or Local Anesthesia for TAVI? A Systematic Review of the Literature and Meta-Analysis. Curr Pharm Des. 2016;22(13):1868‑78.

24. Lau WC, Shannon FL, Hanzel GS, Safian RD, Abbas AE, Sakwa MP, et al. Transfemoral Transcatheter Aortic Valve Replacement Using Fascia Iliaca Block as an Alternative Approach to Conscious Sedation as Compared to General Anesthesia. Cardiovasc Revascularization Med Mol Interv. 2020;21(5):594‑601.

25. Bianco V, Gleason TG, Kilic A, Lee JS, Schindler JT, Rauso L, et al. Open Surgical Access for Transfemoral TAVR Should Not Be a Contraindication for Conscious Sedation. J Cardiothorac Vasc Anesth. janv 2019;33(1):39‑44.

26. Toppen W, Johansen D, Sareh S, Fernandez J, Satou N, Patel KD, et al. Improved costs and outcomes with conscious sedation vs general anesthesia in TAVR patients: Time to wake up? PLOS ONE. 5 avr 2017;12(4):e0173777.

27. Gestion perioperatoire des traitements chroniques et dispositifs medicaux. Preambule. Ann Fr Anesth Réanimation. déc 2009;28(12):1035‑6.

28. Hamm CW, Möllmann H, Holzhey D, Beckmann A, Veit C, Figulla H-R, et al. The German Aortic Valve Registry (GARY): in-hospital outcome. Eur Heart J. 21 juin 2014;35(24):1588‑98.

29. Wenaweser P, Stortecky S, Heg D, Tueller D, Nietlispach F, Falk V, et al. Short-term clinical outcomes among patients undergoing transcatheter aortic valve implantation in Switzerland: the Swiss TAVI registry. EuroIntervention.

déc 2014;10(8):982‑9.

LISTE DES FIGURES

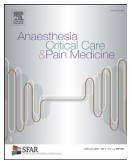
LISTE DES TABLEAUX

TABLE DES MATIERES

ANNEXE

ELSEVIER

SFAR
Société Française d'Anesthésie et de Réanimation



Letter to the Editor

Current French anaesthetic practices for transcatheter aortic valve replacement: A national survey

ARTICLE INFO

Keywords:
Transcatheter aortic valve replacement
Anaesthesia
National survey

1. Introduction

Transcatheter aortic valve replacement (TAVR) has been increasingly performed over the past ten years, due to the broadening of indications and the greater expertise of surgeons and cardiologists [1]. Initially indicated in high-risk patients, recent studies recently reported TAVR interest in patients with intermediate surgical risk [2].

Guidelines governing TAVR procedures mainly focus on the organisation of the centres that carry out this procedure, and patient eligibility criteria [3]. As anaesthetic management of TAVR procedures seems to vary from one centre to another, with no formal guidelines, the present survey was aimed at obtaining the current anaesthetic practices for TAVR in France.

For this purpose, an anonymous survey (Google Forms) was sent to French anaesthesiologist seniors practicing in a TAVR or cardiac surgery unit by email from February to March 2019. The link was also available on the ARCOTHOVA (French Society for Cardiothoracic Anaesthesiologists) website. The survey included 20 questions concerning technical and organisational aspects of anaesthesia for transfemoral TAVR. Answers were collected until April 2019. Data are expressed as medians [interquartile] or numbers (percentage) as appropriate.

Among 439 contacted anaesthesiologists, 124 (28% from 44/53 centres involved in TAVR procedures, 2 (1-3) answers per centre) responded (93 (75%) from university hospital, 17 (14%) from a private centre and 12 (10%) in a non-university hospital). Among them, 113 (91%) reported a main activity in a cardiac unit. In these centres, <5, 5 to 9 and >9 TAVR procedures per week were performed in 19 (15%), 71 (57%) and 34 (27%).

2. Technical aspects

Local anaesthesia associated with sedation was preferentially used by 73 responders (59%) (Table 1). Forty-five responders (36%) stated they never perform general anaesthesia (except for complications).

Remifentanil was the most commonly used drug for sedation (Table 1). Remifentanil and propofol were used alone by 50 (40%) and 11 (9%) of respondents, respectively. Remifentanil in combination with propofol or midazolam was used by 20 (16%) and 9 (7%) respondents, respectively. Hypnosis was used by 11 (9%) respondents, including 7 (6%) in association with an intravenous sedation (Table 1).

Regional anaesthesia was performed by 41 responders (33%). The reasons for not using regional anaesthesia were: a lack of utility (51%), a lack of practice (11%) and potential risks of bleeding (anticoagulation, antiplatelet therapies) (8%).

For postoperative analgesia, paracetamol was given by 119 (96%) respondents. Tramadol, nefopam, and morphine or oxycodone were given by 32 (26%), 26 (21%) and 26 (21%) respondents, respectively.

3. Organisational aspects

For 74 (60%) responders, an anaesthesiologist and a nurse anaesthetist were systematically present (Table 1). The presence of an anaesthesiologist was not systematic for 28 (23%) respondents (8/53 centres in France), and 38 (31%) respondents reported the systematic presence of an anaesthesiologist at the weekly meeting dedicated to TAVR.

Patients were transferred to a post-anaesthesia care unit (PACU) immediately after the intervention for 77 (62%) responders. However, this surveillance was rarely or never done in PACU for the others. After TAVR procedure, the patient was admitted in a continuous care unit (cardiology, cardiac surgery, polyvalent, or in intensive care) for 112 (90%) of respondents.

Finally, 52 (42%) responders were favourable to the absence of an anaesthesiologist during TAVR procedures, but only under certain conditions (for example, a ward procedure allowing selection of patients) for 20 (38%) of them (Table 1). The main argument for unfavourable respondents was the risk of serious complications requiring the immediate presence of an anaesthesiologist in the operating theatre (tamponade, aortic annular rupture, vascular lesions, prosthesis migration).

4. Discussion

In the present survey, local anaesthesia with sedation was mainly preferred for TAVR procedures. However, the presence of an anaesthesiologist during this procedure remains systematic in 36 (82%) responding centres and was warranted by 72 (58%) respondents.

Recent studies confirm a significant decrease in the use of general anaesthesia over the last 10 years, even if general anaesthesia remains used in around 50% of procedures [1]. Data

https://doi.org/10.1016/j.accpm.2019.10.018

Please cite this article in press as: Rineau E, et al. Current French anaesthetic practices for transcatheter aortic valve replacement: A national survey. Anaesth Crit Care Pain Med (2020), https://doi.org/10.1016/j.accpm.2019.10.018

Table 1
Technical and organisational aspects of anaesthesia for TAVR procedures: positive response rate for each item.

Technical aspects	
Most used type of anaesthesia	$n = 124$
Local anaesthesia alone (%)	11
Local anaesthesia plus sedation (%)	59
Regional anaesthesia plus sedation (%)	18
General anaesthesia (%)	6
Other (%)	4
Medications used for sedation	$n = 124$
Remifentanil (%)	65
Propofol (%)	29
Midazolam (%)	22
Dexmedetomidine (%)	5
Sufentanil (%)	5
Ketamine (%)	3
Types of blocks used for regional anaesthesia	$n = 41$
Ilioinguinal block (%)	15
Fascia iliaca block (%)	10
Transversus abdominis plane block (%)	10
Femoral nerve block (%)	6
Genitofemoral nerve block (%)	4
Hypnosis	$n = 124$
Never or almost never used (%)	86
Regularly used, with intravenous sedation (%)	6
Regularly used, even without intravenous sedation (%)	3
Sometimes used (%)	3
Organisational aspects	$n = 124$
Systematic presence of anaesthesiologist or nurse anaesthetist (%)	86
Systematic presence of anaesthesiologist and nurse anaesthetist (%)	60
Presence of an anaesthesiologist	
Regular (%)	96
Systematic (%)	77
Presence of a nurse anaesthesiologist	
Regular (%)	87
Systematic (%)	68
Systematic presence of an anaesthesiologist at the weekly meeting dedicated to TAVR (%)	31
PACU after intervention	
Systematic (%)	52
Often (%)	10
Rarely (%)	21
Never (%)	17
Most often place used for hospitalisation after intervention	
Continuing care unit of cardiology (%)	73
Conventional unit of cardiology (%)	18
Polyvalent continuing care unit (%)	10
Continuing care unit of cardiac surgery (%)	4
Intensive care unit (%)	3
Conventional unit of cardiac surgery (%)	2
Favourable opinion to perform TAVR without systematic presence of an anaesthesiologist	
Yes (%)	16
Yes, but under elective conditions (%)	26
No (%)	58

PACU: post-anaesthesia care unit; TAVR: Transcatheter aortic valve replacement.

from the FRANCE-TAVI registry should soon show rates close to 10% that will confirm the results of our investigation (data not yet published). Indeed, the use of general anaesthesia decreases when TAVR procedures increase [1]. The greater expertise of operators performing TAVR procedures probably led to avoid general anaesthesia. Moreover, local anaesthesia likely allows achieving more TAVR procedures per day. Studies also showed that the use of local anaesthesia with sedation allows a decrease in the per procedure use of catecholamines, and a decrease in the duration of hospitalisation in comparison to general anaesthesia [4]. However, no significant difference on patient outcome has been shown between local anaesthesia plus sedation and general anaesthesia [4], even if this difference tends to be significant in centres where local anaesthesia is preferred [5]. Interestingly, hypnosis seems to be regularly used by 9% of respondents, and studies are needed to assess its potential interests in this specific indication.

The presence of an anaesthesiologist remains systematic in the vast majority of centres and is warranted by most of respondents. Indeed, sedation with remifentanil or/and propofol could induce respiratory depression requiring the rapid intervention of an anaesthesiologist. However, the current increase in TAVR activity could prompt to propose a specific organisation, as the number of anaesthesiologists remains stable. Recent European guidelines did not answer this question yet, but highlight the necessary presence of the anaesthesiologist within a heart team regarding TAVR procedures.

With the increase of TAVR, local anaesthesia with sedation seems to be preferred. However, most of anaesthesiologists warrant a systematic presence of an anaesthesiologist during this procedure as it is indicated in intermediate and high-risk patients with potential serious complications. In this context, interdisciplinary professional recommendations could be required to optimally secure this procedure.

Source of funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Disclosure of interest

The authors declare that they have no competing interest.

Acknowledgements

We would like to thank Dr. Frédéric Pinaud (Department of Cardiac Surgery, CHU Angers) and Dr. Stéphane Delépine (Department of Cardiology, CHU Angers) for their help.

References

[1] Vemulapalli S, Carroll JD, Mack MJ, Li Z, Dai D, Kosinski A, et al. Procedural volume and outcomes for transcatheter aortic-valve replacement. N Engl J Med 2019;380:2541–50.

[2] Duceau B, Bruckert V, Mongardon N, Bouglé A. Transcatheter aortic valve replacement for symptomatic aortic stenosis: the default strategy? Anaesth Crit Care Pain Med 2019;423–4.

[3] Falk V, Baumgartner H, Bax JJ, De Bonis M, Hamm C, Holm PJ, et al. 2017 ESC/EACTS Guidelines for the management of valvular heart disease. Eur J Cardiothorac Surg 2017;52:616–64.

[4] Ehret C, Rossaint R, Foldenauer AC, Stoppe C, Stevanovic A, Dohms K, et al. Is local anaesthesia a favourable approach for transcatheter aortic valve implantation?. A systematic review and meta-analysis comparing local and general anaesthesia. BMJ Open 2017;7:e016321.

[5] Hyman MC, Vemulapalli S, Szeto WY, Stebbins A, Patel PA, Matsouaka RA, et al. Conscious sedation versus general anaesthesia for transcatheter aortic valve replacement: insights from the national cardiovascular data registry society of thoracic Surgeons/American college of cardiology transcatheter valve therapy registry. Circulation 2017;136:2132–40.

Emmanuel Rineau[a,b,*], Chloé Lieppe[a,b], Laurence Chausseret[a], Sophie Provenchère[c], Philippe Mauriat[d]

[a]*Département d'Anesthésie Réanimation, CHU Angers, 4, rue Larrey, 49100 Angers, France*

[b]*Faculté de santé, Université d'Angers, 28 rue Roger-Amsler, 49045 Angers, France*

[c]*Département d'Anesthésie-Réanimation, AP–HP, Hôpital Bichat-Claude Bernard, 46, rue Henri-Huchard, 75018 Paris, France*

[d]*Département d'Anesthésie-Réanimation, Hôpital Haut-Lévêque, CHU de Bordeaux, Avenue Magellan, 33600 Pessac, France*

[*]Corresponding author

E-mail address: erineau@live.fr (E. Rineau).

Available online xxx

Please cite this article in press as: Rineau E, et al. Current French anaesthetic practices for transcatheter aortic valve replacement: A national survey. Anaesth Crit Care Pain Med (2020), https://doi.org/10.1016/j.accpm.2019.10.018

LIEPPE Chloé

Procédures TAVI sous analgo-sédation : évaluation de l'intérêt du TAP block associé à l'anesthésie locale. Une étude rétrospective sur 191 patients.

RÉSUMÉ

Introduction : Avec l'augmentation du nombre de procédures TAVI ces dernières années, les pratiques anesthésiques ont évolué et la sédation, associée à une anesthésie locale ou loco-régionale, est désormais le mode d'anesthésie privilégié par les anesthésistes. Cependant, aucune étude n'a évalué l'utilité de l'ALR en comparaison avec l'AL en cas de sédation seule. Notre but était d'évaluer l'intérêt de la réalisation d'un transverse abdominal plane block (TAP) préopératoire lors des interventions de TAVI sous sédation.

Matériel et méthodes : Cette étude rétrospective monocentrique au CHU d'Angers a inclus tous les patients ayant eu un TAVI par voie transfémorale sous sédation de Janvier à Décembre 2018. Le groupe de patients ayant eu un TAP était comparé avec ceux ayant eu une anesthésie locale (AL). Le critère de jugement principal était l'insuffisance d'anesthésie peropératoire définie par soit la nécessité d'ajout de propofol, soit une anesthésie générale non prévue, soit une sédation avec cible de rémifentanil > 3 ng/mL. Les critères de jugement secondaires étaient la douleur postopératoire, la durée d'intervention, les complications et la durée d'hospitalisation.

Résultats : 191 patients ont été inclus, 126 dans le groupe AL, et 65 dans le groupe TAP. Les populations des deux groupes étaient comparables. Un nombre significativement plus important de patients nécessitait un complément d'anesthésie dans le groupe AL, 111 (89%) vs 34 (55%) dans le groupe TAP, p < 0,01. De plus, les patients du groupe AL présentaient plus souvent une douleur importante (EN > 4) en postopératoire, 14 (11%) vs 1 (1,6%) dans le groupe TAP, p = 0,02. Il n'existait pas de différence significative concernant les paramètres vitaux peropératoires, l'utilisation d'amines, de cristalloïdes, et l'apparition de complications, la durée d'intervention ou la durée d'hospitalisation. Cependant, la nicardipine était utilisée plus fréquemment dans le groupe TAP en peropératoire.

Conclusion : Dans cette étude rétrospective, les patients ayant eu TAP block nécessitaient moins de compléments anesthésiques que les patients eu une anesthésie locale seule pour les procédures TAVI sous sédation. De plus, bien que les niveaux de douleurs étaient faibles, ces patients présentaient moins souvent une douleur postopératoire sévère. Des études prospectives sont nécessaires pour confirmer l'intérêt de l'anesthésie loco-régionale pour les procédures TAVI sous sédation.

Mots-clés : Transcatheter Aortic Valve Implentation, anesthésie locale, anesthésie loco-régionale, Transversus Abdominis Plane-block, sédation

TAVI under sedation: evaluation of adding a TAP block to a local anaesthesia. A retrospective single-center study.

ABSTRACT

Introduction: With the increase in the number of TAVI procedures in recent years, anesthetic practices have evolved and sedation, associated with local or regional anesthesia, is now the preferred type of anesthesia by anesthesiologists in charge of these procedures. However, no study has evaluated the usefulness of regional anesthesia compared to local anesthesia (LA) with sedation alone. Our aim was to assess the value of performing a preoperative transverse abdominal plane block (TAP) during TAVI procedures under sedation.

Material and methods: In this single-center retrospective study at the University Hospital of Angers, all patients who had transfemoral TAVI under sedation from January to December 2018 were included. The group of patients who received a TAP was compared with those of patients who received local anesthesia (LA) only. The primary endpoint was insufficient intraoperative anesthesia defined by either the need to add propofol, the need for unplanned general anesthesia, or the need for a sedation with a remifentanil target > 3 ng / mL. Secondary outcomes were postoperative pain, duration of surgery, complications and length of hospital stay.

Results: 191 patients were included, 126 in the LA group, and 65 in the TAP group. Populations of both groups were comparable. A significantly greater number of patients required additional anesthesia in the LA group, 111 (89%) vs. 34 (55%) in the TAP group, p <0.01. In addition, patients in the LA group more often presented significant pain (EN> 4) postoperatively, 14 (11%) vs. 1 (1.6%) in the TAP group, p = 0.02. There was no significant difference in intraoperative vital parameters, in the use of amines or crystalloids, in the onset of complications, and in durations of the operation or lengths of hospital stay. However, nicardipine was used more frequently in the TAP group intraoperatively.

Conclusion: In this retrospective study, patients who received a TAP block required less additional intraprocedural anesthesia than patients who received local anesthesia only for TAVI procedures under sedation. In addition, although levels of pain were low in both groups, patients with TAP presented less frequently a significant postoperative pain. Prospective studies are needed to confirm the value of regional anesthesia for TAVI procedures under sedation.

Keywords: Transcatheter Aortic Valve Implantation, Local Anesthesia, Regional Anesthesia, Transversus Abdominis Plane-block, sedation

FACULTÉ DE SANTÉ
UNIVERSITÉ D'ANGERS

FACULTÉ
DE SANTÉ
UNIVERSITÉ D'ANGERS