

A Retrospective Analysis of Anaesthesia Management for Geriatric Patients in the Non-Operating Room

ORCID Oytun Dora¹, ORCID Leyla İyilikçi², ORCID Sibel Büyükçoban², ORCID Şule Özbilgin², ORCID Esmâ Adıyaman²

¹Department of Anesthesiology and, Intensive Care Unit, Faculty of Medicine Katip Çelebi University, İzmir, Turkey

²Department of Anesthesiology and Intensive Care, Faculty of Medicine Dokuz Eylül University, İzmir, Turkey

Abstract

BACKGROUND/AIMS: In the present study, we aimed to analyse typically used anaesthesia methods and associated complications in geriatric patients.

MATERIALS AND METHODS: We included 3,012 outpatients who received anaesthesia. The patients' data were obtained from anaesthesia records and analysed retrospectively. Anaesthesia methods (sedation, spinal anaesthesia, general anaesthesia, combined spinal-epidural anaesthesia or monitored anaesthesia care); descriptive statistics (age, weight, operation time, gender, American Society of Anesthesiologists (ASA) classification, drug intake and operation type); and complications (desaturation, injection pain, nausea/vomiting, aspiration, hypotension, bradycardia and perforation) were analysed.

RESULTS: The mean age of the patients who developed intra- and post-operative complications was 73.35±5.88 years. The mean anaesthesia time was 69.98±55.44 min. Hypotension and gender showed significant association. Hypotension was observed in 29 (1.7%) male and 7 (0.5%) female patients. The ASA classification and bradycardia showed significant association; sedation and general anaesthesia were significantly associated with complications.

CONCLUSION: No major complication, morbidity or mortality was observed in any geriatric patient who received anaesthesia outside the operating room. Comorbidities should be detected with appropriate physical, laboratory and radiological examinations and appropriately treated prior to the anaesthesia application. Moreover, the anaesthesia method must be determined based on the results of these examinations and the characteristics of the procedure.

Keywords: Geriatric patients, anaesthesia, complications, sedation

INTRODUCTION

The elderly population (>65 years) has tripled over the past 50 years and it is estimated to increase three-fold over the next 50 years, reaching approximately 72.1 million. In the United States, the number of people >65 years of age is expected to increase nearly two-fold by 2050. A similar trend has been reported in Europe, with the elderly population expected to account for 30% of the total population by 2060.^{1,2} Recently,

outpatient anaesthesia practices for diagnosis and treatment have been implemented in different fields such as endovascular intervention, the placement of automatic implantable cardioverter-defibrillator (AICD), as well as for cerebral and other embolization.³ Due to advances in technology and pharmacological procedures, more complicated and invasive interventions are being increasingly used to manage extremely ill patients, in addition to non-invasive interventions for the diagnosis and treatment of outpatients receiving anaesthesia; this has led to an

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ORCID IDs of the authors: O.D. 0000-0002-4325-070X; L.İ. 0000-0002-9055-7018; S.B. 0000-0002-5756-980X; Ş.Ö. 0000-0002-2940-8988; E.A. 0000-0001-6775-5529.



Address for Correspondence: Şule Özbilgin

E-mail: sozbilginmd@gmail.com

ORCID ID: orcid.org/0000-0002-2940-8988

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increased incidence of specific problems and potential complications.⁴ The most common complications are serious hemodynamic instability and respiratory complications.⁵ In particular, risks and complications associated with anaesthesia increase in geriatric patients [age, comorbid diseases and American Society of Anesthesiologists (ASA) classification]; therefore, such cases warrant more attention and more thorough anaesthesia implementation.^{3,4} The incidence of most major complications was higher for all examined outcomes in the OR population.

In addition, non-invasive surgical alternatives force anaesthesiologists to work in units other than operating rooms to reduce health care costs.³ Therefore, attempts should be made to achieve basic standards for appropriate monitoring and equipment to be used in performing practices outside operating rooms in order not to undermine patient safety.^{3,4}

Physiologically, ageing can alter the pharmacokinetics and pharmacodynamics of anaesthetics. Thus, anaesthesiologists should take into account all age-related changes in organ systems as cardiovascular, pulmonary and central nervous system functions are significant determinants of the outcomes of surgical interventions performed under general and local anaesthesia.³ Additionally, elderly patients have decreased homeostatic reserves, which can compromise their ability to cope with stress and inflammatory processes during the perioperative period. Therefore, anaesthetic methods and drugs should be individualised with consideration to age-related physiological changes.⁴

The aim of this study was to analyse some typically used outpatient anaesthesia methods and related complications in geriatric patients at our hospital.

MATERIALS AND METHODS

The study was approved (approval number: 602-GOA) by the non-interventional ethics Committee of our university. Geriatric patients who were diagnosed and treated during a 9-year period (2003-2011) and who received outpatient anaesthesia were included. Patient data regarding anaesthesia methods were retrieved from their anaesthesia records. Descriptive data, including age, weight, operation time, gender, ASA classification, anaesthetics and complications [desaturation ($SpO_2 < 90$), injection pain, nausea/vomiting, aspiration, hypotension (systolic artery pressure < 90 mmHg or diastolic artery pressure < 60 mmHg), bradycardia (< 50 /min) and perforation], were retrospectively analysed.

Statistical Analysis

The Statistical Package of Social Sciences 15 (SPSS 15.0, Chicago, IL, USA) was used for the data analysis. Statistically significant differences between demographic characteristics and other continuous variables were estimated using Student's t-test. Statistically significant differences between groups and categorical variables were estimated using the chi-square test. The Mann-Whitney U test was used for subgroup analyses of data with non-normal distribution $p < 0.05$ was considered significant.

RESULTS

Among 16,045 patients who received outpatient anaesthesia in our hospital for diagnosis or treatment, 3,012 (18.7%) patients were included as their data were available. The patients' demographic characteristics

were significantly different (Table 1). Overall, 29 types of interventions were performed on these 3,012 patients. The intervention types and the anaesthetics used are shown in Tables 2 and 3, respectively.

The overall rate of complications was 18.5%. Rates of bradycardia, hypotension, desaturation, injection pain, arrhythmia, tachycardia, aspiration and nausea/vomiting were 14%, 3%, 1.9%, 1.7%, 1.6%, 0.3%, 0.1% and 0.1%, respectively. The distribution of the incidence of complications according to ASA classifications was examined (Table 4). ASA class III and IV patients showed significantly higher rates of complications than ASA class I and II patients ($p < 0.007$). When the complications were individually evaluated, ASA class III and IV patients more frequently developed bradycardia, hypotension and arrhythmia (Table 4). A list of the frequently used drugs during anaesthesia management is shown in Table 5.

The total number of patients admitted into clinics was 195. Sixty-six patients had stents inserted due to carotid artery stenosis, 53 patients had endovascular intervention, 34 patients had automatic AICD inserted and 26 patients had cerebral or other embolization (aneurysm, AVM and others). All these patients were admitted into the clinic for 1 day as routine procedure. Here, the specific difference relates to 16 patients with electroconvulsive therapy (ECT). These patients who had ECT applied were psychiatry clinic patients. This patient group had 8 or 10 sessions with ECT administered 3 days per week, so the duration of their admission was as long as their treatment duration.

DISCUSSION

According to the World Health Organization, the ageing of the world population has led to an increase in the rates of cancer, diabetes, cardiovascular diseases, chronic lung diseases and mental disorders, particularly dementia. Comprehensive studies are required to prevent these diseases.⁶

Table 1. Patient demographics (n=3,012)

Features	Range	Average
Age (year)	65-99	75.89±6.06
65-74	1,913	
75-80	744	
>81	355	
Weight (kg)	35-125	71.66±10.01
Duration of anaesthesia (min)	15-480	47.96±34.65
Sex	Number of patients (n)	Percent (%)
Female (%)	1,300	43.2
Male (%)	1,712	56.8
ASA classifications	Number of patients (n)	Percent (%)
ASA I	30	1.0
ASA II	2,179	72.3
ASA III	691	22.9
ASA IV	112	3.7
Interventions	Number of patients (n)	Percent (%)
Elective	2,974	98.7
Emergency	38	1.3

ASA: American Society of Anesthesiologists

Table 2. Distribution of outpatient diagnoses and treatment interventions

Intervention	Number of patients (n)	Percent (%)
Colonoscopy	923	30.6
Endoscopy-colonoscopy	721	23.9
Endoscopic retrograde cholangiopancreatography (ERCP)	487	16.2
Gastroscopy	224	7.4
Endoscopic ultrasonography (EUS)	143	4.7
Percutaneous endoscopic gastrostomy opening	93	3.1
Placing a stent due to carotid artery stenosis	66	2.2
Computed tomography	57	1.9
Endovascular intervention (abdominal and/or thoracic aortic aneurysm)	53	1.8
Double balloon	49	1.6
Prostate biopsy	37	1.2
Placing automatic implantable cardioverter-defibrillator	34	1.1
Cerebral and other embolisation (aneurysm, AVM and others)	26	0.9
Bronchoscopy	20	0.7
Magnetic resonance imaging	18	0.6
Electroconvulsive therapy	16	0.5
Orthopaedic interventions	10	0.3
Hydatid cyst aspiration	9	0.3
Brachytherapy	9	0.3
Pace-maker placement	4	0.1
Cardiac catheterisation with and without electrophysiological examination	2	0.1
Radiotherapy and brachytherapy due to various reasons	2	0.1
Bone marrow biopsy	2	0.1
ERCP + EUS	2	0.1
Liver biopsy	1	0.0
Renal biopsy	1	0.0
Operations for aches	1	0.0
Catheterisation	1	0.0
Double-J catheterisation	1	0.0
Total	3,012	100

Statistically significant differences between hypotension and male gender were noted in this study. This may be explained by excessive cardiovascular practices employed in females, such as endovascular interventions for abdominal aorta and/or thoracic aortic aneurysms; stent placement for carotid artery stenosis; cerebral and other embolisations for aneurysms or arteriovenous malformation; pacemaker placement; AICD placement and cardiac cauterisation with or without electrophysiological examination. Therefore, more cardiovascular interventions may be required in male geriatric patients than in female patients, which may, in turn, lead to more complications.

Emergency interventions for geriatric cases were presumed to be effective when complications occurred. However, we noted that except for nausea/vomiting, no complications related to emergency interventions occurred. Therefore, geriatric patients receiving general anaesthesia have a lower frequency and less severity of post-operative pain and nausea/vomiting than younger patients.⁷

Decreased vocal cord sensitivity against stimuli in elderly patients increases the risk of aspirating stomach content and the possibility for pulmonary complications.⁸ In the present study, nausea/vomiting and aspiration occurred in 2 patients each, which is consistent with previous reports. Interestingly, hypotension was observed only in those geriatric patients who received combined spinal-epidural anaesthesia. In contrast, bradycardia and hypotension were observed in those geriatric patients who received spinal anaesthesia. We speculate that these complications occurred because of the high rates of cardiovascular diseases in geriatric patients who frequently undergo interventions for abdominal aorta and/or thoracic aortic aneurysms and stent placements.

Table 3. Anaesthesia management for geriatric patients

Anaesthesia types	Number of patients (n)	Percent (%)
Sedoanalgesia	2,950	97.9
Spinal anaesthesia + sedation	12	0.4
Combined spinal-epidural anaesthesia + sedation	6	0.2
Spinal anaesthesia without sedation	21	0.7
General anaesthesia	21	0.7
Monitored anaesthesia care without sedation	2	0.1
Total	3,012	100

Table 4. Distribution of complications according to the ASA classifications of patients

Complications	ASA I and II, n (%) [*]	ASA III and IV, n (%) [*]	p-value
Desaturation	18 (0.8)	9 (1.1)	0.431
Injection pain	21 (1.0)	6 (0.7)	0.600
Bradycardia	125 (5.7)	67 (8.3)	0.008
Aspiration	2 (0.1)	0 (0)	-
Nausea/vomiting	1 (0.0)	1 (0.1)	0.462**
Hypotension	18 (0.8)	18 (2.2)	0.001
Tachycardia	2 (0.1)	2 (0.2)	0.290**
Arrhythmia	4 (0.2)	11 (1.4)	0.000**
Total complications	171 (7.7)	87 (10.8)	0.007

^{*}Column percent, ^{**}Fisher's exact test, ASA: American Society of Anesthesiologists

Table 5. Frequently used drugs

Drugs	Number of patients (n)	Percent (%)
Midazolam	2,947	97.8
Flumazenil	2,491	82.7
Propofol	2,660	88.3
Etomidate	230	7.6
Lidocaine	135	4.5
Ketamine	47	1.6
Bupivacaine	37	1.2
Sevoflurane	15	0.5
Thiopental	12	0.4
Isflurane	7	0.2

Careful titration to produce desirable effects of anaesthetics helps to prevent the extension of effect duration and other undesirable side effects.⁹ Short-acting anaesthetics, such as propofol, desflurane, remifentanyl, mivacurium, atracurium and cisatracurium, that do not greatly depend on circulation and lung function may be useful.¹⁰ In this study, midazolam-ketamine (25 mg), only after premedication with midazolam propofol-fentanyl/remifentanyl, etomidate-remifentanyl/fentanyl and ketamine-fentanyl combinations, was used for sedation depending on the patient characteristics and interventions to be carried out.

In interventions where general anaesthesia was implemented, thiopental and etomidate for induction and sevoflurane and isoflurane for maintenance as inhalation agents were used. Since many of these cases were outpatients, flumazenil was used in a majority (82%) of these cases who received midazolam for antagonisation.

Owing to recent advances in anaesthesia procedures as well as surgical and monitoring modalities, the ambulatory setting offers numerous potential advantages for elderly patients undergoing elective surgery.^{3,8} The most common procedures for elderly outpatients can be performed with minimally invasive approaches and safely managed in ambulatory settings. However, age is independently associated with an increased rate of unanticipated hospital admissions within 30 days of ambulatory surgery.^{7,11}

Age and a multitude of comorbidities during the implementation of outpatient anaesthesia increase the risks associated with interventions.⁹ Generally, geriatric patients fall under ASA classes III and IV, which is important information when implementing anaesthesia. Our thorough search of the literature yielded no studies regarding the implementation of outpatient anaesthesia in geriatric patients. The complication rate increases with increasing ASA classification.^{5,12} Moreover, more geriatric patients in this study were ASA class II. Of note, the bradycardia rate significantly increased in geriatric patients in relation to comorbidities (chronic renal failure, carotid artery stenosis and pacemaker placements).

Study Limitations

This study has a few limitations: We included geriatric patients with comorbid diseases. We have ASA classes of these patients who were included in this study. However, there were no results of the comorbidities in the geriatric patients. There were no records of the years of experience of the anaesthesiologists who managed the

anaesthesia. Another limitation of this study was that we did not find any information regarding the admission day to the hospital or the re-planned hospital admission rates.

CONCLUSION

The ambulatory setting offers potential advantages for elderly patients undergoing elective surgery owing to advances in both surgical and anaesthetic modalities, which in turn can result in a more rapid recovery, fewer complications, greater patient satisfaction and lower medical care cost. In this study, we presented our experiences with anaesthesia in geriatric patients. No major complication, morbidity or mortality was observed in any geriatric patient who underwent outpatient anaesthesia. Outpatient anaesthesia was implemented through various methods, and we observed increased rates of routine anaesthesia practices in this group for both diagnosis and treatment. Therefore, before implementing outpatient anaesthesia, it is crucial to evaluate pre-anaesthetics administered to the patients, to know the patients' psychological and anatomical characteristics, to know the features of the best anaesthesia method and to inform the patients and their relatives.

ETHICS

Ethics Committee Approval: The study was approved (decision no: 602-GOA) by the non-interventional ethics Committee of our university.

Informed Consent: Patient data regarding anaesthesia methods were retrieved from their anaesthesia records.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: O.D., Design: O.D., Supervision: L.I., Data Collection and/or Processing: S.B., Ş.Ö., Analysis and/or Interpretation: S.B., Ş.Ö., Literature Search: S.B., Ş.Ö., E.A., Writing: O.D., Critical Review: L.I.

DISCLOSURES

Conflict of Interest: No conflict of interest was declared by the authors.

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